WSDOT/WSF
Contract No. 009338
Mukilteo Ferry Terminal (Phase 2) - Marine Structures
MCC #: 20-19-013

This submittal is a Resubmittal: Yes or No
This submittal contains a substitution: Yes or No

Date: 12/21/2021
Subcontractor/Supplier: Jesse Engineering/Dalton Electric

SM-250A OHL Electrical O&M Manual

Reviewed by K. Brock 12/28/2021. Revise and Resubmit.

General Notes:
1.Please remove all extraneous information and documentation regarding components that is not part of the equipment.

2. Show only pages that have the part number of the component and pages containing technical information about the applicable component. Full product line catalogs should not be provided, just the perinent catalog pages.
3. Highlight in the provided information the part numbers on the product data sheet matching the part provided and cross out not pertinent information. See pdf page 1149 for example..
4. Remove all Foreign Language information (e.g. pdf pages 1106-1137) and if not already present, english translation of said pages.

5.BOM's for all components have errors such as incorrect part numbers, incomplete part numbers, missing product information, incorrect quantities, incompatible parts for the function (a 1/10th amp fuse in a minimum 2 amp circuit), etc. Please review BOM's and provide the part numbers for the actual equipment provided.

Manson Construction Co.
5209 East Marginal Way South
Seattle, WA 98134

Manson Construction Co. has reviewed the attached submittal and certifies it is correct and in strict conformance with the Contract Documents.

Signed: Date: 12/21/2021

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

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OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

SECTION 1: OVERVIEW

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

SECTION 1: OVERVIEW
SUBSECTION 1.1: GENERAL INFORMATION

1 GENERAL INFORMATION

1.1 General Contractor Information

Manson Construction Co.
5209 E. Marginal Way So.
Seattle, WA 98124

Representative: Kelli Rider- Project Engineer
Tel: 206-762-0850
Email: krider@mansonconstruction.com

1.2 Subcontractor Information

Control Panels

Jesse Engineering Co.
1840 Marine View Drive
Tacoma, WA 98422

Representative: Alex Perez-Project Manager
Tel: 253-552-1517
Email: aperez@jesse-co.com

Electrical System
Dalton Electric Company
3511 132nd Street SW, Suite 4
Lynnwood, WA 98087

Representative: Mike Gortner
Tel: 425-591-2267
Email: mike@daltonelectriccompany.com

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

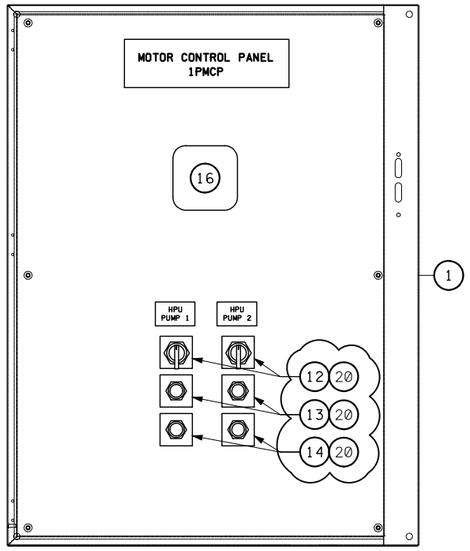
SECTION 1: OVERVIEW
SUBSECTION 1.2: SYSTEM DESCRIPTION

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL
OHL ELECTRICAL SYSTEM

SECTION 2: CONTROL PANELS

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL
OHL ELECTRICAL SYSTEM

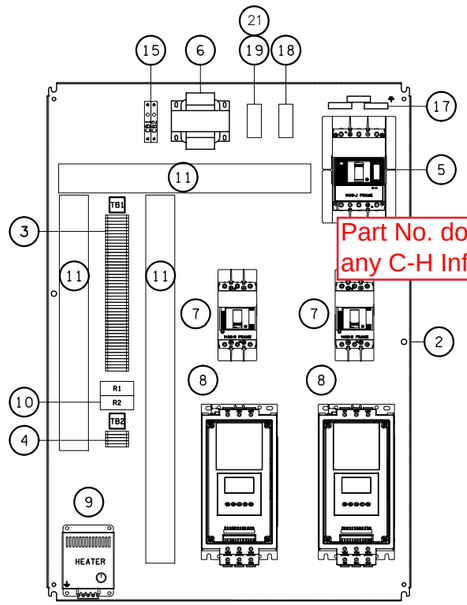
SECTION 2: CONTROL PANELS
SUBSECTION 2.1: SHOP DRAWINGS



1PMCP FRONT VIEW

0 1

SCALE ¾″ = 1′-0″



1PMCP BACKPANEL LAYOUT

0 1

SCALE ¾″ = 1′-0″

BILL OF MATERIAL 1PMCP

PC#	QTY	DESCRIPTION	SPECIFICATION	MFGR / PART NUMBER	NAMEPLATE LETTERING
1	1	DISCONNECT ENCLOSURE	WALL MOUNTED, DISCONNECT ENCLOSURE, 42x32x10 INCHES, NEMA 12	HOFFMAN A42SA3210LP	MOTOR CONTROL PANEL 1PMCP
2	1	BACK PANEL	CONDUCTIVE STEEL PANEL	HOFFMAN A42P30G	
3*	50	TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, FEED THROUGH, 20A, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 3031364	TB1
4*	5	GROUNDING TERMINALS	IEC SCREW TERMINAL, SINGLE CIRCUIT, GROUNDING, #14-#4 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 3036165	TB2
5	1	MAIN CIRCUIT BREAKER	150AMP, 3 POLE, MOLDED CASE CIRCUIT BREAKER WITH LOAD SIDE POWER DISTRIBUTION TERMINALS (4 TERMINALS PER PHASE MAXIMUM), AUXILIARY CONTACT, FLEXIBLE CABLE OPERATOR COMPATIBLE WITH DISCONNECT ENCLOSURE	CUTLER HAMMER JGE3150FAG 3TA250FJ3 AUX1A1BPK JHMFS04	
6	1	CONTROL POWER TRANSFORMER	500VA, 480/120VAC PRI/SEC, INDUSTRIAL CONTROL TRANSFORMER WITH PRIMARY AND SECONDARY FUSE PROTECTION	CUTLER HAMMER C0500E2AFB	
7	2	MOTOR CIRCUIT PROTECTOR	MOTOR CIRCUIT PROTECTOR TYPE MOLDED-CASE CIRCUIT BREAKER SIZED ACCORDING TO NEC BASED ON MOTOR NAMEPLATE FLA, AUX CONTACT	ALLEN BRADLEY 140MG-H8P-C70	
8	2	MOTOR STARTER	SOLID STATE, SOFT START MOTOR STARTER, 480 VAC, 40 AMP MINIMUM, ADJUSTABLE ACCELERATION RAMP, OVERLOAD PROTECTION, STATUS CONTACTS FOR OVERLOAD AND UP TO SPEED STATUS	ALLEN BRADLEY SMC-FLEX CONTROLLER 150-F60NDB	
9	1	CABINET HEATER	100 WATT, 120VAC, THERMOSTATICALLY CONTROLLED, FAN DRIVEN HEATER	HOFFMAN DAH1001A	
10	3	RELAY	15A DPDT MINIATURE RELAY COMPLETE WITH RAIL, RELAY SOCKET AND HOLD DOWN SPRING	IDEC RELAY: RJ2S-C-A120 BASE: SJ2S-05B	
11	AS REQ'D	WIREWAY FOR DIGITAL/POWER WIRING	WIRE DUCT 2"Wx2"H AND COVER - GRAY	TY-DUCT TY2X2G	
12*	2	SELECTOR SWITCH	HEAVY DUTY, TYPE 4X, 30MM, THREE POSITION HAND-OFF-AUTO SELECTOR SWITCH, CONTACTS AS SHOWN ON SCHEMATIC	ALLEN BRADLEY 800H-JRX2B	HAND-OFF-AUTO
13*	2	STOP PUSHBUTTON	HEAVY DUTY, TYPE 4X, 30MM,NON ILLUMINATED PUSHBUTTON, RED, 1NO/1NC CONTACT	ALLEN BRADLEY 800H-AR6A	STOP
14*	2	START PUSHBUTTON	HEAVY DUTY, TYPE 4X, 30MM,NON ILLUMINATED PUSHBUTTON, GREEN 1NO/1NC CONTACT	ALLEN BRADLEY 800H-AR1A	START
15	2	HIGH-DENSITY MINIATURE CIRCUIT BREAKERS	THERMAL-MAGNETIC TYPE SUPPLEMENTARY OVERCURRENT PROTECTIVE DEVICES, SIZES SHOWN ON SCHEMATIC	ALLEN BRADLEY 1492-GH030	
16	1	POWER METER	MULTIFUNCTION ELECTRICAL POWER METER FOR 3 PHASE, 480VAC POWER SYSTEMS. THE METER SHALL HAVE AN ACCURACY OF +/- 0.1% OR BETTER FOR VOLTS AND AMPS. THE METER SHALL PROVIDE TRUE RMS MEASUREMENTS OF VOLTAGE PHASE TO PHASE, CURRENT PER PHASE.	ELECTRO INDUSTRIES/ GAUGETECH MODEL SHARK 100	
17	2	CURRENT TRANSFORMERS	SOLID CORE CURRENT TRANSFORMER	PCS 16-200-00	
18	1	TERMINAL BLOCK	DISCONNECT TERMINAL BLOCK 500V 24A	PHOENIX 3212139	
19	1	FUSE BLOCK	3 POLE FUSE BLOCK 600V 30A	EATON CHCC3I	F1-3
20	6	LEGEND PLATES	LEGEND PLATES	ALLEN BRADLEY 800T-W100J	2x HAND-OFF-AUTO 2x STOP 2x START
21	3	FUSE	600V FAST ACTING FUSE 1/10A	EATON FTK-R-1/10	F1-3

*PART NUMBER UPDATED FROM ORIGINAL CONSTRUCTION DRAWINGS

Part No. does not match any C-H Info Provided.

No info given for this product in provided documentation

Part No. does not match any Eaton Info Provided.

Provide A-B Part no. for each type of Legend Plt.

Fuse sizing is not correct for transformer primary or secondary protection. Please show actual fuses provided

No info given for this product in provided documentation

Part No. not found in provided information

Part No. not found in provided information

Part No. not found in provided information. No Cam Operator Info.

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		
B	AS-BUILT REVISION.	1/27/21	DMM/RW
A	PIECE 2 PART NUMBER WAS A42P32G IN ERROR.	8/11/20	DMM/RW

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN	P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PMCP	DWG NO. 2021402
CHECKED	D SHULL		SALES ORDER NO. 20214
ENGINEER	R WALDEN		SHEET 1 OF 3
DATE	12/18/19		D SIZE
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ERGOSYNCH

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SUBMITTAL DATE: 12/22/17						WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. QQ****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

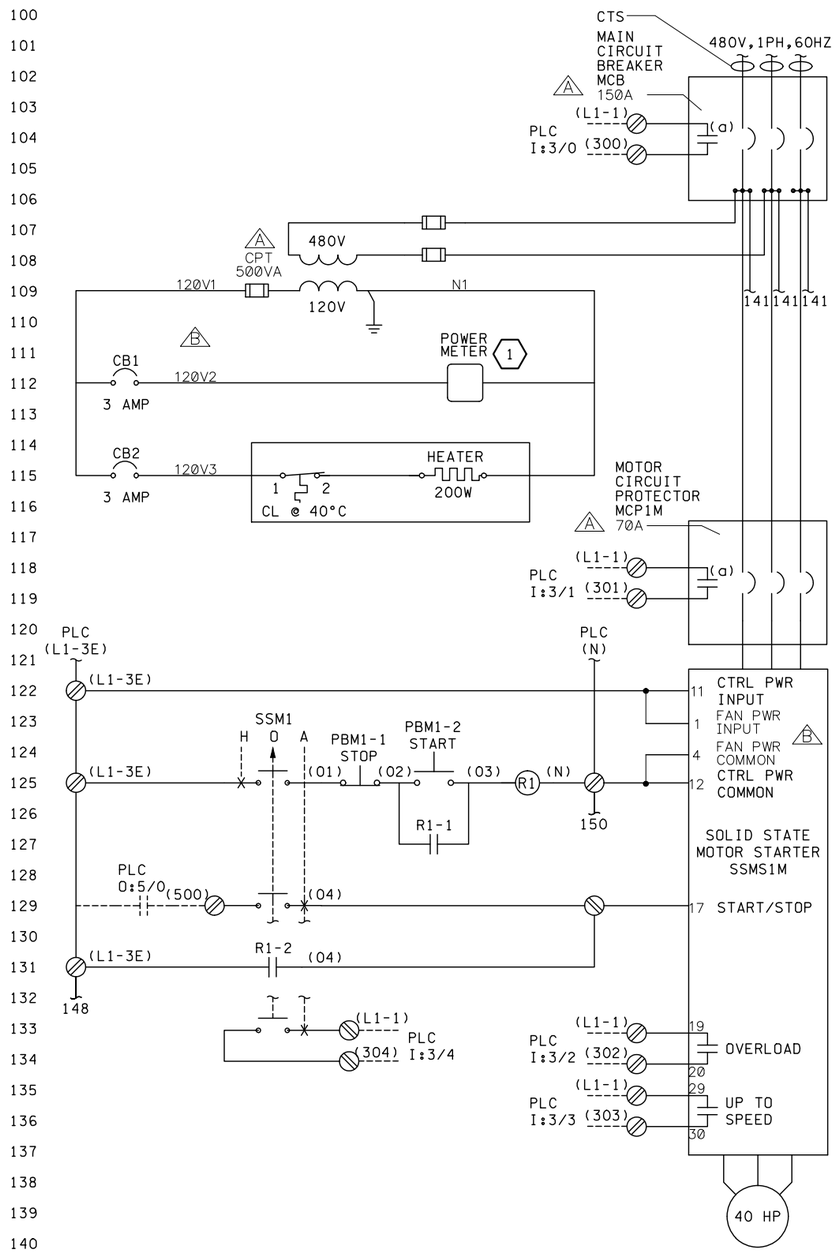
MARC KNICKERBOCKER — STATE OF WASHINGTON — 41469 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

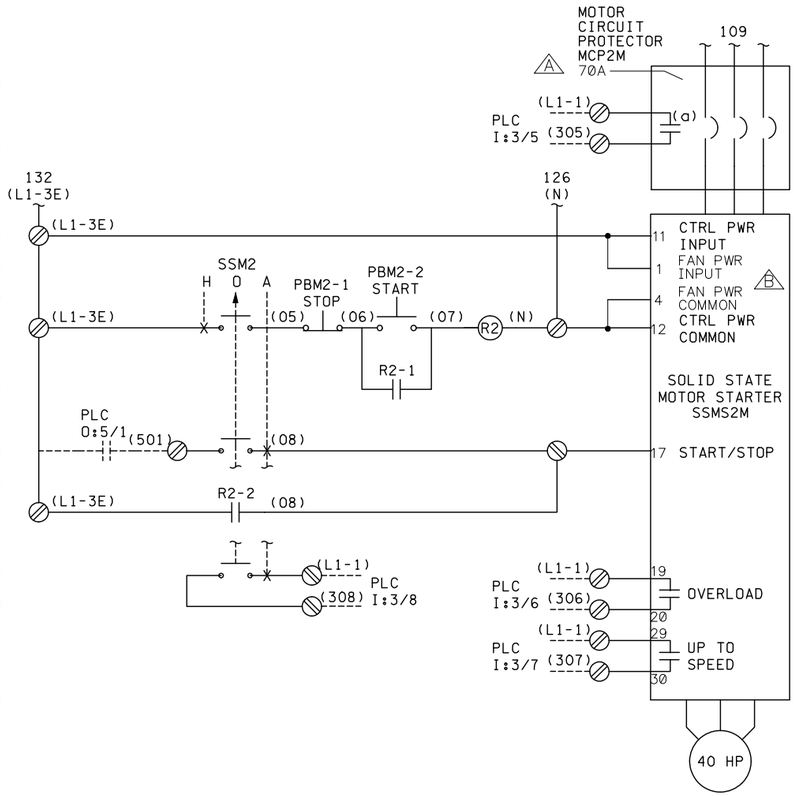
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION
SLIP 1 OHL MOTOR CONTROL PANEL (1PMCP) LAYOUT AND BOM

EP14.00

SHEET 810 OF 1521 SHEETS





CONSTRUCTION NOTES:

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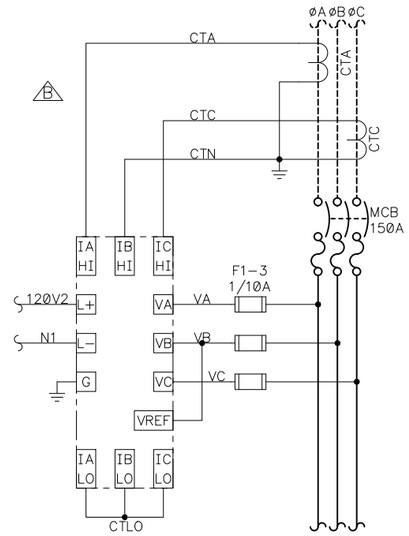

SCHEMATIC SHEET 1

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		
B	AS-BUILT REVISION.	1/27/21	DMM/RW
A	ADD VALUES TO MCB, XFMR, MCP1M, AND MCP2M.	8/11/20	DMM/RW

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PMCP	DWG NO.: 2021402
CHECKED: D SHULL		SALES ORDER NO.: 20214
ENGINEER: R WALDEN		SHEET 2 OF 3
DATE: 12/18/19		SCALE 1:1 — D SIZE
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ERGOSYNCH

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ENTERED BY: J. MCNABB	12/22/17					REGION NO.	STATE
CHECKED BY: S. HARRIS	12/22/17					10	WASH
MAR PROJ ENGR: C. TORRES						JOB NUMBER	
DIR TERM ENGR: N. MCINTOSH						14W121	
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		CONTRACT NO.	
						00****	

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21489 — REGISTERED PROFESSIONAL ENGINEER
12/15/2017

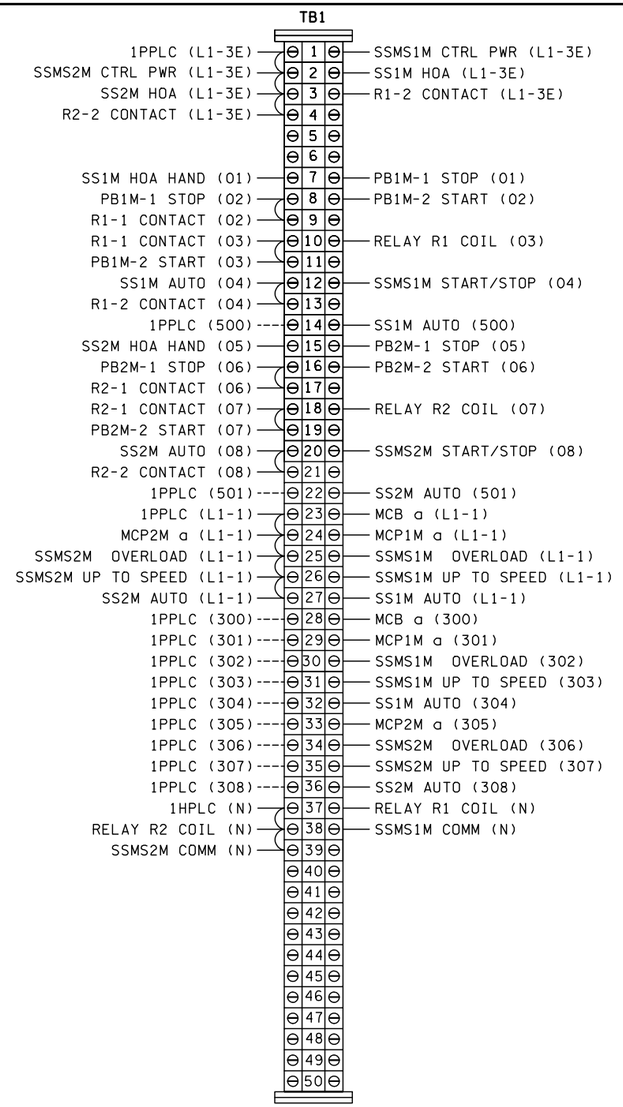
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL MOTOR CONTROL PANEL (1PMCP) SCHEMATIC

EP14.01

SHEET 811 OF 1521 SHEETS



TERMINAL WIRING

ERGOSYNCH

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PMCP	DWG NO.: 2021402	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 3 OF 3	
DATE: 12/18/19		SCALE 1:1	D SIZE
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ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121	
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****	
MAR PROJ ENGR: C. TORRES							
DIR TERM ENGR: N. MCINTOSH							
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY			

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21489 — REGISTERED PROFESSIONAL ENGINEER
12/15/2017

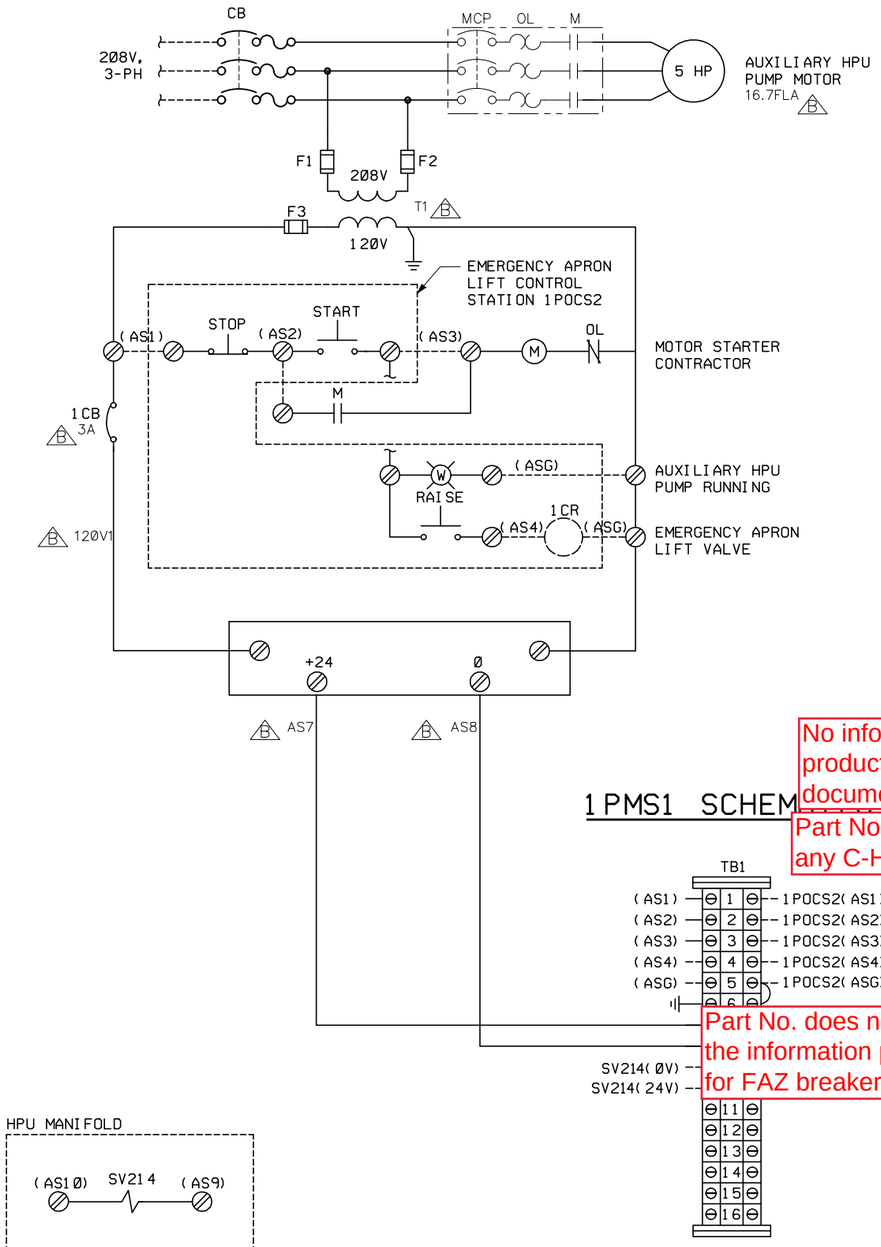
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL MOTOR CONTROL PANEL (1PMCP) TERMINAL WIRING

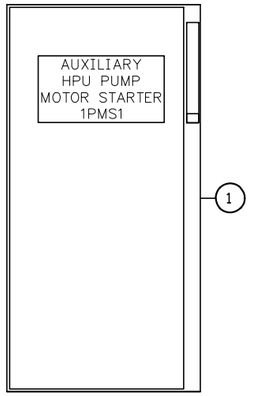
EP14.02

SHEET 812 OF 1521 SHEETS



1PMS1 SCHEM

1PMS1 TERMINAL WIRING



1PMS1 FRONT VIEW

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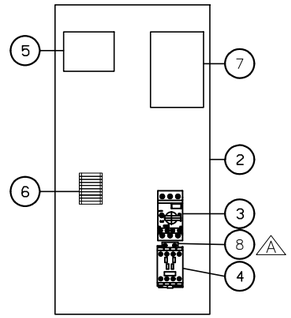
SCALE 1" = 1'-0"



1PMS1 BACKPANEL LAYOUT

0 1
SCALE 1" = 1'-0"

BILL OF MATERIAL 1PMS1

PC#	QTY	DESCRIPTION	SPECIFICATION	MFGR / PART NUMBER	NAMEPLATE LETTERING
1	1	COMBINATION MOTOR STARTER	OVERSIZE ENCLOSURE, NEMA 4X, 316 SS	HOFFMAN CDSC24228SS6	AUXILIARY HPU PUMP MOTOR STARTER 1PMS1
2	1	BACK PANEL	STEEL BACKPANEL	CP2420G	
3	1	MOTOR CIRCUIT PROTECTOR	MOTOR CIRCUIT PROTECTOR 14.5-20A 3 POLE	ALLEN BRADLEY 140M-D8E-C20	
4	1	CONTACTOR	~~FULL VOLTAGE,~~ NON-REVERSING AC MAGNETIC CONTACTOR, 30A 3 POLE, WITH 120V COIL FOR 208V 5HP, 3-PHASE MOTOR	ALLEN BRADLEY 100-C30D01	
5	1	CONTROL POWER ~~TRANSFORMER~~	208-120V CONTROL POWER TRANSFORMER WITH PRIMARY AND SECONDARY FUSE BLOCK	CUTLER-HAMMER C0500E3AFB	
6*	1	TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, FEED THROUGH, 20A, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 364	TB1
7*	1	MAIN CIRCUIT BREAKER	INCOMING CIRCUIT BREAKER, 30A WITH AUXILLIARY CONTACT AND CABLE HANDLE OPERATOR	CUTLER-HAMMER EGE3030FFG EHMFS03	
A 8	1	MOTOR CIRCUIT PROTECTOR CONNECTING MODULE	MOTOR CIRCUIT PROTECTOR CONNECTING MODULE	ALLEN BRADLEY 140M-D-PNC37	
B 9	1	POWER SUPPLY	24VDC 80W	ALLEN BRADLEY 1606-XLE80E	
B ~~10~~		~~CIRCUIT BREAKER~~	~~1 POLE 3A~~	FAZ-C03/1-NA-SP	

*PART NUMBER UPDATED FROM ORIGINAL CONSTRUCTION DRAWINGS

No info given for this product in provided documentation

Part No. does not match any C-H Info Provided.

Part No. does not match the information provided for FAZ breakers.

No info given for this product in provided documentation

REV.	DESCRIPTION	DATE	APPROVED
A	AS-BUILT REVISION.	12/26/21	DMM/RW
A	PIECE 3 PART NUMBER WAS 140M-C2E-C23, ADD PIECE 8.	8/24/20	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN	P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL PUMP STARTER PANEL 1PMS1	DWG NO. 2021403
CHECKED	D SHULL		SALES ORDER NO. 20214
ENGINEER	R WALDEN		SHEET 1 OF 1
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ERGOSYNCH

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ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER [redacted]
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH		[redacted]IONS 10/30/1[redacted]				
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21480 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

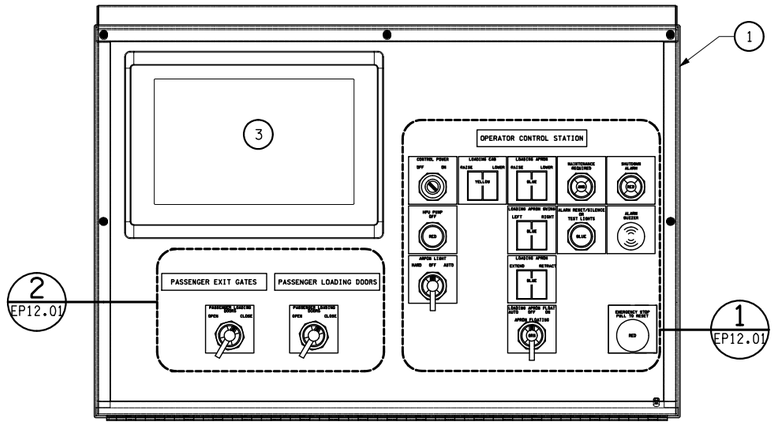
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL AUXILIARY HPU PUMP MOTOR STARTER (1PMS1) LAYOUT BOM

EP14.03

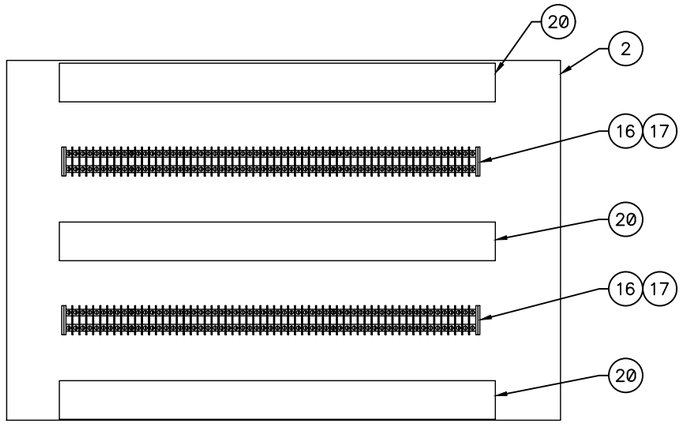
SHEET 459 OF 484 SHEETS



OPERATOR CONTROL STATION (1POCS1) FRONT VIEW

0 1

SCALE IN FEET



BACKPANEL LAYOUT

0 1

SCALE IN FEET

BILL OF MATERIAL 1POCS1

PC#	QTY	DESCRIPTION	SPECIFICATION	MFGR / PART NUMBER	
1	1	ENCLOSURE	CONSOLET, 30-DEGREE 30x20 INCH WORK SURFACE, CONTINUOUS HINGE COVER, STAINLESS STEEL	HOFFMAN C20C30SS	OPER 1POC
2*		PANEL	PANEL	HOFFMAN A30P20G	
3	1	OPERATOR INTERFACE TOUCHSCREEN	OPERATOR INTERFACE GRAPHIC TERMINAL, TOUCH SCREEN, 12 INCH DISPLAY, COLOR, 120VAC, ETHERNET COMMUNICATIONS AND PROGRAMMING SOFTWARE (FURNISH TO THE ENGINEER)	ALLEN BRADLEY 2711P PANELVIEW PLUS 7 PERFORMANCE 2711P-T12W22A9P, FACTORY TALK VIEW STUDIO MACHINE EDITION (FURNISH TO THE ENGINEER)	
4	1	KEYED SELECTOR SWITCH	30MM 2-POSITION WATERTIGHT/ OIL TIGHT SELECTOR SWITCH, CYLINDER LOCK OPERATOR, MAINTAINED AND KEY REMOVAL IN BOTH POSITIONS CONTACTS AS REQUIRED	ALLEN BRADLEY 800T-H33	CONTROL POWER OFF-ON
5	4	DUAL SQUARE PUSHBUTTON	30.5MM SQUARE MULTIFUNCTION WATERTIGHT/OILTIGHT TWO BUTTON MOMENTARY PUSHBUTTONS WITH MECHANICAL INTERLOCK. CONTACTS AS REQUIRED	EATON E30AC	LOADING CAB RAISE-LOWER LOADING APRON RAISE-LOWER LOADING APRON SW LEFT-RIGHT LOADING APRON EXTEND-RETRACT
6	2	DUAL SQUARE PUSHBUTTON	TYPE B LENSES FOR 30.5MM SQUARE OPERATORS, YELLOW	EATON E30KB400	LOADING CAB RAISE-LOWER
7	6	DUAL SQUARE PUSHBUTTON	TYPE B LENSES FOR 30.5MM SQUARE OPERATORS, BLUE	EATON E30KB900	LOADING APRON RAISE-LOWER LOADING APRON SW LEFT-RIGHT LOADING APRON EXTEND-RETRACT
8	8	DUAL SQUARE PUSHBUTTON	CONTACT BLOCK FOR 30.5MM SQUARE OPERATORS, 1 N.O.	EATON E30KLA1	LOADING CAB RAISE-LOWER LOADING APRON RAISE-LOWER LOADING APRON S LEFT-RIGHT LOADING APRON EXTEND-RETRACT
9	2	PILOT LIGHTS	30MM WATERTIGHT/ OIL TIGHT LED PILOT LIGHTS, 120VAC, LENS COLOR AS SHOWN ON DRAWINGS	ALLEN BRADLEY 800H-QH2R (RED) 800H-QH2A (YEL)	MAINTENANCE REQUIRED SHUTDOWN ALARM
10	1	PANEL MOUNT AUDIBLE SIGNAL DEVICE	30MM SMALL ENCLOSED ALARM, 72dB OUTPUT, 120VAC	ALLEN BRADLEY 855P-B10SE22	ALARM BUZZER
11*	2	PUSHBUTTON	30MM NEMA 4X MOMENTARY NON-ILLUMINATED PB UNIVERSAL, WITH 1NO, 1NC CONTACT	ALLEN BRADLEY 800H-AR7A (BLU) 800H-AR6A (RED)	ALARM RESET/SILE HPU PUMP OFF
12*	1	ILLUMINATED SELECTOR SWITCH	30MM WATERTIGHT/ OILTIGHT ILLUMINATED SELECTOR SWITCH, 3-POSITION MAINTAINED, GLOVED HAND KNOB, 120VAC LIGHT, COLOR AS SHOWN ON DRAWINGS, CONTACTS AS REQUIRED	ALLEN BRADLEY 800H-2JRRH2KB7AX	LOADING APRON FL AUTO-OFF-ON
13*	1	HAND-OFF-AUTO SELECTOR SWITCH	30MM WATERTIGHT/OILTIGHT NON-ILLUMINATED SELECTOR SWITCH, 3-POSITION MAINTAINED, GLOVED HAND KNOB, CONTACTS AS REQUIRED	ALLEN BRADLEY 800H-JRX91B	APRON LIGHT HAND-OFF-AUTO
14*	2	TWO-POSITION SELECTOR SWITCH	30MM WATERTIGHT/ OILTIGHT NON-ILLUMINATED SELECTOR SWITCH, 2 POSITION MAINTAINED, GLOVED HAND KNOB, CONTACTS AS REQUIRED	ALLEN BRADLEY 800H-HR17A	PASSENGER EXIT GATES OPEN CLOSE PASSENGER LOADING EAST DOORS OPEN CLOSE
15*	1	EMERGENCY STOP PUSHBUTTON	30MM WATERTIGHT/OILTIGHT ILLUMINATED PUSH-PULL MUSHROOM OPERATOR PUSHBUTTON, 120VAC LIGHT, RED COLOR, CONTACTS AS REQUIRED	ALLEN BRADLEY 800H-FRXTQH2RA1	EMERGENCY STOP
16*	AS REQ'D	TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, FEED THROUGH, 20A, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 364	TB1,TB2
17*	5	GROUNDING TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, GROUNDING, 20A, #22-12#AWG WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 380	TB3
18	14	LEGEND PLATE	LEGEND PLATES	ALLEN BRADLEY 800T-W100J	SEE LEGEND PLATE DETAILS
19	1	LEGEND PLATE	LEGEND PLATE FOR EMERGENCY STOP	ALLEN BRADLEY 800H-W797A	
20	AS REQ'D	WIRE DUCT	2"Wx3"H AND COVER, GRAY	TY-DUCT TY2x3WPG6	

*PART NUMBER UPDATED FROM ORIGINAL CONSTRUCTION DRAWINGS

Part No. reflects a switch with no contacts. Schematic shows 1 contact. Please revise.

No info given for this product in provided documentation

No info given for this product in provided documentation

No info given for this product in provided documentation

No info given for this product in provided documentation

Part No. missing information. No Cam Operator Info. Additionally, switch is a maintained switch and 91 denotes a spring return from both switch

Part No. not correct for SW.

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1POCS1	DWG NO.: 2021404	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 1 OF 3	
DATE: 12/18/19		ACAD FILENAME: 2021404.dwg	SCALE 1:1 — D SIZE

ERGOSYNCH

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SUBMITTAL DATE: 12/22/17	JMCNABB					
DESIGNED BY: M. KNICKERBOCKER	12/22/17					WA-2017-007-00
ENTERED BY: J. MCNABB	12/22/17					REGION NO. / STATE: 10 WASH
CHECKED BY: S. HARRIS	12/22/17					JOB NUMBER: 14W121
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						CONTRACT NO.: 00****
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21489 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

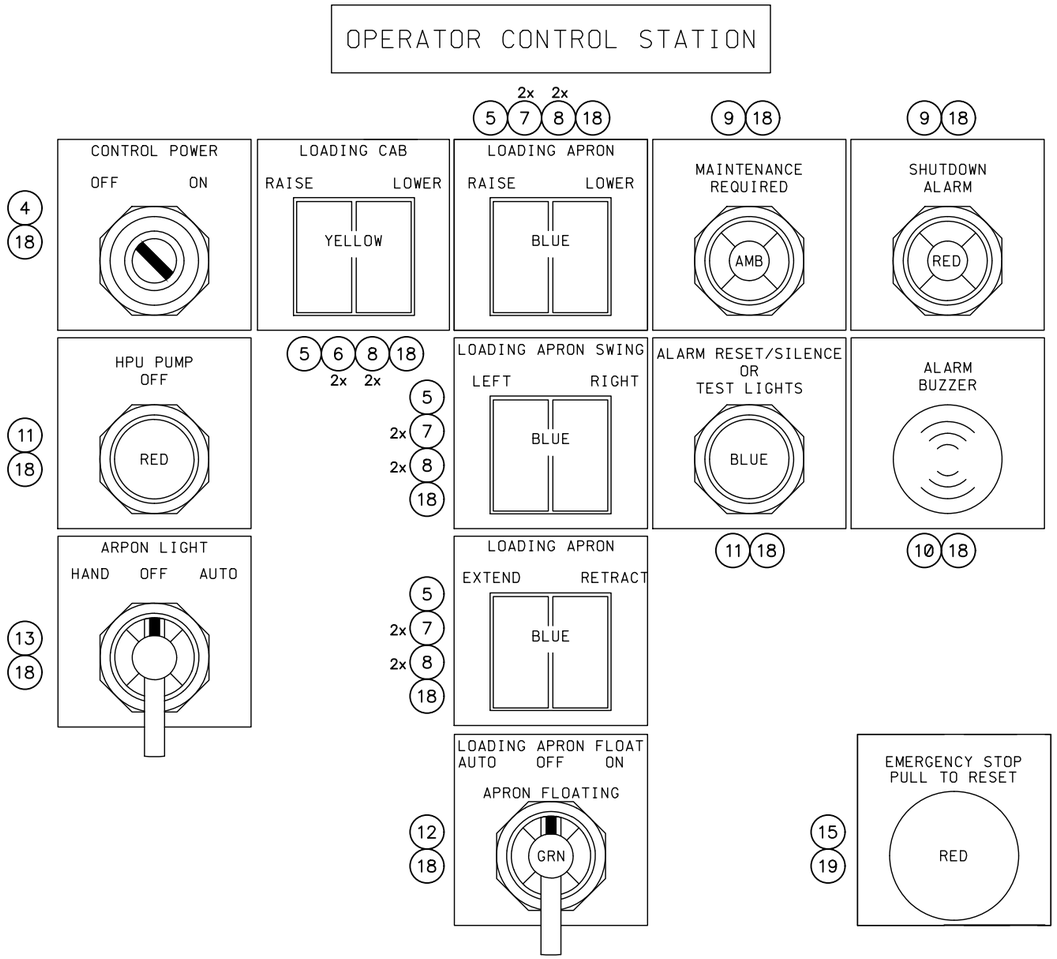
SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL OPERATOR CONTROL STATION (1POCS1) LAYOUT

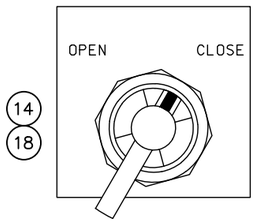
EP12.00

SHEET 806 OF 1521 SHEETS

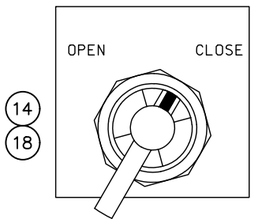
OPERATOR CONTROL STATION



PASSENGER EXIT GATES



PASSENGER LOADING EAST DOORS



2 EP12.00 DETAIL

1 EP12.00 DETAIL

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1POCS1	DWG NO.: 2021404	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 2 OF 3	
DATE: 12/18/19		SCALE 1:1	D SIZE
ACAD FILENAME: 2021404.dwg			

ERGOSYNCH

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SUBMITTAL DATE: 12/22/17	JMCNABB						
DESIGNED BY: M. KNICKERBOCKER	12/22/17					WA-2017-007-00	
ENTERED BY: J. MCNABB	12/22/17					REGION NO. 10	STATE WASH
CHECKED BY: S. HARRIS	12/22/17					JOB NUMBER 14W121	
MAR PROJ ENGR: C. TORRES							
DIR TERM ENGR: N. MCINTOSH						CONTRACT NO. 00****	
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY			

MARC KNICKERBOCKER — STATE OF WASHINGTON — 41489 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION
SLIP 1 OHL OPERATOR CONTROL STATION (1POCS1) DETAILS

EP12.01

SHEET 807 OF 1521 SHEETS

PASSENGER EXIT GATES OPEN-CLOSE

(L1-1) (214)

EAST PASSENGER LOADING DOORS OPEN-CLOSE

(L1-1) (215)

APRON LIGHT HAND-OFF-AUTO

(114) (L1-1)

(115) (L1-1)

HPU PUMP OFF

(113) (L1-1)

CONTROL POWER OFF-ON

(112) (L1-1)

(L1-6) (N) (G)

HMI OPERATOR INTERFACE

LOADING CAB RAISE-LOWER

(L1-1) (101)

(L1-1) (102)

LOADING APRON FLOAT AUTO-OFF-ON

(510) (N)

(109) (L1-1)

(110) (L1-1)

LOADING APRON EXTEND-RETRACT

(105) (L1-1)

(106) (L1-1)

LOADING APRON SWING LEFT-RIGHT

(107) (L1-1)

(108) (L1-1)

LOADING APRON RAISE-LOWER

(103) (L1-1)

(104) (L1-1)

ALARM RESET/SILENCE TEST LIGHTS

(L1-1) (111)

MAINTENANCE REQUIRED

(N) (A) (511)

EMERGENCY STOP PULL TO RESET

(509) (N)

(L1-3E) (L1-3)

(100) (L1-1)

ALARM BUZZER

(508) (N)

SHUTDOWN ALARM

(512) (N)

TB1

(100) (101) (102) (103) (104) (105) (106) (107) (108) (109) (110) (111) (112) (113) (114) (115) (214) (215) (509) (510) (511) (512) (L1-1) (L1-1) (L1-1) (L1-3) (L1-3E) (L1-6) (N) (N) (508) A

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

1PPLC(100) 1PPLC(101) 1PPLC(102) 1PPLC(103) 1PPLC(104) 1PPLC(105) 1PPLC(106) 1PPLC(107) 1PPLC(108) 1PPLC(109) 1PPLC(110) 1PPLC(111) 1PPLC(112) 1PPLC(113) 1PPLC(114) 1PPLC(115) 1PPLC(214) 1PPLC(215) 1PPLC(509) 1PPLC(510) 1PPLC(511) 1PPLC(512) 1PPLC(L1-1) 1PPLC(L1-1) 1PPLC(L1-1) 1PPLC(L1-3) 1PPLC(L1-3E) 1PPLC(L1-6) 1PPLC(N) 1PPLC(N) 1PPLC(508)

TB2

HMI(G) 1PPLC(G)

GROUNDING TERMINAL (TYP)

DOOR(G)

ERGOSYNCH

REV.	DESCRIPTION	DATE	APPROVED
A	AS-BUILT REVISION.	1/27/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.

ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS

8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: **MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1POCS1**	DWG NO. **2021404**	
CHECKED: D SHULL		SALES ORDER NO. **20214**	
ENGINEER: R WALDEN		SHEET 3 OF 3	
DATE: 12/18/19		SCALE 1:1	**D** SIZE
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SUBMITTAL DATE: 12/22/17	JMCNABB					WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER STATE OF WASHINGTON 21489 REGISTERED PROFESSIONAL ENGINEER 12/15/2017

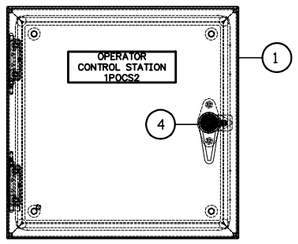
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

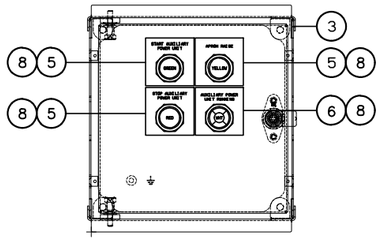
SLIP 1 OHL OPERATOR CONTROL STATION (1POCS1) TERMINAL WIRING

EP12.02

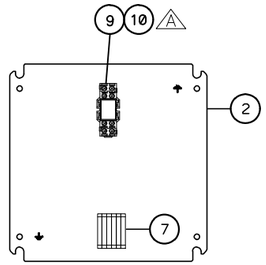
SHEET 808 OF 1521 SHEETS



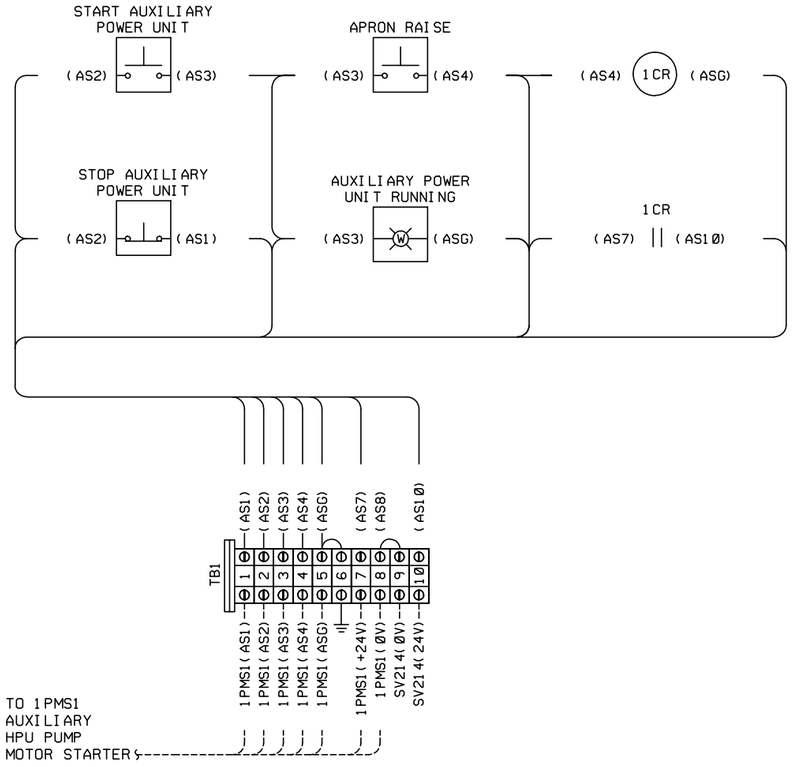
1POCS2 FRONT VIEW



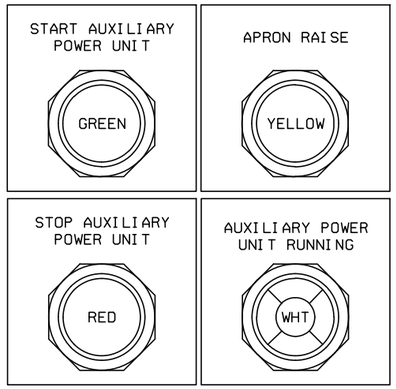
1POCS2 SWINGOUT PANEL



1POCS2 BACKPANEL



TERMINAL WIRING



LEGEND PLATES

BILL OF MATERIAL 1POCS2

PC#	QTY	DESCRIPTION	SPECIFICATION	MFGR / PART NUMBER	NAMEPLATE LETTERING
1	1	ENCLOSURE	WALL MOUNTED, HINGE COVER WITH QUARTER TURN LATCH, 12X12X6 INCHES, NEMA 4X 316 STAINLESS STEEL	HOFFMAN CSD12126SS6	EMERGENCY APRON LIFT OPERATOR CONTROL STATION 1POSC2
2	1	BACK PANEL	CONDUCTIVE STEEL PANEL	CP1212G	
3	1	SWING OUT PANEL	SWING OUT PANEL WITH QUARTER-TURN LATCH, CONDUCTIVE STEEL	CSP1212	
4	1	HANDLE	NON-LOCKING HANDLE	CWHNL	
5*	3	PUSHBUTTON	30MM NEMA 4X MOMENTARY NON-ILLUMINATED PUSHBUTTON UNIVERSAL, 1NO, 1NC CONTACT	ALLEN BRADLEY 800H-AR1A (GRN) 800H-AR9A (YLW) 800H-AR6A (RED)	START AUXILIARY POWER UNIT APRON RAISE STOP AUXILIARY POWER UNIT
6	1	PILOT LIGHTS	30MM WATERTIGHT/OILTIGHT LED PILOT LIGHT, 120VAC, LENS COLOR AS SHOWN ON DRAWINGS	ALLEN BRADLEY 800H-QRH2W	AUXILIARY POWER UNIT RUNNING
7*	AS REQ'D	TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, FEED THROUGH, 20A, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 364	TB1
8	4	LEGEND PLATE	LEGEND PLATES	ALLEN BRADLEY 800T-W100J	SEE LEGEND PLATE DETAILS
A 9	1	Relay	2 Pole double throw with 120V coil	RH2B-UL-120V	1CR
A 10	1	Relay socket	2 Pole double throw mounting socket	SH2B-05C	1CR

*PART NUMBER UPDATED FROM ORIGINAL CONSTRUCTION DRAWINGS

REV.	DESCRIPTION	DATE	APPROVED
A	AS-BUILT REVISION	1/27/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1POCS2	DWG NO.: 2021405	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 1 OF 3	
DATE: 12/18/19		SCALE 1:1	D SIZE
ACAD FILENAME: 2021405.dwg			

ERGOSYNCH

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PRINTED: 2:27:37 PM 11/8/2019	LAST PRINTED BY:					FED. AID PROJ. NO.
SUBMITTAL DATE: 12/22/17	JMCNABB					WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 / STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH		[redacted]/ISIONS	1[redacted]			
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 41489 — REGISTERED PROFESSIONAL ENGINEER
12/15/2017

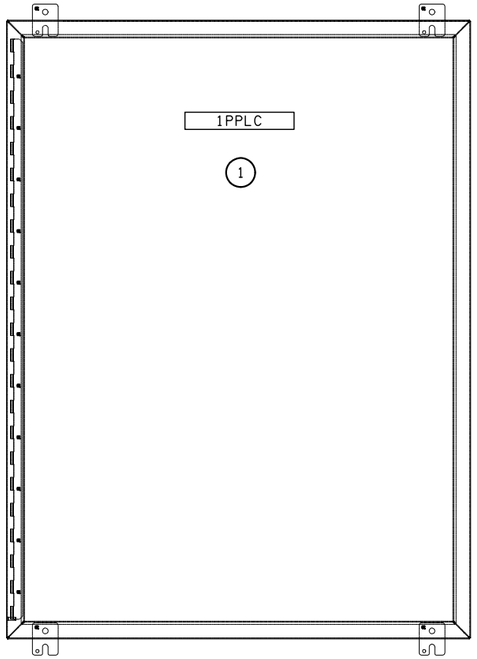
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL OPERATOR CONTROL STATION (1POCS2)

EP12.03

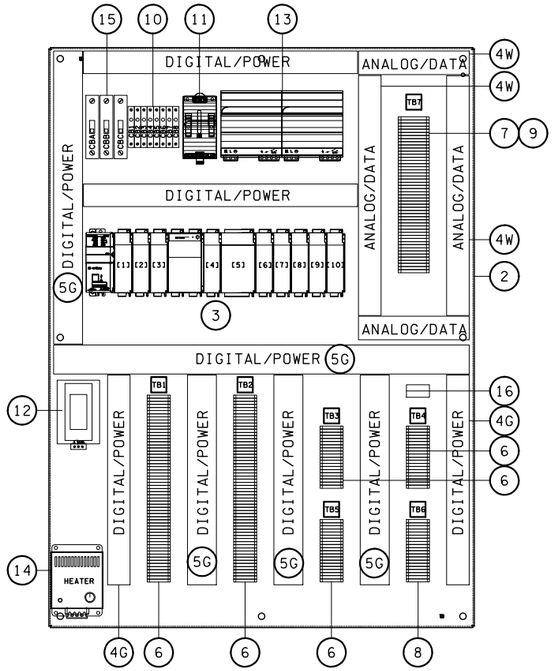
SHEET 454A OF 484 SHEETS



1PPLC CABINET

0 1

SCALE 1'' = 1'-0''



1PPLC BACKPANEL LAYOUT

0 1

SCALE 1'' = 1'-0''

BREAKER SCHEDULE	
BREAKER	LOAD
CBA	PLC INPUTS/OUTPUTS
CBB	PLC CABINET AUX.
CBC	APRON LIGHT
CB1	PLC INPUTS
CB2	PLC POWER
CB3	PLC OUTPUTS
CB4	24VDC POWER SUPPLY 1
CB5	24VDC POWER SUPPLY 2
CB6	1POCS1 PANELVIEW
CB7	PLC CABINET HEATER
CB8	RECEPTACLE

NAMEPLATE E

INSTALL NAMEPLATE INSIDE CABINET DOOR
ADJACENT TO BREAKER LOCATION

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: **MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC**	DWG NO.: **2021406**	
CHECKED: D SHULL		SALES ORDER NO.: **20214**	
ENGINEER: R WALDEN		SHEET 1 OF 10	
DATE: 12/18/19		SCALE 1:1	D SIZE
ACAD FILENAME: 2021406.dwg			

ERGOSYNCH

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PRINTED: 11:33:00 AM 1/10/2018	LAST PRINTED BY:					FED.AID PROJ.NO.
SUBMITTAL DATE: 12/22/17	JMCNABB					WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER STATE OF WASHINGTON 41469 REGISTERED PROFESSIONAL ENGINEER 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET LAYOUT

EP11.00

SHEET 796 OF 1521 SHEETS

BILL OF MATERIAL 1PPLC

PC#	QTY	DESCRIPTION	SPECIFICATION	MFGR / PART NUMBER	NAMEPLATE LETTERING
1	1	ENCLOSURE	WALL MOUNTED, CONTINUOUS HINGE COVER WITH 3-POINT LATCH, 48x36x12 INCHES, NEMA 4X 316 STAINLESS STEEL	HOFFMAN A48H3612SS6LP	3HPLC
2	1	BACKPANEL	CONDUCTIVE STEEL PANEL	HOFFMAN A48P36G	
3	1	PLC	PROGRAMMABLE LOGIC CONTROLLER, 2MB AVAILABLE MEMORY, DUAL ETHERNET/IP PORTS AND PROGRAMMING SOFTWARE (FURNISH TO THE ENGINEER)	ALLEN BRADLEY COMPACTLOGIX 1769-L33ER CONTROLLER, STUDIO 5000	
	1		PLC POWER SUPPLY, 120VAC INPUT POWER, COMPATIBLE WITH THE CONTROLLER	ALLEN BRADLEY 1769-PA2	
	4		16 POINT, 120VAC, DIGITAL INPUT MODULE	ALLEN BRADLEY 1769-IA16	
	1		16 POINT, 120VAC, DIGITAL OUTPUT MODULE	ALLEN BRADLEY 1769-OA16	
	1		16 POINT , 24VDC, DIGITAL INPUT MODULE	ALLEN BRADLEY 1769-IQ16	
	1		4 CHANNEL ANALOG CURRENT/ VOLTAGE ISOLATED INPUT MODULE	ALLEN BRADLEY 1769-IF4I	
	1		4 CHANNEL ANALOG CURRENT ISOLATED OUTPUT MODULE	ALLEN BRADLEY 1769-OF4CI	
	1		LEFT END CAP TERMINATOR	ALLEN BRADLEY 1769-ECL	
4G	AS REQ'D	WIREWAY FOR DIGITAL/POWER WIRING	WIRE DUCT 1.5"Wx3'H AND COVER - GRAY	TY-DUCT TY15X3WPG6	
4W	AS REQ'D	WIREWAY FOR ANALOG/DATA WIRING	WIRE DUCT 1.5"Wx3'H AND COVER - WHITE	TY-DUCT TY15X3WPW6	
5G	AS REQ'D	WIREWAY FOR DIGITAL/POWER WIRING	WIRE DUCT 2"Wx3"H AND COVER - GRAY	TY-DUCT TY2X3WPG6	
6*	AS REQ'D	TERMINALS	SPRING TERMINAL, SINGLE CIRCUIT, FEED THROUGH, 20A, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 364	TB1, TB2, TB3, TB4, TB5
7*	AS REQ'D	TERMINALS	TWO LEVEL, TWO CIRCUIT FEED THROUGH TERMINAL BLOCK, GRAY, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 31 429	TB7
8*	AS REQ'D	GROUNDING TERMINALS	SPRING TERMINA… #22-12#AWG WITH… END ANCHOR	PHOENIX 30 31 380	TB7
9*	AS REQ'D	GROUNDING TERMINALS	TWO LEVEL, TWO… BLOCK, GREEN/YELLOW STRIPE, #22-#12 AWG, WITH MOUNTING RAIL AND HEAVY DUTY END ANCHOR	PHOENIX 30 36 039	TB6
10	8	HIGH-DENSITY MINIATURE CIRCUIT BREAKERS	THERMAL-MAGNETIC TYPE SUPPLEMENTARY OVERCURRENT PROTECTIVE DEVICES, SIZES SHOWN ON SCHEMATIC	ALLEN BRADLEY 1492-GH100 1492-GH070 1492-GH030	CB1-CB8
11	1	FILTER	DIN RAIL SURGE PROTECTOR FILTER PROTECTIVE DEVICE PROVIDING TRANSIENT AND NOISE PROTECTION, 120VAC, 10AMPS	ALLEN BRADLEY 4983-DC120-05	FLT1, FLT2
12	1	RECEPTACLE	GFI DUAL UTILITY OUTLET	ALLEN BRADLEY 1492-REC15G	
13	2	24VDC POWER SUPPLY	120V INPUT, 24VDC 10A OUTPUT, BALANCED CURENT SHARING DURING PARALLEL OPERATION, N+1 REDUNDANCY	ALLEN BRADELEY 1606-XL240DR 1606-XLSRED40	
14	1	CABINET HEATER	100 WATT, 120VAC, THERMOSTATICALLY CONTROLLED, FAN-DRIVEN HEATER	HOFFMAN DAH1001A	
A 15*	3	SUPPLEMENTAL PROTECTION CIRCUIT BREAKER	CURRENT LIMITING IEC MINIATURE CIRCUIT BREAKER, SIZES SHOWN ON SCHEMATIC	CUTLER HAMMER FAZ-D20/1-NA-SP	~~CBA, CBB, CBC~~
16	2	RELAYS	15A DPDT MINIATURE RELAY COMPLETE WITH RAIL, RELAY SOCKET AND HOLD DOWN SPRING	IDEC RELAY: RJ2S-C-A120 BASE: SJ2S-05B	CR1, CR2

*PART NUMBER UPDATED FROM ORIGINAL CONSTRUCTION DRAWINGS

Quantity doesn't match

1606-XL240DR is not found in provided information

Part No. not found in provided information

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 2 OF 10	
DATE: 12/18/19		SCALE 1:1	D SIZE
ACAD FILENAME: 2021406.dwg			

ERGOSYNCH

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SUBMITTAL DATE: 12/22/17	JMCNABB					WA-2017-007-00	
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10	STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121	
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. QQ****	
MAR PROJ ENGR: C. TORRES							
DIR TERM ENGR: N. MCINTOSH							
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY			

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21460 — REGISTERED PROFESSIONAL ENGINEER
12/15/2017

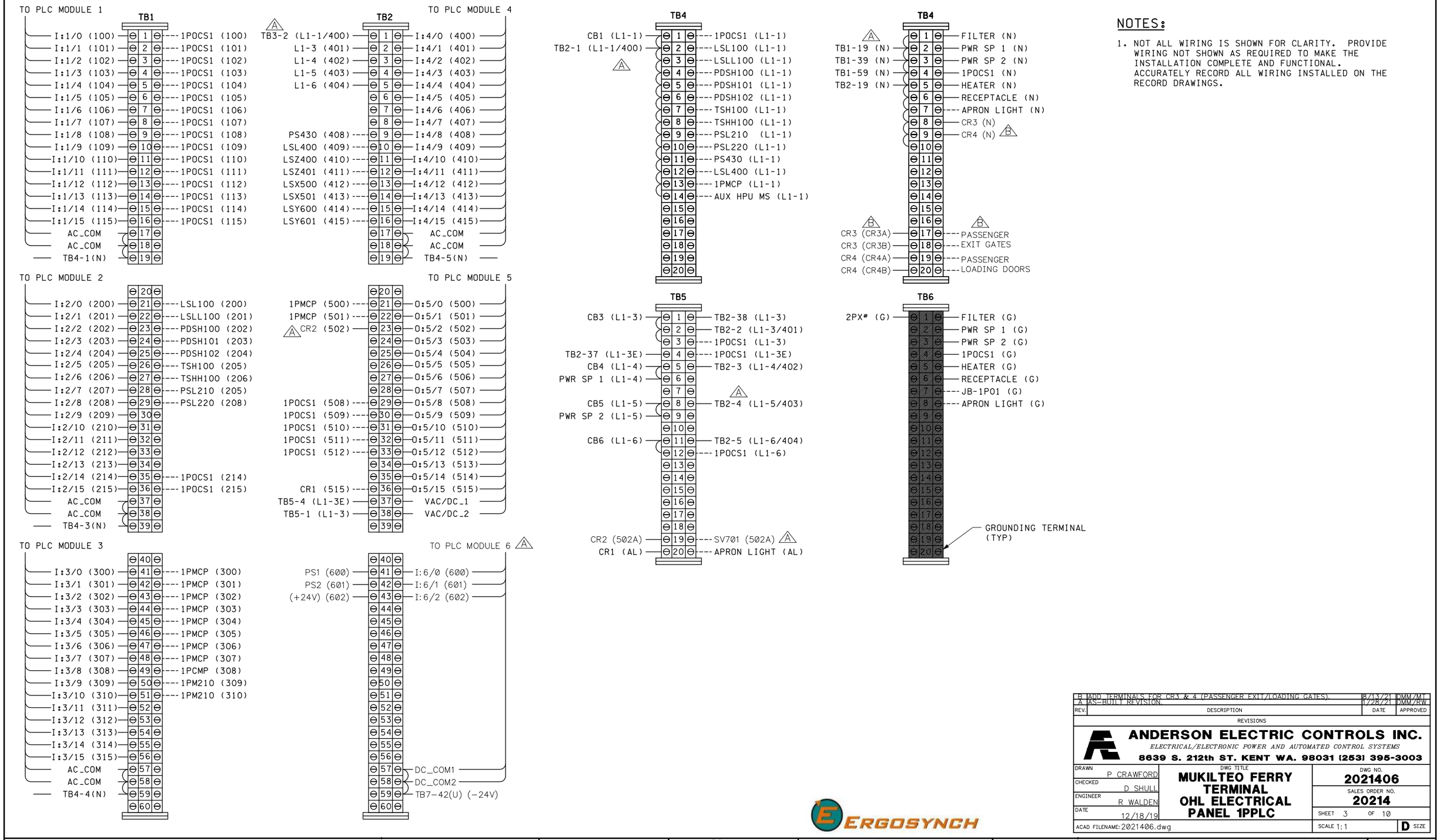
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET BOM

EP11.01

SHEET 797 OF 1521 SHEETS



NOTES:

1. NOT ALL WIRING IS SHOWN FOR CLARITY. PROVIDE WIRING NOT SHOWN AS REQUIRED TO MAKE THE INSTALLATION COMPLETE AND FUNCTIONAL. ACCURATELY RECORD ALL WIRING INSTALLED ON THE RECORD DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
B	ADD TERMINALS FOR CR3 & 4 (PASSENGER EXIT/LOADING GATES).	8/13/21	DMM/MT
A	AS-BUILT REVISION.	1/28/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN	P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO. 2021406
CHECKED	D SHULL		SALES ORDER NO. 20214
ENGINEER	R WALDEN		SHEET 3 OF 10
DATE	12/18/19		D SIZE
ACAD FILENAME: 2021406.dwg			SCALE 1:1

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ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21460 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

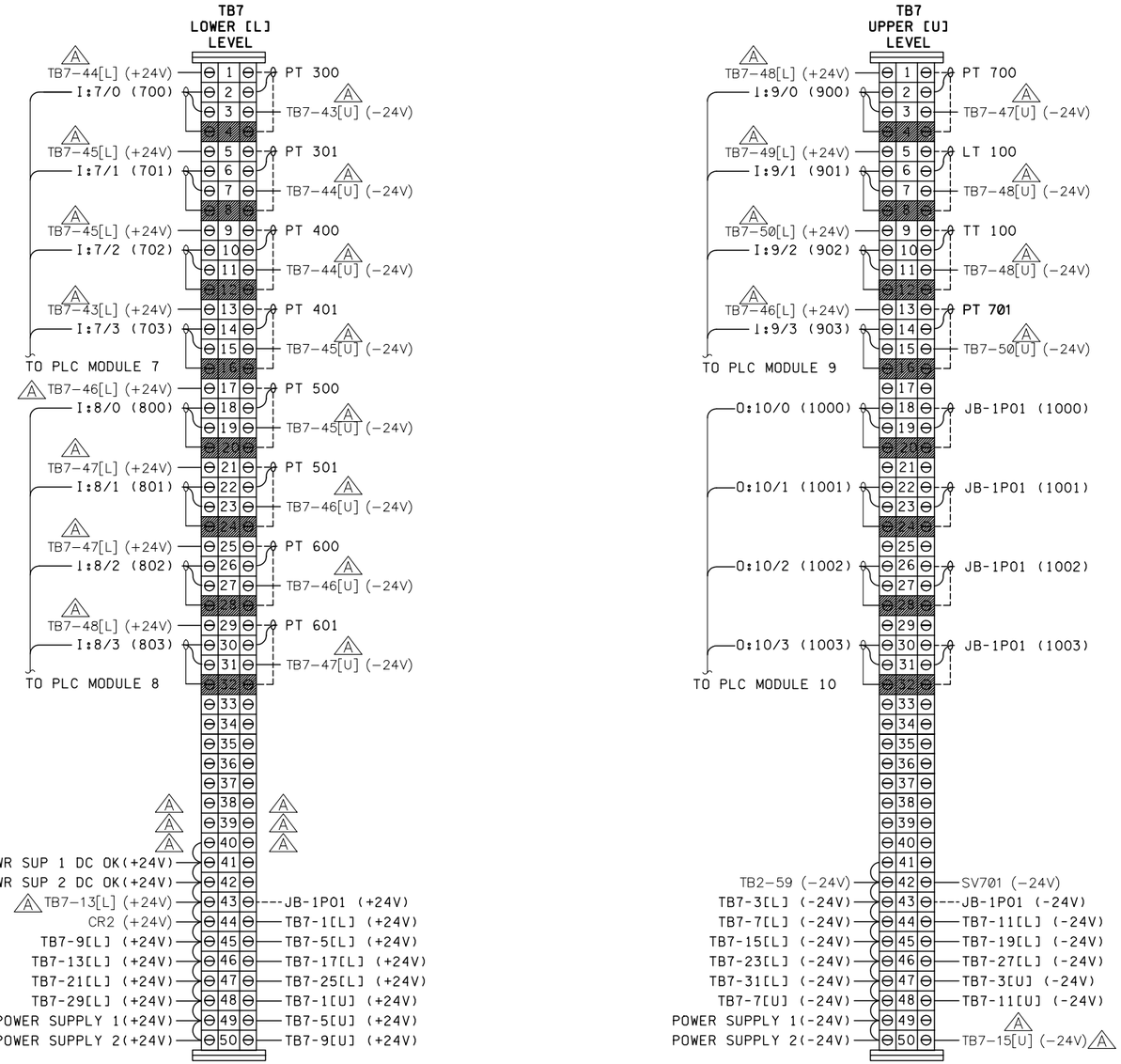
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET TERMINAL WIRING 1

EP11.02

SHEET 798 OF 1521 SHEETS



REV.	DESCRIPTION	DATE	DMM/RW APPROVED
A	AS-BUILT REVISION.	1/28/21	

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: **MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC**	DWG NO.: **2021406**	
CHECKED: D SHULL		SALES ORDER NO.: **20214**	
ENGINEER: R WALDEN		SHEET 4 OF 10	
DATE: 12/18/19	ACAD FILENAME: 2021406.dwg	SCALE 1:1	D SIZE

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SUBMITTAL DATE: 12/22/17	JMCNABB					
DESIGNED BY: M. KNICKERBOCKER	12/22/17					WA-2017-007-00
ENTERED BY: J. MCNABB	12/22/17					REGION NO. STATE
CHECKED BY: S. HARRIS	12/22/17					10 WASH
MAR PROJ ENGR: C. TORRES						JOB NUMBER 14W121
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		CONTRACT NO. QQ****

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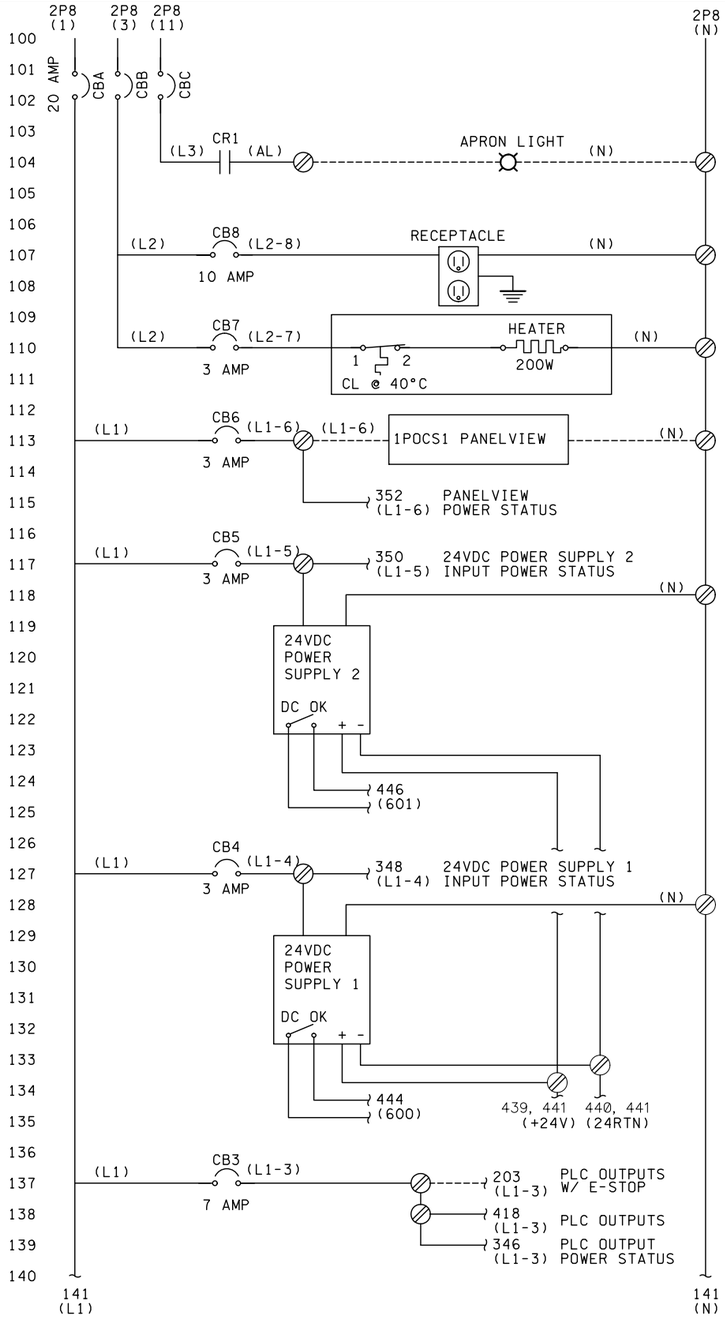
Washington State Department of Transportation
WASHINGTON STATE FERRIES

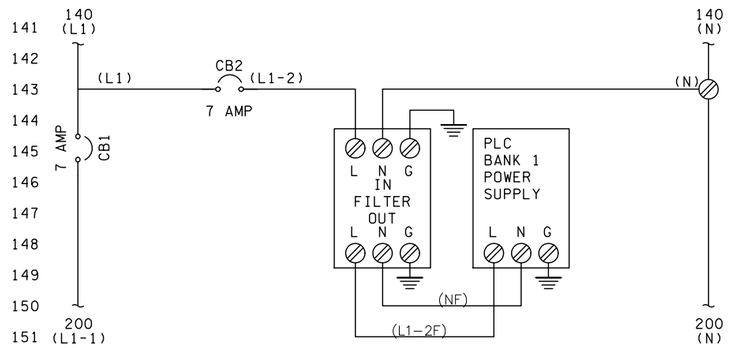
SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET TERMINAL WIRING 2

EP11.03

SHEET 799 OF 1521 SHEETS





SCHEMATIC SHEET 1

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406
CHECKED: D SHULL		SALES ORDER NO.: 20214
ENGINEER: R WALDEN		SHEET 5 OF 10
DATE: 12/18/19		SCALE 1:1 — D SIZE
ACAD FILENAME: 2021406.dwg		

ERGOSYNCH

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SUBMITTAL DATE: 12/22/17						WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 / STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. QQ****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

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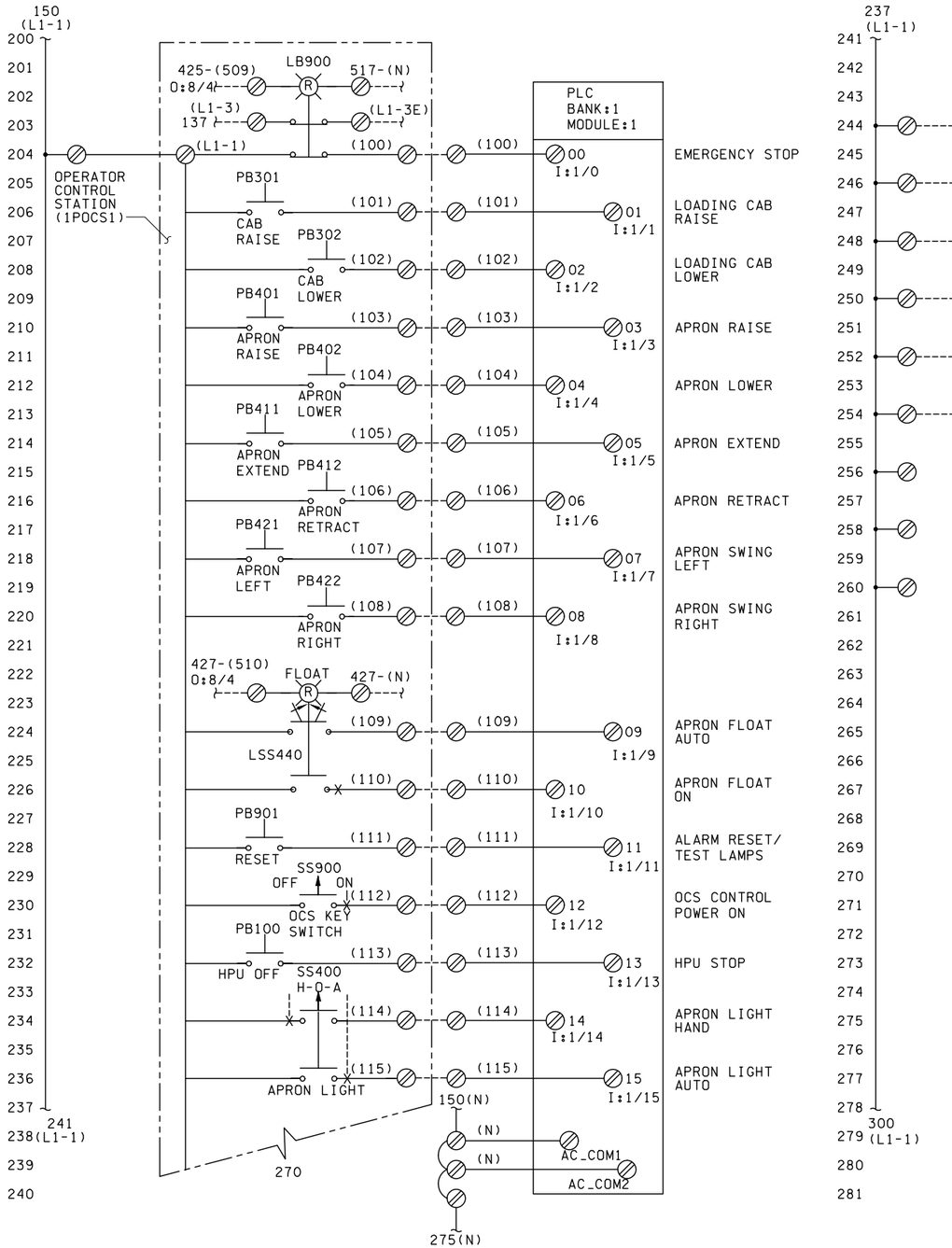
Washington State Department of Transportation
WASHINGTON STATE FERRIES

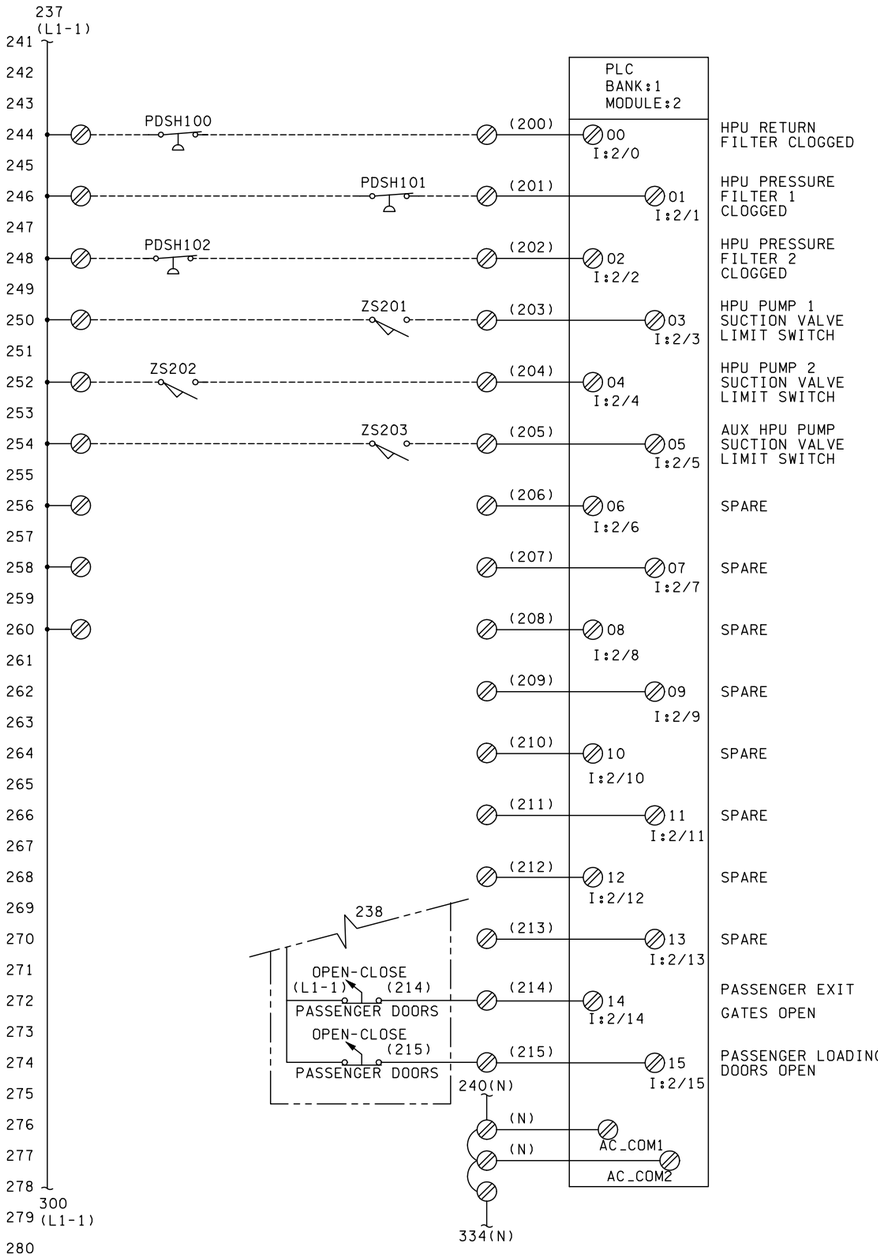
SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 1

EP11.04

SHEET 800 OF 1521 SHEETS





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	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 6 OF 10	
DATE: 12/18/19		SCALE 1:1	D SIZE
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ENTERED BY:	J. MCNABB	12/22/17				10	WASH
CHECKED BY:	S. HARRIS	12/22/17				JOB NUMBER	
MAR PROJ ENGR:	C. TORRES					14W121	
DIR TERM ENGR:	N. MCINTOSH					CONTRACT NO.	
ASST SECRETARY:	A. SCARTON		REVISION	DATE	BY	00****	

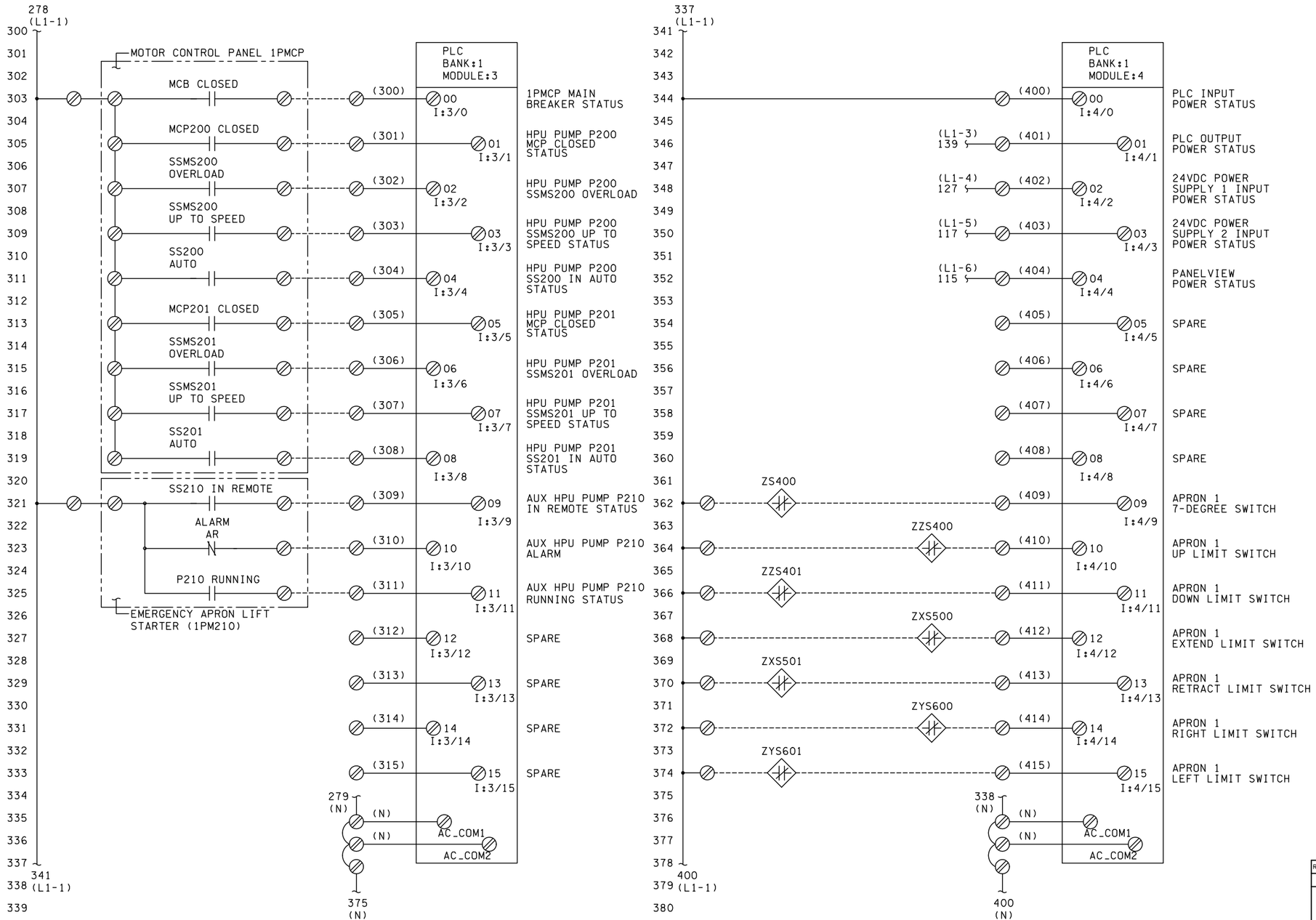
MARC KNICKERBOCKER — STATE OF WASHINGTON — 21460 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION
SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 2

EP11.05

SHEET 801 OF 1521 SHEETS



SCHEMATIC SHEET 3

REV.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN			
DATE: 12/18/19		SHEET 7 OF 10	
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ERGOSYNCH

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SUBMITTAL DATE: 12/22/17		JMCNABB					
DESIGNED BY:	M. KNICKERBOCKER	12/22/17				WA-2017-007-00	
ENTERED BY:	J. MCNABB	12/22/17				REGION NO. 10	STATE WASH
CHECKED BY:	S. HARRIS	12/22/17				JOB NUMBER 14W121	
MAR PROJ ENGR:	C. TORRES						
DIR TERM ENGR:	N. MCINTOSH					CONTRACT NO.	
ASST SECRETARY:	A. SCARTON		REVISION	DATE	BY	00****	

MARC KNICKERBOCKER STATE OF WASHINGTON 41469 REGISTERED PROFESSIONAL ENGINEER
12/15/2017

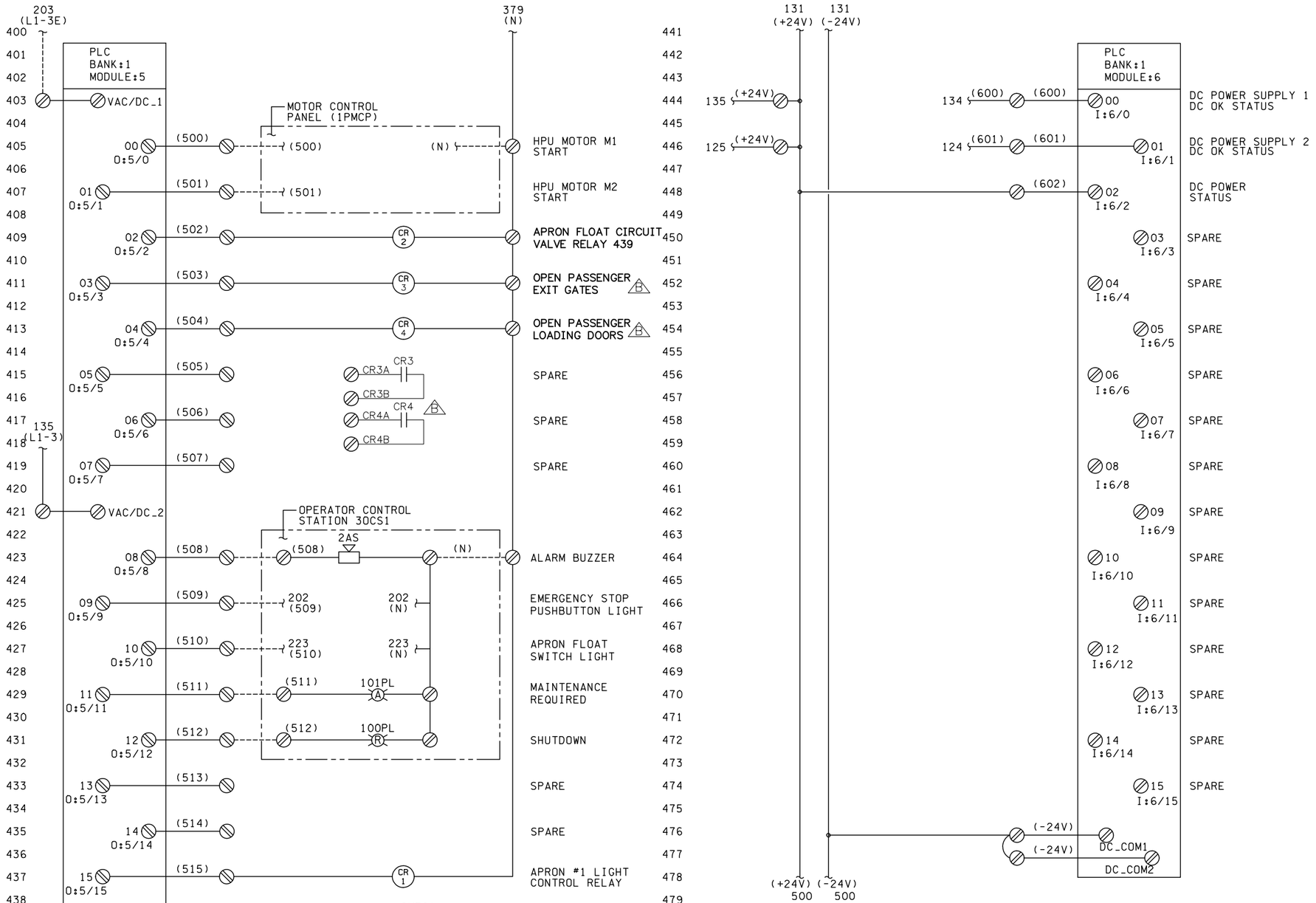
Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 3

EP11.06

SHEET 802 OF 1521 SHEETS



SCHEMATIC SHEET 4

REV.	DESCRIPTION	DATE	APPROVED
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A	AS-BUILT REVISION.	7/28/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN	P CRAWFORD	DWG TITLE: **MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC**	DWG NO. **2021406**
CHECKED	D SHULL		SALES ORDER NO. **20214**
ENGINEER	R WALDEN		SHEET 8 OF 10
DATE	12/18/19	ACAD FILENAME: 2021406.dwg	SCALE 1:1 — **D** SIZE

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SUBMITTAL DATE: 12/22/17						WA-2017-007-00
DESIGNED BY: M. KNICKERBOCKER	12/22/17					REGION NO. 10 / STATE WASH
ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21489 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

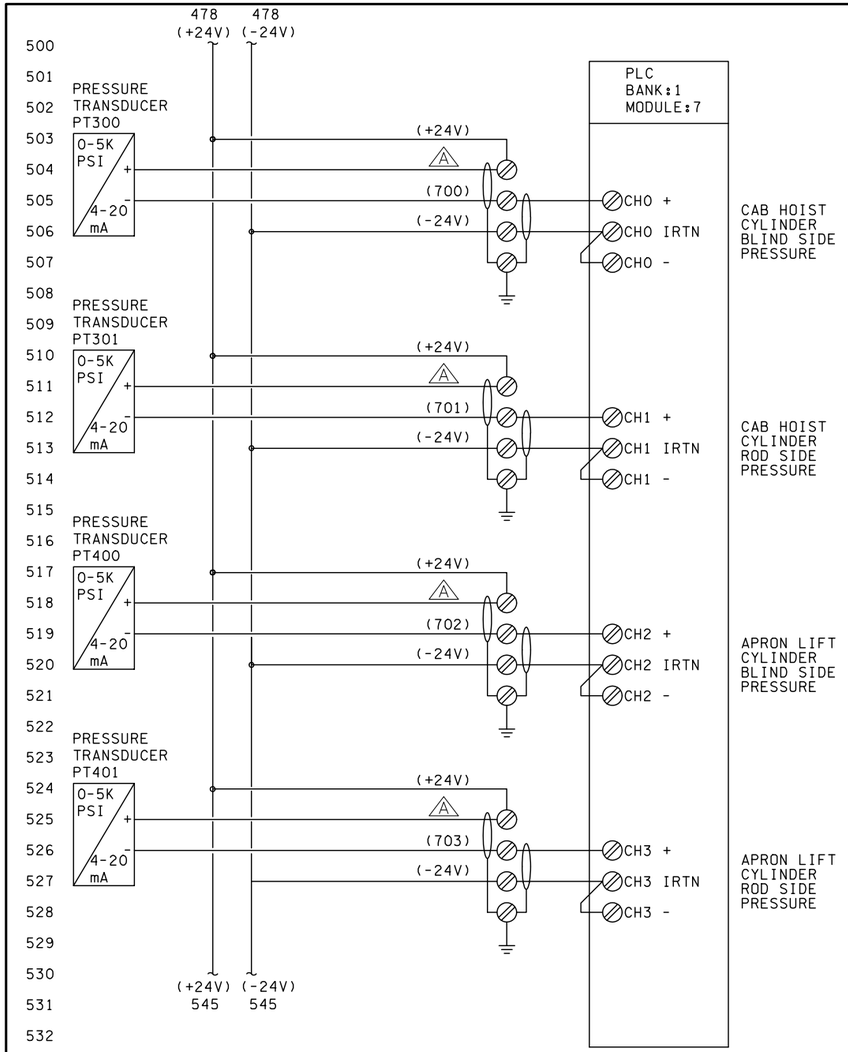
Washington State Department of Transportation
WASHINGTON STATE FERRIES

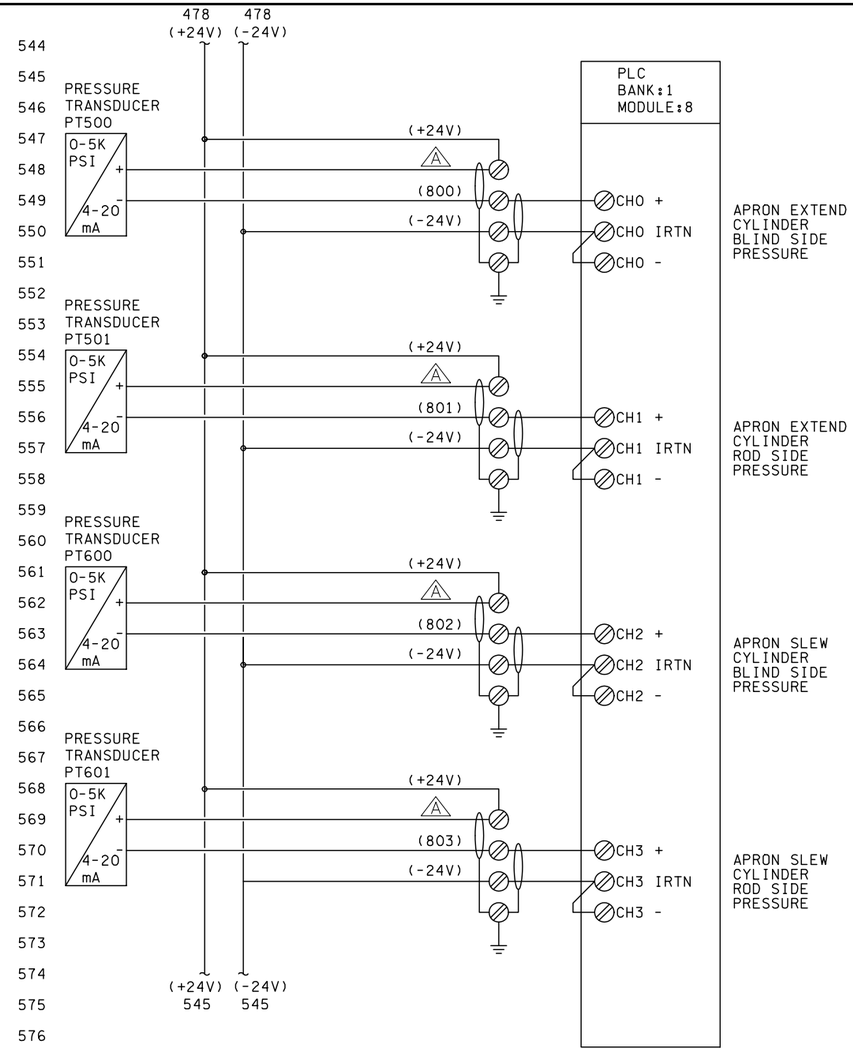
SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION

SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 4

EP11.07

SHEET 803 OF 1521 SHEETS





SCHEMATIC SHEET 5

REV.	DESCRIPTION	DATE	APPROVED
A	AS-BUILT REVISION.	1/28/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
ENGINEER: R WALDEN		SHEET 9 OF 10	
DATE: 12/18/19		SCALE 1:1	D SIZE
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ERGOSYNCH

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ENTERED BY:	J. MCNABB	12/22/17					
CHECKED BY:	S. HARRIS	12/22/17					JOB NUMBER 14W121
MAR PROJ ENGR:	C. TORRES						
DIR TERM ENGR:	N. MCINTOSH						CONTRACT NO. QQ****
ASST SECRETARY:	A. SCARTON		REVISION	DATE	BY		

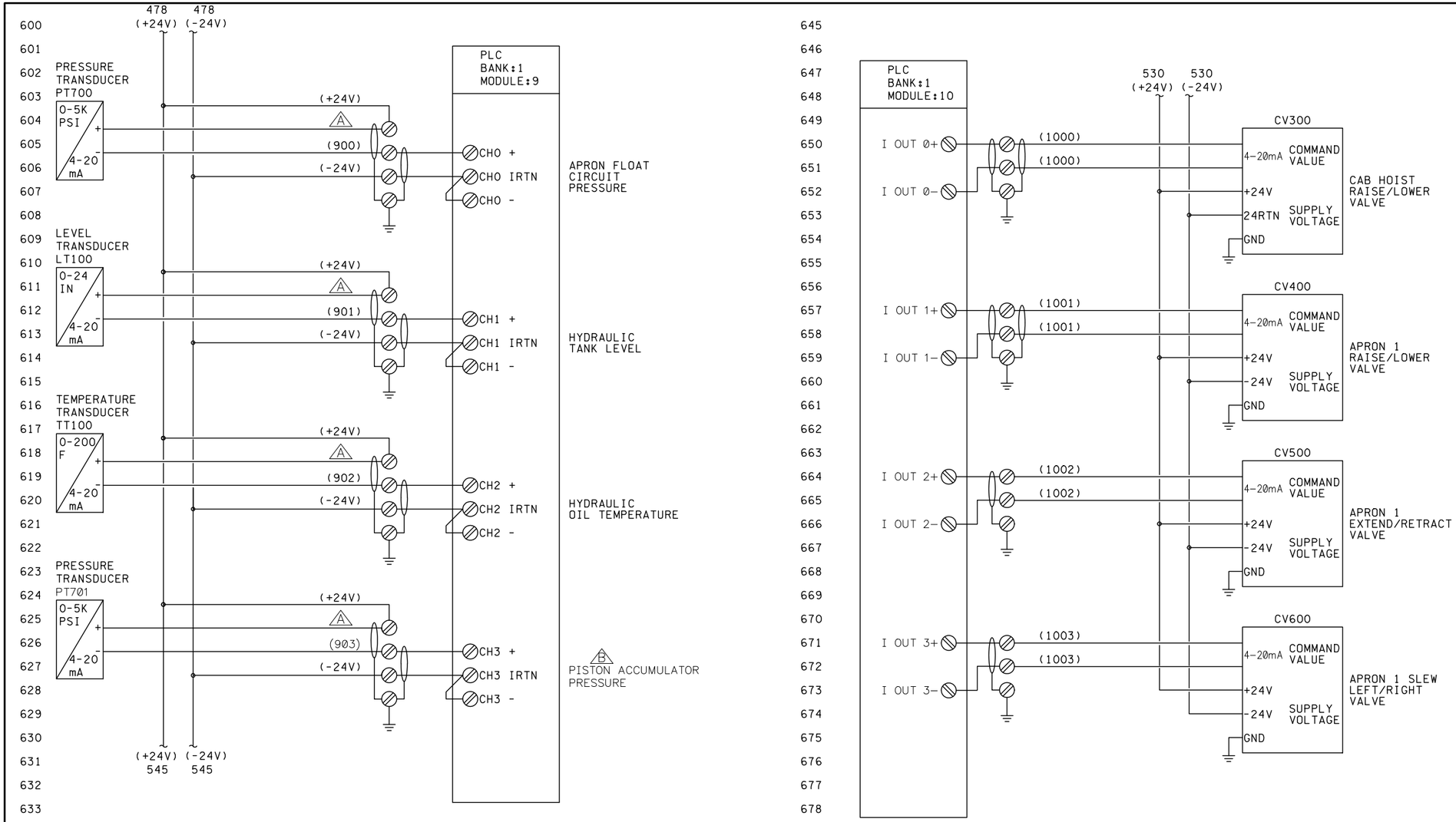
MARC KNICKERBOCKER — STATE OF WASHINGTON — 21460 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION
SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 5

EP11.08

SHEET 804 OF 1521 SHEETS



SCHEMATIC SHEET 6

REV.	DESCRIPTION	DATE	APPROVED
B	ADD NAME FOR PT701.	8/13/21	DMM/MT
A	AS-BUILT REVISION.	1/28/21	DMM/RW

REVISIONS

ANDERSON ELECTRIC CONTROLS INC.
ELECTRICAL/ELECTRONIC POWER AND AUTOMATED CONTROL SYSTEMS
8639 S. 212th ST. KENT WA. 98031 (253) 395-3003

DRAWN: P CRAWFORD	DWG TITLE: MUKILTEO FERRY TERMINAL OHL ELECTRICAL PANEL 1PPLC	DWG NO.: 2021406	
CHECKED: D SHULL		SALES ORDER NO.: 20214	
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ENTERED BY: J. MCNABB	12/22/17					JOB NUMBER 14W121
CHECKED BY: S. HARRIS	12/22/17					CONTRACT NO. 00****
MAR PROJ ENGR: C. TORRES						
DIR TERM ENGR: N. MCINTOSH						
ASST SECRETARY: A. SCARTON		REVISION	DATE	BY		

MARC KNICKERBOCKER — STATE OF WASHINGTON — 21460 — REGISTERED PROFESSIONAL ENGINEER — 12/15/2017

Washington State Department of Transportation
WASHINGTON STATE FERRIES

SR 525
MUKILTEO FERRY TERMINAL (PHASE 2)
FERRY TERMINAL CONSTRUCTION
SLIP 1 OHL ELECTRICAL
PLC CABINET SCHEMATIC 6

EP11.09

SHEET 805 OF 1521 SHEETS

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL
OHL ELECTRICAL SYSTEM

SECTION 2: CONTROL PANELS
SUBSECTION 2.2: PRODUCT DATA

ALLEN BRADLEY 30MM 800H OPERATORS

Allen-Bradley

30 mm Push Button Specifications

Bulletin Numbers 800T and 800H

Topic	Page
800T/H Specifications	2
800T/H DeviceNet Stations	4
800T/H Trigger Action E-stops	5
800T/H Momentary Contact Push Buttons	7
800T/H Selector Switch	10
800T/H Pilot Lights	18
800T/H Push-Pull and Twist-to-release Devices	19
800T Cluster Pilot Lights	23
800T Toggle Switches	24
800T Selector Push Button	25
800H Momentary Contact Flip Lever Devices	26
800T/H Protective Boot Application Information	27
800T/H Approximate Dimensions	28
800T/H Typical Pilot Light Wiring Diagrams	40
800H Push Button Enclosures	41

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

ALLEN BRADLEY 30MM 800H OPERATORS

Specifications★

Electrical Ratings		
Contact ratings		Refer to the contact ratings tables on page 10-4.
Dielectric strength		2200V for one minute, 1300V for one minute (Logic Reed)
Mechanical Ratings		
Vibration		10…2000 Hz, 1.52 mm displacement (peak-to-peak) max./ 10 G max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 ms ≥ 25 g (contact fragility) and no damage at 100 g
Degree of protection		Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65
Mechanical design life cycles		
Push buttons	(Momentary, non-illuminated, flush and extended head)	10,000,000 min.
	(Momentary, illuminated)	250,000 min.
	(Push-pull/twist-to-release)	250,000 min. ‡
Selector switches	(Non-illuminated)	1,000,000 min.
	(Illuminated, key-operated)	200,000 min.
Potentiometers		25,000 min.
All other devices		200,000 min.
Contact operation		Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks: Single break magnetic
Wire gauge/Terminal screw torque		#18…14 AWG (#18…10 Max Duty) / 6…8 lb•in
Typical operating forces Operators without contact blocks		Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3.95 lbs max. Maintained selector switch: 3.6 in•lb max.
Spring return selector switches		3.6 in•lb to stop, 0.2 in•lb to return
Illuminated push buttons and push-to-test pilot lights		5 lb max.
2-position push-pull		8.0 lb max. push or pull
3-position push-pull		8 lb max. push to in position or pull to center position (15 lb max. pull to out position)
Twist-to-release or push-pull		9 lbs max. push or pull 30 in•oz max. twist, 6 in•oz minimum return
Potentiometer		Rotational torque 3…12 in•oz; stopping torque 12 in•lb (minimum)
Contact blocks	Standard	1 lb
	Logic Reed	1 lb max.
	Sealed switch	3 lb max. at 0.205 in. plunger travel
	Stackable sealed switch	1 lb max.
	MaxDuty	1.4 lb max.
	PenTUFF	1.4 lb max.
	Self Monitoring	1.6 lb
Environment		
Temperature range	Operating	-40…+131 °F (-40…+55 °C)
	Storage	-40…+185 °F (-40…+85 °C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for use in lower temperature applications.		
Humidity		50…95% RH from 77…140 °F (25…60 °C) per Procedure IV of MIL-STD-810C, Method 507.1 cycling test

★ **Performance Data** — Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

‡ Illuminated Trigger Action E-stops are rated for 150,000 min. mechanical operations when using Cat. No. 800TC-XD4S Self-Monitoring Contact Blocks (SMCBs).

ALLEN BRADLEY 30MM 800H OPERATORS

Standard Contact Ratings

Minimum: 24V, 24 mA

Maximum thermal continuous current I^{th} 10 A AC/2.5 A DC. Bulletin 800T units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200VA 60 A 60 A	720VA 720VA 10 A
DC 600	DC-13	Q600	28…600 24…28★	69VA 2.5 A	

★ For applications below 17V/5 mA, Pen*TUFF* or Logic Reed contacts are recommended.

Electrical design life cycles: 1,000,000 (at max. rated load)

Explosion-Protected Contact Ratings

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200VA 60 A 60 A	720VA 720VA 10 A
DC 600	DC-13	Q600	28…600 24…28	69VA 2.5 A	

Maximum thermal continuous current Ith = 10 A
Minimum low energy switching load: 17V DC, 5 mA
Electrical design life cycles: 1,000,000 (24V DC, 25 mA)
Vibration: 5 g, 0.7 mm peak-to-peak displacement, sine sweep 10…2000 Hz / IEC 60068-2-6
Shock: 15 g (800H-TFRX_ trigger action E-stops), 50 g (all other devices) / IEC 60068-2-27

Sealed Switch Contact Ratings

Minimum: 5V, 1 mA

Maximum continuous current I_{th} 5 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600VA 30 A	360VA 3 A
DC 300	DC-13	P300	24…300 0…24	138VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Minimum: 5V, 10 mA (digital); 24V, 1 mA (analog)

Maximum continuous current I_{th} 2.5 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800VA 15 A	180VA 1.5 A
DC 150	DC-13	Q150	24…150 0…24	69VA 2.5 A	

Logic Reed Contact Ratings

Minimum — DC: 5V, 1 mA
Maximum — DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.
Electrical design life cycles: 200,000 (at max. rated load)

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA
Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC. Bulletin 800T units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800VA 15 A	180VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28VA 1.0 A	

Snap Action Contact Ratings

Max. Opertnl. Volts U_e	Contact Rating Designation	Rated Operational Currents		
		Volts U_e	Make	Break
AC 300	A300	120…300 24…72	7200VA 60 A	720VA 10 A
DC 250	—	230…250 115…125	0.2 A 0.4 A	

MaxDuty Contact Rating

Maximum thermal continuous current I_{th} 24 A.
Pilot Duty — 120V AC, 12 A; 24V DC, 10 A
Motor Ratings — 120V AC, 1.5 Hp; 240V AC, 3 Hp; 24V DC, 10 A FLA/60 A LRA

Time Delay Contacts

Max. Opertnl. Volts U_e	Contact Rating Designation	Rated Operational Currents		
		Volts U_e	Make	Break
AC 120	B150	120	3600VA	360VA

Note: This device is not rated for DC applications.

Adjustment range: 0.5…15 s ± 25% I_{th} = 5 A

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting Rings
- Sockets

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Mineral Filled Nylon

- Trim washer

Thermoplastic Polyester

- Non-illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Nitrile (Synthetic Rubber)

- Gaskets and internal seals

Standards Compliance

UL 508

CCC

Certifications

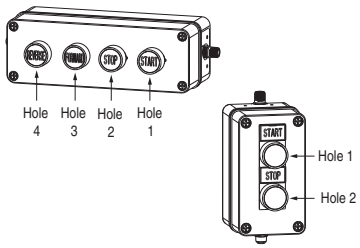
UL Listed
(File No. E14840, E10314
Guide No. NKCR, NOIV, NISD)

CSA Certified
(File No. LR1234, LR11924)

CSA C22.2, No. 14

CE Marked (EN/IEC 60947-5-1, EN/IEC 60947-5-5, EN ISO 13850)

DeviceNet Stations



Two-Unit 800T – ____ ____ ____ ____ ____ ____ ____

a b c d (Hole One c + d) c d (Hole Two c + d) e

Three-Unit 800T – ____ ____ ____ ____ ____ ____ ____ ____ ____

a b c d (Hole One c + d) c d (Hole Two c + d) c d (Hole Three c + d) e

Four-Unit 800T – ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

a b c d (Hole One c + d) c d (Hole Two c + d) c d (Hole Three c + d) c d (Hole Four c + d) e

a

Orientation	
Code	Description
V	Vertical
H	Horizontal

b

Enclosure Style		
Grey Code	Description	Yellow Code
A	2-hole	K
B	3-hole	L
C	4-hole	M
G	E-stop only♣	N

c

Operator Types	
Code	Description
A	Non-illuminated flush (800T-A*)
B	Non-illuminated extended (800T-B*)
C	Non-illuminated mushroom (800T-D*)
D	Illuminated mushroom (800T-QM*)
E	Illuminated extended (800T-QB*)
F	Illuminated guarded (800T-QA*)
G	2-position SS maintained (800T-H2*)
H	3-position SS maintained (800T-J2*)
J	Enhanced pilot light (800T-QH*)
K	Non-illuminated 2-position push/pull (800T-FX*)§
L	Non-illuminated push/pull twist-to-release (800T-FXT*)§
M	Illuminated 2-position push/pull (800T-FXQH*)
N	2-position key SS (800T-H33*)‡
P	3-position key SS (800T-J44*)‡
Q	2-position SS spring return from right (800T-H5*)
R	3-position SS spring return from all (800T-J91*)
T	Illuminated 2-position SS maintained (800T-24H*H*)
U	Illuminated 3-position SS maintained (800T-24J*H*)
V	Non-illuminated 3-position push/pull (800T-FXM*)
W	Potentiometer♠

d

Color/Text	
Code	Description
1	Green
2	Black (non-illuminated only)
3	Orange (non-illuminated only)
4	Grey (non-illuminated only)
5	White
6	Red
7	Blue
8	Clear (illuminated only)
9	Yellow (non-illuminated)/ amber (illuminated)
A	Green with Start legend
B	Red with Stop legend
C	Red with E-Stop legend
D	Black with Off/On legend
E	Black with Hand/Off/Auto legend
F	Red with Push to Stop/Pull to Start legend
G	Blue with Reset legend
H	Red with Power On legend
X	N/A (i.e. key ss)

e

External I/O Version♦	
Code	Description
Blank	No external I/O
A	1 input/1 output (sinking)
B	1 input/1 output (sourcing)
C	2 input
E	2 output (sourcing)
F	1 E-stop block∆
G	2 E-stop blocks∆
H	2 input + 2 input
K	2 input + 2 output (sourcing)
L	1 input/1 output (sinking) + 1 E-stop block∆
M	1 input/1 output (sourcing) + 1 E-stop block∆
N	1 input/1 output (sinking) + 2 E-stop blocks∆
P	1 input/1 output (sourcing) + 2 E-stop blocks∆
Q	2 input + 1 E-stop block∆
R	2 input + 2 E-stop blocks∆
U	2 output (sourcing) + 1 E-stop block∆
W	2 output (sourcing) + 2 E-stop blocks∆
X	2 input + 1 input/1 output (sinking)

‡ Operator Types N and P from Table c must choose Color/Text option X from Table d.

§ Operator Types K and L from Table c may be used as Emergency Stops. To be valid as an E-Stop, the operators must use Color/Text option C from Table d and it must be placed in the last hole position in the enclosure. An E-Stop connector also must be chosen from Table e.

♣ Enclosure Style option G from Table b can only select one operator from Table c. Valid options are K and L with E-Stop.

∆ External I/O Versions F, L, M, Q, and U receive only one contact block for the external E-Stop string. These connectors are rated to 3 A. If more than 3 A of current is needed or if there are two E-Stop strings, use External I/O Versions G, N, P, R, and W. These versions receive two contact blocks. This allows for 6 A of switching or for two E-Stop strings.

♦ This is an 8-in/4-out device. 2-in/1-out is assigned to each hole position in the enclosure. If a 2-hole enclosure is selected, 4-in and 2-out are assigned internally and up to 4 unassigned I/O points can be assigned to external connectors. This device contains up to two physical external I/O connectors. The "+" symbol in the Description field of Table e indicates that two external connectors exist. If an E-Stop connector is used, 2 unassigned I/O points can be assigned to the other connector.

♠ Available for certain applications, please contact your local Allen-Bradley distributor.

2-Position Red Trigger Action Twist-to-Release, Non-Illuminated

- Tamper resistant – front-of-panel mounting and non-removable operator head
- Compliant with global E-stop standards, including EN ISO 13850 and EN 60947-5-5

Cat. No. 800T-TFXJET6

Cat. No. 800T-TFXLET6

Cat. No. 800T-TFXK6

Cat. No. 800H-TFRXT6

800 T ____ – TFX T 6 D2

a b c d e

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

800T Type 4/13 Code	Description	800H Type 4/4X/13 Code
TFX	Standard (45 mm) mushroom head	TFRX
TFXJ	Jumbo (60 mm) mushroom head	TFRXJ
TFXJE	Jumbo (60 mm) mushroom head with "E-STOP"	TFRXJE
TFXK	45 mm mushroom head key release	—
TFXL	63 mm anodized aluminum head	—
TFXLE	63 mm anodized aluminum head with "E-STOP"	—

d

Release Function	
Code	Color
Blank	Key release♠
T	Twist release

e

Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No contacts on operator
Standard			
D2	X	O	1 N.C.
A	O X	X O	1 N.O. - 1 N.C.
A4	X X	O O	2 N.C.
Pen*TUFF* (Low Voltage)			
D2V	X	O	1 N.C.
AV	O X	X O	1 N.O. - 1 N.C.

Note: X = Closed/O = Open
♠ Configurable only with **FXK** head type.

2-Position Red Trigger Action Twist-to-Release, Illuminated

- Tamper resistant – front-of-panel mounting and non-removable operator head
- Compliant with global E-stop standards, including EN ISO 13850 and EN 60947-5-5
- LED illumination provided as standard

Cat. No. 800T-TFXTS00R

Cat. No. 800T-TFXJETS00R

Cat. No. 800H-TFRXTS00R

Cat. No. 800H-TFRXJETS00R

800	T		– TFXT	QH	2	R	A
	a	*b*	*c*	*d*	*e*		*f*

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Head Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
TFXT	Standard (45 mm) mushroom head	TFRXT
TFXJT	Jumbo (60 mm) mushroom head	TFRXJT
TFXJET	Jumbo (60 mm) mushroom head with "E-STOP"	TFRXJET

d

Illumination Option	
Code	Description
PH	Transformer with LED lamp
QH	Universal with LED lamp

e

Voltage	
Transformer	
Code	Description
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
46	480V AC 50/60 Hz
56	600V AC 50/60 Hz
Universal	
Code	Description
2	12…130V AC/DC

f

Target		
Contact		
N.O.	O	X
N.C./ N.C.L.B./ S.M.C.B.	X	O
Contact Blocks		
Code	Description	
Blank	No contacts	
Standard		
D2	1 N.C.	
D4S	1 S.M.C.B.	
A	1 N.O. - 1 N.C.	
G1	2 N.O. - 2 N.C.	
Pen*TUFF* (Low Voltage)		
D2V	1 N.C.	
AV	1 N.O. - 1 N.C.	
G1V	2 N.O. - 2 N.C.	

Note: X = Closed/O = Open

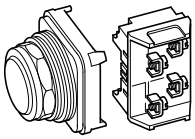
Momentary Contact Push Button Devices, Non-Illuminated

Flush Head Unit
Cat. No. 800T-A1A

Extended Head Unit
Cat. No. 800T-B6A

Booted Unit
Cat. No. 800H-R2A

Bootless Flush Head Unit
Cat. No. 800H-AR1A



800 T ___ – A 1 ___ A
a b c d e f

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Operator Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
A	Flush head	AR
B	Extended head	BR
D	Mushroom head	DR
DX	Mushroom head less color cap	DRX
—	Bootless guarded head	GR
—	Booted head	R★

d

Color Cap	
Code	Description
Blank	Used only when ordering Operator Type DX/DRX
1	Green
2	Black
3	Orange‡

d (cont'd)

Color Cap	
Code	Description
4	Grey‡
5	White‡
6	Red
7	Blue
9	Yellow

e

Special Mushroom Head	
Code	Description
J♣	Jumbo mushroom head — plastic
L♣	Jumbo mushroom head — metal

Note: Special mushroom head options only apply to mushroom head operator type code D/DR (Table c).

f

Contact Block(s)	
Code	Description
Blank	No contacts
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2	2 N.O.§
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.

f (cont'd)

Contact Block(s)	
Code	Description
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
Time Delay	
T	1 N.O. Depress close, delayed opening
S	1 N.C. Depress open, delayed closure
Snap Action	
M	1 N.O. - 1 N.C.
N	2 N.O. - 2 N.C.
Class 1, Div. 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R	2 N.O.§
A4R	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.

f (cont'd)

Contact Block(s)	
Code	Description
Class 1, Div. 2	
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
A2Y	2 N.O.
A4Y	2 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C

Time Delay Contacts

Series C field installable kits can only be used with Series T or later operators. Adjustable range of 0.5 to 15 s + 25%. Maximum continuous current Ith 5 A.

Snap Action Contacts

Snap-action contacts feature a quick make, quick break snap-action mechanism that is only available on factory assembled units. Maximum continuous current I_{th} 10 A.

★ Underlying operators are extended head. Boot material is chlorosulfonated polyethylene.
‡ Not available for booted operators.
§ A2 and A2R contact blocks cannot be stacked upon, but can stack on other contact blocks.
♣ Jumbo mushroom heads not available in white color.

ALLEN BRADLEY 30MM 800H OPERATORS

Momentary Contact Push Button Devices, Illuminated

Extended Head Without Guard
Cat. No. 800T-PB16R

Extended Head without Guard
Cat. No. 800H-PRB16R

800	T		–	P	B	H	16	R	
	a	*b*		*c*	*d*	*e*	*f*	*g*	*h*

a

Protection Rating	
Code	**Description**
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	**Description**
Blank	No guards
C	Guards on terminals

c

Power Module Type		
800T Type 4/13	**Description**	**800H Type 4/4X/13**
Code		**Code**
P	Transformer (or dual input)	PR
Q	Full voltage/ Universal	QR

d

Head Type	
Code	**Description**
A	Extended head with guard
B	Extended head without guard
M	Mushroom
MJ	Jumbo mushroom

e

Illumination Options	
Code	**Description**
Blank	Incandescent
H	LED
Dual Input	
D	Diode type§
T	Transformer — relay type
TH	Transformer — relay type LED

f

Voltage	
Transformer	
Code	**Description**
16	120V AC, 50/60 Hz
26	240V AC, 50/60 Hz
46	480V AC, 50/60 Hz
56	600V AC, 50/60 Hz
Full Voltage — Incandescent	
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
10	120V AC/DC
20	240V AC/DC
Universal — LED	
2	12…130V AC/DC
Dual Input	
16	120V AC
24	24V AC/DC♦

g

Lens Color	
Code	**Description**
Blank	No lens with standard contacts 1 N.O. - 1 N.C.
X	No lens if ordering any contacts other than standard 1 N.O. - 1 N.C.
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White

h

Contact Block(s)	
Code	**Description**
X	No contacts
Standard	
Blank	1 N.O. - 1 N.C.
D1	1 N.O.
Pen*TUFF* (Low Voltage)	
AV	1 N.O. - 1 N.C.
Class 1, Div. 2	
Logic Reed	
AR	1 N.O. - 1 N.C.
Sealed Switch	
AP	1 N.O. - 1 N.C.
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C.

§ Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs.
♦ Dual input diode only.

Momentary Contact Push Button Devices, Non-Illuminated — With Two-Color Molded Legend Caps

Cat. No. 800T-A00 with Cat. No. 800T-LC103W installed

Cat. No. 800H-BR00 with Cat. No. 800T-LC604 installed

800	T		–	A	103W	A
	a	*b*		*c*	*d*	*e*

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Operator Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
A	Flush head	AR
B	Extended head	BR

d

Cap Text/Color			
Code	Text	Color	
		Cap	Text
101W	I	Green	White
103W	START		
105W	ON		
121W	START / I		
202W	O	Black	White
204W	STOP		
207W	RESET		
208W	↑		
209W	FORWARD		
210W	REVERSE		
212W	JOG		
213W	UP		
214W	DOWN		
215W	RAISE		
216W	LOWER		
217W	IN		
218W	OUT		
219W	HIGH		
220W	LOW		
222W	STOP / O		
501B	I	White	Black
503B	START		
508B	↑		
521B	START / I		
602W	O	Red	White
604W	STOP		
606W	OFF		
622W	STOP / O		
707W	RESET	Blue	White
711W	R		

e

Contact Block(s)	
Code	Description
Blank	No contacts
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2	2 N.O.§
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.
Class 1, Div. 2	
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
A2Y	2 N.O.
A4Y	2 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C

e (cont'd)

Contact Block(s)	
Code	Description
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
Time Delay	
T	1 N.O. Depress close, delayed opening
S	1 N.C. Depress open, delayed closure
Snap Action	
M	1 N.O. - 1 N.C.
N	2 N.O. - 2 N.C.
Class 1, Div. 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R	2 N.O.§
A4R	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.

§ A2 and A2R contact blocks cannot be stacked upon, but can stack upon other contact blocks.

ALLEN BRADLEY 30MM 800H OPERATORS

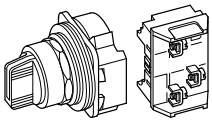
2-Position Selector Switch Devices, Non-Illuminated

Standard Knob Operator
Cat. No. 800T-H2A

Knob Lever Operator
Cat. No. 800T-H17A

Standard Knob Operator
Cat. No. 800H-HR2A

800	T		– HA	2	A
	a	*b*	*c*	*d*	*e*



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Knob Insert Colors		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
H	White	HR
HX	Packet of colored inserts‡	HRX
Metal Wing Lever Colors♣		
Code	Color	Code
HA	Red	—
HG	Grey	—

d

Operator Type and Function	
Standard Knob	
Code	Operator Function
2	Maintained
4	Spring return from left§
5	Spring return from right
Knob Lever♣	
Code	Operator Function
17	Maintained
18	Spring return from left§
19	Spring return from right
Metal Wing Lever♣	
Code	Operator Function
11	Maintained
15	Spring return from left§
16	Spring return from right
Coin Slot♣	
Code	Operator Function
6	Maintained
7	Spring return from left
8	Spring return from right

e

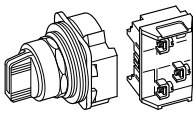
Contact Block(s)			
Code	Description		
	Contact Configuration	2-Position	
Blank	No contacts	—	—
Standard			
D1	1 N.O.	O	X
D2	1 N.C.	X	O
A	1 N.O. - 1 N.C.	O	X
		X	O
B	2 N.O. - 2 N.C.	O	X
		X	O
		O	X
		X	O
Max Duty (Horsepower Rated)Δ			
D1M	1 N.O.		
D2M	1 N.C.		
Pen*TUFF* (Low Voltage)Δ			
D1V	1 N.O.		
D2V	1 N.C.		
AV	1 N.O. - 1 N.C.		
BV	2 N.O. - 2 N.C.		
Class1, Div. 2			
Logic ReedΔ			
D1R	1 N.O.		
D2R	1 N.C.		
AR	1 N.O. - 1 N.C.		
BR	2 N.O. - 2 N.C.		
Sealed SwitchΔ			
D1P	1 N.O.		
D2P	1 N.C.		
AP	1 N.O. - 1 N.C.		
BP	2 N.O. - 2 N.C.		
Stackable Sealed SwitchΔ			
D1Y	1 N.O.		
D2Y	1 N.C.		
AY	1 N.O. - 1 N.C.		
BY	2 N.O. - 2 N.C.		

‡ One insert of each color (blue, green, orange, red, and yellow).
§ Target tables are reversed from those shown.
♣ Only available on Bul. 800T, Type 4/13 operators.
Δ Contact target tables same as those listed for standard contact blocks.

2-Position Selector Switch Devices, Non-Illuminated (Bul. 800T only)

2-Position Cylinder Lock Operator
Cat. No. 800T-H33A

800 T ___ – H31 ___ A
a *b* *c* *d* *e*



a

Protection Rating	
Code	Description
T	Metal, Type 4/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Key Removal Position	
Maintained	
Code	Operator Function
H31	Key removal — left
H32	Key removal — right
H33	Key removal — both
Spring Return From Left	
Code	Operator Function
H42	Key removal — right★
Spring Return From Right	
Code	Operator Function
H48	Key removal — left

d

Key Options for Cylinder LocksΔ			
Code	T Series Key No.	Code	T Series Key No.
Blank	D018 (Std. Key)	15	T112
03	D020	16	T115
04	D025	17	T324
05	D335	18	T382
06	D429	19	T404
07	D461	20	T171
08	D111	21	T484
09	D587	22	T547
10	D682	23	T569
11	D713	24	T692
12	D900	25	T752
13	D992	26	T178
14	D118	—	—

e

Contact Block(s)			
Code	Description		
	Contact Configuration	2-Position	
Blank	No contacts	—	—
Standard			
D1	1 N.O.	O	X
D2	1 N.C.	X	O
A	1 N.O. - 1 N.C.	O	X
		X	O
B	2 N.O. - 2 N.C.	O	X
		X	O
		O	X
		X	O
Max Duty (Horsepower Rated)			
D1M	1 N.O.		
D2M	1 N.C.		
Pen*TUFF* (Low Voltage)			
D1V	1 N.O.		
D2V	1 N.C.		
AV	1 N.O. - 1 N.C.		
BV	2 N.O. - 2 N.C.		
Class1, Div. 2			
Logic Reed♣			
D1R	1 N.O.		
D2R	1 N.C.		
AR	1 N.O. - 1 N.C.		
BR	2 N.O. - 2 N.C.		
Sealed Switch♣			
D1P	1 N.O.		
D2P	1 N.C.		
AP	1 N.O. - 1 N.C.		
BP	2 N.O. - 2 N.C.		
Stackable Sealed Switch♣			
D1Y	1 N.O.		
D2Y	1 N.C.		
AY	1 N.O. - 1 N.C.		
BY	2 N.O. - 2 N.C.		

★ Target tables are reversed from those shown.
♣ Contact target tables same as those listed for standard and Pen*TUFF* contact blocks.
Δ Device supplied with 2 keys. Replacement key part no. for standard D018 key is X-181170. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for additional replacement key numbers.

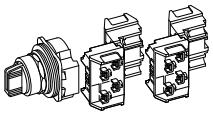
3-Position Selector Switch Devices, Non-Illuminated

Standard Knob Operator
Cat. No. 800T-J2A

Knob Lever Operator
Cat. No. 800T-J17A

Standard Knob Operator
Cat. No. 800H-JR2A

800 T ___ – J 2 ___ C
a b c d e f



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Knob Insert Colors		
800T Type 4/13 Code	Description	800H Type 4/4X/13 Code
J	White	JR
JX	Packet of colored inserts★	JRX
Metal Wing Lever Colors‡		
Code	Color	Code
JA	Red	—
JG	Grey	—

d

Knob/Lever Type Operators	
Standard Knob	
Code	Operator Function
2	Maintained
4	Spring return from left
5	Spring return from right
91	Spring return from both
Knob Lever‡	
Code	Operator Function
17	Maintained
18	Spring return from left
19	Spring return from right
20	Spring return from both
Metal Wing Lever‡	
Code	Operator Function
11	Maintained
15	Spring return from left
16	Spring return from right
141	Spring return from both
Coin Slot‡	
Code	Operator Function
10	Spring return from both

e

Cam Option§Δ	
Code	Description
Blank	KB7 cam (std.)
KA1	KA1 cam
KA7	KA7 cam

e (cont'd)

Cam Option§Δ	
Code	Description
KC1	KC1 cam
KC7	KC7 cam
KD7	KD7 cam
KE7♣	KE7 cam
KQ1	KQ1 cam
KQ7	KQ7 cam
KR1♣	KR1 cam
KR7♣	KR7 cam
KT1♣	KT1 cam
KT7♣	KT7 cam
KU7♣	KU7 cam

f

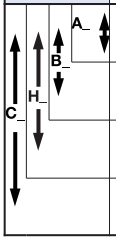
Contact Blocks	
Code	Description
Blank	No contacts on operator
Standard	
A	1 N.O. - 1 N.C. 1-**800T-XA** on white side
B	2 N.O. - 2 N.C. 2-**800T-XA**s — 1 on white side/1 on black side
PenTUFF (Low Voltage)	
AV	1 N.O. - 1 N.C. 1-**800T-XAV** on white side
BV	2 N.O. - 2 N.C. 2-**800T-XAV**s — 1 on white side/1 on black side

f (cont'd)

Contact BlocksΔ	
Code	Description
Blank	No contacts
Class 1, Div. 2	
Logic Reed	
AR	1 N.O. - 1 N.C. 1-**800T-XAR** on white side
BR	2 N.O. - 2 N.C. 2-**800T-XAR**s — 1 on white side/1 on black side
Sealed Switch	
AP	1 N.O. - 1 N.C. 1-**800T-XAP** on white side
BP	2 N.O. - 2 N.C. 2-**800T-XAP**s — 1 on white side/1 on black side
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C. 1-**800T-XAY** on white side
BY	2 N.O. - 2 N.C. 2-**800T-XAY**s — 1 on white side/1 on black side

★ One insert of each color (blue, green, orange, red, and yellow).
‡ Only available on Bul. 800T, Type 4/13 operators.
§ If an overlapping cam is required, consult your local distributor.
♣ Not available with wing levers.
Δ See Table 1 for cam selections and associated targets.

Table 1. Cam and Contact Block Functionality Table

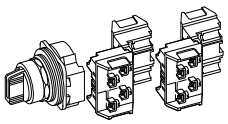
Contact Block Suffix Code	Contact Block Side	Circuits	Cam Codes																																							
			KB7 (Std.)			KA1			KA7			KC1			KC7			KD7			KE7			KQ1			KQ7			KR1			KR7			KT1			KT7			KU7		
	White	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	X	O	X	X	O	X	X	O	X	X	O	X	O	O	X	X	O	O	X	O	O
		B	O	O	X	O	X	O	O	X	O	O	X	O	O	X	O	O	X	O	O	X	X	O	X	O	O	X	O	O	X	O	O	X	O	O	O	O	O	X	O	X	O	O
	Black	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	O	X	X	O	O	O	O	O	X
		B	O	O	X	O	X	O	O	X	O	O	X	O	O	O	O	O	X	O	X	O	X	X	O	O	X	O	O	X	O	X	X	O	O	X	X	X	X	O	O	X	X	X	X	O
	White	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	X	O	X	X	O	X	X	O	X	X	O	X	O	O	X	X	O	O	X	O	O
		B	O	O	X	O	X	O	O	X	O	O	X	O	O	X	O	O	X	O	O	X	X	O	X	O	O	X	O	O	X	O	O	X	O	O	O	O	O	X	O	X	O	O
	Black	A	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	X	O	O	O	O	X	O	O	X	X	O	O	O	O	X	X	O	O	O	X	X	O	O	O	O	O	X
		B	O	O	X	O	X	O	O	X	O	X	O	O	O	O	X	O	X	O	X	X	O	O	X	O	O	X	O	X	X	O	O	X	X	X	X	O	O	X	X	X	X	O

Note: X = Closed/O = Open

3-Position Selector Switch Devices, Non-Illuminated (Bul. 800T only)

3-Position Cylinder Lock Operator
Cat. No. 800T-J41A

800 T ___ – J41 ___ KC1 A
a b c d e f



a

Protection Rating	
Code	Description
T	Metal, Type 4/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Key Removal Position	
Maintained	
Code	Operator Function
J41	Key removal — left
J42	Key removal — center
J43	Key removal — right
J44	Key removal — all
J45	Key removal — left and center
J46	Key removal — right and left
J47	Key removal — right and center
Spring Return from Left	
J50	Key removal — center
J52	Key removal — right
J51	Key removal — right and center

c (cont'd)

Key Removal Position	
Spring Return from Right	
Code	Operator Function
J69	Key removal — left
J38	Key removal — center
J73	Key removal — left and center
Spring Return from Both	
J631	Key removal — center

d

Key Options for Cylinder Locks♣	
Code	Key No.
Blank	D018 (standard key)
03	D020
04	D025
05	D335
06	D429
Note: Refer to page 11 for additional key option codes.	

e

Cam Option‡	
Code	Description
Blank	KB7 cam (std.)
KA1	KA1 cam
KA7	KA7 cam
KC1	KC1 cam
Note: See Table 1 on page 12 for cam selections.	

e (cont'd)

Cam Option‡	
Code	Description
KC7	KC7 cam
KD7	KD7 cam
KE7	KE7 cam
KQ1	KQ1 cam
KQ7	KQ7 cam
KR1	KR1 cam
KR7	KR7 cam
KT1	KT1 cam
KT7	KT7 cam
KU7	KU7 cam

f

Contact Blocks	
Code	Description
Blank	No contacts
Standard	
A	1 N.O. - 1 N.C. 1-**800T-XA** on white side
B	2 N.O. - 2 N.C. 2-**800T-XA**s — 1 on white side/1 on black side
Pen*TUFF* (Low Voltage)	
AV	1 N.O. - 1 N.C. 1-**800T-XAV** on white side
BV	2 N.O. - 2 N.C. 2-**800T-XAV**s — 1 on white side/1 on black side

f (cont'd)

Contact Blocks	
Class 1, Div. 2	
Logic Reed	
Code	Description
AR	1 N.O. - 1 N.C. 1-**800T-XAR** on white side
BR	2 N.O. - 2 N.C. 2-**800T-XAR**s — 1 on white side/1 on black side
Sealed Switch	
AP	1 N.O. - 1 N.C. 1-**800T-XAP** on white side
BP	2 N.O. - 2 N.C. 2-**800T-XAP**s — 1 on white side/1 on black side
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C. 1-**800T-XAY** on white side
BY	2 N.O. - 2 N.C. 2-**800T-XAY**s — 1 on white side/1 on black side

‡ If an overlapping cam is required, consult your local Rockwell Automation sales office or Allen-Bradley distributor.
♣ Device supplied with 2 keys. Replacement key part no. for standard D018 key is X-181170. See page 10-46 for additional replacement key numbers.

Table 1. Cam and Contact Block Functionality Table

| Contact Block Suffix Code | Contact Block Side | Ckts | Cam Codes | | |

ALLEN BRADLEY 30MM 800H OPERATORS

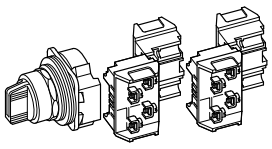
4-Position Selector Switch Devices, Non-Illuminated

Standard Knob Operator
Cat. No. 800T-N2KN4B

Knob Lever Operator
Cat. No. 800T-N17KN4B

Standard Knob Operator
Cat. No. 800H-NR2KF4AAXX

800 T _ – N 2 KF4 B
a b c d e f



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Knob Insert Colors		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
N	White	NR
NX	Packet of colored inserts★	NRX
Metal Wing Lever Colors		
Code	Color	Code
NA	Red	—
NG	Grey	—

d

Operator Function and Knob Type	
Standard Knob	
Code	Operator Function
2	Maintained
3	Spring return from position 1 to position 2
9	Spring return from position 4 to position 3
Knob Lever♣	
Code	Operator Function
17	Maintained
29	Spring return from position 1 to position 2
30	Spring return from position 4 to position 3
Metal Wing Lever♣	
Code	Operator Function
11	Maintained
13	Spring return from position 1 to position 2
14	Spring return from position 4 to position 3

e

Cam OptionΔ	
Code	Description
KF4	F cam
KG4	G cam
KK4♦	K cam
KM4♦	M cam
KP4	P cam
KN4	Overlapping cam‡

f

Contact BlocksΔ		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
Blank	No contacts	Blank
Standard		
B	2 N.O. - 2 N.C. 2-**800T-XA**s — 1 on white side/ 1 on black side	AAXX
H	3 N.O. - 3 N.C. 3-**800T-XA**s — 2 on white side/ 1 on black side	AAAX
C	4 N.O. - 4 N.C. 4-**800T-XA**s — 2 on white side/ 2 on black side	AAAA

f (cont)

Contact Blocks		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
Pen*TUFF* (Low Voltage)		
BV	2 N.O. - 2 N.C.	FFXX
HV	3 N.O. - 3 N.C.	FFFX
CV	4 N.O. - 4 N.C.	FFFF
Class 1, Div. 2		
Logic Reed§		
BR	2 N.O. - 2 N.C.	TTXX
HR	3 N.O. - 3 N.C.	TTTX
CR	4 N.O. - 4 N.C.	TTTT
Sealed Switch§		
BP	2 N.O. - 2 N.C.	PPXX
Stackable Sealed Switch♣		
BYΔ	2 N.O. - 2 N.C.	TTXX
HYΔ	3 N.O. - 3 N.C.	TTTX
CYΔ	4 N.O. - 4 N.C.	TTTT

★ One insert of each color (blue, green, orange, red, and yellow).
‡ Overlapping cam. See Publication 800T-2.8 for overlap specifications.
§ Contact block mounting same as listed for standard and Pen*TUFF* contact blocks.
♣ Only available on Bul. 800T, Type 4/13 operators.
Δ See Table 1 for proper cam/contact selection.
♦ Not available with wing levers.

Table 1. Cam and Contact Block Functionality Table

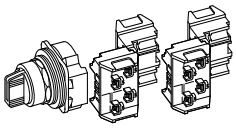
Contact Block Suffix Code	Contact Block Side	Circuits	Cam Codes																									
			KF4				KG4				KK4				KM4				KP4				KN4‡					
C_, H_, B_	White	A	X	O	O	O	X	X	O	O	O	O	X	X	X	O	O	O	O	O	O	X	O	X	O	O		
		B	O	X	O	O	O	O	X	O	X	X	O	O	O	X	X	O	O	X	O	O	O	O	O	X		
	Black	A	O	O	O	X	X	O	O	O	X	O	O	X	O	O	O	X	O	O	X	X	O	O	X	O		
		B	O	O	X	O	O	O	O	X	O	X	X	O	O	X	O	O	X	O	O	O	X	O	O	O		
	White	A	X	O	O	O	X	X	O	O	O	O	X	X	X	O	O	O	O	O	O	X	O	X	O	O		
		B	O	X	O	O	O	O	X	O	X	X	O	O	O	X	X	O	O	X	O	O	O	O	O	X		
	Black	A	O	O	O	X	X	O	O	O	X	O	O	X	O	O	O	X	O	O	X	X	O	O	X	O		
		B	O	O	X	O	O	O	O	X	O	X	X	O	O	X	O	O	X	O	O	O	X	O	O	O		

Note: X = Closed/O = Open

4-Position Selector Switch Devices, Non-Illuminated (800T only)

Cylinder Lock Operator
Cat. No. 800T-N32KF4B

800 T ____ – N31 ____ KM4 C
a b c d e f



a

Protection Rating	
Code	Description
T	Metal, Type 4/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Key Removal Position and Operator Function	
Maintained	
Code	Operator Function
N31	Key removal position 1
N32	Key removal position 2
N33	Key removal position 3
N34	Key removal position 4
N61	Key removal all positions

c (cont'd)

Key Removal Position and Operator Function	
Spring Return From Position 1 to Position 2	
Code	Description
N132	Key removal position 2
N133	Key removal position 3
N134	Key removal position 4
N154	Key removal positions 2, 3, and 4
Spring Return From Position 4 to Position 3	
Code	Operator Function
N231	Key removal position 1
N232	Key removal position 2
N233	Key removal position 3
N251	Key removal positions 1, 2, and 3

d

Key Options for Cylinder Locks♣	
D Series	
Code	Key No.
Blank	D018 (standard key)
03	D020
04	D025
05	D335
06	D429
Note: Refer to page 11 for additional key option codes.	

e

Cam Option	
Code	Description
KF4	F cam
KG4	G cam
KK4	K cam
KM4	M cam
KP4	P cam
KN4	Overlapping cam‡
Note: See Table 1 for proper cam selection.	

f

Contact Blocks	
Code	Description
Blank	No contacts
Standard	
B	2 N.O. - 2 N.C. 2-**800T-XA**s — 1 on white side/1 on black side
H	3 N.O. - 3 N.C. 3-**800T-XA**s — 2 on white side/1 on black side
C	4 N.O. - 4 N.C. 4-**800T-XA**s — 2 on white side/2 on black side
Pen*TUFF* (Low Voltage)	
BV	2 N.O. - 2 N.C. 2-**800T-XAV**s — 1 on white side/1 on black side
HV	3 N.O. - 3 N.C. 3-**800T-XAV**s — 2 on white side/1 on black side
CV	4 N.O. - 4 N.C. 4-**800T-XAV**s — 2 on white side/2 on black side
Class 1, Div. 2	
Logic Reed§	
BR	2 N.O. - 2 N.C.
HR	3 N.O. - 3 N.C.
CR	4 N.O. - 4 N.C.
Sealed Switch§	
BP	2 N.O. - 2 N.C.
Stackable Sealed Switch§	
BY	2 N.O. - 2 N.C.
HY	3 N.O. - 3 N.C.
CY	4 N.O. - 4 N.C.
Note: Associated targets shown in Table 1.	

Note: X = Closed/O = Open
‡ Overlapping cam. One layer of contact blocks allowed, no stacking. See Publication 800T-2.8 for overlap specifications.
§ Contact block mounting same as listed for standard and Pen*TUFF* contact blocks.
♣ Device supplied with 2 keys. Replacement key part no. for standard D018 key is X-181170. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for additional replacement key numbers.

Table 1. Cam and Contact Block Functionality Table

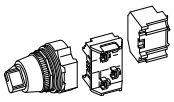
Contact Block Suffix Code	Contact Block Side	Circuits	Cam Codes																							
			KF4				KG4				KK4				KM4				KP4				KN4‡			
C_ H_ B_	White	A	X	O	O	O	X	X	O	O	O	O	X	X	X	O	O	O	O	O	O	X	O	X	O	O
		B	O	X	O	O	O	O	X	O	X	X	O	O	O	X	X	O	O	X	O	O	O	O	O	X
	Black	A	O	O	O	X	X	O	O	O	X	O	O	X	O	O	O	X	O	O	X	X	O	O	X	O
		B	O	O	X	O	O	O	O	X	O	X	X	O	O	X	O	O	X	O	O	O	X	O	O	O
	White	A	X	O	O	O	X	X	O	O	O	O	X	X	X	O	O	O	O	O	O	X	O	X	O	O
		B	O	X	O	O	O	O	X	O	X	X	O	O	O	X	X	O	O	X	O	O	O	O	O	X
	Black	A	O	O	O	X	X	O	O	O	X	O	O	X	O	O	O	X	O	O	X	X	O	O	X	O
		B	O	O	X	O	O	O	O	X	O	X	X	O	O	X	O	O	X	O	O	O	X	O	O	O

2-Position Knob/Lever Type Selector Switch Devices, Illuminated

Standard Knob Operator
Cat. No. 800T-16HR2KB6AX

Knob Lever Operator
Cat. No. 800H-16HRR17KB6AX

800	T		–	16	H	R		2	KB6	A	X
	a	*b*		*c*	*d*	*e*	*f*	*g*	*h*	1st Level *i*	2nd Level *j*



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Power Module Type and Voltage	
Full Voltage — Incandescent	
Code	Description
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
Universal — LED	
2	12…130V AC/DC
Transformer	
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
For other voltages, please consult your local Rockwell Automation sales office or Allen-Bradley distributor.	

d

No. of Positions		
Bul. 800T Type 4/13	Description	Bul. 800H Type 4/4X/13
Code		Code
H	2-position	HR

e

Knob Color	
Code	Color
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White
X	No knob

f

Illumination Options	
Code	Description
Blank	Incandescent
H	LED

Table 1. Selector Switch Cam Targets

Cam Description (2-Position)		
Target		Contact Block Code♠
↖	↗	
O	X	D, H, V, R, 5
X	O	E, U, W, S, 6

X = Closed/O = Open

g

Operator Function and Knob Type	
Standard Knob or No Knob	
Code	Operator Function
2	Maintained
4	Spring return from left
5	Spring return from right
Knob Lever	
17	Maintained
18	Spring return from left
19	Spring return from right

h

Cam Options	
2-Position	
Code	Operator Function
KB6	Maintained cam
KL8	Spring return cam

Table 2. Contact Block Code Reduction Rules

Contact Block Substitution	
Combination	Code
Standard	
D + E	A
D + D	M
E + E	N

i, j

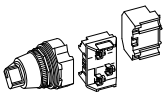
Contact Blocks∆	
Code	Description
Blank (both pos.)	No contacts
Standard	
D	1 N.O.
E	1 N.C.
A	1 N.O. - 1 N.C.
X	No contacts in this position
Pen*TUFF* (Low Voltage)	
H	1 N.O.
U	1 N.C.
F	1 N.O. - 1 N.C.
Class 1, Div. 2	
Logic Reed	
V	1 N.O.
W	1 N.C.
T	1 N.O. - 1 N.C.
Sealed Switch	
R	1 N.O.
S	1 N.C.
P	1 N.O. - 1 N.C.
Stackable Sealed Switch	
5	1 N.O.
6	1 N.C.
7	1 N.O. - 1 N.C.

∆ Contact blocks used on white side only.
♠ Target tables are reversed for spring return from left operators.

3-Position Knob/Lever Type Selector Switch Devices, Illuminated

Standard Knob Operator
Cat. No. 800T-16JR2KB7AX

Standard Knob Operator
Cat. No. 800H-16JRR2KB7AX

									1st Level	2nd Level	
800	T		– 16	J	R		2	KB7	A	X	
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Power Module Type and Voltage	
Full Voltage — Incandescent	
Code	Description
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
Universal — LED	
2	12…130V AC/DC
Transformer	
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
For other voltages, please consult your local Rockwell Automation sales office or Allen-Bradley distributor.	

d

No. of Positions		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
J	3-position	JR

e

Knob Color	
Code	Color
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White
X	No knob

f

Illumination Options	
Code	Description
Blank	Incandescent
H	LED§

g

Operator Function and Knob Type	
Standard Knob or No Knob	
Code	Operator Function
2	Maintained
4	Spring return from left
5	Spring return from right
91	Spring return from both
Knob Lever	
Code	Operator Function
17	Maintained
18	Spring return from left
19	Spring return from right
20	Spring return from both

h

Cam Options	
3-Position	
Code	Operator Function
KB7	B7 cam
KC1	C1 cam
KC7	C7 cam
KE7	E7 cam
KQ1	Q1 cam
KT1	T1 cam

i, j

Contact Blocks♣	
Code	Description
Blank (both pos.)	No contacts

i, j (cont'd)

Contact Blocks♣	
Code	Description
Standard	
A	1 N.O. - 1 N.C.
X	No contacts in this position
Pen*TUFF* (Low Voltage)	
F	1 N.O. - 1 N.C.
Class 1, Div. 2	
Logic Reed	
T	1 N.O. - 1 N.C.
Sealed Switch	
P	1 N.O. - 1 N.C.
Stackable Sealed Switch	
7	1 N.O. - 1 N.C.

Table 1. Selector Switch Cam Targets

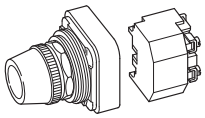
Target			Cam Description (3-Position)					
			KB7	KC1	KC7	KE7	KQ1	KT1
X	O	O	D, H, V, R, 5	—	D, H, V, R, 5	D, H, V	—	E, U, W, S, 6
O	X	O	—	E, U, W, S, 6	E, U, W, S, 6	—	E, U, W, S, 6	—
O	O	X	E, U, W, S, 6	D, H, V, R, 5	—	—	—	D, H, V, R, 5
X	X	O	G, I	J, Q	—	—	—	J, Q
O	X	X	J,Q	—	J,Q	E, U, W, S, 6	—	—
X	O	X	—	G,I	G,I	—	D, H, V, R, 5	—

§ LEDs available in red, green, amber, blue, and white. White LEDs only available in 6V, 24V, 120V, and 130V full voltage and all transformer units. LED color matches lens color, except clear lens supplied with white LED and white lens supplied with amber LED. All LEDs except 120V have an internal shunt resistor for use with solid-state outputs.
♣ Contact blocks used on white side only.

Pilot Light Devices

Transformer Type Pilot Light
Cat. No. 800T-P16R

Push-to-Test Pilot Light
Cat. No. 800T-PT16R



800	T		–	P	T		16	G	(Push-to-Test) AR
	a	*b*		*c*	*d*	*e*	*f*	*g*	*h*

a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Power Module Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
P	Transformer (or dual input)	PR
Q	Full voltage/ Universal	QR

d

Lamp Test Options	
Code	Description
Blank	No test option▽
T	Push-to-test
D	Dual input — diode△♠
DT	Dual input — transformer relay♠
Note: Push-to-test supplied with factory jumpered contact block.	

e

Illumination Options	
Code	Description
Blank	Incandescent
H	LED♣

f

Voltage	
Transformer	
Code	Description
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
46	480V AC 50/60 Hz
56	600V AC 50/60 Hz
Full Voltage — Incandescent	
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
10	120V AC/DC
20	240V AC/DC
Universal — LED	
2	12…130V AC/DC
Dual Input	
16	120V AC
24	24V AC/DC (Dual input diode only)

g

Lens Color		
Code	Color	Glass Code #
Blank	No lens	Blank
A	Amber	D
B	Blue	E
C	Clear	F
G	Green	H
R	Red	J
W	White	K

h

Contact Blocks (Push-to-test units only)	
Code	Description
Standard	
Blank	1 N.O. - 1 N.C.
Pen*TUFF* (Low Voltage)	
AV	1 N.O. - 1 N.C.
Class 1, Div. 2	
Logic Reed	
AR	1 N.O. - 1 N.C.
Sealed Switch	
AP	1 N.O. - 1 N.C.
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C.

▽ Non-push-to-test pilot lights using the universal LED option cannot be ordered as Bul. 800HC or 800TC. The terminals are finger-safe as standard.
△ Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs.
♠ Dual input devices (diode or transformer type) cannot be ordered as Bul. 800HC or 800TC. Finger-safe terminal guards are not available.
♣ LED illumination option is not available with diode type dual input.
Glass lens available on 800T pilot lights only. Not available on push-to-test units.

2-Position Push-Pull and Push-Pull/Twist Release Devices, Non-Illuminated

Note: A jumbo or large legend plate is recommended, if space allows.

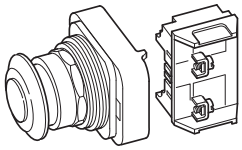
2-Position Push-Pull
Cat. No. 800T-FX6D4

2-Position Metal Push-Pull
Cat. No. 800TC-FXLE6D4S

2-Position Push-Pull / Twist
Cat. No. 800T-FXT6D4

2-Position Push-Pull / Twist
Cat. No. 800H-FRXT6D4

800 T ___ – FX 1 A1
a b c d e



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Head Type §		
800T Type 4/13 Code	Description	800H Type 4/4X/13 Code
FX	Mushroom head (push-pull)	—
FXC	90 mm anodized aluminum head (push-pull)	—
FXJ	Jumbo mushroom head (push-pull)	—
FXJE	Jumbo mushroom head (push-pull) with "E-Stop"	—
FXL	63 mm anodized aluminum head (push-pull)	—
FXLE	63 mm anodized aluminum head (push-pull) with "E-Stop"	—
FXT	Push-pull/twist-to-release	FRXT
FXJT	Jumbo head push-pull with twist-to-release	FRXJT

d

Color Cap	
Code	Color
Blank	No cap ♣
1	Green
2	Black
3	Orange
4	Grey
5	White
6	Red
7	Blue
9	Yellow

e

Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No contacts on operator
Standard			
D1	O	X	1 N.O.
D2	X	O	1 N.C.
D4	X	O	1 N.C.L.B.★
A	O X	X O	1 N.O. - 1 N.C.
A1	O X	X O	1 N.O. - 1 N.C.L.B.★
A5	X X	O O	2 N.C.L.B. ∇★

e (cont'd)

Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No contacts
Pen*TUFF* (Low Voltage)			
D1V	O	X	1 N.O.
D2V	X	O	1 N.C.
D4V	X	O	1 N.C.L.B.
AV	O X	X O	1 N.O. - 1 N.C.
Class 1, Div. 2			
Logic Reed			
D1R	O	X	1 N.O.
D2R	X	O	1 N.C.
AR	O X	X O	1 N.O. - 1 N.C.
Sealed Switch			
D1P	O	X	1 N.O.
D2P	X	O	1 N.C.
AP	O X	X O	1 N.O. 1 N.C.
Stackable Sealed Switch			
D1Y	O	X	1 N.O.
D2Y	X	O	1 N.C.
AY	O X	X O	1 N.O. - 1 N.C.

Note: X = Closed/O = Open
★ Normally closed late break contact. When button is pushed from the OUT to IN position, the mechanical detent action of the operator occurs before electrical contacts change state. When the button is pulled from the IN in the OUT position, the electrical contacts change state before the mechanical detent occurs.
§ Devices with N.C.L.B. contacts meet EN ISO 13850 and IEC 60947-5-5 standards for emergency stop applications.
♣ Not valid with head Type J or JT.
∇ Two 800T-XD4 contact blocks supplied.

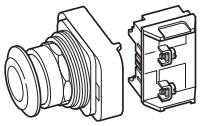
3-Position Push-Pull Devices, Non-Illuminated

Note: A jumbo or large legend plate is recommended, if space allows.

3-Position Push-Pull
Cat. No. 800T-FXM6A7

3-Position Push-Pull
Cat. No. 800H-FRXM6A7

800	T		– FX	M	1	A7
	a	*b*	*c*	*d*	*e*	*f*



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Head Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
FX	Mushroom head (push-pull)	FRX
FXC	90 mm anodized aluminum head (push-pull)	—
FXJ	Jumbo mushroom head (push-pull)	FRXJ
FXL	63 mm anodized aluminum head (push-pull)	—

d

Operator Function			
Code	Operator Position		
	Out	Center	In
M	Momentary	Maintained	Maintained
N	Momentary	Maintained	Momentary

e

Color Cap	
Code	Color
Blank	No cap §
1	Green
2	Black
3	Orange
4	Grey
5	White
6	Red
7	Blue
9	Yellow

f

Contact Block(s)				
Code	Operator Position			Description
	Out	Ctr.	In	
Blank	—	—	—	No contacts
Standard				
A	O X	O O	X O	1 N.O. - 1 N.C.
A1	O X	O X	X O	1 N.O. - 1 N.C.L.B.
A7	X X	O X	O O	1 N.C. - 1 N.C.L.B.
B6	X X X X	O X O X	O O O O	2 N.C. - 2 N.C.L.B.
Pen*TUFF* (Low Voltage)				
AV	O X	O O	X O	1 N.O. - 1 N.C.

f (cont'd)

Contact Block(s)				
Code	Operator Position			Description
	Out	Ctr.	In	
Class 1, Div. 2				
Logic Reed				
AR	O X	O O	X O	1 N.O. - 1 N.C.
Sealed Switch				
AP	O X	O O	X O	1 N.O. - 1 N.C.
Stackable Sealed Switch				
AY	O X	O O	X O	1 N.O. - 1 N.C.

Note: X = Closed/O = Open
§ Not valid with head Type J.

2-Position Push-Pull and Push-Pull/Twist Release Devices, Illuminated

Note: A jumbo or large legend plate is recommended, if space allows.

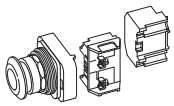
Illuminated 2-Position Push-Pull
Cat. No. 800T-FXP16RA1

2-Position Push-Pull
Cat. No. 800T-FXJEP16RA1

Illuminated 2-Position Push-Pull/Twist
Cat. No. 800T-FXTP16RA1

Illuminated 2-Position Push-Pull/Twist
Cat. No. 800H-FRXTP16RA1

800	T		–	FX	T	PH	16	R	A1
	a	*b*		*c*	*d*	*e*	*f*	*g*	*h*



a

Protection Rating	
Code	**Description**
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	**Description**
Blank	No guards
C	Guards on terminals

c

Head Type ♣		
800T Type 4/13	**Description**	**800H Type 4/4X/13**
Code		**Code**
FX	Mushroom head	FRX
FXJ	Jumbo mushroom	FRXJ
FXJE	Jumbo mushroom (push-pull) with "E-Stop"	—

d

Operator Function	
Code	**Description**
Blank	Push-pull #
T	Push-pull/twist

e

Illumination Options	
Transformer	
Code	**Description**
P	Incandescent
PH	LED
Full Voltage	
Q	Incandescent
QH	Universal LED
Dual Input	
D	Diode type ♠
DT	Transformer — relay type
DTH	Transformer — relay type LED

f

Voltage §	
Transformer	
Code	**Description**
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
Full Voltage	
24	24V AC/DC
10	120V AC/DC
20	240V AC/DC
Universal LED	
2	12…130V AC/DC
Dual Input	
16	120V AC
24	24V AC/DC (dual input diode only)

g

Color Cap	
Code	**Color**
X	No cap (not valid with head Type J)
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White

h

Target		
Contact		
N.O.	O	X
N.C./ N.C.L.B.	X	O

Contact Blocks	
Code	**Description**
Blank	No contacts
Standard	
D1	1 N.O.
D2	1 N.C.
D4	1 N.C.L.B.
A	1 N.O. - 1 N.C.
A1	1 N.O. - 1 N.C.L.B.
A5	2 N.C.L.B. ∇
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.

h (cont'd)

Contact Blocks	
Code	**Description**
Class 1, Div. 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
AR	1 N.O. - 1 N.C.
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
AP	1 N.O. - 1 N.C.
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
AY	1 N.O. - 1 N.C.

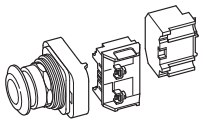
§ See page 18 for additional voltage code options.
♣ Devices with N.C.L.B. contacts meet EN ISO 13850 and IEC 60947-5-5 standards for emergency stop applications.
Push-Pull is available only with Bul. 800T.
♠ Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs.
∇ Two stacked 800T-XD4 contact blocks supplied.

3-Position Push-Pull Devices, Illuminated

Illuminated 3-Position Push-Pull
Cat. No. 800T-FXMP16RA7

Illuminated 3-Position Push-Pull
Cat. No. 800H-FRXMP16A7

800 T [ ] – FX M PH 16 R A1
a b c d e f g h



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Head Type		
800T Type 4/13	Description	800H Type 4/4X/13
Code		Code
FX	Mushroom head	FRX
FXJ	Jumbo mushroom	FRXJ

d

Operator Function			
Code	Operator Position		
	Out	Ctr.	In
M	Mom.	Main.	Main.
N	Mom.	Main.	Mom.

Mom. – Momentary,
Main. – Maintained.

e

Illumination Options	
Transformer	
Code	Description
P	Incandescent
PH	LED
Full Voltage	
Q	Incandescent
QH	Universal LED
Dual Input	
D	Diode type ♠
DT	Transformer — relay type
DTH	Transformer — relay LED

f

Voltage ♣	
Transformer	
Code	Description
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
Full Voltage	
24	24V AC/DC
10	120V AC/DC
20	240V AC/DC
Universal LED	
2	12…130V AC/DC
Dual Input	
16	120V AC
24	24V AC/DC #

g

Color Cap	
Code	Color
X	No cap (not valid with head Type J)
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White

h

Target			
Contact			
N.O.	O	O	X
N.C.	X	O	O
N.C.L.B.	X	X	O
Contact Blocks			
Code	Description		
Blank	No contacts on operator		
Standard			
A	1 N.O. - 1 N.C.		
A1	1 N.O. - 1 N.C.L.B.		
A7	1 N.C. - 1 N.C.L.B.		
Pen*TUFF* (Low Voltage)			
AV	1 N.O. - 1 N.C.		
Class 1, Div. 2			
Logic Reed			
AR	1 N.O. - 1 N.C.		
Sealed Switch			
AP	1 N.O. - 1 N.C.		
Stackable Sealed Switch			
AY	1 N.O. - 1 N.C.		

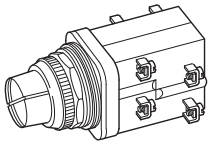
♣ See page 18 (Table f) for additional voltage code options.
♠ Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs and neon indicators.
Dual input diode only.

Cluster Pilot Light Devices (Bul. 800T Only)★

Color Cap Only With Lamps
Cat. No. 800T-N249

Complete Unit
Cat. No. 800T-PC416

800T	–	PC	3	16	W	R	X	R
	a	*b*	*c*	*d*	*e* Position 1	*f* Position 2	*g* Position 3	*h* Position 4



a

Finger-Safe Guards	
Code	**Description**
Blank	No guards
C	Guards on terminals

b

Power Module Type	
Code	**Description**
QC	Full voltage
PC	Transformer

c

Illumination Options and No. of Units	
Incandescent	
Code	**Description**
2	2 unit cluster
3	3 unit cluster
4	4 unit cluster
LED‡§♣Δ	
L2	2 unit cluster
L3	3 unit cluster
L4	4 unit cluster

d

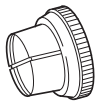
Voltage Options	
Full Voltage	
Code	**Description**
06	6V AC/DC
12	12V AC/DC
24	24V AC/DC
Transformer	
16	120V AC, 50/60 Hz

e, f, g, h

Color Options	
Code	**Color**
Blank (All 4 Positions)	Standard unit♦
X	No color
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White

Custom Lens Caps for Cluster Pilot Lights

800T	–	N249		R	G	A	W
		a	*b*	*c* Position 1	*d* Position 2	*e* Position 3	*f* Position 4



a

No. of Lamps/Voltage	
Transformer	
Code	**Description**
N50	4 lamps, 120V AC, 50/60 Hz
N51	3 lamps, 120V AC, 50/60 Hz
N52	2 lamps, 120V AC, 50/60 Hz
N249	4 lamps, 6V AC/DC
N250	4 lamps, 12V AC/DC
N251	4 lamps, 24V AC/DC
N252	3 lamps, 6V AC/DC
N253	3 lamps, 12V AC/DC
N254	3 lamps, 24V AC/DC
N255	2 lamps, 6V AC/DC
N256	2 lamps, 12V AC/DC
N257	2 lamps, 24V AC/DC

b

Illumination Options	
Code	**Description**
Blank	Incandescent
L	LED‡

c, d, e, f

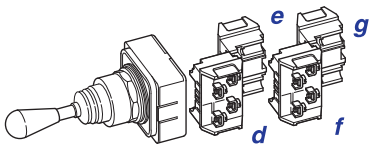
Code	Description
Blank (All Positions)	Standard unit♦
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White
X	No color

★ Rated Type 4/13 indoor only.
‡ LEDs are available in red, green and amber only; lens color matches LED color. Exception: the white lens is supplied with an amber LED.
§ White lenses use amber LEDs.
♣ LEDs could be adversely affected when used with solid-state outputs.
Δ 6V and 12V are positive polarity. 24V LEDs are bipolar.
♦ Consult your local Rockwell Automation sales office or Allen-Bradley distributor for standard unit colors.

1-, 2-, 3-, 4-Way Toggle Switches (Bul. 800T only)

800T ____ – T2 H2 E E X X

a	b	c	d	e	f	g
			Right	Left	Right	Left



a

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

b

Operator Type	
Code	Description
T1	1-way toggle
T2	2-way toggle
T3	3-way toggle
T4	4-way toggle

Table 1. Contact Block Code

Contact Block Substitution	
Combination	Code
Standard	
D + E	A
D + D	★ M
E + E	N
J + D	B
J + E	C

c

Lever Movement and Function					
Type	Function Code		Description ↑	←	→	↓
1-Way	↑ A	1	M	—	—	—
		2	S	—	—	—
	← B	1	—	M	—	—
		2	—	S	—	—
	→ C	1	—	—	M	—
		2	—	—	S	—
	↓ D	1	—	—	—	M
		2	—	—	—	S
2-Way	E	1	M	M	—	—
		2	M	S	—	—
		3	S	S	—	—
		4	S	M	—	—
	F	1	—	M	M	—
		2	—	M	S	—
		3	—	S	S	—
		4	—	S	M	—
2-Way	G	1	—	—	M	M
		2	—	—	M	S
		3	—	—	S	S
		4	—	—	S	M
	H	1	M	—	—	M
		2	M	—	—	S
		3	S	—	—	S
		4	S	—	—	M
2-Way	J	1	M	—	M	—
		2	M	—	S	—
		3	S	—	S	—
		4	S	—	M	—
	K	1	—	M	—	M
		2	—	M	—	S
		3	—	S	—	S
		4	—	S	—	M

c (cont'd)

Lever Movement and Function					
Type	Function Code		Description ↑	←	→	↓
3-Way	L	1	M	M	M	—
		2	M	M	S	—
		3	M	S	M	—
		4	M	S	S	—
		5	S	M	M	—
		6	S	S	M	—
		7	S	M	S	—
		8	S	S	S	—
	N	1	—	M	M	M
		2	—	M	M	S
		3	—	M	S	M
		4	—	M	S	S
		5	—	S	M	M
		6	—	S	S	M
		7	—	S	M	S
		8	—	S	S	S
3-Way	P	1	M	—	M	M
		2	M	—	M	S
		3	M	—	S	M
		4	M	—	S	S
		5	S	—	M	M
		6	S	—	S	M
		7	S	—	M	S
		8	S	—	S	S
	Q	1	M	M	—	M
		2	M	M	—	S
		3	M	S	—	M
		4	M	S	—	S
		5	S	M	—	M
		6	S	S	—	M
		7	S	M	—	S
		8	S	S	—	S
4-Way	R	1	M	M	M	M
		2	M	M	M	S
		3	M	M	S	M
		4	M	M	S	S
		5	M	S	M	M
		6	M	S	S	M
		7	M	S	M	S
		8	M	S	S	S
	T	1	S	M	M	M
		2	S	M	M	S
		3	S	M	S	M
		4	S	M	S	S
		5	S	S	M	M
		6	S	S	S	M
		7	S	S	M	S
		8	S	S	S	S

Note: M = Maintained,
S = Spring Return
★ **XA2** and **XA2R** contact blocks cannot be stacked upon, but they can stack on other contact blocks.

d, e, f, g

Contact Blocks	
Code	Description
Blank (all pos.)	No contacts
Standard	
D	1 N.O.
E	1 N.C.
G	1 N.O.E.M.
J	1 N.C.L.B.
A	1 N.O. - 1 N.C.
X	No contacts in this position
Pen*TUFF* (Low Voltage)	
H	1 N.O.
U	1 N.C.
I	1 N.O.E.M.
Q	1 N.C.L.B.
F	1 N.O. - 1 N.C.
Class 1, Div. 2	
Logic Reed	
V	1 N.O.
W	1 N.C.
T	1 N.O. - 1 N.C.
Sealed Switch	
R	1 N.O.
S	1 N.C.
P	1 N.O. - 1 N.C.
Stackable Sealed Switch	
5	1 N.O.
6	1 N.C.
7	1 N.O. - 1 N.C.

Table 2. 1-2-3-4 Way Toggle Switch Cam Targets

Contact Configuration					Suffix Code	
Position					Contact/Side	
Up	Left	Center	Right	Down	Right Side	Left Side
O	X	O	O	O	D, H, V, R, 5	—
O	O	O	O	X	E, U, W, S, 6	—
X	O	X	X	X	J, Q	—
X	X	X	X	O	G, I	—
X	O	O	O	O	—	E, U, W, S, 6
O	O	O	X	O	—	D, H, V, R, 5
O	X	X	X	X	—	G, I
X	X	X	O	X	—	J, Q

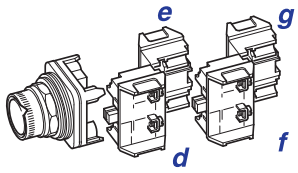
ALLEN BRADLEY 30MM 800H OPERATORS

Selector Push Button Devices (Bul. 800T only)

Selector Push Button
Cat. No. 800T-K2AAXX

800T ____ **– KD** **2** **G** **J** **D** **E**

a	*b*	*c*	*d* Right	*e* Left	*f* Right	*g* Left



a

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

b

Cam and Head Type	
Code	Description
K	A cam with flush operator
KA	A cam with extended operator
KB	B cam with flush operator
KC	C cam with flush operator
KD	D cam with flush operator
KE	E cam with flush operator
Note: See Table 1 for Target description of each cam.	

c

Color Cap	
Code	Color
1	Green
2	Black
6	Red

d, e, f, g

Contact Blocks	
Code	Description
Blank (all pos.)	No contacts on operator
Standard	
D	1 N.O.
E	1 N.C.
G	1 N.O.E.M.
J	1 N.C.L.B.
A	1 N.O. - 1 N.C.
X	No contacts in this position
Pen*TUFF* (Low Voltage)	
H	1 N.O.
U	1 N.C.
I	1 N.O.E.M.
Q	1 N.C.L.B.
F	1 N.O. - 1 N.C.

d, e, f, g (cont'd)

Contact Blocks	
Code	Description
Class 1, Div. 2	
Logic Reed	
V	1 N.O.
W	1 N.C.
T	1 N.O. - 1 N.C.
Sealed Switch	
R	1 N.O.
S	1 N.C.
P	1 N.O. - 1 N.C.
Stackable Sealed Switch	
5	1 N.O.
6	1 N.C.
7	1 N.O. - 1 N.C.

Table 2. Contact Block Reduction Rules

Contact Block Substitution	
Standard	
Combination	Substitute Code
D + E	A
D + D	M★
E + E	N
J + D	B
J + E	C

Table 1. Selector Push Button Cam Targets (Note: X = Closed/O = Open)

Sleeve Position				Cam Description									
				KA/K		KB		KC		KD		KE	
Button Free	Button Pressed	Button Free	Button Pressed	Contact Block Side									
				Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
O	O	O	X	—	—	—	D, H, V, R, 5	—	D, H, V, R, 5	—	—	—	—
O	O	X	O	E, U, W, S, 6	E, U, W, S, 6	—	—	—	—	—	E, U, W, S, 6	—	E, U, W, S, 6
O	O	X	X	—	—	—	—	—	—	E, U, W, S, 6	—	E, U, W, S, 6	—
O	X	O	O	—	—	—	—	D, H, V, R, 5	—	D, H, V, R, 5	—	D, H, V, R, 5	—
O	X	O	X	D, H, V, R, 5	D, H, V, R, 5	D, H, V, R, 5	—	—	—	—	D, H, V, R, 5	—	D, H, V, R, 5
O	X	X	O	—	—	—	—	—	—	—	—	—	—
X	O	X	O	J or Q	J or Q	E, U, W, S, 6	—	—	—	—	J or Q	—	J or Q
X	X	O	O	—	—	—	—	—	—	G or I	—	G or I	—
X	X	O	X	G or I	G or I	—	—	—	—	—	G or I	—	G or I
X	O	X	X	—	—	—	—	E, U, W, S, 6	—	J or Q	—	J or Q	—
X	X	X	O	—	—	—	E, U, W, S, 6	—	E, U, W, S, 6	—	—	—	—

Momentary Contact Flip Lever Devices (Bul. 800H Type 4/4X only)

Flip Lever Operator
Cat. No. 800H-WK42B

Flip Lever Operator
Cat. No. 800H-WK61B

800H ___ – WK 6 1 A
a b c d

a

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

b

Operator Color	
Code	Description
4	Grey
6	Red

c

Operator Types			
Code	Description	Code	Description
—	Blank	20	OUT
1	STOP	21	RAISE
2	START	22	RESET
3	CLOSE	23	REVERSE
4	DOWN	24	RIGHT
5	EMERG. STOP	25	RUN
6	FAST	26	SECOND SPEED
7	FORWARD	27	SLOW
8	FULL SPEED	28	TEST
9	HIGH	29	THIRD SPEED
10	IN	30	UP
11	INCH	31	O
12	JOG	32	I
13	LEFT	33	AVANT
14	LOW	34	OUVRIR
15	LOW SPEED	35	ARRIER
16	LOWER	36	MARCHE
17	OFF	37	ESSAI
18	ON	38	ARRET
19	OPEN		

d

Contact Block(s)	
Code	Description
Blank	No contacts
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2	2 N.O.
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.
Class 1, Div. 2	
Sealed Switch	
D1P	1 N.O.
D2P	1 N.C.
AP	1 N.O. - 1 N.C.
BP	2 N.O. - 2 N.C
Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
A2Y	2 N.O.
A4Y	2 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C

d (cont'd)

Contact Block(s)	
Code	Description
Pen*TUFF* (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
Class 1, Div. 2	
Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R	2 N.O.§
A4R	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.

ALLEN BRADLEY 30MM 800H OPERATORS

Protective Boot Application Information

– **Chlorosulfonated Polyethylene (synthetic rubber)**
Very resistant to attack by oxidizing chemicals such as concentrated sulfuric acid and hypochlorite solutions. Also resistant to attack by oils and performs well in a wide range of other chemicals and solvents. Good flex and high impact resistance. This is the standard boot material supplied with 800H NEMA Type 4/4X push buttons unless otherwise specified.

– **Silicone**
Superior high temperature resistance. Particularly suited for use where organic acids or vegetable oils may be present. Also superior resistance to the effects of outdoor use, such as oxygen, ozone, and weather.

– **Urethane**
Excellent resistance to mechanical failure. Most durable boot material. Particularly suited for use where lubricating oils and automotive fuels may be present. Also well-suited for outdoor use.

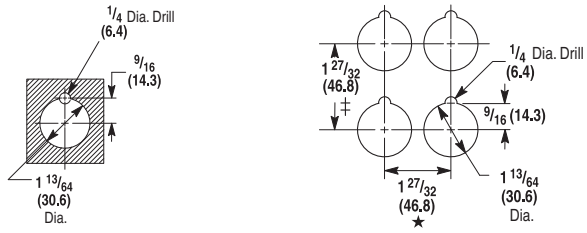
– **Ethylene-propylene**
Particularly suited for high temperature applications. Resistant to attack by many acids and alkalies, detergents, phosphate esters, ketones, alcohols, and glycols. Outstanding service in areas with hot water and steam wash downs.

ALLEN BRADLEY 30MM 800H OPERATORS

Approximate Dimensions

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Mounting Instructions for Push Buttons with Shallow Blocks, Mini Blocks, Logic Reed Blocks, Sealed Switch Blocks, and Time Delay Blocks (see footnotes for exceptions)



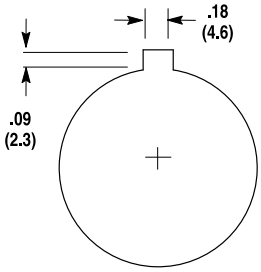
★ Change to 2-1/4 in. (57.2 mm) for transformer type pilot light, push-to-test pilot lights, illuminated selector switches, and all push-pull buttons.
Note: Large legend plate requires minimum horizontal spacing of 2-15/32 in. (62.7 mm).

‡ Vertical minimum spacing dimension changes for the following legend plates: jumbo 2-15/32 in. (62.7 mm); large 2-7/16 in. (61.9 mm); cluster pilot light and 2-, 3-, 4-way switches 2-1/16 in. (52.4 mm).

Panel Thickness — Kits are shipped with three 1/16 in. (1.58 mm) gaskets. Refer to table below for number of washers required for various panel thicknesses.

Sketch illustrates the minimum distance between centerlines when mounting Bulletin 800T/H controls either side-by-side, facing each other, or one above the other. When control units are mounted so that the contact block terminals face each other, the 2-1/4 in. (57.2 mm) dimension must be used in order to get proper electrical clearance. When control units are mounted so that the contact block terminals do not face each other, the 1-27/32 in. (46.8 mm) dimension can be used.

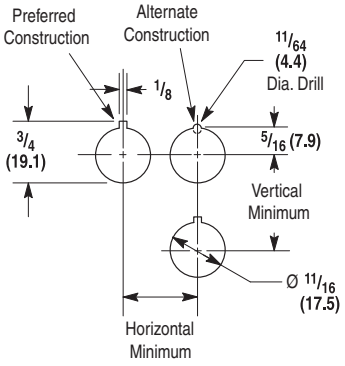
Typical Panel Cut-Out



	1/16 in. (1.6 mm) (16 Gauge)	7/64 in. (2.8 mm) (12 Gauge) 9/64 in. (3.6 mm) (10 Gauge)	3/16 in. (4.8 mm) Panel	Thicker Than 3/16 in. (4.8 mm) Panel	Thicker Than 1/4 in. (6.4 mm) Panel
800T	3 washers	2 washers	1 washer	Counterbore to 3/16 in. (4.8 mm)	Counterbore to 3/16 in. (4.8 mm)
800H	4 washers	3 washers	2 washers	1 washer	Counterbore to 1/4 in. (6.4 mm)

Mounting Instructions for 18 mm Small Pilot Lights

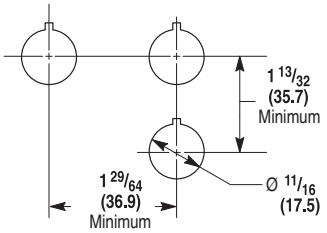
Type A Legend Plate



Cat. No. 800T-N515

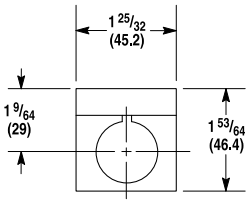
Device	Dimensions	
	Horizontal	Vertical
800T-PS, PSD, PST, QS, QST and RST	31/32 (24.6)	1-5/32 (29.4)
800T-PSDT	1-3/64 (26.6)	1-15/64 (31.4)

Type B Legend Plate

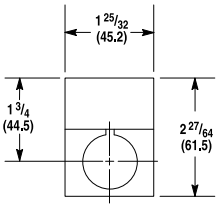


Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

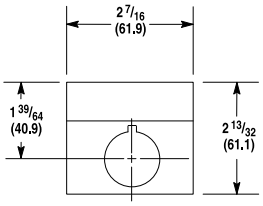
Legend Plate Dimensions (Bul. 800T Only)



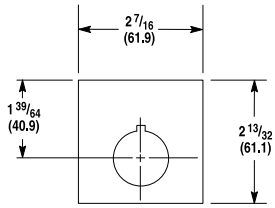
Standard Legend Plate



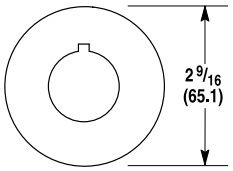
Jumbo Legend Plate



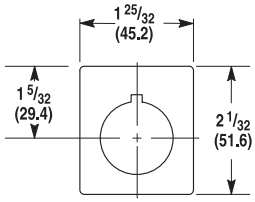
Large Legend Plate (Automotive Industry Type)



Large Size Push-Pull/Twist Legend Plate Cat. No. 800T-X647★



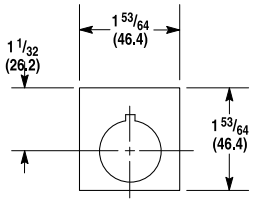
Round Cat. No. 800T-X646★



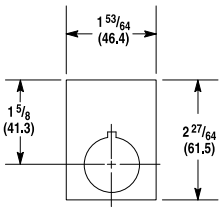
Cluster Pilot Light and 2-3-4 Way Switch Silver Legend Plate Cat. No. 800T-X619

★For panel mounting only. Not for use with Allen-Bradley enclosures.

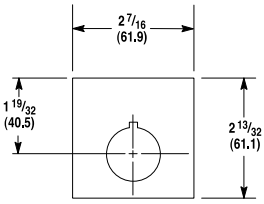
Legend Plate Dimensions (Bul. 800H Only)



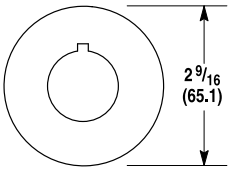
Type 4/4X Standard Legend Plate



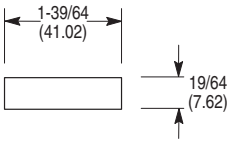
Type 4/4X Jumbo Legend Plate



Type 4/4X Large Legend Plate (Automotive Industry Type)



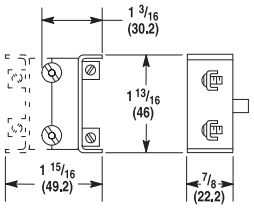
Type 4/4X Round



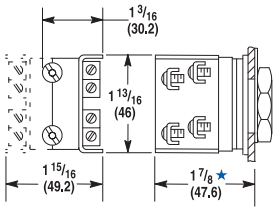
Type 4/4X Standard Legend Plate (Flip Lever Operators)

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

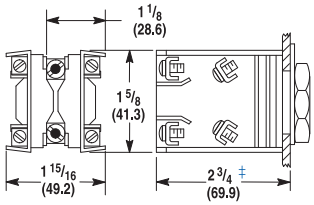
Blocks (Bul. 800T Only)



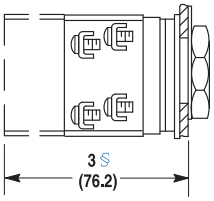
Mini Contact Block
7/8 (22.2) Deep



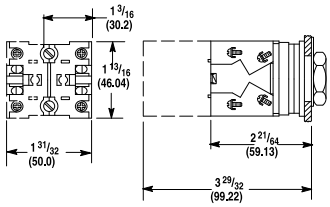
Shallow, PenTUFF,
and Logic Reed Contact Blocks
1-1/8 (28.6) Deep



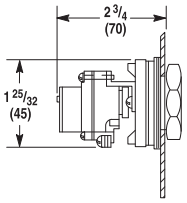
Sealed Switch Block
2 (50.8) Deep



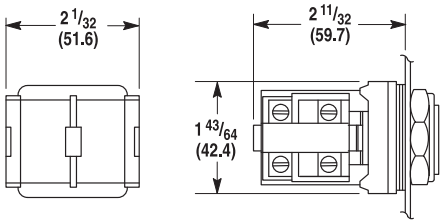
Tandem Mounting
(2 shallow contact
blocks stacked)



Stackable Sealed Switch Block
1.58 (40.1) Deep



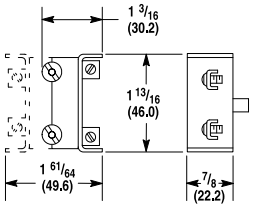
Time Delay Contact Block
(For Push Buttons Only)



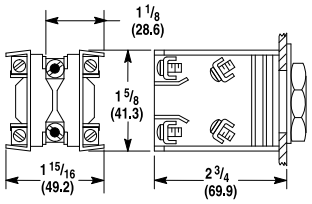
Snap Action Contact Block (For Push Button Only)

★ Dimension shown is for push buttons. Selector switch dimension is 2-1/32 in. (51.6 mm).
‡ Dimension shown is for push buttons. Selector switch dimension is 2-27/32 in. (72.2 mm).
§ Dimension shown is for push buttons. Selector switch dimension is 3-5/32 in. (80.2 mm).

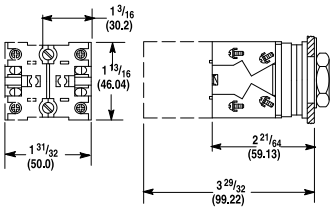
Blocks (Bul. 800H Only)



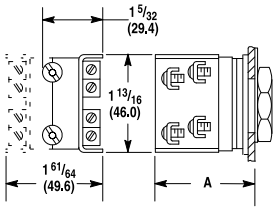
Mini Contact Block



Sealed Switch Block
2 (50.8) Deep



Stackable Sealed Switch Block
1.58 (40.1) Deep



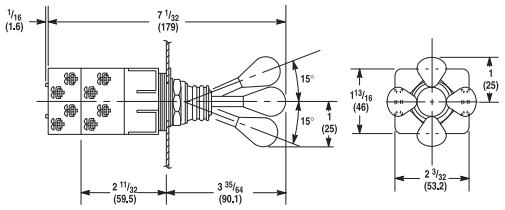
Shallow, PenTUFF and Logic
Reed Contact Blocks

Dim.	Momentary Push Button	Maintained Push Button	Selector Switch
A	2 (50.8)	2 (50.8)	1-29/32 (48.4)

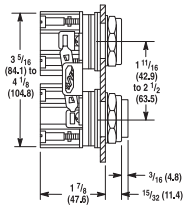
Operator Extension Behind Panel — When mounted with thrust washer, trim washer, or notched legend plate and correct number of rubber washers.

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Push Buttons and Switches (Bul. 800T Only)

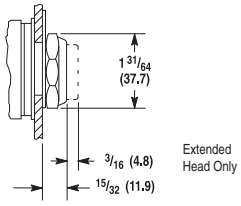


2-3-4 Way Switch
Shipping Wt. with 2 Contact Blocks 6 oz (0.17 kg)
Shipping Wt. with 4 Contact Blocks 8-1/2 oz (0.24 kg)

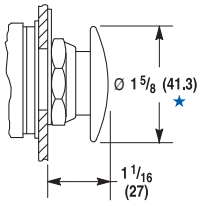


Mechanically Interlocked Maintained Contact Push Button
Shipping Wt. 1 lb (0.45 kg)

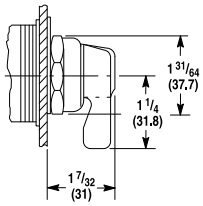
Push Buttons and Pilot Lights



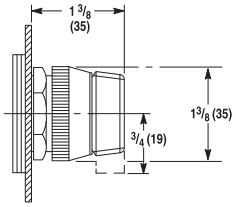
Flush and Extended Head Push Button
Shipping Wt. 5-1/2 oz (0.15 kg)



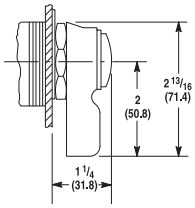
Mushroom Head Push Button
Shipping Wt. 7-1/2 oz (0.21 kg)



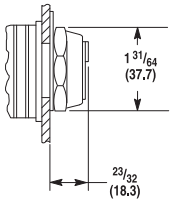
Non-Illuminated Knob Lever and Standard Knob Selector Switch
Shipping Wt. 6 oz (0.17 kg)



Illuminated Knob Lever and Standard Knob Selector Switch
Shipping Wt. 6 oz (0.17 kg)



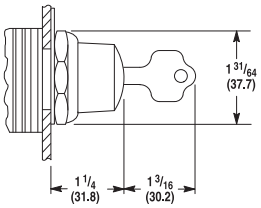
Wing Lever Selector Switch
Shipping Wt. 8 oz (0.22 kg)



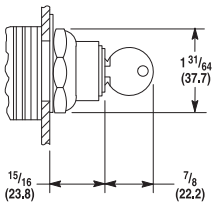
Coin Slot Selector Switch
Shipping Wt. 6 oz (0.17 kg)

★ Except jumbo which is 2-1/4 (57.2).

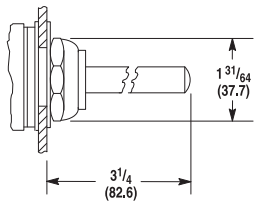
Operator Extension in Front of Panel (Bul. 800T Only)



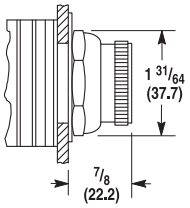
Key Operated Selector Switch
Shipping Wt. 12 oz (0.34 kg)



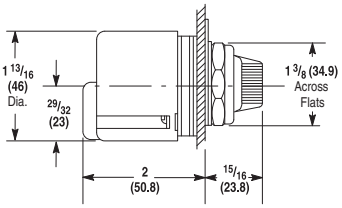
Push Button with Cylinder Lock
Shipping Wt. 12 oz (0.34 kg)



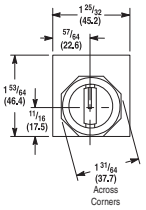
Wobble Stick
Shipping Wt. 9 oz (0.25 kg)



Selector Push Button
Shipping Wt. 6 oz (0.17 kg)

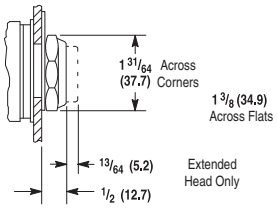


Type J Potentiometer Unit
Shipping Wt. 4 oz (0.11 kg)

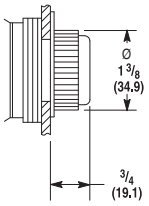


Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

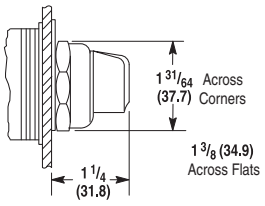
Push Buttons and Switches (Bul. 800H Only)



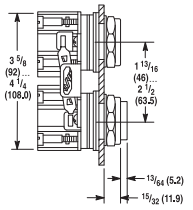
Bootless Flush and Extended Head Momentary Contact Push Button
Shipping Weight. 5-1/2 oz (0.16 kg)



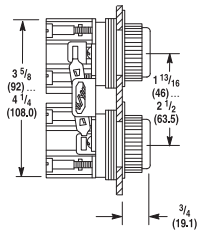
Booted Flush and Extended Head Momentary Contact Push Button
Shipping Weight. 5-1/2 oz (0.16 kg)



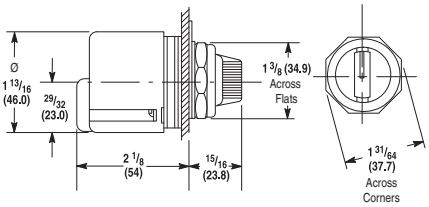
Standard Knob Selector Switch Non-Illuminated
Shipping Weight. 6 oz (0.17 kg)



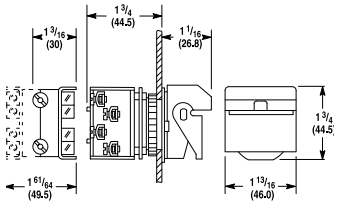
Bootless Maintained Contact Push Buttons



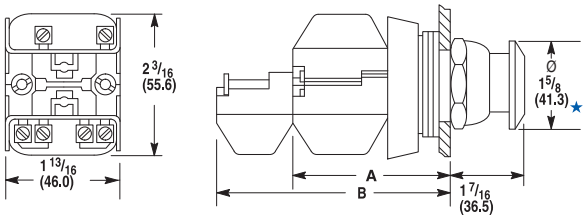
Booted Maintained Contact Push Buttons
Shipping Weight. 1 lb (0.45 kg)



Type J Potentiometer Unit
Shipping Weight. 7 oz (0.20 kg)



Type 4 Flip Lever
Shipping Weight. 8 oz (0.14 kg)



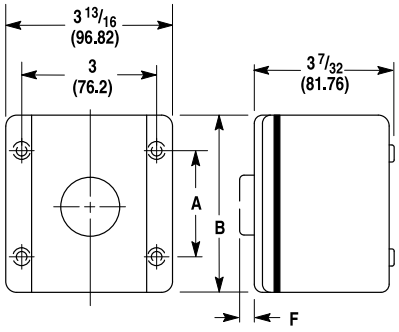
Mushroom Head — Maintained and Momentary

Non-Illuminated Mushroom and Push-Pull Push Buttons

Cat. No. Suffix	Description	Dimensions		Shipping Weights
D4	One Shallow Block	A	2-1/32 (51.6)	5 oz (0.14 kg)
A1, A5 and A7	Two Shallow blocks	A	2-1/32 (51.6)	6 oz (0.17 kg)
B6	Two Shallow Blocks and Two Mini Blocks	B	2-7/8 (73.0)	8 oz (0.22 kg)

★ Jumbo versions are 2-1/4 (57.2).

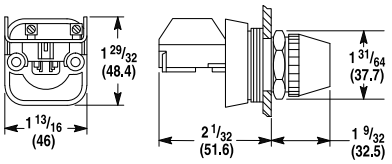
Break-Glass Station



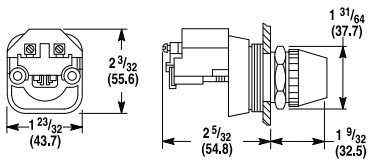
A = 2 3/4 (69.85)
B = 4 3/16 (106.38)
F = 9/16 (14.28)

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

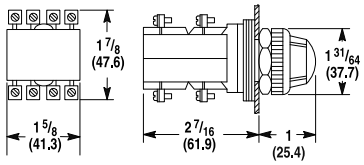
Pilot Light and Illuminated Devices (Bul. 800T Only)



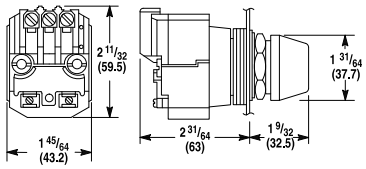
Full Voltage, Neon and Dual Input Pilot Light
Shipping Wt. 5 oz (0.14 kg)



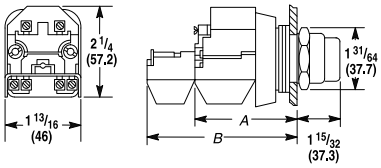
Transformer Type Pilot Light
Shipping Wt. 8 oz (0.22 kg)



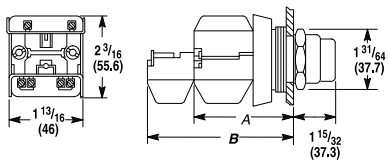
Cluster Pilot Light
Shipping Wt. 12 oz (0.34 kg)



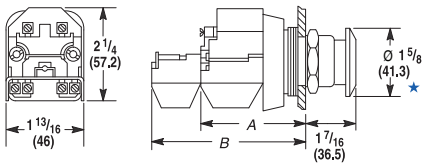
Dual Input Transformer Type Pilot Light



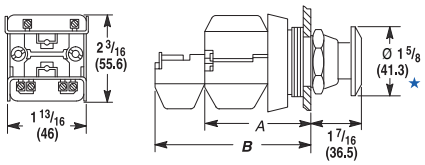
Transformer Type (Push-to-Test Pilot Light and Illuminated Push Button)



Full Voltage, Neon and Dual Input Type (Push-to-Test Pilot Light and Illuminated Push Button)



Push-Pull and Twist or Pull Release Units (Transformer Type Illuminated)



Push-Pull and Twist or Pull Release Units (Full Voltage, Neon and Dual Input Illuminated and All Non-Illuminated)

★ Jumbo mushroom versions are 2-1/4 in. (57.2 mm) diameter.

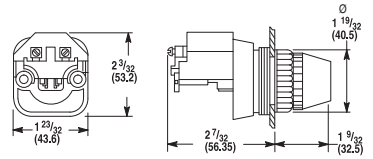
Push-to-Test Pilot Lights Illuminated Push Buttons and Illuminated Push-Pull Buttons								Non-Illuminated Push-Pull Buttons				
Cat. No. Suffix‡	Description	Transformer Type			Full Voltage or Neon Type			Cat. No. Suffix	Description	Transformer Type		
		Dim.		Ship. Wt.	Dim.		Ship. Wt.			Dim.		Ship. Wt.
D4	Transformer or Terminal Module and One Shallow Contact Block	A	2-5/32 (54.8)§	9 oz. (0.25 kg)	A	2-1/32 (51.6)	7 oz. (0.25 kg)	D4	One Shallow Contact Block	A	2-1/32 (51.6)	5 oz. (0.14 kg)
A1 and A7	Transformer or Terminal Module and One Shallow Block and One Mini Contact Block	B	2-7/8 (73)	10 oz. (0.28 kg)	B	2-7/8 (73)	8 oz. (0.22 kg)	A4 A5 A7	Two Shallow Contact Blocks	A	2-1/32 (51.6)	6 oz. (0.17 kg)
AP D1P D2P	Transformer or Terminal Module and One Sealed Switch Contact Block	A	3-1/32 (77)	10 oz. (0.28 kg)	A	2-29/32 (73.8)	8 oz. (0.22 kg)	B6	Two Shallow Blocks and Two Mini Contact Blocks	B	2-7/8 (73)	8 oz. (0.22 kg)

‡ Applies to illuminated push-pull push buttons only.

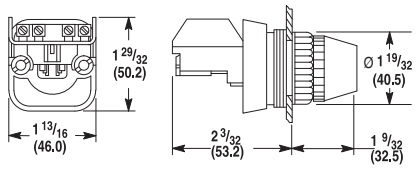
§ Dual input type pilot light dimension is 2-13/32 in. (61.1 mm).

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

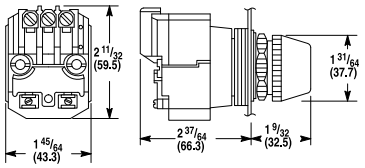
Push-to-Test Pilot Light and Illuminated Devices (Bul. 800H Only)



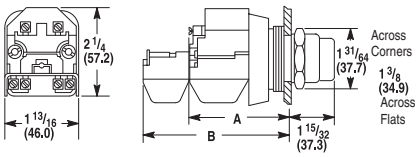
Transformer Type Pilot Light (Incandescent and LED)
Shipping Weight. 12 oz (0.34 kg)



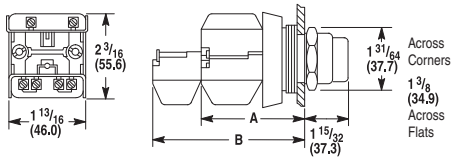
Full Voltage and Dual Input Diode Type Pilot Light (Incandescent, Neon, LED)
Shipping Weight. 5 oz (0.14 kg)



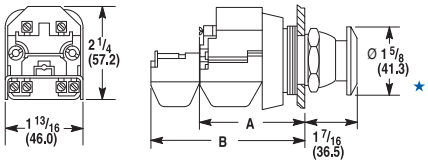
Dual Input Transformer Type Pilot Light
Shipping Weight. 14 oz (0.40 kg)



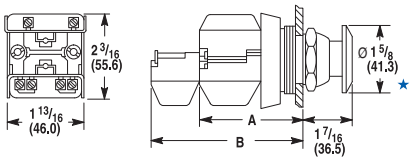
Push-to-Test Pilot Light and Illuminated Push Button (Transformer Type: Incandescent, LED)



Push-to-Test Pilot Light and Illuminated Push Button (Full Voltage: Incandescent, LED, Neon; and Dual Input Type)



Momentary Mushroom, Push-Pull and Twist or Pull Release Units (Transformer Type: Incandescent, LED; Illuminated)



Momentary Mushroom, Push-Pull and Twist or Pull Release Units (Full Voltage: Incandescent, LED, Neon; and Dual Input Illuminated)

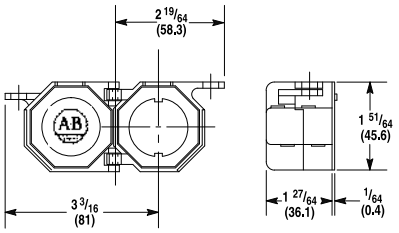
Push-to-Test Pilot Lights
Illuminated Push Buttons, Illuminated Push-Pull and Twist or Pull Release Push Buttons

Cat. No. Suffix‡	Description	Transformer Type			Full Voltage or Neon Type		
		Dimension		Shipping Weight	Dimension		Shipping Weight
D4	Transformer or Terminal Module and One Shallow Contact Block	A	2-5/32 (54.8)§	9 oz. (0.25 kg)	A	2-1/32 (51.6)♣	7 oz. (0.20kg)
A1 and A7	Transformer or Terminal Module, One Shallow Block and One Mini Contact Block	B	2-7/8 (73)	10 oz. (0.28 kg)	B	2-7/8 (73)	8 oz. (0.22 kg)
AP	Transformer or Terminal Module and One Sealed Switch Contact Block	B	2-29/32 (73.8)	10 oz. (0.28 kg)	B	2-29/32 (73.8)	8 oz. (0.22 kg)

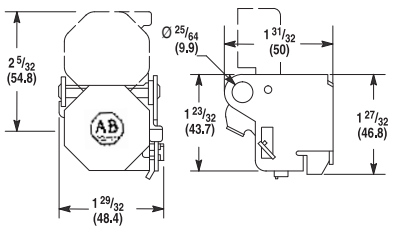
★ Jumbo mushroom versions are 2-1/4 in. (57.2 mm) diameter.
‡ Applies to illuminated push-pull push buttons only.
§ Dual input type pilot light dimension is 2-13/32 in. (61.1 mm).
♣ Dual input type pilot light dimension is 2-9/32 in. (57.9 mm).

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

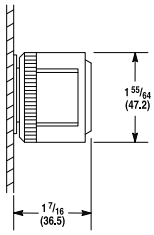
Accessories



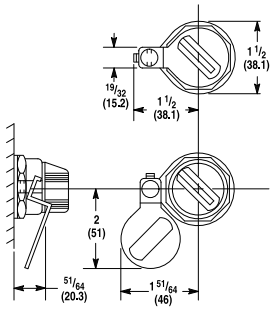
Push Button Padlocking Cover
(not for use with Jumbo Mushroom Head devices)
Shipping Wt. 1 oz (0.03 kg)



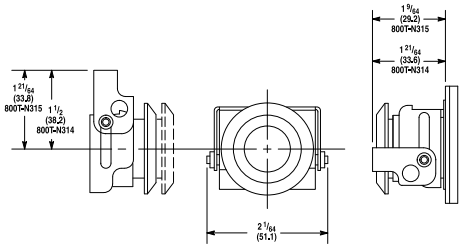
Selector Switch and Potentiometer
Unit Padlocking Cover



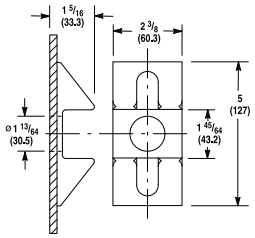
Protective Ring and
Push-Pull Illuminated
or Non-Illuminated Operators



Selector Switch
Padlocking Attachment

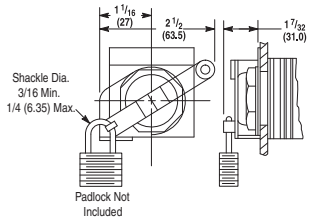


Push-Pull Padlocking Attachment and
Metal Mushroom Push Button Padlocking Attachment

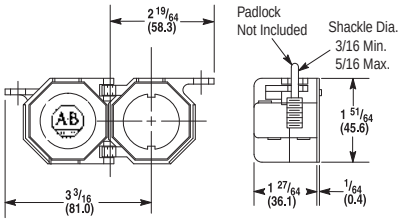


Ramp Guard for Push-Pull Illuminated or
Non-Illuminated Operators

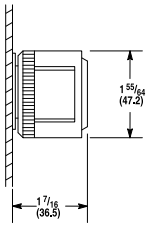
Accessories (Bul. 800H Only)



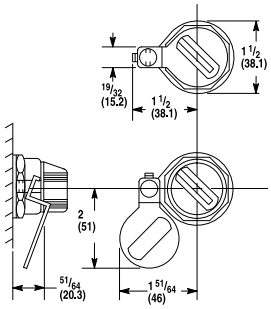
Locking Attachment for Extended,
Non-Illuminated Push Buttons



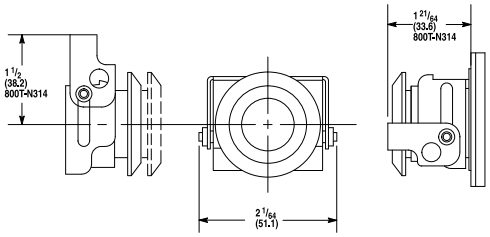
800H-N140 Locking Cover for 2-Position
Non-Illuminated Maintained Twist or Pull
Release and Standard Knob Selector Switch
(1-5/8 (41.3) Mushroom Head only)



Protective Ring for 2-Position
Push-Pull/Twist Illuminated
or Non-Illuminated Operators



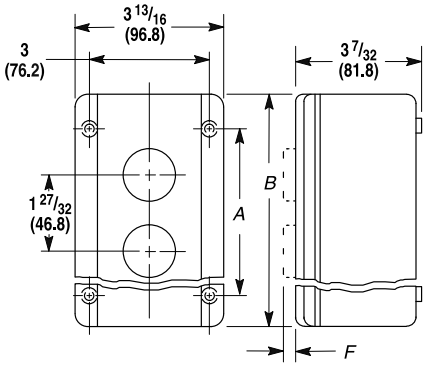
Non-Illuminated Selector Switch
Padlocking Adjustment



Push-Pull/Twist Padlocking Attachment

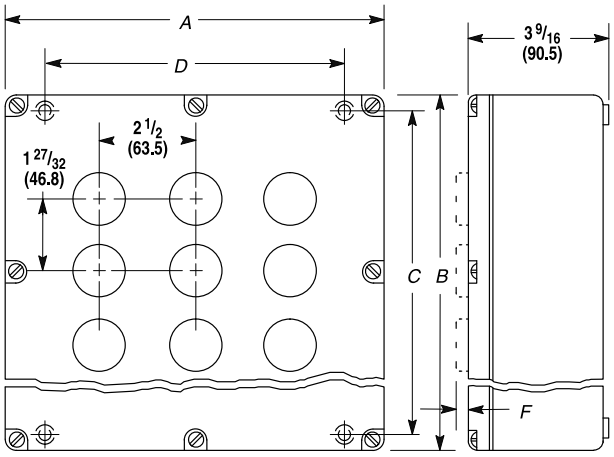
Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Die Cast Enclosures (Bul. 800T Only)



Enclosure Dimensions					
	No. of Units				
Dim.	1	2	3	4	6
A	2-3/4 (69.9)	4-1/2 (114.3)	6-1/4 (158.8)	8 (203.2)	12-1/8 (308)
B	4-3/16 (106.4)	5-7/8 (144.2)	7-9/16 (192.1)	9-1/2 (241.3)	13-1/2 (342.4)

Note: Mounting holes (4) — Screw shaft 13/64 in. (5.16 mm) max. diameter.



Enclosure Dimensions				
	No. of Units			
Dim.	6	9	12	16
A	7-1/4 (184.2)	9-3/4 (247.7)	9-3/4 (247.7)	12-1/2 (317.5)
B	9 (228.6)	9 (228.6)	11 (279.4)	11 (279.4)
C	8-1/4 (209.6)	8-1/4 (209.6)	10-1/8 (257.2)	10-1/8 (257.2)
D	5-3/8 (136.5)	7-7/8 (200)	7-7/8 (200)	10-5/8 (269.9)

Note: Mounting holes (4) — Screw shaft 7/32 in. (5.56 mm) max. diameter.

F Dimension

Type of Unit		Dimension F
Push Buttons	Flush Extended Extended Mushroom Selector Cylinder Lock	15/32 (11.9) 21/32 (16.7) 1 (25.4) 7/8 (22.2) 1-13/16 (46)
Selector Switches	Standard Cylinder Lock Coin Slot	1-7/32 (30.9) 2-7/16 (61.9) 3/4 (19.1)
Pilot Light		1-1/8 (28.6)
Potentiometers		1-1/16 (27)

Conduit Openings

General Class	Description	No. of Units★						
		1...4	6	9	12	16	20	25
Surface Mounted Enclosure	Die Cast	3/4 in. 14 N.P.T.	1 in. 11-1/2 N.P.T.	1 in. 11-1/2 N.P.T.	1 in. 11-1/2 N.P.T.	1-1/2 in. 11-1/2 N.P.T.	—	—

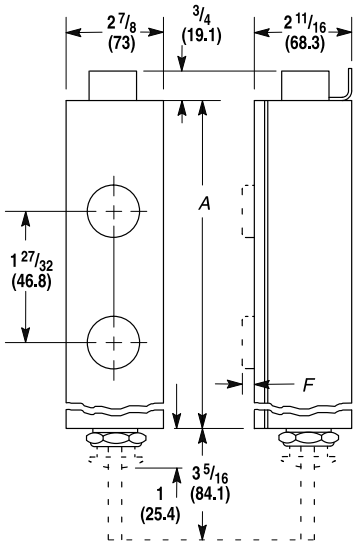
★ Number of units that can be mounted in the enclosure.

ALLEN BRADLEY 30MM 800H OPERATORS

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

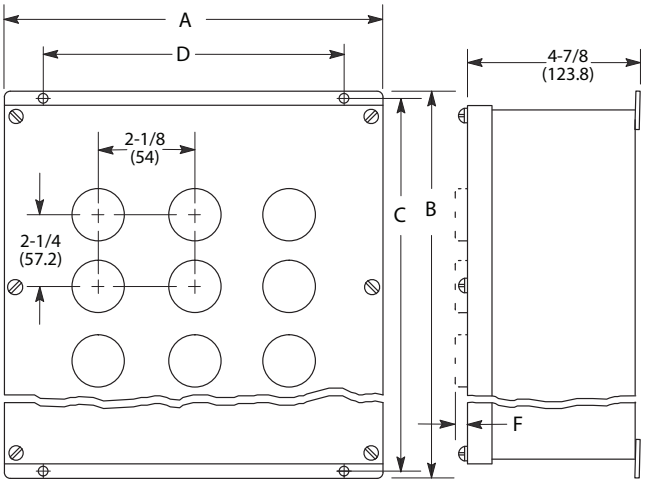
Enclosures (Bul. 800T Only), Continued

Pendant Stations



No. of Units	Dimension A
2	5-13/16 (147.6)
3	7-21/32 (194.5)
4	9-1/2 (241.3)
5	11-11/32 (288.1)
6	13-3/16 (335)
7	15-1/32 (381.7)
8	16-7/8 (428.6)
9	18-23/32 (475.4)
10	20-9/16 (522.3)

Sheet Metal Enclosures



Enclosure Dimensions						
	No. of Units					
Dim.	6	9	12	16	20	25
A	6-15/16 (176.2)	8-11/16 (220.7)	8-11/16 (220.7)	10-7/16 (265.1)	10-7/16 (265.1)	12-1/2 (317.5)
B	11-1/8 (282.6)	11-1/8 (282.6)	13-1/2 (342.9)	13-1/2 (342.9)	15-7/8 (403.2)	15-7/8 (403.2)
C	10-1/2 (266.7)	10-1/2 (266.7)	12-7/8 (327)	12-7/8 (327)	15-1/4 (387.4)	15-1/4 (387.4)
D	5 (127)	6-3/4 (171.5)	6-3/4 (171.5)	8-1/2 (215.9)	8-1/2 (215.9)	10-1/4 (260.4)

Note: Mounting holes (4) — Screw shaft 7/32 in. (5.56 mm) max. diameter.

F Dimension

Type of Unit		Dimension F
Push Buttons	Flush Extended Extended Mushroom Selector Cylinder Lock	15/32 (11.9) 21/32 (16.7) 1 (25.4) 7/8 (22.2) 1-13/16 (46)
Selector Switches	Standard Cylinder Lock Coin Slot	1-7/32 (30.9) 2-7/16 (61.9) 3/4 (19.1)
Pilot Light		1-1/8 (28.6)
Potentiometers		1-1/16 (27)

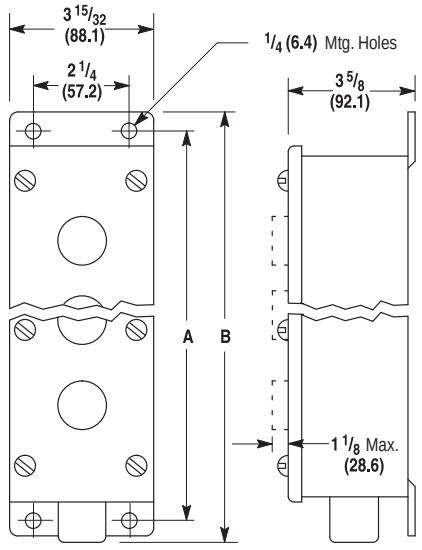
Conduit Openings

General Class	Description	No. of Units★						
		1...4	6	9	12	16	20	25
Surface Mounted Enclosure	Sheet Metal	None — Drilled to suit by customer.						
Pendant Type Enclosure	with Opening in Bottom	No. of Units★						
		2...5			6...10			
		1 (25.4) Conduit Hub			1-1/4 (31.8) Conduit Hub			
	with Opening in Cover	1 (25.4) Conduit Hub			1-1/4 (31.8) Conduit Hub			

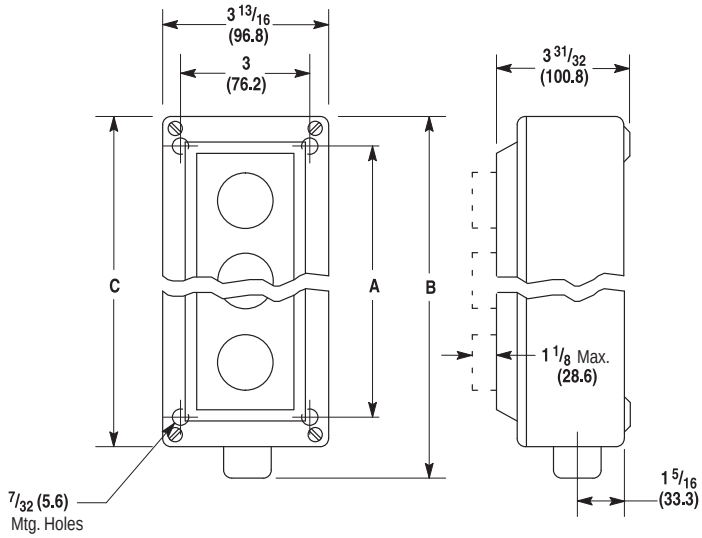
★ Number of units that can be mounted in the enclosure.

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Enclosures (Bul. 800H Only)



Type 4/4X/13 Stainless Steel
Watertight, Oiltight, Corrosion Resistant Enclosure



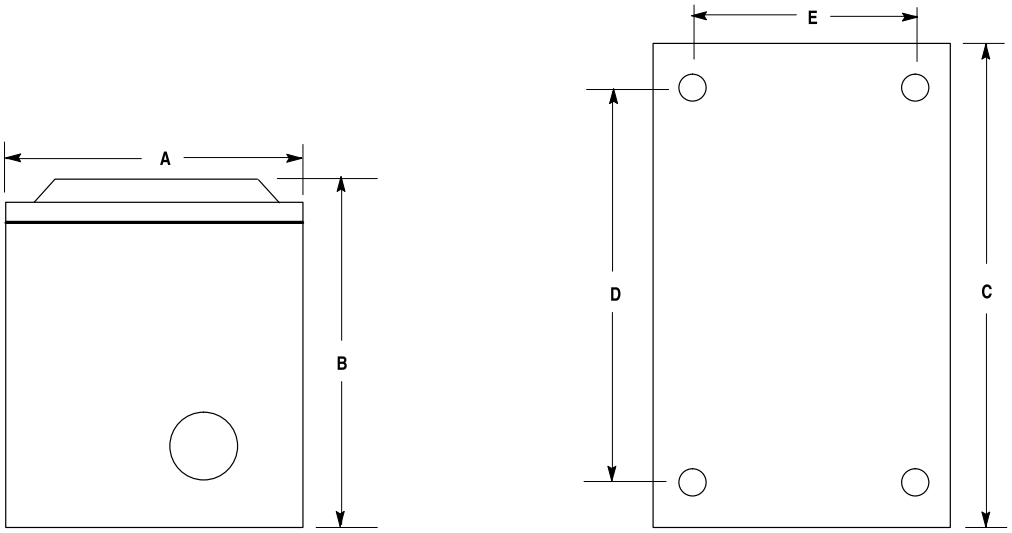
Type 4/4X/13 Rosite Glass Polyester
Watertight, Oiltight, Corrosion Resistant Enclosure

Dimension	Type 4/4X/13 Stainless Steel — Number of Units							
	1	2	3	4	5	6	7	8
A	5-5/32 (131)	7 (177.8)	8-27/32 (224.6)	10-11/16 (271.5)	12-17/32 (318.3)	14-3/8 (365.1)	16-7/32 (412)	18-1/16 (458.8)
B	6-13/32 (162.7)	8-1/4 (209.6)	10-1/8 (257.2)	11-31/32 (304)	14-1/32 (356.4)	15-7/8 (403.2)	17-3/4 (450.8)	19-19/32 (497.7)
C	—				—			
Conduit Knockout Size	—				—			
Pipe Tap Size	3/4 (19.1)				1 (25.4)			
Approximate Shipping Wt. [lbs (kg)]	2-3/4 (1.3)	3-3/4 (1.7)	4-3/4 (2.2)	5-3/4 (2.6)	6-3/4 (3.1)	7-3/4 (3.5)	8-3/4 (4)	9-3/4 (4.4)

Dimension	Type 4/4X/13 Rosite — Number of Units					
	1	2	3	4	5	6
A	4-1/2 (114.3)	4-1/2 (114.3)	6-1/4 (158.8)	8 (203.2)	12-1/8 (308)	12-1/8 (308)
B	7-1/32 (178.6)	7-1/32 (178.6)	8-23/32 (221.5)	10-21/32 (270.7)	14-7/8 (377.8)	14-7/8 (377.8)
C	5-7/8 (149.2)	5-7/8 (149.2)	7-9/16 (192)	9-1/2 (241.8)	13-1/2 (342.9)	13-1/2 (342.9)
Conduit Knockout Size	—				—	
Pipe Tap Size	3/4 (19.1)				1 (25.4)	
Approximate Shipping Wt. [lbs (kg)]	2 (0.9)	2 (0.9)	2-1/2 (1.1)	3 (1.4)	4 (1.8)	4 (1.8)

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Enclosures (Bul. 800H Only), Continued

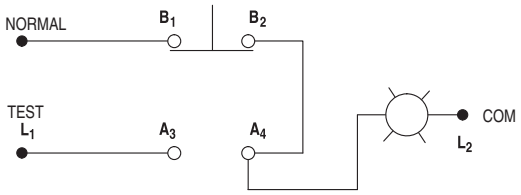


Dimension	Fiberglass Type 4/4X/12/13		
	Number of Units		
	1	2	3
A x B x C	4-1/2 x 5-3/16 x 6 (114.3 x 131.8 x 152.4)	4-1/2 x 5-3/16 x 8 (114.3 x 131.8 x 203.2)	6-1/2 x 5-7/16 x 8 (165.1 x 138.1 x 203.2)
D x E	4-3/4 x 2 (120.7 x 50.8)	6-3/4 x 2 (171.5 x 50.8)	6-3/4 x 4 (171.5 x 101.6)
Conduit Knockout Size	3/4 (19.1)	1 (25.4)	1 (25.4)
Approximate Shipping Wt. [lb (kg)]	2 (0.9)	1/4 (1.0)	3 (1.4)

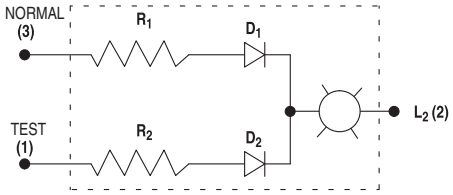
ALLEN BRADLEY 30MM 800H OPERATORS

Typical Pilot Light Wiring Diagrams

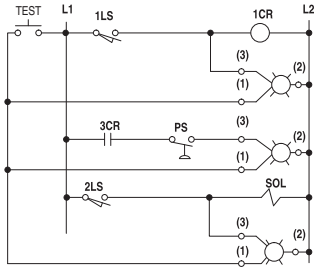
See applicable codes and laws



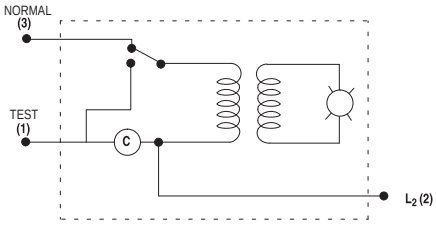
Push-to-Test Pilot Light Device Schematic



Dual Input Diode Pilot Light Device Schematic



Dual Input Pilot Light Typical Application Wiring Diagram



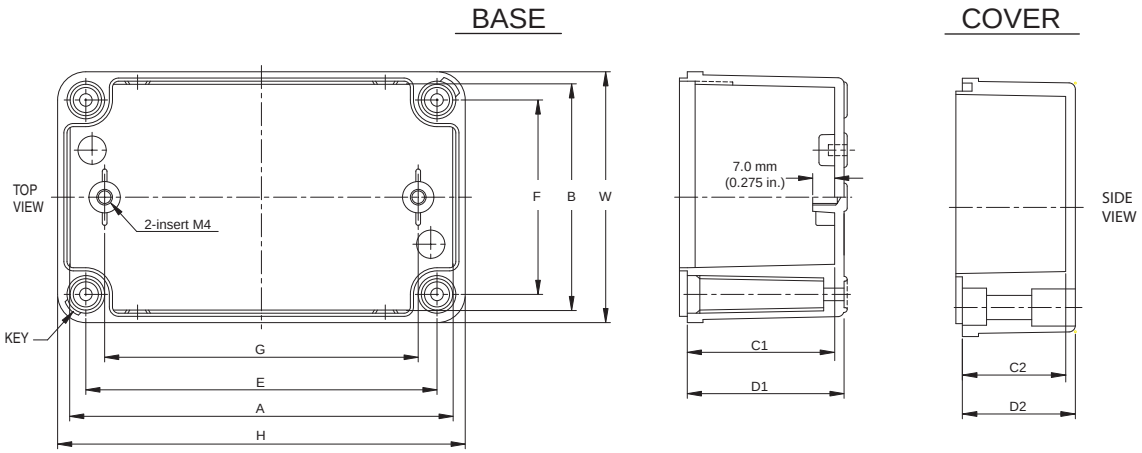
Dual Input Pilot Light Transformer Type Device Schematic

General Purpose Enclosures

Bulletin	800H
Description	**Push Button Enclosure**
Features	Designed to house 30.5 mm (Bul. 800H) push buttons (available in grey or yellow colors)
Dimensions [mm]	Available in 4 sizes (Height x Width x Depth) 1-Hole: 110 x 80 x 70 2-Hole: 130 x 80 x 85 3-Hole: 180 x 80 x 85 4-Hole: 250 x 80 x 85
Degree of Protection	Type 1, 4, 4X, 12, 13 IP66 Indoor/Outdoor
Storage Temperature Range	-40…+75 °C (-40…+158 °F)
Operating Temperature Range	-40…+55 °C (-40…+131 °F)
Material	
Enclosure	Thermoplastic polyester blend, UL94-5VA
Gasket	Foam-in-place polyutherane
Standards	UL 508A and CSA C22.2, No. 14
Certifications	cULus, CE

Approximate Dimensions

Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

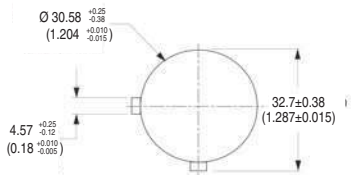


Thermoplastic Polyester Type 4/4X

Cat. No.	Overall Dimension				Inside Dimension				Enclosure Mounting Dimension		Mounting Plate Mounting Dim.
	H	W	D1	D2	A	B	C1	C2	E	F	G
800H-1HZ4__	110 (4.33)	80 (3.15)	50 (1.97)	20 (0.79)	104 (4.09)	74 (2.91)	46.5 (1.83)	16.5 (0.65)	92 (3.62)	62 (2.44)	80 (3.15)
800H-2HZ4__	130 (5.12)	80 (3.15)	50 (1.97)	35 (1.38)	120 (4.72)	70 (2.76)	46.5 (1.83)	31.5 (1.24)	112 (4.41)	62 (2.44)	100 (3.94)
800H-3HZ4__	180 (7.09)	80 (3.15)	50 (1.97)	35 (1.38)	170 (6.69)	70 (2.76)	46.5 (1.83)	31.5 (1.24)	162 (6.38)	62 (2.44)	150 (5.91)
800H-4HZ4__	250 (9.84)	80 (3.15)	50 (1.97)	35 (1.38)	240 (9.45)	70 (2.76)	46.5 (1.83)	31.5 (1.24)	232 (9.13)	62 (2.44)	220 (8.66)

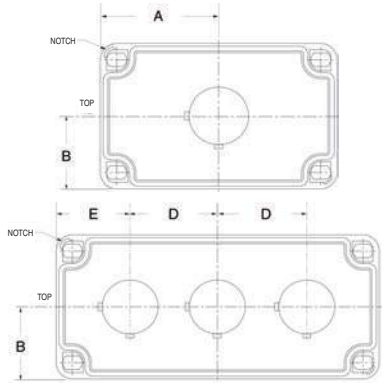
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

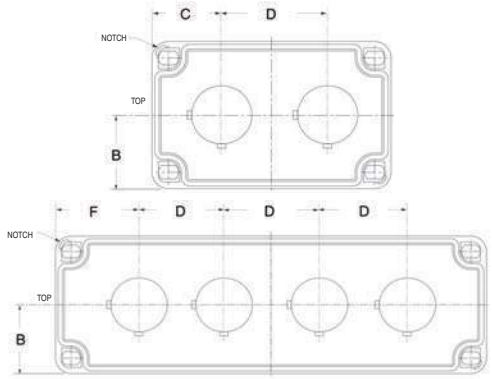
Push Button Hole



30.5 mm Push Button Hole

Push Button Hole Spacing





Cat. No.	Type	A	B	C	D	E	F
800H-1HZ4C	1-Hole	55±.216 (2.165±0.0085)	40±0.5 (1.57±0.020)	—	46.8±0.191 (1.843±0.0075)	—	—
800H-2HZ4C	2-Hole	—		41.6±0.175 (1.64±0.0069)		—	—
800H-3HZ4C	3-Hole	—		—		43.2 +0.32/-0.18 (1.7 +0.0126/-0.0071)	—
800H-4HZ4C	4-Hole	—		—		—	54.8±0.216 (2.16±0.0085)

ALLEN BRADLEY 30MM 800H OPERATORS

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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ALLEN BRADLEY 140M

Allen-Bradley

Motor Protection Circuit Breaker and Motor Circuit Protector Specifications

Bulletin 140M

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Summary of Changes

This publication adds product selection and accessory information.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Use of Motor Protection Circuit Breakers with Variable- Frequency Drives, publication 140M-AT002	Provides application information about using 140M devices with variable-frequency drives.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, https://www.rockwellautomation.com/global/certification/overview.page?	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

ALLEN BRADLEY 140M

Notes:

ALLEN BRADLEY 140M

Bulletin 140M Motor Protection Circuit Breakers

Overview

Motor Protection Circuit Breakers may provide the following protective and control functions.

- Disconnect for Motor Branch Circuit
- Branch-Circuit, Short-Circuit Protection (Magnetic Protection)
- Overload Protection (Thermal Protection)
- Switching (Manual)

In North America, electrical codes require that an individual Motor Branch Circuit be protected by a UL/CSA Listed Fuse, Circuit Breaker or Self-Protected Combination Motor Controller.

140M-C, D, and F Frames

The 140M-C, D, and F frame Motor Protection Circuit Breakers may have two cULus Listings - as Manual, Self-Protected Combination Motor Controllers and as Manual Motor Controllers (with optional approvals for Motor Disconnect and Group Installation). Cat. No. 140M-D8V* can also be applied at the output of a variable frequency drive (VFD) in multi-motor applications. See Application Conditions (140M-D8V) on page 41 for more information.

When UL/CSA listed as Manual, Self-Protected Combination Motor Controllers, the 140M Motor Protection Circuit Breakers provide all of the necessary NEC/CEC requirements for the protection and control of individual Motor Branch Circuits without additional protective devices.

At some higher voltages and currents (particularly at 600V), a few of the 140M-C, D, and F frame devices are only UL/CSA Listed as Manual Motor Controllers (with optional approvals for Motor Disconnect and Group Installation). In NEC/CEC Group Installations, these devices must be applied per the appropriate rules which require the use of an upstream Branch-Circuit, Short-Circuit Protective Device (BCPD).

Type E and Type F Combination Motor Controllers

Most of the 140M-C...F motor protection circuit breakers are UL Listed as a manual Type E self-protected combination motor controller. Although there are many tests involved, one of the critical tests a self-protected combination motor controller must pass, is to perform 6000 electrical operations and an additional 4000 mechanical operations after a short circuit.

By definition, a **Type F** combination motor controller consists of a Type E manual self protected combination motor controller and a magnetic or solid-state motor controller (such as a Bulletin 100-C contactor or an SMC). As with a manual Type E self-protected combination motor controller, additional short-circuit protection is not required for the individual motor circuits.

A combination of a Bulletin 140M manual self protected combination motor controller and 100-C contactor can be listed as a Type E self-protected combination motor controller. In this case, both the 140M and 100-C must pass the additional 6000 electrical and 4000 mechanical operational test. In some cases, this may require over sizing of the Bulletin 140M MPCB or the 100-C contactor to achieve weld free performance and meet the additional life requirements.

Standards Compliance and Certifications

Standards Compliance	Certifications
IEC/EN60947-1,-2,-4-1,-5-1	CE Marked
IEC/EN60204-1	CCC
CSA,C22.2 No.14	CSA Certified
UL508	cULus Listed (File No. E54612, NLRV(7); E205542, NKJH(7); E197878, DIVQ(7);)
	ATEX

	C-Frame	**D-Frame**	**F-Frame**
Max. Current I_e	32 A	32 A	45 A
Current Rating	0.1…32 A	1.6…32 A	6.3…45 A
Short Circuit Protection	✓	✓	✓
Standard Magnetic T rip	✓	✓	✓
High Magnetic Trip	✓	✓	✓
Magnetic Only Trip (MCP)	✓	✓	✓
Overload Protection	✓	✓	✓
Trip Class	10	10	10
Application at output of VFD (multi-motor)		✓ (140M-D8V)	
Standards Compliance			
CSA22.2, No.14	✓	✓	✓
UL508 (Group Installation)	✓ (see ratings)	✓ (see ratings)	✓ (see ratings)
UL508 Manual, Self Protected (Type E)	✓ (see ratings)	✓ (see ratings)	✓ (see ratings)
UL508 (Overload Protection)	✓	✓	✓
IEC60947-1,-2	✓	✓	✓
IEC60947-4-1	✓	✓	✓
CE	✓	✓	✓
ATEX (IEC60079-14)	✓ (up to 25 A)	✓ (up to 25 A; except 140M-D8V)	—
CCC	✓ (up to 25 A)	✓ (up to 25 A)	✓
Accessories			
External Rotary Operator	✓	✓	✓
Auxiliary Contacts	✓	✓	✓
Trip Indication Contacts	✓	✓	✓

ALLEN BRADLEY 140M

Catalog Number Explanation

Examples given in this section are not intended to be used for product selection.

140M	–	C	2	E	–	A63	–	KN	–	CC	–	GJ
a		b	c	d		e		f		g		h

a	
Bulletin Number	
Code	**Description**
140M	Motor Protection Circuit Breaker

b	
Frame/Rating	
Code	**Description**
C	32 A
D	32A
F	45A

c	
Interrupting Rating/Breaking Capacity	
Code	**Description**
2	Normal Break
8	High Break

d	
Protection Type	
Code	**Description**
E	Adj Thermal/ Fixed Mag(13 x I_n)
T	Adj Thermal/Fixed Mag (Fixed at 16...20 x I_n)
V	Adj Thermal/Fixed Mag application at output of VFD (multi-motor)

e		
Current Range		
Code	**Description**	**Example**
A	A=0.10	A16=0.16
B	B=1.0	B16=1.6
C	C=10	C16=16
D	D=100	D16=160
E	E=1000	E16=1600

f		
Miscellaneous		
Code	**Description**	**Frame Size**
KN	Black Lockable Knob	C,D,F
KRY	Red/Yellow Lockable Knob	C,D,F
TE	Spacing Adapter for Self-Protected Starters (Type E)	C,D,F
MT	STD BusBar Mount, Top	C,D,F

g			
Auxiliary Trip Contacts			
C, D, F Frames			
1st Code	**Description**	**2nd Code**	**Description**
Bottom Front		**Right Side**	
X	Placeholder	X	Placeholder
A	1 N.C.	C	1 N.O.+1 N.C.
B	1 N.O.	D	2 N.O.
C	1 N.O.+1 N.C.	E	2 N.C.
D	2N.O.	K	1 N.C. (SC+OL) + 1 N.C. (SC)
E	2N.C.	L	1 N.O. (SC+OL) + 1 N.O. (SC)
R	1 N.C.+ 1 N.O. (SC + OL)	M	1 N.C. (SC + OL)+ 1 N.O. (SC)
S	1 N.O.+1 N.O.(SC+OL)	N	1 N.O. (SC + OL) + 1 N.C. (SC)
		Q	1 N.O. (SC)+1 N.C.(SC)

h			
UV and Shunt Trips			
C, D, F Frame			
1st Code	**Description**	**2nd Code**	**Description**
Left Side		**Voltage**	
G	Undervoltage Trip	J	24V AC, 60 Hz
P	Shunt Trip	K	24V AC, 50 Hz
		D	120V AC, 60 Hz
		C	110V AC, 50 Hz
		H	208V AC, 60 Hz
		F	220…230V AC, 50 Hz
		A	240V AC, 60Hz
		T	277V AC, 60 Hz
		N	380…400V AC, 50 Hz
		B	480V AC, 60Hz and 415V AC, 50 Hz
		VC	600V AC, 60Hz
		M	575V AC, 60Hz and 500V AC, 50 Hz

Application Diagrams

Group Installation with MPCBs

There is only one Branch Circuit Protective Device (BCPD) for the "Group".

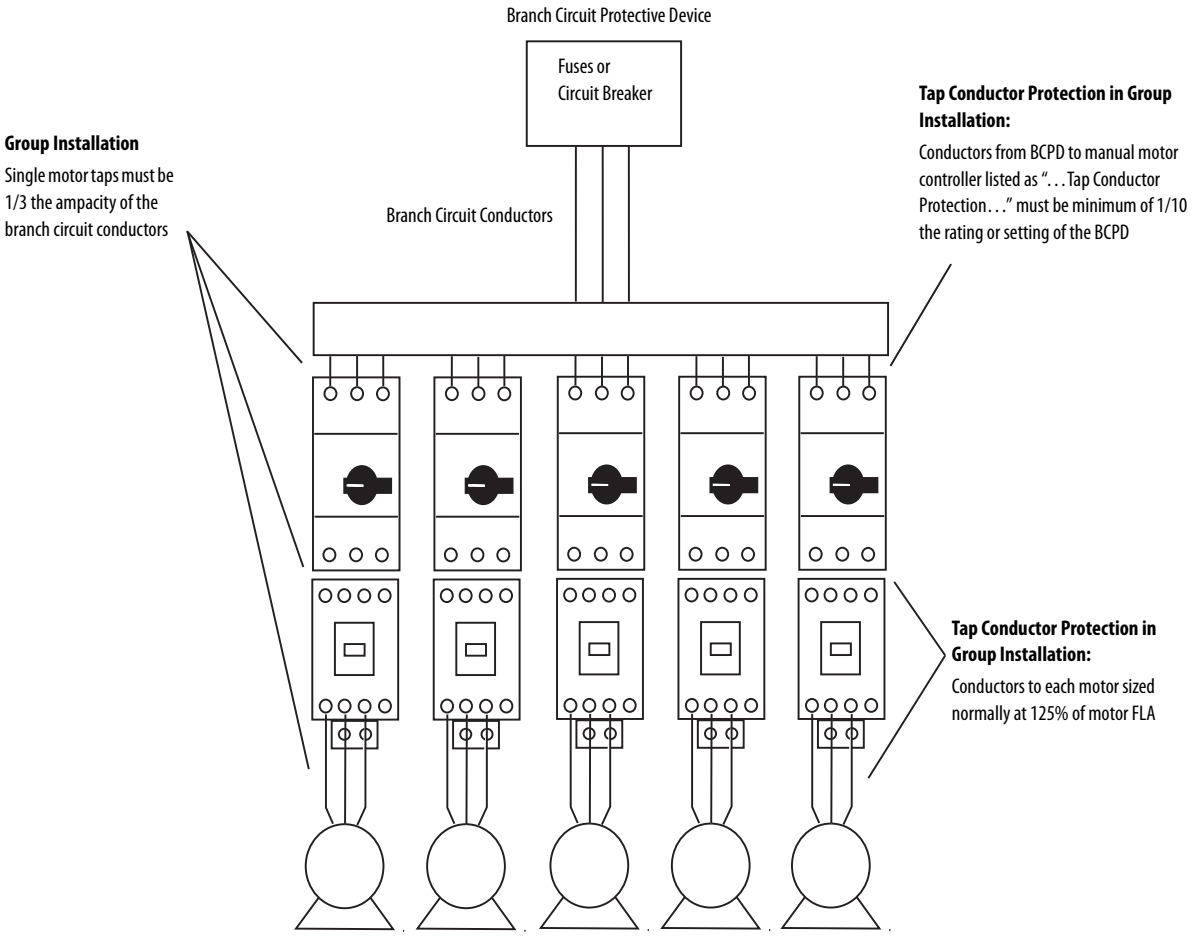
Group installation has been successfully used for many years in the U.S. and Canada. It allows "two or motors or one or more motors and other loads to be connected to the same branch-circuit...". The most restrictive part of the conditions specified for Group Installation is the requirement for the protection of the conductors for each motor circuit. In the U.S. NEC for 2002, a new rule for the conductor sizing was added for devices that are listed and marked "Suitable for use as Tap Conductor Protection".

Figure 1 shows an example that illustrates installations involving multiple motors with a single BCPD protecting the entire "Group".

Bulletin 140M Motor Protection Circuit Breakers UL/CSA Listed for Group Installation: conductors from the BCPD to each motor must be a minimum of 1/3 the ampacity of the Branch Circuit conductors.

Bulletin 140M Motor Protection Circuit Breakers UL/CSA Listed for Tap conductor Protection in Group Installations: conductors from the BCPD to manual motor controller listed as "...Tap Conductor Protection..." must be minimum of 1/10 the rating or setting of the BCPD. Conductors from the controller to the motor must be 125% of the motor FLA.

Figure 1 - Group Installation with MPCBs

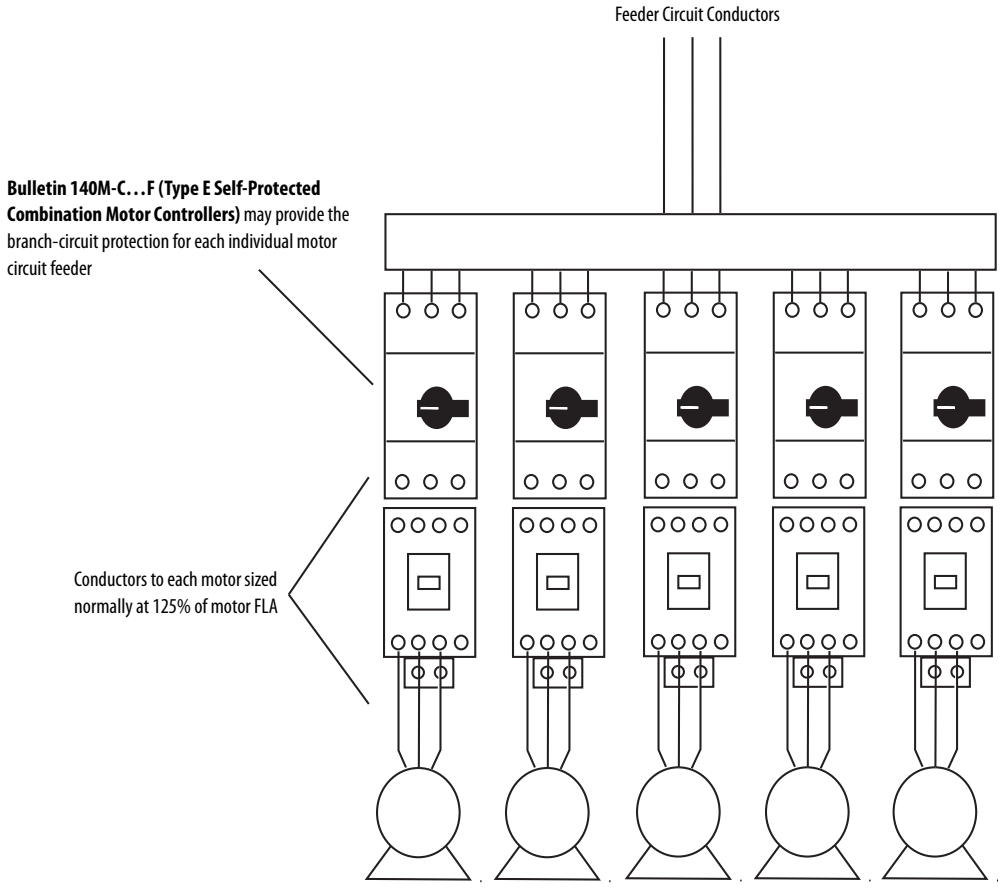


Multiple Motor Installation with MPCBs

Each Motor has an Individual Branch Circuit Protective Device.

Bulletin 140M Motor Protection Circuit Breakers (MPCBs) are UL/CSA Listed as **Type E Manual Self-Protected Combination Motor Controllers** or UL/CSA Listed as Circuit Breakers. These UL/CSA Listings allow the Bulletin 140M MPCBs to provide the branch-circuit, short-circuit protection (as well as overload protection) for each individual motor circuit. Additional short-circuit protection is not required for the protection of the individual motor circuits, leaving only the requirement for protection of the feeder circuit conductors by an upstream protective device. Figure 2 shows an example that illustrates installations involving multiple motors, each with its own branch-circuit protection (BCPD).

Figure 2 - Multiple Motor Installation with MPCBs



Product Selection

140M-C

140M-D

140M-F

Rated Operational Current (I_e) [A]	Motor Current Adjustment Range [A]	Magnetic Trip Current [A]	Max. Short Circuit Current [kA]		Max. 3-phase Hp Ratings[1]				Max. kW, 3-Phase — AC-3[1]				Cat. No.
			400V (I_{cu})	480V (group motor)	200V	230V	460V	575V	230V	400/415V	500V	690V	
C-Frame													
0.16	0.10…0.16	2.1	100	65	—	—	—	—	—	0.02	0.06	0.06	140M-C2E-A16
0.25	0.16…0.25	3.3	100	65	—	—	—	—	—	0.04	0.09	0.09	140M-C2E-A25
0.4	0.25…0.40	5.2	100	65	—	—	—	0.25	0.06	0.09	0.12	0.18	140M-C2E-A40
0.63	0.40…0.63	8.2	100	65	—	—	0.25	0.33	0.09	0.18	0.18	0.25	140M-C2E-A63
1	0.63…1.0	13	100	65	—	—	0.5	0.75	0.18	0.25	0.37	0.55	140M-C2E-B10
1.6	1.0…1.6	21	100	65	0.25	0.33	1	1	0.25	0.55	0.75	1.1	140M-C2E-B16
2.5	1.6…2.5	33	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-C2E-B25
4	2.5…4.0	52	100	65	1	1	3	3	0.75	1.5	2.2	3	140M-C2E-B40
6.3	4.0…6.3	82	100	65	1.5	2	5	5	1.5	2.2	3	4	140M-C2E-B63
10	6.3…10	130	100	65	3	3	7.5	10	2.2	4	6.3	7.5	140M-C2E-C10
16	10…16	208	65	30	5	5	10	15	4	7.5	10	13	140M-C2E-C16
20	14.5…20	260	50	30	5	7.5	15	20	5.5	10	11	17	140M-C2E-C20
25	18…25	325	15	25	7.5	7.5	20	20	5.5	11	15	22	140M-C2E-C25
29	24…29	406	15	25	7.5	10	20	25	7.5	13	18.5	25	140M-C2E-C29
32	27…32	448	15	25	7.5	10	25	30	7.5	15	20	25	140M-C2E-C32
D-Frame													
2.5	1.6…2.5	33	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-D8E-B25
4	2.5…4.0	52	100	65	1	1	3	3	0.75	1.5	2.2	3	140M-D8E-B40
6.3	4.0…6.3	82	100	65	1.5	2	5	5	1.5	2.2	3	4	140M-D8E-B63
10	6.3…10	130	100	65	3	3	7.5	10	2.2	4	6.3	7.5	140M-D8E-C10
16	10…16	208	100	65	5	5	10	15	4	7.5	10	13	140M-D8E-C16
20	14.5…20	260	100	65	5	7.5	15	20	5.5	10	11	17	140M-D8E-C20
25	18…25	325	65	30	7.5	7.5	20	20	5.5	11	15	22	140M-D8E-C25
29	24…29	406	50	30	7.5	10	20	25	7.5	13	18.5	25	140M-D8E-C29
32	27…32	448	50	30	7.5	10	25	30	7.5	15	20	25	140M-D8E-C32
D-Frame, 140M-D8V…													
1.6	1.0…1.6	82	65	65	0.25	0.33	1	—	0.25	0.55	0.75	—	140M-D8V-B16
2.5	1.6…2.5	82	65	65	0.5	0.75	1.5	—	0.37	0.75	1.1	—	140M-D8V-B25
4	2.5…4.0	82	65	65	1	1	3	—	0.75	1.5	2.2	—	140M-D8V-B40
6.3	4.0…6.3	82	65	65	1.5	2	5	—	1.5	2.2	3	—	140M-D8V-B63
10	6.3…10	130	65	65	3	3	7.5	—	2.2	4	6.3	—	140M-D8V-C10
16	10…16	208	65	65	5	5	10	—	4	7.5	10	—	140M-D8V-C16
20	14.5…20	260	65	65	5	7.5	15	—	5.5	10	11	—	140M-D8V-C20
25	18…25	325	65	30	7.5	7.5	20	—	5.5	11	15	—	140M-D8V-C25
29	24…29	406	50	30	7.5	10	20	—	7.5	13	18.5	—	140M-D8V-C29
32	27…32	448	50	30	7.5	10	25	—	7.5	15	20	—	140M-D8V-C32

ALLEN BRADLEY 140M

Rated Operational Current (I_e) [A]	Motor Current Adjustment Range [A]	Magnetic Trip Current [A]	Max. Short Circuit Current [kA]		Max. 3-phase Hp Ratings(1)				Max. kW, 3-Phase — AC-3(1)				Cat. No.
			400V (I_{cu})	480V (group motor)	200V	230V	460V	575V	230V	400/415V	500V	690V	
F-Frame													
10	6.3…10	130	100	65	3	3	7.5	10	2.2	4	6.3	7.5	140M-F8E-C10
16	10…16	208	100	65	5	5	10	15	4	7.5	10	13	140M-F8E-C16
20	14.5…20	260	100	65	5	7.5	15	20	5.5	10	11	17	140M-F8E-C20
25	18…25	325	100	65	7.5	10	20	25	6.3	11	15	22	140M-F8E-C25
32	23…32	416	65	65	7.5	10	25	30	7.5	15	20	30	140M-F8E-C32
45	32…45	585	65	65	10	15	30	40	13	22	30	40	140M-F8E-C45

(1) Horsepower/kW ratings show are for reference. The final selection of the MPCB depends on the actual motor full load current.

High Inrush Motor Protection Circuit Breakers

- Short-circuit Protection — High Magnetic Trip (Fixed at 16...21 x I_e)
- Overload Protection — Trip Class 10

140M-C

140M-D

140M-F

Rated Operational Current (I_e) [A]	Motor Current Adjustment Range [A]	Magnetic Trip Current [A]	Max. Short Circuit Current [kA]		Max. 3-phase Hp Ratings(1)				Max. kW, 3-Phase — AC-3(1)				Cat. No.
			400V (I_{cu})	480V (group motor)	200V	230V	460V	575V	230V	400/415V	500V	690V	
C-Frame													
0.16	0.10…0.16	3.3	100	65	—	—	—	—	—	0.02	0.06	0.06	140M-C2T-A16
0.25	0.16…0.25	5.2	100	65	—	—	—	—	—	0.04	0.09	0.09	140M-C2T-A25
0.4	0.25…0.40	8.2	100	65	—	—	—	0.25	0.06	0.09	0.12	0.18	140M-C2T-A40
0.63	0.40…0.63	13	100	65	—	—	0.25	0.33	0.09	0.18	0.18	0.25	140M-C2T-A63
1	0.63…1.0	21	100	65	—	—	0.5	0.75	0.18	0.25	0.37	0.55	140M-C2T-B10
1.6	1.0…1.6	33	100	65	0.25	0.33	1	1	0.25	0.55	0.75	1.1	140M-C2T-B16
2.5	1.6…2.5	52	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-C2T-B25
4	2.5…4	82	100	65	1	1	3	3	0.75	1.5	2.2	3	140M-C2T-B40
6.3	4…6.3	130	100	65	1.5	2	5	5	1.5	2.2	3	4	140M-C2T-B63
10	6.3…10	208	100	30	3	3	7.5	10	2.2	4	6.3	7.5	140M-C2T-C10
16	10…16	260	50	30	5	5	10	15	4	7.5	10	13	140M-C2T-C16
D-Frame													
16	10…16	260	100	65	5	5	10	15	4	7.5	10	13	140M-D8T-C16
20	14.5…20	325	65	30	5	7.5	15	20	5.5	10	11	17	140M-D8T-C20
F-Frame													
25	18…25	416	65	65	7.5	10	20	25	6.3	11	15	22	140M-F8T-C25
32	23…32	585	65	65	7.5	10	25	30	7.5	15	20	30	140M-F8T-C32

(1) Horsepower/kW ratings show are for reference. The final selection of the MPCB depends on the actual motor full load current.

Screwless Motor Protection Circuit Breakers

- Short-circuit Protection — High Magnetic Trip (Fixed at 16...21 x I_e)
- Overload Protection — Trip Class 10

140M-RC2

Rated Operational Current (I_e) [A]	Motor Current Adjustment Range [A]	Magnetic Trip Current [A]	Max. Short Circuit Current [kA]		Max. 3-phase Hp Ratings[1]				Max. kW, 3-Phase — AC-3[1]				Cat. No.
			400V (I_{cu})	480V (group motor)	200V	230V	460V	575V	230V	400/415V	500V	690V	
C-Frame													
0.16	0.10…0.16	2.1	100	65	—	—	—	—	—	0.02	0.06	0.06	140M-RC2E-A16
0.25	0.16…0.25	3.3	100	65	—	—	—	—	—	0.04	0.09	0.09	140M-RC2E-A25
0.4	0.25…0.40	5.2	100	65	—	—	—	0.25	0.06	0.09	0.12	0.18	140M-RC2E-A40
0.63	0.40…0.63	8.2	100	65	—	—	0.25	0.33	0.09	0.18	0.18	0.25	140M-RC2E-A63
1	0.63…1.0	13	100	65	—	—	0.5	0.75	0.18	0.25	0.37	0.55	140M-RC2E-B10
1.6	1.0…1.6	21	100	65	0.25	0.33	1	1	0.25	0.55	0.75	1.1	140M-RC2E-B16
2.5	1.6…2.5	33	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-RC2E-B25
4	2.5…4.0	52	100	65	1	1	3	3	0.75	1.5	2.2	3.0	140M-RC2E-B40
6.3	4.0…6.3	82	100	65	1.5	2	5	5	1.5	2.2	3.0	4.0	140M-RC2E-B63
10	6.3…10	130	100	65	3	3	7.5	10	2.2	4.0	6.3	7.5	140M-RC2E-C10
16	10…16	208	65	30	5	5	10	15	4.0	7.5	10	13	140M-RC2E-C16

(1) Horsepower/kW ratings show are for reference. The final selection of the MPCB depends on the actual motor full load current.

ALLEN BRADLEY 140M

Bulletin 140M Motor Circuit Protectors

Overview

Motor Circuit Protectors (MCPs) may provide the following protective and control functions.

- Disconnect for Motor Branch Circuit
- Branch-Circuit, Short-Circuit Protection (Magnetic Protection)
- Switching (Manual)

In North America, electrical codes require that an individual Motor Branch Circuit be protected by a UL/CSA Listed Fuse, Circuit Breaker or Self-Protected Combination Motor Controller.

140M-C, D, and F Frames:

The 140M-C, D and F frame Motor Circuit Protectors have one UL/CSA Listing - as Manual Motor Controllers (with optional approvals for Motor Disconnect and Group Installation). In NEC/CEC Group Installations, these devices must be applied per the appropriate rules, which require the use of an upstream Branch-Circuit, Short-Circuit Protective Device (BCPD).

The 140M-C, D and F Frame Motor Circuit Protectors are also UL/CSA Listed, together with a Bulletin 100C contactor and Bulletin 193 overload relay, as part of our Bulletin 103T and 107T Self-Protected IEC Combination Starters. These starters are then able to provide all of the necessary NEC/CEC requirements for the protection and control of individual Motor Branch Circuits without additional protective devices.

Standards Compliance and Certifications

Standards Compliance	Certifications
IEC/EN60947-1,-2,-4-1,-5-1	CE Marked
IEC/EN60204-1	CCC
CSA,C22.2 No.14	cULus Listed (File No. E54612, Guide No. NLRV, NLRV7)
UL508	

	C-Frame	**D-Frame**	**F-Frame**
Current Rating	0.16…2.5 A	2.5…32 A	25…45 A
Short Circuit Protection	✓	✓	✓
Standards Compliance:			
CSA22.2, No.14	✓	✓	✓
UL508 (Group Installation)	✓	✓	✓
IEC60947-2	✓	✓	✓
CE	✓	✓	✓
CCC	✓	✓ (up to 25 A)	✓
Accessories			
External Rotary Operator	✓	✓	✓
Auxiliary Contacts	✓	✓	✓
Trip Indication Contacts	✓	✓	✓

Catalog Number Explanation

Examples in this section are not intended to be used for product selection.

140M	–	C	2	N	–	A63	–	KN	–	CC	–	GJ
a		b	c	d		e		f		g		h

a	
Bulletin Number	
Code	**Description**
140M	Motor Circuit Protector

b	
Frame/Rating	
Code	**Description**
C	25 A
D	32A
F	45A

c	
Interrupting Rating/Breaking Capacity	
Code	**Description**
2	Normal Break
8	High Break

d	
Protection Type	
Code	**Description**
N	Fixed Mag only (13 x I_n)

e		
Current Range		
Code	**Description**	**Example**
A	A=0.10	A16=0.16
B	B=1.0	B16=1.6
C	C=10	C16=16
D	D=100	D16=160
E	E=1000	E16=1600

f		
Miscellaneous		
Code	**Description**	**Frame Size**
KN	Black Lockable Knob	C,D,F
KRY	Red/Yellow Lockable Knob	C,D,F
TE	Spacing Adapter for Self-Protected Starters (Type E)	C,D,F
MT	STD BusBar Mount, Top	C,D,F

g			
Auxiliary Trip Contacts			
C, D, F Frames			
1st Code	**Description**	**2nd Code**	**Description**
Bottom Front		**Right Side**	
X	Placeholder	X	Placeholder
A	1 N.C.	C	1 N.O.+1 N.C.
B	1 N.O.	D	2 N.O.
C	1 N.O.+1 N.C.	E	2 N.C.
D	2N.O.	K	1 N.C. (SC+OL) + 1 N.C. (SC)
E	2N.C.	L	1 N.O. (SC+OL) + 1 N.O. (SC)
R	1 N.C.+ 1 N.O. (SC + OL)	M	1 N.C. (SC + OL)+ 1 N.O. (SC)
S	1 N.O.+1 N.O.(SC+OL)	N	1 N.O. (SC + OL) + 1 N.C. (SC)
		Q	1 N.O. (SC)+1 N.C.(SC)

h			
UV and Shunt Trips			
C, D, F Frame			
1st Code	**Description**	**2nd Code**	**Description**
Left Side		**Voltage**	
G	Undervoltage Trip	J	24V AC, 60 Hz
P	Shunt Trip	K	24V AC, 50 Hz
		D	120V AC, 60 Hz
		C	110V AC, 50 Hz
		H	208V AC, 60 Hz
		F	220…230V AC, 50 Hz
		A	240V AC, 60Hz
		T	277V AC, 60 Hz
		N	380…400V AC, 50 Hz
		B	480V AC, 60Hz and415V AC, 50 Hz
		VC	600V AC, 60Hz
		M	575V AC, 60Hz and500V AC, 50 Hz

ALLEN BRADLEY 140M

Application Diagrams

Group Installation with MCPs

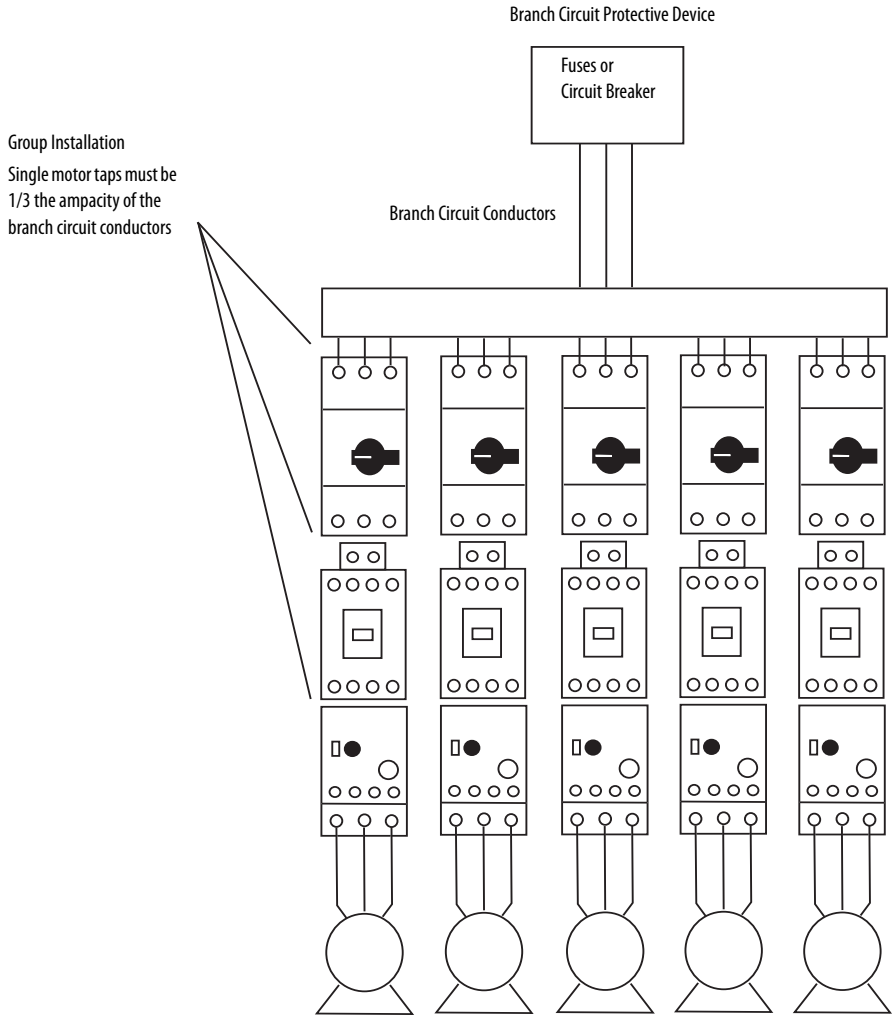
There is only one Branch Circuit Protective Device (BCPD) for the "Group".

Group installation has been successfully used for many years in the U.S. and Canada. It allows "two or motors or one or more motors and other loads to be connected to the same branch-circuit...". The most restrictive part of the conditions specified for Group Installation is the requirement for the protection of the conductors for each motor circuit.

Figure 3 shows an example that illustrates installations involving multiple motors with a single BCPD protecting the entire "Group".

Bulletin 140M Motor Circuit Protectors UL/CSA Listed for Group Installation: conductors from the BCPD to each motor must be a minimum of 1/3 the ampacity of the Branch Circuit conductors. MCPs do not provide thermal protection, so a separate overload relay must be used. Because of this, MCPs cannot be UL/CSA Listed for Tap Conductor Protection in group installations.

Figure 3 - Group Installation with MCPs

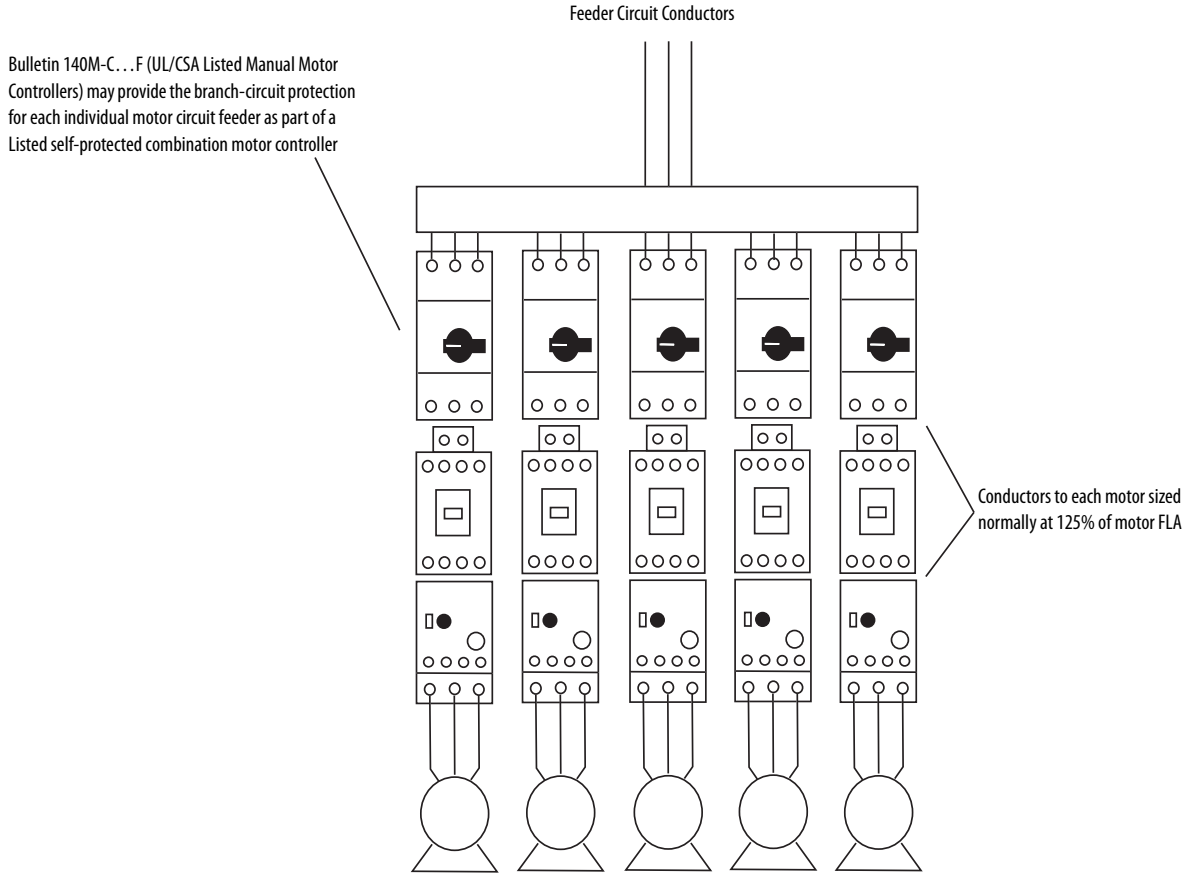


Multiple Motor Installation with MCPs

Each Motor has an Individual Branch Circuit Protective Device.

Bulletin 140M Motor Circuit Protectors (MCPs) are UL/CSA Listed as part of a Combination Motor Controllers or a Self-Protected Combination Motor Controller consisting of a 140M Motor Circuit Protector, a 100-C Contactor, and a 193 Overload Relay. These UL/CSA Listings allow the Bulletin 140M MCPs to provide the branch-circuit, short-circuit protection for each individual motor circuit. Additional short-circuit protection is not required for the protection of the individual motor circuits, leaving only the requirement for protection of the feeder circuit conductors by an upstream protective device. Figure 4 shows an example that illustrates installations involving multiple motors, each with its own branch-circuit protection (BCPD).

Figure 4 - Multiple Motor Installation with MCPs



ALLEN BRADLEY 140M

Product Selection

- For trip Class 10 motor applications

140M-C

140M-D

140M-F

Rated Operational Current (I_e) [A][1]	Magnetic Trip Current [A]	Ultimate Interrupting Current [kA]		Max. 3-phase Hp Ratings[2]				Max. kW, 3-Phase — AC-3[2]				Cat. No.
		400V (I_{cu})	480V (group motor)	200V	230V	460V	575V	230V	400/415V	500V	690V	
C-Frame												
0.16	2.1	100	65	—	—	—	—	—	0.02	0.06	0.06	140M-C2N-A16
0.25	3.3	100	65	—	—	—	—	—	0.04	0.09	0.09	140M-C2N-A25
0.4	5.2	100	65	—	—	—	0.25	0.06	0.09	0.12	0.18	140M-C2N-A40
0.63	8.2	100	65	—	—	0.25	0.33	0.09	0.18	0.18	0.25	140M-C2N-A63
1	13	100	65	—	—	0.5	0.75	0.18	0.25	0.37	0.55	140M-C2N-B10
1.6	21	100	65	0.25	0.33	1	1	0.25	0.55	0.75	1.1	140M-C2N-B16
2.5	33	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-C2N-B25
D-Frame												
2.5	33	100	65	0.5	0.75	1.5	2	0.37	0.75	1.1	1.8	140M-D8N-B25
4	52	100	65	1	1	3	3	0.75	1.5	2.2	3	140M-D8N-B40
6.3	82	100	65	1.5	2	5	5	1.5	2.2	3	4	140M-D8N-B63
10	130	100	65	3	3	7.5	10	2.2	4	6.3	7.5	140M-D8N-C10
16	208	100	65	5	5	10	15	4	7.5	10	13	140M-D8N-C16
25	325	65	30	7.5	7.5	20	20	5.5	11	15	22	140M-D8N-C25
32	448	50	30	7.5	10	25	30	7.5	15	20	25	140M-D8N-C32
F-Frame												
25	325	100	65	7.5	10	20	25	6.3	11	15	22	140M-F8N-C25
32	416	65	65	7.5	10	25	30	7.5	15	20	30	140M-F8N-C32
45	585	65	65	10	15	30	40	13	22	30	40	140M-F8N-C45

(1) In applications with 140M-C_N, 140M-D_N and 140M-F_N as the short circuit protection device of heavy duty starting motors, the rated operational current I_e of the above devices must be over-dimensioned with following factors:
Class 10 = 1.00
Class 15 = 1.22
Class 20 = 1.42
Class 25 = 1.58
Class 30 = 1.73

(2) Horsepower/kW ratings show are for reference. The final selection of the MCP depends on the actual motor full load current.

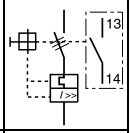
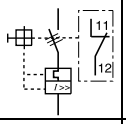
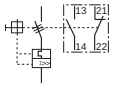
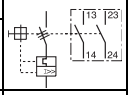
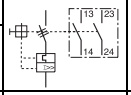
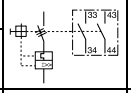
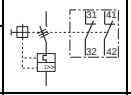
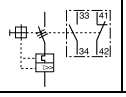
ALLEN BRADLEY 140M

Notes:

ALLEN BRADLEY 140M

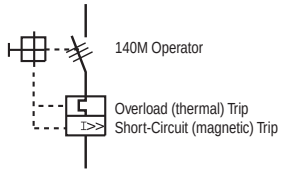
Accessories

Auxiliary Contacts

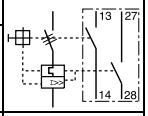
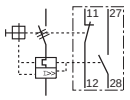
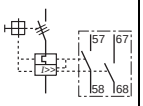
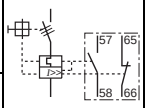
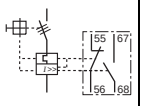
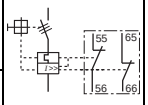
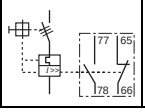
Description	Operator Position[1] OFF	ON	Tripped	Term. No.	Contact Description	Connection Diagram[2]	For Use With	Cat. No.
Front-Mounted Auxiliary Contact • 1-pole or 2-pole • No additional space required • Only one per device	0	X	0	13-14	N.O. Aux		140M-C, D, F; 140U-D (UL489 only in combination with 140M-C-AFC)	140M-C-AFA10
	X	0	X	11-12	N.C. Aux			140M-C-AFA01
	0	X	0	13-14	N.O. Aux		140M-C, D, F; 140U-D (UL489 only in combination with 140M-C-AFC)	140M-C-AFA11
	X	0	X	21-22	N.C. Aux			
	0	X	0	13-14	N.O. Aux			140M-C-AFA20
	0	X	0	23-24	N.O. Aux			
	X	0	X	11-12	N.C. Aux			140M-C-AFA02
	X	0	X	21-22	N.C. Aux			
Right Side-Mounted Auxiliary Contact • 2-pole • Adds 9 mm to the width of the device • Two per device	0	X	0	33-34	N.O. Aux		140M-C, D, F	140M-C-ASA20
	0	X	0	43-44	N.O. Aux			
	X	0	X	31-32	N.C. Aux		140M-C, D, F	140M-C-ASA02
	X	0	X	41-42	N.C. Aux			
	0	X	0	33-34	N.O. Aux		140M-C, D, F	140M-C-ASA11
	X	0	X	41-42	N.C. Aux			

(1) X = Contact Closed; 0 = Contact Open

(2) Connection Diagram Reference:

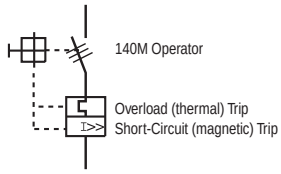


Trip Contacts

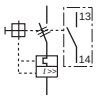
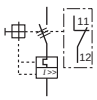
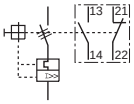
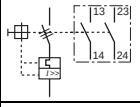
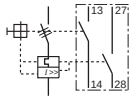
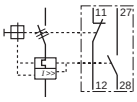
Description		Operator Position(1)			Term. No.	Contact Description	Connection Diagram(2)	For Use With	Cat. No.
		OFF	ON	Tripped					
	Front-Mounted Trip Contact • 2-pole • Indicates tripping of device • No additional space required	0	X	0	13-14	N.O. Aux		140M-C, D, F; 140U-D (UL489 only in combination with 140M-C-AFC)	140M-C-AFAR10A10
		0	0	X	27-28	N.O. Trip (short-circuit and overload)			
		X	0	X	11-12	N.C. Aux			140M-C-AFAR10A01
		0	0	X	27-28	N.O. Trip (short-circuit and overload)			
	Right-Side Mounted Trip Contact • 2-pole • Indicates tripping of the device • Adds 9 mm to the width of the device • One only per device • A right-side mounted auxiliary contact may be tandem mounted on top of this trip contact	0	0	X	57-58	N.O. Trip (short-circuit and overload)		140M-C, D, F	140M-C-ASAR10M10
		0	0	X	67-68	N.O. Trip (short-circuit)			
		0	0	X	57-58	N.O. Trip (short-circuit and overload)		140M-C, D, F	140M-C-ASAR10M01
		X	X	0	65-66	N.C. Trip (short-circuit)			
		X	X	0	55-56	N.C. Trip (short-circuit and overload)		140M-C, D, F	140M-C-ASAR01M10
		0	0	X	67-68	N.O. Trip (short-circuit)			
		X	X	0	55-56	N.C. Trip (short-circuit and overload)		140M-C, D, F	140M-C-ASAR01M01
		X	X	0	65-66	N.C. Trip (short-circuit)			
		0	0	X	77-78	N.O. Trip (short-circuit)		140M-C, D, F	140M-C-ASAM11
		X	X	0	65-66	N.C. Trip (short-circuit)			

(1) X = Contact Closed; 0 = Contact Open

(2) Connection Diagram Reference:

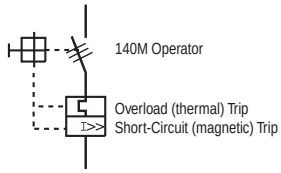


Auxiliary and Trip Contacts

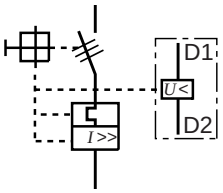
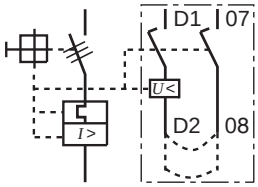
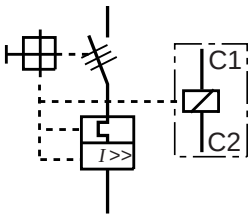
Description		Operator Position(1) OFF	ON	Tripped	Term. No.	Contact Description	Connection Diagram(2)	For Use With	Cat. No.
	Front-Mounted Auxiliary Contact • 1-pole or 2-pole • No additional space required • - Only 1 per device	0	X	0	13-14	N.O. Aux		140M-C, D, F; 140M-RC	140M-RC-AFA10
		X	0	X	11-12	N.C. Aux			140M-RC-AFA01
		0	X	0	13-14	N.O. Aux		140M-C, D, F; 140M-RC	140M-RC-AFA11
		X	0	X	21-22	N.C. Aux			
		0	X	0	13-14	N.O. Aux			140M-RC-AFA20
		0	X	0	23-24	N.O. Aux			
	Front-Mounted Trip Contact • 2-pole • Indicates tripping of device • No additional space required	0	X	0	13-14	N.O. Aux		140M-C, D, F; 140M-RC	140M-RC-AFAR10A01
		0	0	X	27-28	N.O. Trip (short-circuit and overload)			
		X	0	X	11-12	N.C. Aux			140M-RC-AFAR10A10
		0	0	X	27-28	N.O. Trip (short-circuit and overload)			

(1) X = Contact Closed; 0 = Contact Open

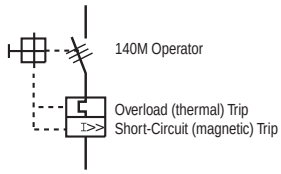
(2) Connection Diagram Reference:



Undervoltage and Shunt Tip Units

Description	Connection Diagram(1)	Trip Rating	For Use With	Cat. No.
Undervoltage Trip • Left-side mounted • Adds 18 mm to the width of the device • Automatically trips MPCB/MCP when voltage falls below 35…70%		24V, 60 Hz	140M-C, D, F; 140U-D	140M-C-UXJ
		24V, 50 Hz		140M-C-UXK
		120V, 60 Hz		140M-C-UXD
		110V, 50 Hz		140M-C-UXC
		208V, 60 Hz		140M-C-UXH
		220…230V, 50 Hz		140M-C-UXF
		240…260V, 60 Hz		140M-C-UXA
		277V, 60 Hz		140M-C-UXT
		380…400V, 50 Hz		140M-C-UXN
		480V, 60 Hz/415V, 50 Hz		140M-C-UXB
		575V, 60 Hz/500V, 50 Hz		140M-C-UXM
		600V, 60 Hz		140M-C-UXVC
Undervoltage Trip • Left-side mounted • 2 early make contacts integrated • Adds 18 mm to the width of the device • Automatically trips MPCB/MCP when voltage falls below 35…70%		24V, 60 Hz	140M-C, D, F	140M-C-UCJ
		24V, 50 Hz		140M-C-UCK
		120V, 60 Hz		140M-C-UCD
		110V, 50 Hz		140M-C-UCC
		208V, 60 Hz		140M-C-UCH
		220…230V, 50 Hz		140M-C-UCF
		240…260V, 60 Hz		140M-C-UCA
		277V, 60 Hz		140M-C-UCT
		380…400V, 50 Hz		140M-C-UCN
		480V, 60 Hz/415V, 50 Hz		140M-C-UCB
		575V, 60 Hz/500V, 50 Hz		140M-C-UCM
		600V, 60 Hz		140M-C-UCVC
Shunt Trip • Left-side mounted • Adds 18 mm to the width of the device • Provides remote tripping of the MPCB/MCP • Maximum on time for DC operated devices: 5 sec.		24V, 60 Hz	140M-C, D, F; 140U-D	140M-C-SNJ
		24V, 50 Hz		140M-C-SNK
		110V, 50 Hz/120V, 60 Hz		140M-C-SND
		208V, 60 Hz		140M-C-SNH
		220…230V, 50 Hz		140M-C-SNF
		240…260V, 60 Hz		140M-C-SNA
		277V, 60 Hz		140M-C-SNT
		380…400V, 50 Hz		140M-C-SNN
		480V, 60 Hz/415V, 50 Hz		140M-C-SNB
		575V, 60 Hz/500V, 50 Hz		140M-C-SNM
		600V, 60 Hz		140M-C-SNVC
		24V DC		140M-C-SNZJ

(1) Connection Diagram Reference:



Additional Accessories

	Description		For Use With	Cat. No.
	Anti-Tamper Shield • Provides protection against inadvertent adjustment of the current setting • Must be ordered in multiples of 10 (10 pcs/pkg)		140M-C, D, F	140M-C-CA
	Lockable Twist Knob • For one padlock 5 mm (3/16 in.) diameter shackle • Can be locked in OFF position	Black	140M-C, D, F 140U- D	140M-C-KN1
		Red/Yellow		140M-C-KRY1
	Locking Tag • Padlock attachment to the lockable handles • Up to three padlocks 4…8 mm (5/16 in.) diameter shackle		140M-C-KN1 140M- C-KRY1	140M-C-M3
	Door Coupling Handle • For 3 padlocks 4…8 mm (5/16 in.) in diameter • IP66 Protection/Type 1, 4, 4X, 12 Interlock override capability • Can be modified for locking in ON position • Ships with coupling — order extension shaft and legend plate separately • Mounting depth (front of DIN Rail to front of enclosure door): 140M-C: 105.5 mm ± 5 mm (4.15 in. ± 3/16 in.) 140M-D: 114.5 mm ± 5 mm (4.5 in. ± 3/16 in.) 140M-F: 137.1 mm ± 5 mm (5.4 in. ± 3/16 in.) 140U-D: 114.5mm ± 5mm (4.5 in. ±3/16 in.) ser E or later handles only	Black	140M-C, D, F 140U- D	140M-C-DN66
		Red/Yellow		140M-C-DRY66
	Extension Shaft • Cut to required length for mounting depth (front of DIN Rail to front of enclosure door): 140M-C: 117…338 mm (4.6….13.3 in.) 140M-D: 126…347 mm (5.0….13.7 in.) 140M-F: 149…369 mm (5.9….14.5 in.) 140U-D: 126...347 mm (5.0...13.7 in.) ser E or later handles only		140M-C-DN66, 140M-C-DRY66,	140M-C-DS
	Extension Shaft (Extended Length) • Cut to required length for mounting depth (front of DIN Rail to front of enclosure door): 140M-C: 117…488 mm (4.6…19.2 in.) 140M-D: 126…497 mm (5.0…19.6 in.) 140M-F: 149…519 mm (5.9…20.4 in.) 140U-D: 126...497 mm (5.0...19.6 in.) ser E or later handles only		140M-C-DN66, 140M-C-DRY66	140M-C-DSL
	Door Coupling Handle • Type 3, 3R, 4, 4X, 12 (IP66) • For up to 2 padlocks • Fits in 30.5 mm cutout • Requires 140M-C-DNC coupler	Black	140M-C, D, F 140U- D	140M-SB
		Red/Yellow		140M-SY
	Extension Shaft • Cut to required length for mounting depth (front of DIN Rail to front of enclosure door)	12 in. (30.48 cm)	140M-SB, 140M-SY	140M-S1
		21 in. (53.34 cm)		140M-S2
	Coupler • Included with Cat. Nos. 140M-C-DN66 and 140M-C-DRY66		140M-C, D, F 140U- D	140M-C-DNC
	Extension Shaft Support • Provides consistent alignment of the 140M-C-DS and 140M-C-DSL shafts with the 140M-C-DN66 or 140M-C-DRY66 door coupling handles. • It is recommended for shaft lengths >200 mm. • Snaps on the right side of the 140M-C, -D, -F or 140U-D and allows for the addition of one side-mounted auxiliary contact. • Width 9 mm. • For use with screw-mounted or hat rail mounted devices.		140M-C, D, F 140U- D	140M-C-SHS

	Description		For Use With	Cat. No.
	Legend Plate	Marking: "Hauptschalter" and "Main Switch"	140-CDN66	140M-C-DFCN
		Marking: "Not-Aus" and "Emergency Off"	140-CDRY66	140M-C-DFCRY
	IP65 Non-Metallic Enclosure • Knockouts for M20 and M25 fittings • Suitable for flexible cable with internal ground wire or conduit when externally grounded around the outside of the enclosure (no UL/CSA approval)	Black Handle	140M-C	198E-AYTG2
		Red/Yellow Handle	140M-C	198E-AYTJ2
	Screw Adapter • For screw arrangement of a motor protection circuit breaker • Must be ordered in multiples of 10 (10 pcs/pkg)		140M-C, D, F 140U- D	140M-C-N45

	Description	For Use With	Cat. No.
	ECO Connecting Module — 12 A • For DOL and reversing starters • Eco-starters mount on single DIN Rail (140M on DIN Rail) • Electrical and mechanical interconnection of 140M and 100-K contactors	140M-C to 100-K	140M-C-PEK12
	ECO Connecting Modules — 25 A • Eco-starters mount on single DIN Rail (140M on DIN Rail) • Electrical and mechanical interconnection of 140M MPCB and 100-C (with AC coils or 24V DC electronic coils) contactors	140M-C to 100-C09…C23	140M-C-PEC23
		140M-D to 100-C09…C23	140M-D-PEC23
	ECO Connecting Modules — 25 A • Eco-starters mount on single DIN Rail (100-C on DIN Rail) • Electrical and mechanical interconnection of 140M MPCB and 100-C (with conventional DC coils)	140M-C, 140M-D to 100-C09…C23	140M-C-PEC23A
	Connecting Modules — 25 and 45 A • Contactor and MPCB MUST BE mounted separately on (2) DIN Rails Electrical interconnection of 140M and 100-C (with AC coils)	140M-C to 100-C09…C23	140M-C-PNC23
		140M-D to 100-C09…C23	140M-D-PNC23
		140M-D to 100-C30…C37	140M-D-PNC37
		140M-F to 100-C30…C37	140M-F-PNC37
		140M-F to 100-C43	140M-F-PNC43
	Coil Modules — 25 A and 45 A • For use with Bulletin 103T/107T 3-component starters	140M-C, -D to 100-C09…C23	140M-C-PSC23
		140M-D, -F to 100-C30…C43	140M-F-PSC43
	Spacing Adapter • Required for self-protected combination motor controller (Type E) applications of Bul. 140M-C, -D, and -F MPCBs. Not for use with bus bars.	140M-C, -D	140M-C-TE1
		140M-F	140M-F-TE

	Description		For Use With	Cat. No.
	Feeder Block for Compact Busbar • Supply of compact busbars Increases terminal capacity		140M-C	140M-C-WBE
			140M-F	140M-F-WBE
	Feeder Terminal for Compact Busbar • For supply of compact busbars • Top feed — overlaps compact busbar • Meets IEC spacing requirements		140M-C, -D	140M-C-WTN
	Feeder Terminal for Compact Busbar • For supply of compact busbars • Top feed — overlaps compact busbar • Meets UL Type E spacing requirements		140M-C, -D	140M-C-WTEN
			140M-F	140M-F-WTE
	Three-phase Compact Busbar for 32 A Motor Protection Circuit Breakers — 64 A Max. Continuous Current • 45 mm spacing • For use with front-mounted auxiliary contact	2 connections	140M-C, -D	140M-C-W452N
		3 connections		140M-C-W453N
		4 connections		140M-C-W454N
		5 connections		140M-C-W455N
	Three-phase Compact Busbar for 32 A Motor Protection Circuit Breakers — 64 A Max. Continuous Current • 54 mm spacing • For use with side-mounted auxiliary contact	2 connections	140M-C, -D	140M-C-W542N
		3 connections		140M-C-W543N
		4 connections		140M-C-W544N
		5 connections		140M-C-W545N
	Three-phase Compact Busbar for 45 A Motor Protection Circuit Breakers — 115 A Max. Continuous Current • 54 mm spacing • For use with front-mounted auxiliary contact	2 connections	140M-F	140M-F-W542
		3 connections		140M-F-W543
		4 connections		140M-F-W544
	Three-phase Compact Busbar for 45 A Motor Protection Circuit Breakers — 115 A Max. Continuous Current • 63 mm spacing • For use with side-mounted auxiliary contact	2 connections	140M-F	140M-F-W632
		3 connections		140M-F-W633
		4 connections		140M-F-W634
	Terminal Cover • For covering of unused compact bus bar terminals IP2X finger protection • Must be ordered in multiples of 10 • (10 pcs/pkg)		140M-C, -D	140M-C-WSN
			140M-F	140M-F-WS
	Top Hat Rail Adapter — 10 mm • Adjusts the depth of the 140M-C to the 140M-D • Allows the use of compact busbars across both frame sizes • Must be ordered in multiples of 10 • (10 pcs/pkg)		140M-C	140-KBH2
	DIN (#3) symmetrical hat rail • 35 x 7.5 x 1 m • (10 pcs/pkg)		140M-D, -F	199-DR1
	DIN (#3) Symmetrical Rail • 35 mm x 15 mm x 1 m long • Top Hat Rail (DIN #3 Symmetrical Rail) • (5 pcs/pkg)		140M-C, -D, -F	1492-DR9

ALLEN BRADLEY 140M

Notes:

ALLEN BRADLEY 140M

Specifications

Application Ratings

UL/CSA Listed Application Ratings, Motor Protection Circuit Breaker Only

Cat. No.	UL 508 — Manual Motor Controller							UL 508 Self-Protected (Type E) Combination Motor Controller	
	Max. Fuse or C.B. per NEC	Group Motor Installation		Motor Disconnect		Tap Conductor Protection			
		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]	
		480V	600V	480V	600V	480Y/277V(1)	600Y/347V(1)	480Y/277V(1)	600Y/347V(1)
C-Frame									
140M-C2E-A16	450	65	47	65	47	65	47	65	47
140M-C2E-A25	450	65	47	65	47	65	47	65	47
140M-C2E-A40	450	65	47	65	47	65	47	65	47
140M-C2E-A63	450	65	47	65	47	65	47	65	47
140M-C2E-B10	450	65	47	65	47	65	47	65	47
140M-C2E-B16	450	65	47	65	47	65	47	65	47
140M-C2E-B25	450	65	30	65	30	65	30	65	30
140M-C2E-B40	450	65	25	65	25	65	25	65	25
140M-C2E-B63	450	65	30	65	30	65	—	65	—
140M-C2E-C10	450	65	30	65	30	65	—	65	—
140M-C2E-C16	450	30	30	30	30	30	—	30	—
140M-C2E-C20	450	30	30	10	10	10	—	10	—
140M-C2E-C25	450	25	10	10	5	—	—	—	—
140M-C2E-C29	450	25	5	10	—	—	—	—	—
140M-C2E-C32	450	25	5	10	—	—	—	—	—
140M-C2T-A16	450	65	47	65	47	65	47	65	47
140M-C2T-A25	450	65	47	65	47	65	47	65	47
140M-C2T-A40	450	65	47	65	47	65	47	65	47
140M-C2T-A63	450	65	47	65	47	65	47	65	47
140M-C2T-B10	450	65	47	65	47	65	47	65	47
140M-C2T-B16	450	65	47	65	47	65	30	65	30
140M-C2T-B25	450	65	25	65	25	65	25	65	25
140M-C2T-B40	450	65	30	65	30	65	—	65	—
140M-C2T-B63	450	65	30	65	30	65	—	65	—
140M-C2T-C10	450	30	30	30	30	30	—	30	—
140M-C2T-C16	450	30	30	10	10	10	—	10	—
D-Frame (D8E)									
140M-D8E-B25	450	65	30	65	30	65	30	65	30
140M-D8E-B40	450	65	30	65	30	65	30	65	30
140M-D8E-B63	450	65	30	65	30	65	30	65	30
140M-D8E-C10	450	65	30	65	30	65	30	65	30
140M-D8E-C16	450	65	30	65	30	65	30	65	30
140M-D8E-C20	450	65	30	65	30	65	—	65	—
140M-D8E-C25	450	30	30	30	30	30	—	30	—
140M-D8E-C29	450	30	30	30	18	—	—	—	—
140M-D8E-C32	450	30	30	30	18	—	—	—	—

(1) For full voltage (delta) ratings above 277V or 347V, follow the NEC or CEC rules for group motor applications.

Cat. No.	UL 508 — Manual Motor Controller							UL 508 Self-Protected (Type E) Combination Motor Controller	
	Max. Fuse or C.B. per NEC	Group Motor Installation		Motor Disconnect		Tap Conductor Protection			
		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]	
		480V	600V	480V	600V	480Y/277V(1)	600Y/347V(1)	480Y/277V(1)	600Y/347V(1)
D-Frame (D8V, D8T)									
140M-D8T-C16	450	65	30	65	30	65	30	65	30
140M-D8T-C20	450	30	30	30	30	30	—	30	—
140M-D8V-B16	450	65	—	65	—	65	—	65	—
140M-D8V-B25	450	65	—	65	—	65	—	65	—
140M-D8V-B40	450	65	—	65	—	65	—	65	—
140M-D8V-B63	450	65	—	65	—	65	—	65	—
140M-D8V-C10	450	65	—	65	—	65	—	65	—
140M-D8V-C16	450	65	—	65	—	65	—	65	—
140M-D8V-C20	450	65	—	65	—	65	—	65	—
140M-D8V-C25	450	30	—	30	—	30	—	30	—
140M-D8V-C29	450	30	—	30	—	—	—	—	—
140M-D8V-C32	450	30	—	30	—	—	—	—	—
F-Frame									
140M-F8E-C10	600	65	30	65	30	65	30	65	30
140M-F8E-C16	600	65	30	65	30	65	30	65	30
140M-F8E-C20	600	65	30	65	30	65	30	65	30
140M-F8E-C25	600	65	30	65	30	65	30	65	30
140M-F8E-C32	600	65	30	65	30	65	30	65	30
140M-F8E-C45	600	65	18	65	18	65	—	65	—
140M-F8T-C25	600	65	30	65	30	65	30	65	30
140M-F8T-C32	600	65	18	65	18	65	18	65	18

(1) For full voltage (delta) ratings above 277V or 347V, follow the NEC or CEC rules for group motor applications.

UL Listed Application Ratings, Motor Circuit Protector Only (Separate Overload Protection Required)

Cat. No.	UL 508 — Manual Motor Controller				
	Max. Fuse or C.B. per NEC	Group Motor Installation		Motor Disconnect	
		Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]	
		480V	600V	480V	600V
C-Frame					
140M-C2N-A16	450	65	47	65	47
140M-C2N-A25	450	65	47	65	47
140M-C2N-A40	450	65	47	65	47
140M-C2N-A63	450	65	47	65	47
140M-C2N-B10	450	65	47	65	47
140M-C2N-B16	450	65	47	65	47
140M-C2N-B25	450	65	30	65	30
D-Frame					
140M-D8N-B25	450	65	30	65	30
140M-D8N-B40	450	65	30	65	30
140M-D8N-B63	450	65	30	65	30
140M-D8N-C10	450	65	30	65	30
140M-D8N-C16	450	65	30	65	30
140M-D8N-C25	450	30	30	30	30
140M-D8N-C32	450	30	30	30	18
F-Frame					
140M-F8N-C25	600	65	30	65	30
140M-F8N-C32	600	65	30	65	30
140M-F8N-C45	600	65	18	65	18

UL Listed Application Ratings - Motor Protection Circuit Breakers with Bulletin 100-K Contactors

Cat. No.	UL 508 — Manual Motor Controller						UL508 Type F Combination Motor Controller		
	Max. Fuse or C.B. per NEC	Minimum Contactor Size	Group Motor Installation		Motor Disconnect		Minimum Contactor Size	Max. Short Circuit Current [kA]	
			Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]			480Y/277V(1)	600Y/347V(1)
			480V	600V	480V	600V			
C-Frame									
140M-C2E-A16	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-A25	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-A40	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-A63	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-B10	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-B16	450	100-K05	65	47	65	47	100-K05	65	47
140M-C2E-B25	450	100-K05	65	30	65	30	100-K05	65	30
140M-C2E-B40	450	100-K05	65	30	65	30	100-K05	65	30
140M-C2E-B63	450	100-K05	65	30	65	30	100-K05	65	—
140M-C2E-C10	450	100-K09	65	30	65	30	100-K09	65	—
140M-C2E-C16	450	100-K12	30	30	30	30	100-K12	30	—
D-Frame									
140M-D8E-B25	450	100-K05	65	30	65	30	100-K05	65	30
140M-D8E-B40	450	100-K05	65	30	65	30	100-K05	65	30
140M-D8E-B63	450	100-K05	65	30	65	30	100-K05	65	30
140M-D8E-C10	450	100-K09	65	30	65	30	100-K09	65	30
140M-D8E-C16	450	100-K12	65	30	65	30	100-K12	65	30

(1) For full voltage (delta) ratings above 277V or 347V, follow the NEC or CEC rules for group motor applications.

UL Listed Application Ratings - Motor Protection Circuit Breakers with Bulletin 100-C Contactors

Cat. No.	UL 508 — Manual Motor Controller						UL508 Type F Combination Motor Controller			UL508 Type E Self-Protected Combination Motor Controller		
	Max. Fuse or C.B. per NEC	Minimum Contactor Size	Group Motor Installation		Motor Disconnect		Minimum Contactor Size	Max. Short Circuit Current [kA]		Minimum Contactor Size	Max. Short Circuit Current [kA]	
			Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]							
			480V	600V	480V	600V		480Y/ 277V(1)	600Y/ 347V(1)		480Y/ 277V(1)	600Y/ 347V(1)
C-Frame												
140M-C2E-A16	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-A25	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-A40	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-A63	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-B10	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-B16	450	100-C09	65	47	65	47	100-C09	65	47	100-C09	65	47
140M-C2E-B25	450	100-C09	65	30	65	30	100-C09	65	30	100-C09	65	30
140M-C2E-B40	450	100-C09	65	30	65	30	100-C09	65	30	—	65	25
140M-C2E-B63	450	100-C09	65	30	65	30	100-C09	65	—	—	65	—
140M-C2E-C10	450	100-C09	65	30	65	30	100-C09	65	—	—	65	—
140M-C2E-C16	450	100-C12	30	30	30	25	100-C12	30	—	—	30	—
140M-C2E-C20	450	100-C16	30	30	30	30	100-C23	10	—	—	10	—
140M-C2E-C25	450	100-C23	30	30	10	10	—	—	—	—	—	—
	450	100-C30	30	30	30	30	—	—	—	—	—	—
140M-C2E-C29	450	100-C30	10	5	10	5	—	—	—	—	—	—
140M-C2E-C32	450	100-C37	10	5	10	5	—	—	—	—	—	—
D-Frame												
140M-D8E-B25	450	100-C09	65	30	65	30	100-C09	65	30	100-C09	65	30
	—	—	—	—	—	—	—	—	—	100-C23	65	30
140M-D8E-B40	450	100-C09	65	30	65	30	100-C09	65	30	100-C23	65	30
140M-D8E-B63	450	100-C09	65	30	65	30	100-C09	65	30	100-C30	65	30
140M-D8E-C10	450	100-C09	65	30	65	30	100-C09	65	30	100-C30	65	30
140M-D8E-C16	450	100-C12	65	30	65	30	100-C12	65	30	100-C30	65	30
140M-D8E-C20	450	100-C23	65	30	65	30	100-C23	65	—	100-C30	65	—
140M-D8E-C25	450	100-C23	65	30	65	30	100-C23	30	—	100-C30	30	—
140M-D8E-C29	450	100-C30	65	10	65	10	—	—	—	—	—	—
140M-D8E-C32	450	100-C37	65	10	65	10	—	—	—	—	—	—
F-Frame												
140M-F8E-C10	600	100-C30	65	30	65	30	100-C30	65	30	100-C30	65	30
140M-F8E-C16	600	100-C30	65	30	65	30	100-C30	65	30	100-C30	65	30
140M-F8E-C20	600	100-C30	65	30	65	30	100-C30	65	30	100-C30	65	30
140M-F8E-C25	600	100-C30	65	30	65	30	100-C30	65	30	100-C30	65	30
140M-F8E-C32	600	100-C30	65	30	65	30	100-C30	65	30	100-C30	65	30
140M-F8E-C45	600	100-C37	65	18	65	18	100-C37	65	—	100-C37	65	—

(1) For full voltage (delta) ratings above 277V or 347V, follow the NEC or CEC rules for group motor applications.

UL Listed Application Ratings - Motor Circuit Protectors with Bulletin 100-C Contactors (Separate Overload Protection Required)

Cat. No.	UL 508 — Manual Motor Controller						UL508 Type E Self-Protected Combination Motor Controller		
	Max. Fuse or C.B. per NEC	Minimum Contactor Size	Group Motor Installation		Motor Disconnect		Minimum Contactor Size	Max. Short Circuit Current [kA]	
			Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]				
			480V	600V	480V	600V		480Y/277V(1)	600Y/347V(1)
C-Frame									
140M-C2N-A16	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-A25	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-A40	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-A63	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-B10	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-B16	450	100-C09	65	47	65	47	100-C09	65	47
140M-C2N-B25	450	100-C09	65	30	65	30	100-C09	65	—
D-Frame									
140M-D8N-B25	450	100-C09	65	30	65	30	100-C09	65	—
	—	—	—	—	—	—	100-C23	65	30
140M-D8N-B40	450	100-C09	65	30	65	30	100-C23	65	30
140M-D8N-B63	450	100-C09	65	30	65	30	100-C30	65	30
140M-D8N-C10	450	100-C09	65	30	65	30	100-C30	65	30
140M-D8N-C16	450	100-C12	65	30	65	30	100-C30	65	30
140M-D8N-C25	450	100-C23	30	30	30	30	100-C30	65	—
140M-D8N-C32	450	100-C37	65	10	65	10	—	—	
F-Frame									
140M-F8N-C25	600	100-C23	65	30	65	30	100-C30	65	30
140M-F8N-C32	600	100-C30	65	30	65	30	100-C30	65	30
140M-F8N-C45	600	100-C37	65	18	65	18	100-C37	65	—

(1) For full-voltage (delta) ratings above 277V or 347V, follow the NEC or CEC rules for group motor applications.

ALLEN BRADLEY 140M

Definition of Type 2 Short Circuit Coordination:

- The contactor or starter must not endanger persons or plant in the event of a short circuit.
- No damage to the motor protection device or other parts may occur with the exception of welding of the contactor or starter contacts if these can be easily separated without appreciable deformation (such as with a screwdriver).

In the event of short circuit, fast-opening, current-limiting Bulletin 140M Motor Protection Circuit Breakers make it possible to build economical, fully short-circuit coordinated starter combinations with Type 2 coordination.

Type 2 Coordination, 400V

Cat. No.			Max. Short-Circuit Current [kA]	Minimum Contactor Size
Standard Motor Protection	High Inrush Motor Protection	Motor Circuit Protection	400V	
C-Frame				
140M-C2E-A16	—	140M-C2N-A16	100	100-C09
140M-C2E-A25	140M-C2T-A16	140M-C2N-A25	100	100-C09
140M-C2E-A40	140M-C2T-A25	140M-C2N-A40	100	100-C09
140M-C2E-A63	140M-C2T-A40	140M-C2N-A63	100	100-C09
140M-C2E-B10	140M-C2T-A63	140M-C2N-B10	100	100-C09
140M-C2E-B16	140M-C2T-B10	140M-C2N-B16	100	100-C09
140M-C2E-B25	140M-C2T-B16	140M-C2N-B25	50	100-C09
140M-C2E-B40	140M-C2T-B25	—	50	100-C09
140M-C2E-B63	140M-C2T-B40	—	50	100-C09
140M-C2E-C10	140M-C2T-B63	—	50	100-C09
140M-C2E-C16	140M-C2T-C10	—	50	100-C12(1)
140M-C2E-C20	140M-C2T-C16	—	50	100-C23
140M-C2E-C25	—	—	15	100-C30
140M-C2E-C29	—	—	15	100-C30
140M-C2E-C32	—	—	15	100-C37
D-Frame				
140M-D8E-B25	—	140M-D8N-B25	100	100-C09
140M-D8E-B40	—	140M-D8N-B40	100	100-C09
140M-D8E-B63	—	140M-D8N-B63	100	100-C09
140M-D8E-C10	—	140M-D8N-C10	65	100-C09
140M-D8E-C16	—	140M-D8N-C16	65	100-C12
140M-D8E-C20	140M-D8T-C16	—	65	100-C23
140M-D8E-C25	140M-D8T-C20	140M-D8N-C25	50	100-C23
140M-D8E-C29	—	—	65	100-C30
140M-D8E-C32	—	140M-D8N-C32	65	100-C37
F-Frame				
140M-F8E-C10	—	—	100	100-C09
140M-F8E-C16	—	—	100	100-C12
140M-F8E-C20	—	—	100	100-C23
140M-F8E-C25	—	140M-F8N-C25	100	100-C30
140M-F8E-C32	140M-F8T-C25	140M-F8N-C32	100	100-C30
140M-F8E-C45	140M-F8T-C32	140M-F8N-C45	100	100-C37

(1) Cat. No. 100-C16 contactors Type 1 only

ALLEN BRADLEY 140M

Type 2 Coordination, 480V

Cat. No.			Max. Short-Circuit Current [kA]	Minimum Contactor Size
Standard Motor Protection	High Inrush Motor Protection	Motor Circuit Protection	480V	
C-Frame				
140M-C2E-A16	—	140M-C2N-A16	65	100-C09
140M-C2E-A25	140M-C2T-A16	140M-C2N-A25	65	100-C09
140M-C2E-A40	140M-C2T-A25	140M-C2N-A40	65	100-C09
140M-C2E-A63	140M-C2T-A40	140M-C2N-A63	65	100-C09
140M-C2E-B10	140M-C2T-A63	140M-C2N-B10	65	100-C09
140M-C2E-B16	140M-C2T-B10	140M-C2N-B16	65	100-C09
140M-C2E-B25	140M-C2T-B16	140M-C2N-B25	50	100-C16
140M-C2E-B40	140M-C2T-B25	—	50	100-C30
140M-C2E-B63	140M-C2T-B40	—	50	100-C30
140M-C2E-C10	140M-C2T-B63	—	50	100-C30
140M-C2E-C16	140M-C2T-C10	—	10	100-C30
140M-C2E-C20	140M-C2T-C16	—	10	100-C30
140M-C2E-C25	—	—	10	100-C30
140M-C2E-C29	—	—	10	100-C30
140M-C2E-C32	—	—	10	100-C37
D-Frame				
140M-D8E-B25	—	140M-D8N-B25	65	100-C09
140M-D8E-B40	—	140M-D8N-B40	65	100-C09
140M-D8E-B63	—	140M-D8N-B63	65	100-C09
140M-D8E-C10	—	140M-D8N-C10	65	100-C09
140M-D8E-C16	—	140M-D8N-C16	65	100-C12
140M-D8E-C20	140M-D8T-C16	—	65	100-C23
140M-D8E-C25	140M-D8T-C20	140M-D8N-C25	65	100-C23
140M-D8E-C29	—	—	65	100-C30
140M-D8E-C32	—	140M-D8N-C32	65	100-C37
F-Frame				
140M-F8E-C10	—	—	65	100-C09
140M-F8E-C16	—	—	65	100-C12
140M-F8E-C20	—	—	65	100-C23
140M-F8E-C25	—	140M-F8N-C25	65	100-C30
140M-F8E-C32	140M-F8T-C25	140M-F8N-C32	65	100-C30
140M-F8E-C45	140M-F8T-C32	140M-F8N-C45	65	100-C37

Type 2 Coordination, 600V

Cat. No.			Max. Short-Circuit Current [kA]	Minimum Contactor Size
Standard Motor Protection	High Inrush Motor Protection	Motor Circuit Protection	600V	
C-Frame				
140M-C2E-A16	—	140M-C2N-A16	47	100-C09
140M-C2E-A25	140M-C2T-A16	140M-C2N-A25	47	100-C09
140M-C2E-A40	140M-C2T-A25	140M-C2N-A40	47	100-C09
140M-C2E-A63	140M-C2T-A40	140M-C2N-A63	47	100-C09
140M-C2E-B10	140M-C2T-A63	140M-C2N-B10	47	100-C09
140M-C2E-B16	140M-C2T-B10	140M-C2N-B16	47	100-C09
140M-C2E-B25	140M-C2T-B16	140M-C2N-B25	10	100-C16
140M-C2E-B40	140M-C2T-B25	—	10	100-C16
140M-C2E-B63	140M-C2T-B40	—	5	100-C23
140M-C2E-C10	140M-C2T-B63	—	5	100-C30
140M-C2E-C16	140M-C2T-C10	—	5	100-C30
140M-C2E-C20	140M-C2T-C16	—	5	100-C30
140M-C2E-C25	—	—	5	100-C30
140M-C2E-C29	—	—	5	100-C30
140M-C2E-C32	—	—	5	100-C37
D-Frame				
140M-D8E-B25	—	140M-D8N-B25	30	100-C30
140M-D8E-B40	—	140M-D8N-B40	30	100-C30
140M-D8E-B63	—	140M-D8N-B63	30	100-C30
140M-D8E-C10	—	140M-D8N-C10	30	100-C30
140M-D8E-C16	—	140M-D8N-C16	30	100-C30
140M-D8E-C20	140M-D8T-C16	—	5	100-C30
140M-D8E-C25	140M-D8T-C20	140M-D8N-C25	5	100-C30
140M-D8E-C29	—	—	10	100-C30
140M-D8E-C32	—	140M-D8N-C32	10	100-C37
F-Frame				
140M-F8E-C10	—	—	30	100-C30
140M-F8E-C16	—	—	30	100-C30
140M-F8E-C20	—	—	30	100-C30
140M-F8E-C25	—	140M-F8N-C25	30	100-C30
140M-F8E-C32	140M-F8T-C25	140M-F8N-C32	30	100-C30
140M-F8E-C45	140M-F8T-C32	140M-F8N-C45	10	100-C37

IEC Performance Data

		Cat.No.140M-C2E-														
		A16	**A25**	**A40**	**A63**	**B10**	**B16**	**B25**	**B40**	**B63**	**C10**	**C16**	**C20**	**C25**	**C29**	**C32**
Rated Operational Current, I_e	[A]	0.16	0.25	0.4	0.63	1	1.6	2.5	4	6.3	10	16	20	25	29	32
Magnetic Release Current	[A]	2.1	3.3	5.2	8.2	13	21	33	52	82	130	208	260	325	406	448
Switching of Standard Three-Phase Motors, AC-3																
230/240V	[kW]	—	—	0.06	0.09	0.18	0.25	0.37	0.75	1.5	2.2	4.0	5.5	5.5	7.5	7.5
400/415V	[kW]	0.02	0.04	0.09	0.18	0.25	0.55	0.75	1.5	2.2	4.0	7.5	10	11	13	15
500V	[kW]	0.06	0.09	0.12	0.18	0.37	0.75	1.1	2.2	3.0	6.3	10	11	15	18.5	20
690V	[kW]	0.06	0.09	0.18	0.25	0.55	1.1	1.8	3.0	4.0	7.5	13	17	22	25	25
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$																
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	100	100	125	125
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	80	100	100	125	125
440/460V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	63	80	80	80	100	100
500V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	80	80	80	80	100	100
690V	[A]	(1)	(1)	(1)	(1)	(1)	16	20	35	50	50	63	63	63	80	80
Ultimate Short Circuit Breaking Capacity, I_{cu}																
230/240V	[kA]	100	100	100	100	100	100	100	100	100	100	100	65	65	50	50
400/415V	[kA]	100	100	100	100	100	100	100	100	100	100	65	50	15	15	15
440/460V	[kA]	100	100	100	100	100	100	100	100	100	50	10	6	6	6	6
500V	[kA]	100	100	100	100	100	100	100	100	100	50	10	6	6	6	6
690V	[kA]	100	100	100	100	100	8	6	6	4	4	3	3	3	3	3
Rated Service Short Circuit Breaking Capacity, I_{cs}																
230/240V	[kA]	100	100	100	100	100	100	100	100	100	100	100	50	50	25	25
400/415V	[kA]	100	100	100	100	100	100	100	100	100	100	50	15	15	15	15
440/460V	[kA]	100	100	100	100	100	100	100	100	100	50	6	6	6	6	6
500V	[kA]	100	100	100	100	100	100	100	100	100	50	6	6	6	6	6
690V	[kA]	100	100	100	100	100	8	6	6	4	4	3	3	3	3	3

(1) No back-up fuse required.

ALLEN BRADLEY 140M

		Cat.No.140M-D8E-									Cat.No.140M-F8E-					
		B25	B40	B63	C10	C16	C20	C25	C29	C32	C10	C16	C20	C25	C32	C45
Rated Operational Current, I_e	[A]	2.5	4.0	6.3	10	16	20	25	29	32	10	16	20	25	32	45
Magnetic Release Current	[A]	33	52	82	130	208	260	325	406	448	130	208	260	325	416	585
Switching of Standard Three-Phase Motors, AC-3																
230/240V	[kW]	0.37	0.75	1.5	2.2	4.0	5.5	5.5	7.5	7.5	2.2	4.0	5.5	6.3	7.5	13
400/415V	[kW]	0.75	1.5	2.2	4.0	7.5	10	11	13	15	4.0	7.5	10	11	15	22
500V	[kW]	1.1	2.2	3.0	6.3	10	11	15	18.5	20	6.3	10	11	15	20	30
690V	[kW]	1.8	3.0	4.0	7.5	13	17	22	25	25	7.5	13	17	22	30	40
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$																
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	100	100	125	125	80	100	100	100	125	125
440/460V	[A]	(1)	(1)	(1)	(1)	80	100	100	125	125	80	100	100	100	125	125
500V	[A]	(1)	(1)	(1)	(1)	80	80	80	100	100	80	100	100	100	125	125
690V	[A]	20	35	50	50	63	63	63	80	80	63	80	80	80	100	100
Ultimate Short Circuit Breaking Capacity, I_{cu}																
230/240V	[kA]	100	100	100	100	100	100	100	65	65	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	100	100	65	50	50	100	100	100	100	65	65
440/460V	[kA]	100	100	100	50	50	50	50	25	25	65	65	65	65	65	50
500V	[kA]	100	100	100	50	50	50	50	25	25	50	50	50	50	50	50
690V	[kA]	10	10	6	6	6	6	6	6	6	10	10	10	10	10	10
Rated Service Short Circuit Breaking Capacity, I_{cs}																
230/240V	[kA]	100	100	100	100	100	100	100	50	50	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	50	25	25	25	25	50	50	50	50	50	50
440/460V	[kA]	100	100	100	50	50	25	25	20	20	50	50	50	50	50	50
500V	[kA]	100	100	100	50	50	25	25	20	20	50	50	50	50	50	50
690V	[kA]	10	10	6	6	4	4	4	4	4	10	10	10	10	6	6

(1) No back-up fuse required.

		Cat. No. 140M-D8V-									
		B16	**B25**	**B40**	**B63**	**C10**	**C16**	**C20**	**C25**	**C29**	**C32**
Rated Operational Current, I_e	[A]	1.6	2.5	4	6.3	10	16	20	25	29	32
Magnetic Release Current	[A]	82	82	82	82	130	208	260	325	406	448
Switching of Standard Three-Phase Motors, AC-3											
230/240V	[kW]	0.25	0.37	0.75	1.5	2.2	4	5.5	5.5	7.5	7.5
400/415V	[kW]	0.55	0.75	1.5	2.2	4	7.5	10	11	13	15
500V	[kW]	0.75	1.1	2.2	3	6.3	10	11	15	18.5	20
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$											
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	100	100	125	125
440/460V	[A]	(1)	(1)	(1)	(1)	(1)	80	100	100	125	125
500V	[A]	(1)	(1)	(1)	(1)	(1)	80	80	80	100	100
Ultimate Short Circuit Breaking Capacity, I_{cu}											
230/240V	[kA]	65	65	65	65	65	65	65	65	65	65
400/415V	[kA]	65	65	65	65	65	65	65	65	50	50
440/460V	[kA]	65	65	65	65	50	50	50	50	25	25
500V	[kA]	65	65	65	65	50	50	50	50	25	25
Rated Service Short Circuit Breaking Capacity, I_{cs}											
230/240V	[kA]	65	65	65	65	65	65	65	65	50	50
400/415V	[kA]	65	65	65	65	65	50	25	25	25	25
440/460V	[kA]	65	65	65	65	50	50	25	25	20	20
500V	[kA]	65	65	65	65	50	50	25	25	20	20

(1) No back-up fuse required.

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		Cat.No.140M-C2N-						
		A16	**A25**	**A40**	**A63**	**B10**	**B16**	**B25**
Rated Operational Current, I_e	[A]	0.16	0.25	0.4	0.63	1	1.6	2.5
Magnetic Release Current	[A]	2.1	3.3	5.2	8.2	13	21	32
Switching of Standard Three-Phase Motors, AC-3								
230/240V	[kW]	—	—	0.06	0.09	0.18	0.25	0.37
400/415V	[kW]	0.02	0.04	0.09	0.18	0.25	0.55	0.75
500V	[kW]	0.06	0.09	0.12	0.18	0.37	0.75	1.1
690V	[kW]	0.06	0.09	0.18	0.25	0.55	1.1	1.8
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$								
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)
440/460V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)
500V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)
690V	[A]	(1)	(1)	(1)	(1)	(1)	16	20
Ultimate Short Circuit Breaking Capacity, I_{cu}								
230/240V	[kA]	100	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	100	100	100
440/460V	[kA]	100	100	100	100	100	100	100
500V	[kA]	100	100	100	100	100	100	100
690V	[kA]	100	100	100	100	100	10	6
Rated Service Short Circuit Breaking Capacity, I_{cs}								
230/240V	[kA]	100	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	100	100	100
440/460V	[kA]	100	100	100	100	100	100	100
500V	[kA]	100	100	100	100	100	100	100
690V	[kA]	100	100	100	100	100	8	6

(1) No back-up fuse required.

		Cat.No.140M-D8N-							Cat.No.140M-F8N-		
		B25	B63	B40	C10	C16	C25	C32	C25	C32	C45
Rated Operational Current, I_e	[A]	2.5	4.0	6.3	10	16	25	32	25	32	45
Magnetic Release Current	[A]	32	52	82	130	208	325	448	325	416	585
Switching of Standard Three-Phase Motors, AC-3											
230/240V	[kW]	0.37	0.75	1.5	2.2	4.0	5.5	7.5	6.3	7.5	13
400/415V	[kW]	0.75	1.5	2.2	4.0	7.5	11	15	11	15	22
500V	[kW]	1.1	2.2	3.0	6.3	10	15	20	15	20	30
690V	[kW]	1.8	3.0	4.0	7.5	13	22	25	22	30	40
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$											
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	100	125	125
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	100	125	100	125	125
440/460V	[A]	(1)	(1)	(1)	(1)	80	100	125	100	125	125
500V	[A]	(1)	(1)	(1)	(1)	80	80	100	100	125	125
690V	[A]	20	35	50	50	63	63	80	80	100	100
Ultimate Short Circuit Breaking Capacity, I_{cu}											
230/240V	[kA]	100	100	100	100	100	100	65	100	100	100
400/415V	[kA]	100	100	100	100	100	65	50	100	65	65
440/460V	[kA]	100	100	100	50	50	50	25	65	65	50
500V	[kA]	100	100	100	50	50	25	25	50	50	50
690V	[kA]	10	6	10	6	6	6	6	10	10	10
Rated Service Short Circuit Breaking Capacity, I_{cs}											
230/240V	[kA]	100	100	100	100	100	100	50	100	100	100
400/415V	[kA]	100	100	100	100	50	25	25	50	50	50
440/460V	[kA]	100	100	100	50	50	25	20	50	50	50
500V	[kA]	100	100	100	50	50	25	20	50	50	50
690V	[kA]	10	6	10	6	4	4	4	10	6	6

(1) No back-up fuse required.

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		Cat.No.140M-C2T-										
		A16	**A25**	**A40**	**A63**	**B10**	**B16**	**B25**	**B40**	**B63**	**C10**	**C16**
Rated Operational Current, I_e	[A]	0.16	0.25	0.40	0.63	1.0	1.6	2.5	4.0	6.3	10	16
Magnetic Release Current	[A]	3.2	5.2	8.2	13	21	32	52	82	130	208	260
Switching of Standard Three-Phase Motors, AC-3												
230/240V	[kW]	—	—	0.06	0.09	0.18	0.25	0.37	0.75	1.5	2.2	4.0
400/415V	[kW]	0.02	0.04	0.09	0.18	0.25	0.55	0.75	1.5	2.2	4.0	7.5
500V	[kW]	0.06	0.09	0.12	0.18	0.37	0.75	1.1	2.2	3.0	6.3	10
690V	[kW]	0.06	0.09	0.18	0.25	0.55	1.1	1.8	3.0	4.0	7.5	13
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$												
230/240V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
400/415V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	80
440/460V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	63	80
500V	[A]	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	80	80
690V	[A]	(1)	(1)	(1)	(1)	(1)	16	20	35	50	50	63
Ultimate Short Circuit Breaking Capacity, I_{cu}												
230/240V	[kA]	100	100	100	100	100	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	100	100	100	100	100	100	50
440/460V	[kA]	100	100	100	100	100	100	100	100	100	10	10
500V	[kA]	100	100	100	100	100	100	100	100	100	10	10
690V	[kA]	100	100	100	100	100	8	6	6	4	4	3
Rated Service Short Circuit Breaking Capacity, I_{cs}												
230/240V	[kA]	100	100	100	100	100	100	100	100	100	100	100
400/415V	[kA]	100	100	100	100	100	100	100	100	100	100	15
440/460V	[kA]	100	100	100	100	100	100	100	100	100	10	6
500V	[kA]	100	100	100	100	100	100	100	100	100	10	6
690V	[kA]	100	100	100	100	100	8	6	6	4	4	3

(1) No back-up fuse required.

		Cat.No.140M-D8T-		Cat.No.140M-F8T-	
		C16	C20	C25	C32
Rated Operational Current, I_e	[A]	16	20	25	32
Magnetic Release Current	[A]	260	325	416	585
Switching of Standard Three-Phase Motors, AC-3					
230/240V(1)	[kW]	4.0	5.5	6.3	7.5
400/415V(1)	[kW]	7.5	10	11	15
500V(1)	[kW]	10	11	15	20
690V(1)	[kW]	13	17	22	30
Back-Up Fuses gG, gL, only if $I_{cc} \geq I_{cu}$					
230/240V	[A]	(2)	(2)	(2)	(2)
400/415V	[A]	80	100	100	125
440/460V	[A]	80	100	100	125
500V	[A]	80	80	100	125
690V	[A]	63	63	80	100
Ultimate Short Circuit Breaking Capacity, I_{cu}					
230/240V	[kA]	100	100	100	100
400/415V	[kA]	100	65	65	65
440/460V	[kA]	50	25	65	65
500V	[kA]	50	25	50	50
690V	[kA]	6	6	10	10
Rated Service Short Circuit Breaking Capacity, I_{cs}					
230/240V	[kA]	100	100	100	100
400/415V	[kA]	25	25	50	50
440/460V	[kA]	25	25	50	50
500V	[kA]	25	25	50	50
690V	[kA]	4	4	6	6

(1) Consult your local Rockwell Automation sales office or Allen-Bradley distributor.
(2) No back-up fuse required.

General Data

Cat.No.		140M-C	140M-D	140M-F
Rated Insulation Voltage U_i				
IEC, SEV, VDE0660	[V]	690		
UL, CSA	[V]	600		
Rated Impulse Withstand Voltage U_{imp}				
Pollution degree		3		
Main circuits U_{imp}/Overvoltage Category		6kV/III		
Auxiliary circuits U_{imp}/Overvoltage Category		6kV/III		
Rated Frequency	[Hz]	50/60		
Utilization Category				
IEC60947-2 (Circuit breaker)		A		
IEC60947-4-1 (Motor starter)		AC-3		
Lifespan				
Mechanical	[operations]	100000		30000
Electrical (I_e max.)	[operations]	100000		30000
Switching Frequency	[operations/h]	max.25		
Ambient Temperature				
Storage	[°C]	-40…+80		
Operation	[°C]	-25…+60		

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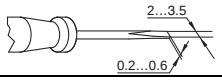
Cat.No.		140M-C	140M-D	140M-F
Climatic resistance				
Moisture change climate (600068-2-30)		23°C/83% relative humidity and 40°C/92% relative humidity, 56 cycles		
Dry heat (60086-2-2)		100°C, relative humidity <50%, 7 days		
Moisture heat (60068-2-3)		40°C, relative humidity 93%, 56 days		
Site Altitude	[m]	to 2000 N.N.		
Protection Class		140M-C; 140M-D : IP2X from all directions 140M-F : IP2X from front with front (upper) terminal wired		
Resistance to Shock, Transport (60068-2-27)		30 g,11 ms, all axes		
Resistance to Vibration, Operation (60068-2-6)		5g		
Rated Thermal Current I_{th}				
up to 40°C ambient temperature	[A]	0.1…32	1.6…32 (1.0…32 for -D8V)	6.3…45
up to 60°C ambient temperature	[A]	0.1…32	1.6…32 (1.0…32 for -D8V)	6.3…45
Rated Supply Current I_e	[A]	0.1…32	1.6…32 (1.0…32 for -D8V)	6.3…45
Dependence on Temperature				
40°C	[A]	no reduction		
50°C	[A]	no reduction		
60°C	[A]	no reduction		
70°C	[A]	15% current reduction of the upper rated current I_e		
Overload Protection				
Characteristics		IEC 60947-4-1Motor protection (except Cat.Nos.140M-C2N,140M-D8N,140M-F8N)		
Ambient Temperature Compensation	[°C]	-20…+60		
Phase-loss Protection		Differential release		
Trip class		10 (except Cat.Nos.140M-C2N,140M-D8N,140M-F8N) fixed setting		
Magnetic Release current (±20%)		fixed setting 13…14 x I_e max. (for 140M-C2E,140M-D8E,140M-F8E,140M-C2N,140M-D8N,140M-F8N) 16…21 x I_e max. (for 140M-C2T, 140M-D8T, 140M-F8T) I_e max. = maximum values of setting ranges fixed magnetic setting for 140M-D8V; see ratings		
Total Power Loss P_v				
Circuit Breaker at rated load operating temperature	[W]	6…11.5	6…11.6	9…16
Main Disconnect Switch Application		Yes, with accessories		
Application Conditions		For utilization outside North America, assemblies (of products) shall comply to the IEC61439-1 requirements		
		140M manual motor starters are intended for use in closed areas without hazardous operating conditions such as dust or explosive or corrosive gases. Enclosures of appropriate manner need to be in place to protect devices in such environments.		
Application Conditions (140M-D8V)		PWM frequency ≤ 4 kHz VFD output frequency 0…400 Hz Maximum cable length that is listed i n the drive instruction manual applies. Adding a common mode core and utilizing XLPE cable helps minimize cable charging current.		

Cat.No.			140M-C…	140M-D…	140M-F…
Conformity to Standards			IEC60947-1;-2;-4-1; EN60947-1;-2;-4-1; UL508; CSA22.2, No.14		
Approvals			CE,UL,CSA		
Terminal Parts Type of terminals					
Screwdriver			PozidrivNo.2/BladeNo.3		PozidrivNo.2/BladeNo.3
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	1…6/No.16…10 1…4/No.16…10		2.5…25/No.14…4 2.5…25/No.14…4
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	1…6/No.16…10 1…6/No.16…10		2.5…25/No.14…4 2.5…25/No.14…4
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	1.5…6/No.16…8 1.5…6/No.16…8		16…25/No.14…4 16…25/No.14…4
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	1…6/No.16…10 1…6/No.16…10		2.5…10/No.14…8 2.5…10/No.14…8
Tightening torque		[N•m]/[lb•in]	2…2.5/18…22		3…3.5/27…30

Cat.No.			140M-RC…
Terminal Parts Type of terminals			
Screwdriver			
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…2.5/— 0.5…2.5/—
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…2.5/No.18…12 0.5…2.5/No.18…12
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	1…4/No.16…12 1…4/No.16…12

Accessories for Bulletin 140M Motor Protection Circuit Breakers

			Auxiliary Contact Blocks for Front Mounting Cat.No.140M-C-AFA…,140M-C-AFAR…			Auxiliary Contact Blocks for Right-Side Mounting Cat.No.140M-C-ASA…,140M-C-ASAR…				
Rated Thermal Current I_{th} at 40°C ambient temperature at 60°C ambient temperature		[A] [A]	5 4			10 6				
Contact Class Coordination According to NEMA										
(UL/CSA Standards)		AC DC	B300 Q300			B600 Q600				
Back-Up Fuses gG, gL		[A]	10			10				
Rated Supply Current		[V]	24	120	240	24	120	240	415	690
	AC-15	[A]	4	3	1.5	6	5	3	2	0.7
	DC-13	[V]	24	120	240	24	120	240	415	
		[A]	2	0.5	0.25	2	0.5	0.25	0.15	
Terminal Parts Type of terminals										
Screwdriver			PozidrivNo.2/BladeNo.3							
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…1.5/18…14 0.75…1.5/18…14			0.5…2.5/18…14 0.75…2.5/18…14				

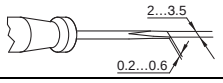
ALLEN BRADLEY 140M

			Auxiliary Contact Blocks for Front Mounting Cat.No.140M-C-AFA…,140M-C-AFAR…	Auxiliary Contact Blocks for Right-Side Mounting Cat.No.140M-C-ASA…,140M-C-ASAR…
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.75…1.5/18…14 0.75…1.5/18…14	0.75…2.5/18…14 0.75…2.5/18…14
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.75…1.5/18…14 0.75…1.5/18…14	0.75…2.5/18…14 0.75…2.5/18…14
Tightening torque		[N•m]/[lb•in]	1.2…1.5/10.6…13	1.2…1.5/10.6…13

		Undervoltage Trip for Left-Side Mounting Cat.No.140M-C-UX…	Undervoltage Trip with 2 Auxiliary Contacts for Left-Side Mounting Cat.No.140M-C-UC…	Shunt Trip for Left-Side Mounting Cat.No.140M-C-SN…
Actuating Voltage				
Pull-in Drop-out		0.85…1.1 x U_s 0.7…0.35 x U_s	0.85…1.1 x U_s 0.7…0.35 x U_s	0.7…1.1 x U_s
Rated Control Voltage	min. max.	21V 50 Hz,24V 60 Hz 600V 50 Hz	21V 50 Hz,24V 60 Hz 600V 50 Hz	21V 50 Hz, 24V 60 Hz 600V 50 Hz
On-Time		100%	100%	AC: 100%; DC: max. 5 sec.
Coil Rating	Pull-in Hold	8.5VA, 8 W 4VA, 2 W	8.5VA, 8 W 4VA, 2 W	8.5VA, 8 W 4VA, 2 W
Terminal Parts Type of terminals				
Screwdriver		PozidrivNo.2/BladeNo.3		
1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…2.5/No.18…14 0.75…2.5/No.18…14		
1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.75…2.5/No.18…14 0.75…2.5/No.18…14		
1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.75…2.5/No.18…14 0.75…2.5/No.18…14		
Tightening torque	[N•m]/[lb•in]	1.2…1.5/10.6…13.3		

			Compact Busbar Feeder Terminal		Compact Busbar		Compact Busbar Feeder Block			
			140M-C-WTN 140M-C-WTEN	140M-F-WTE	140M-C -W…	140M-F -W…	140M-C-WBEL1,L2,L3	140M-C-WBET1,T2,T3	140M-F-WBEL1,L2,L3	140M-F-WBET1,T2,T3
Rated Thermal Current I_{th} at 60°C ambient temperature		[A]	64	120	64	120	64		IEC120/UL115	
	1.conductor	[mm²]/[AWG]	2.5…25/14…4	—	—	—	4…25/10…4	for use with 140M-C-W	4…50/10…4	for use with 140M-F-W
	1.conductor	[mm²]/[AWG]	2.5…25/14…4	4…50/12…1/0	—	—	4…25/10…4	for use with 140M-C-W	4…25/10…4	for use with 140M-F-W
	1.conductor	[mm²]/[AWG]	2.5…25/14…4	2.5…50/ 12…1/0	—	—	2.5…25/ 14…4	for use with 140M-C-W	2.5…25/ 14…4	for use with 140M-F-W
Tightening torque		[N•m]/[lb•in]	3…3.5/27…31	5…6/45…54	—	—	3…3.5/ 27…31	2.5…3/ 23…27	5…6/45…54	

Accessories for Bulletin 140M Screwless

Cat.No.			140M-RC…
Terminal Parts Type of terminals			
Screwdriver			
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…1.5/— 0.5…1.5/—
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…1.5/No.18…14 0.5…1.5/No.18…14
	1.conductor 2.conductor	[mm²]/[AWG] [mm²]/[AWG]	0.5…1.5/No.18…14 0.5…1.5/No.18…14

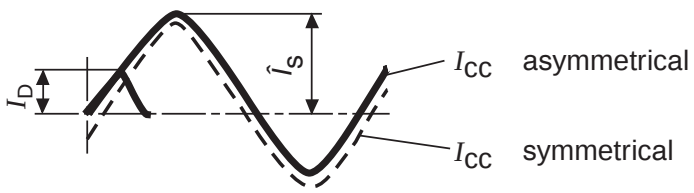
Weights

Description	Weight [g]	Cat.No.
Motor Protection Circuit Breakers	317	140MC-C2E-…
	373	140M-D8E-…
	782	140MC-F8E-…
	315	140M-C2N-…
	365	140M-D8N-…
	782	140M-F8N-…
	315	140M-C2T-…
	365	140M-D8T-…
	782	140M-F8T-…
Auxiliary Contacts	10	140M-C-AFA10
		140M-C-AFA01
		140M-C-AFA11
		140M-C-AFA20
		140M-C-ASA…
	15	140M-C-AFAR10A…
		140M-C-ASAR…M…
		140M-C-ASAM11
Undervoltage Trip	108	140M-C-UX…
	110	140M-C-SN…
	116	140M-C-UC…

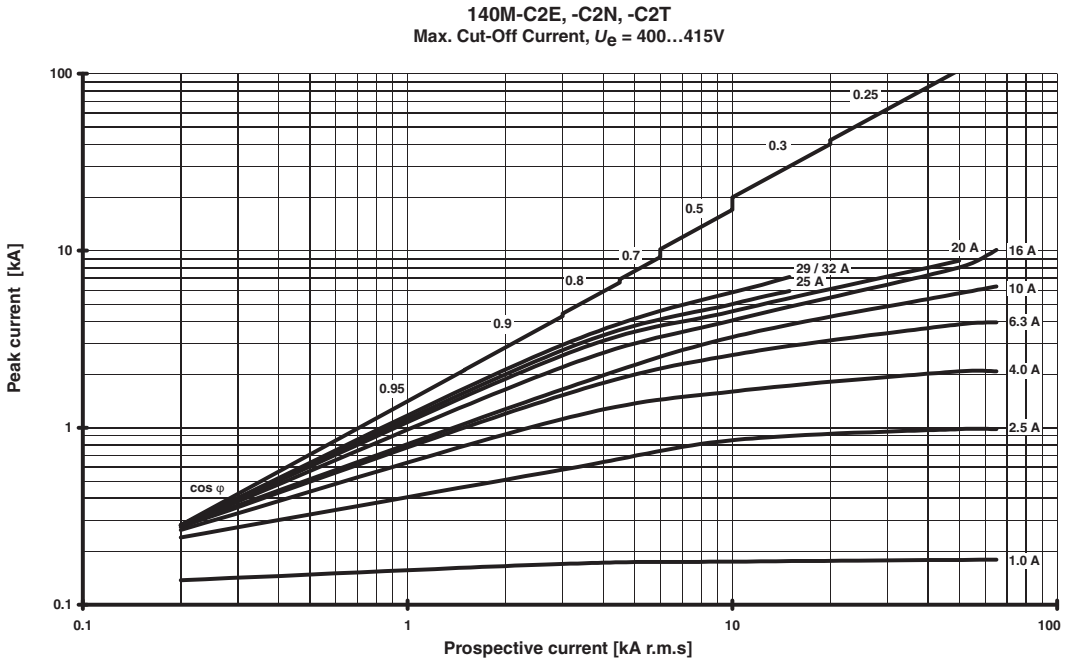
Description	Weight [g]	Cat.No.
Anti-Tamper Cover	2	140M-C-CA
Lockable Twist Knob	5	140M-C-KN1
		140M-C-KRY1
Locking Tag	30	140M-C-M3
Door Coupling Handle	123	140M-C-DN66
		140M-C-NRY66
Extension Shaft	46	140M-C-DS
Legend Plate	4	140M-C-DFC…
Feeder Terminal	51	140M-C-WTEN
	172	140M-F-WT
Compact Busbars	27	140M-C-W452N
	48	140M-C-W453N
	69	140M-C-W454N
	90	140M-C-W455N
	30	140M-C-W542N
	55	140M-C-W543N
	80	140M-C-W544N
	105	140M-C-W545N
Top Hat Rail Adapter	6	140-KBH2

Cutoff Current

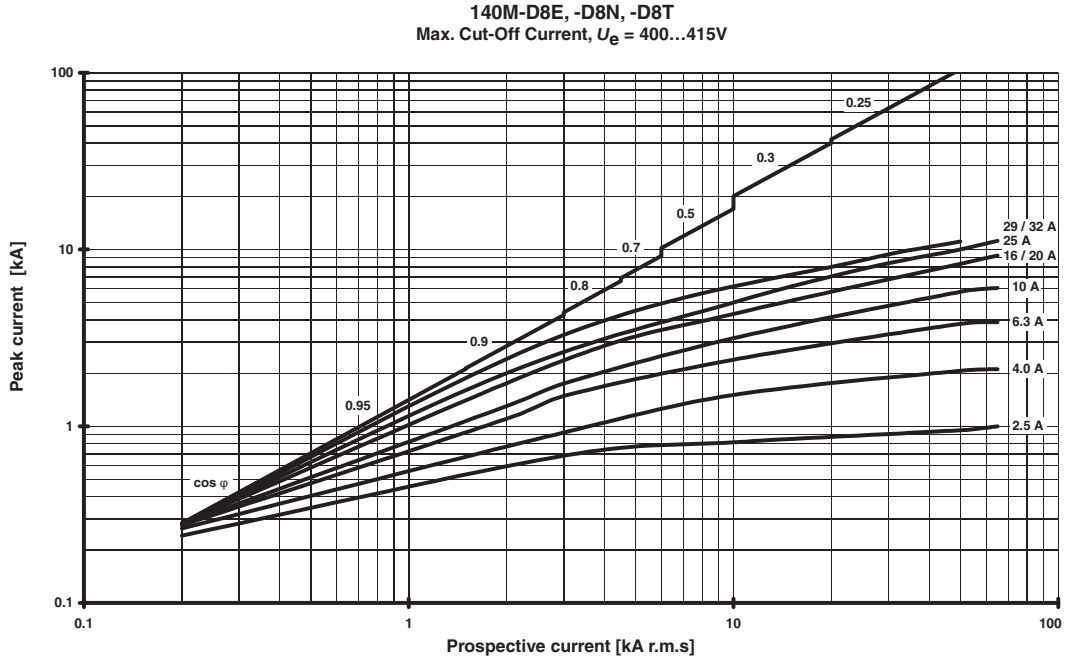
The Bulletin 140-M limits solid short-circuit current I_{cc}(prospective short-circuit current). $I_D$is the maximum cutoff current (highest instantaneous value of the limited short-circuit current). This value is indicated in the following diagrams as a function of the progressive system short-circuit current.



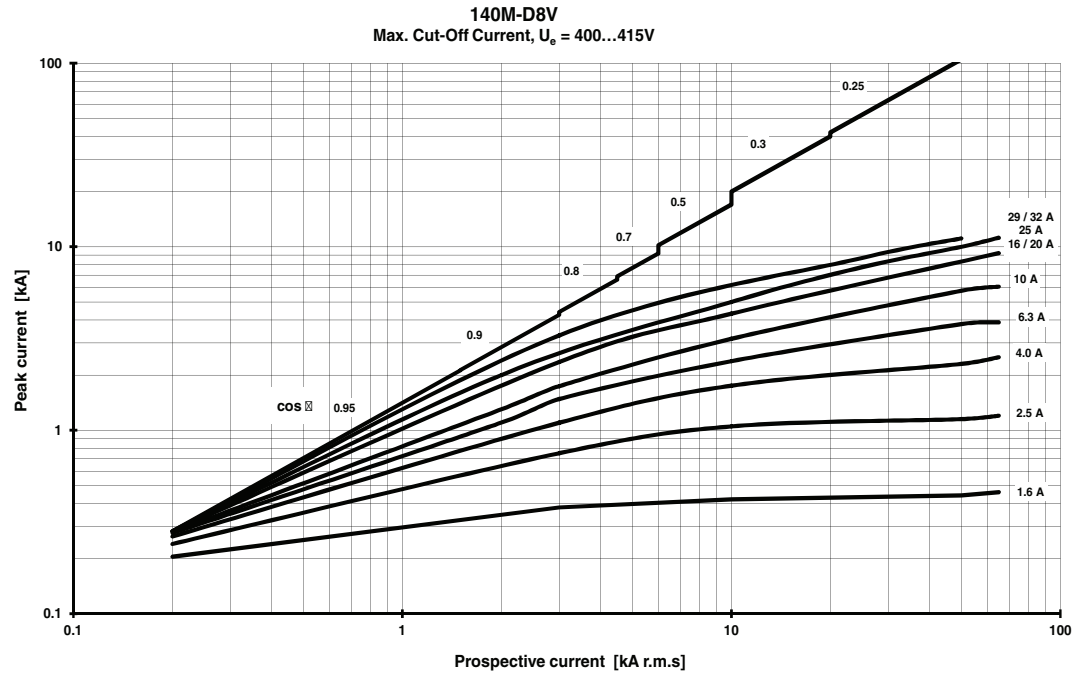
Bulletin140M-C Circuit Breaker (Maximum Cutoff Current)



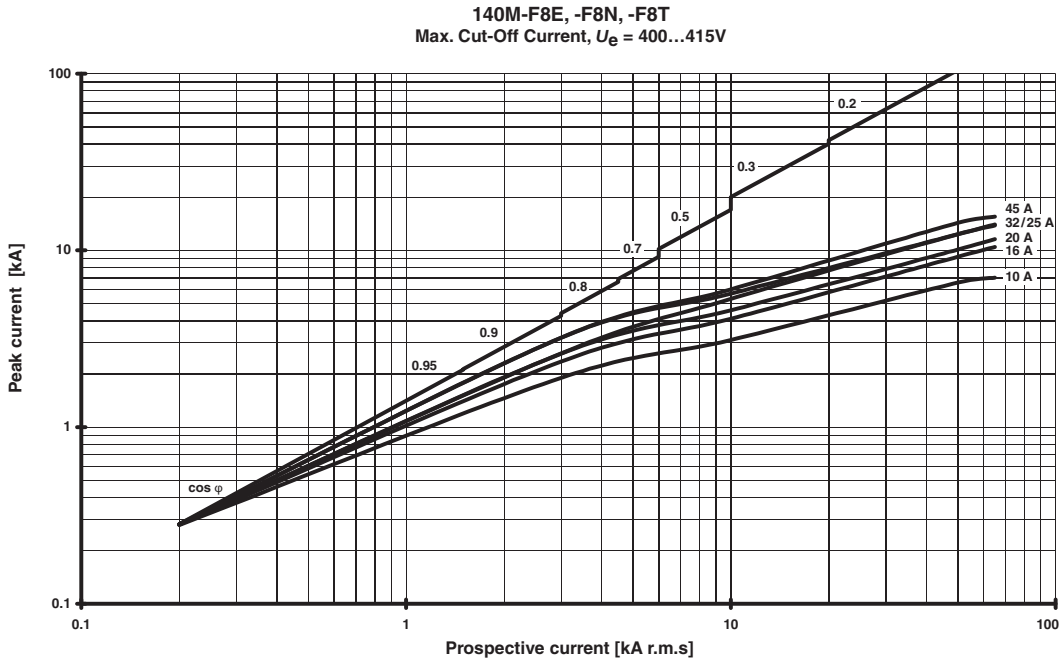
Bulletin140M-D8E, -D8N, D8T Circuit Breaker (Maximum Cutoff Current)



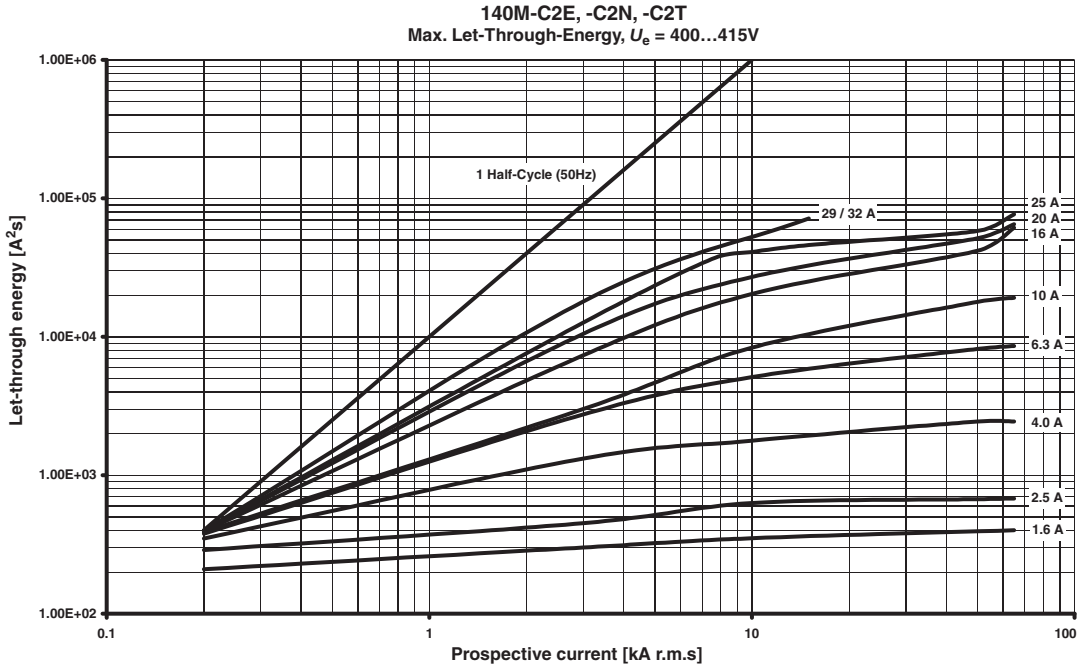
Bulletin140M-D8V Circuit Breaker (Maximum Cutoff Current)



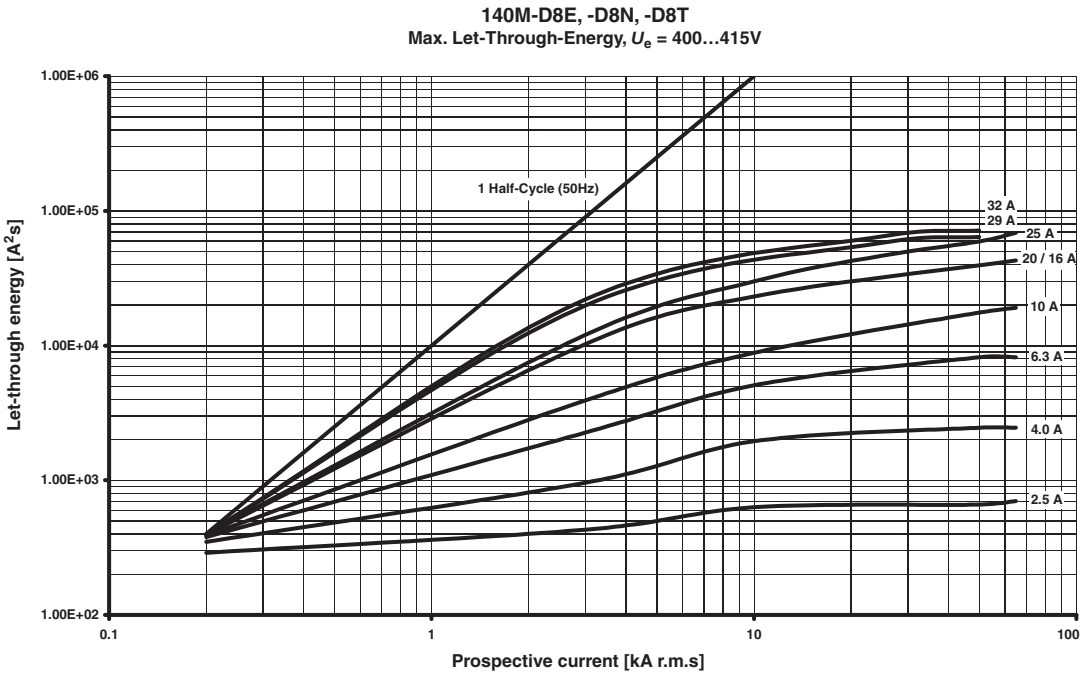
Bulletin140M-F Circuit Breaker (Maximum Cutoff Current)



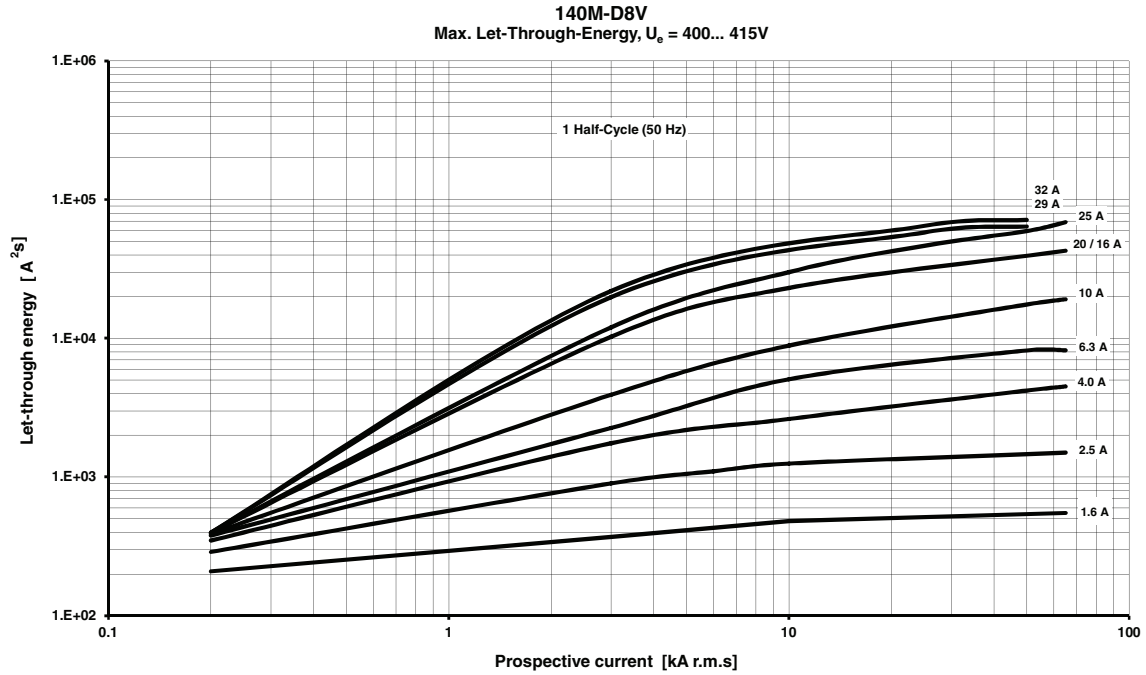
Bulletin140M-C Circuit Breaker (Maximum Let-through Energy)



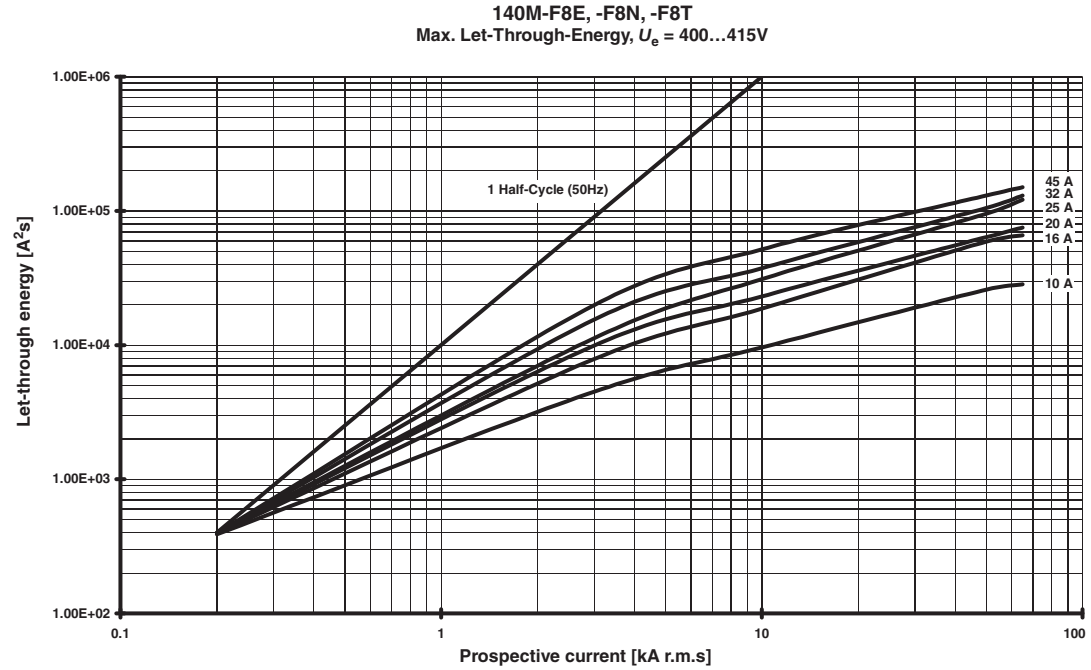
Bulletin140M-D8E, -D8N, -D8T Circuit Breaker (Maximum Let-through Energy)



Bulletin140M-D8V Circuit Breaker (Maximum Let-through Energy)

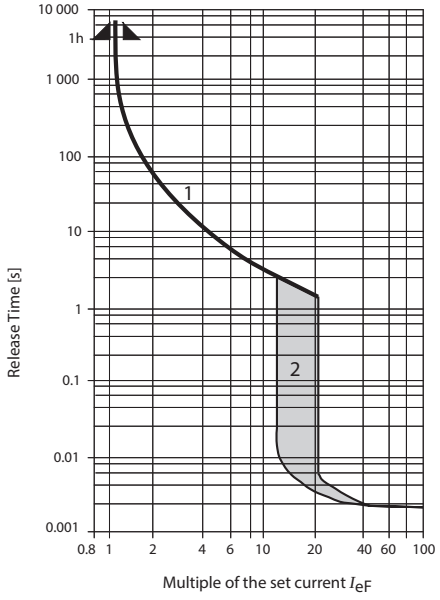


Bulletin140M-F Circuit Breaker (Maximum Let-through Energy)



Time-Current Characteristic

Motor Protection Circuit Breakers Time-Current Characteristic



140M-C, -D, -F Motor Protection Circuit Breakers (for 140M-D8V, see ratings)

Thermal Release Trip Current

The adjustable current-dependent delayed bimetal release protects motors against overload. The curve shows the mean operating current at an ambient temperature of 20 °C starting from the cold state. Careful testing and setting ensures effective motor protection even in the case of single phasing. The overload characteristic is also valid for transformer protection.

Magnetic Release Trip Current

The instantaneous magnetic trip has a fixed operating current setting. This corresponds to 13...14 times the maximum value of setting range. (Transformer protection up to 20 x I_e max.) At a lower setting it is correspondingly higher.

Current Setting I_eF

The overload trip corresponds to a thermal overload relay in a motor starter conforming to IEC947-4-1. If a different value is prescribed (e.g., reduced I_e for cooling medium having a temperature higher than 40 °C or a place of installation higher than 2000 m above sea level), the setting current is equal to the reduced rated current I_e of the motor.

ALLEN BRADLEY 140M

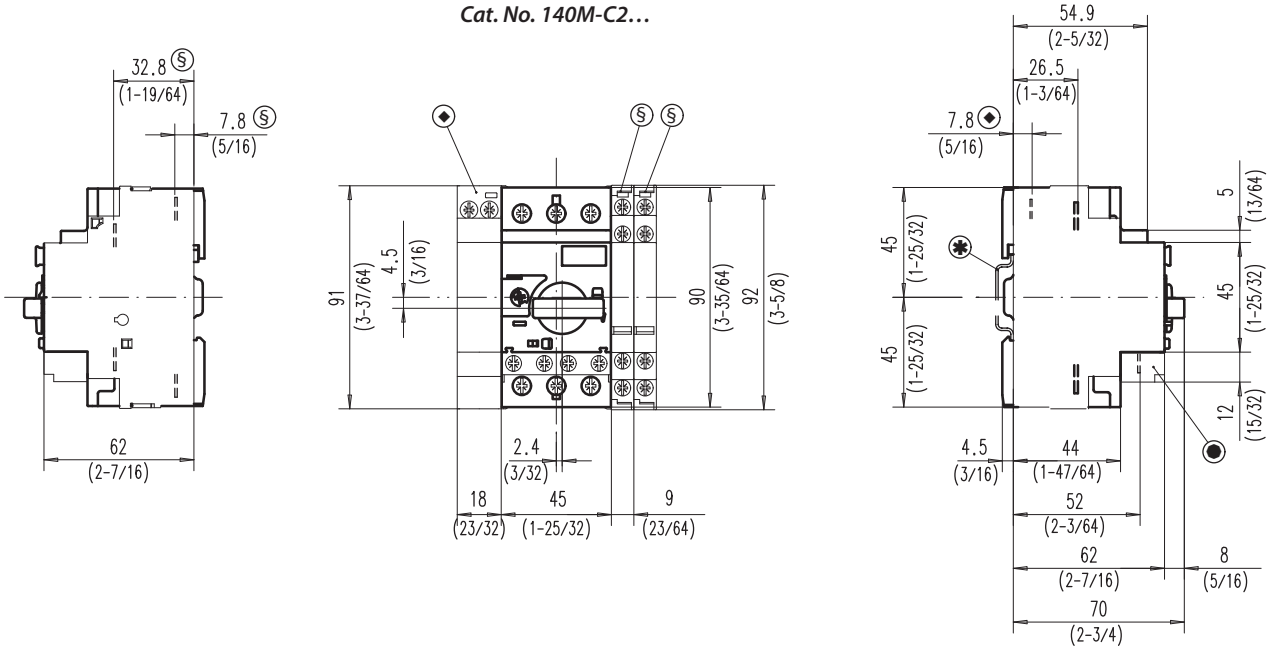
Notes:

Approximate Dimensions

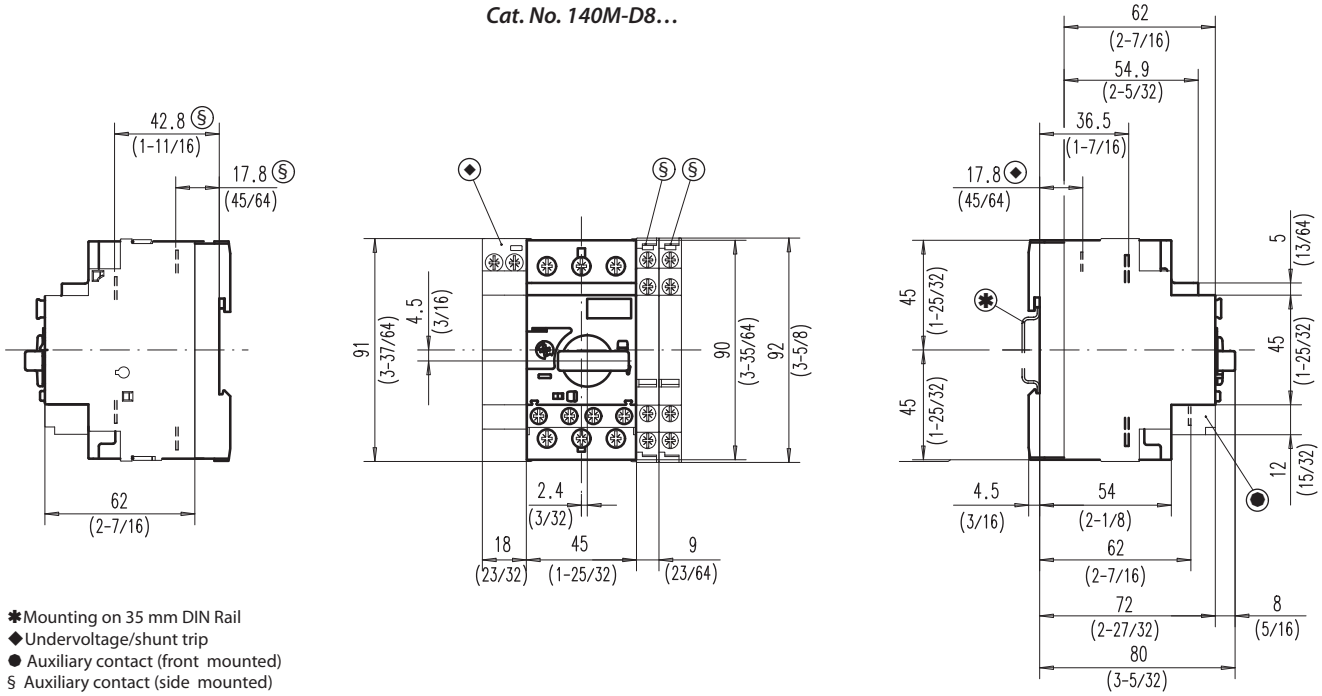
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Cat. No. 140M-C, -D

Cat. No. 140M-C2…



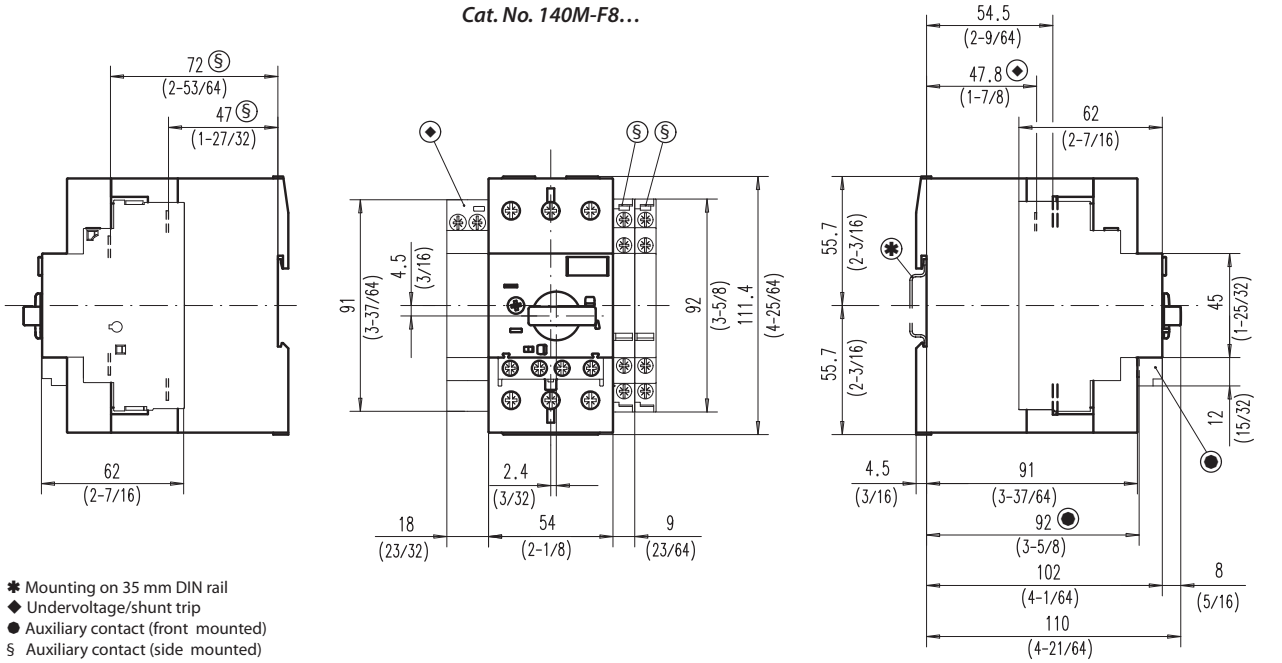
Cat. No. 140M-D8…



✱Mounting on 35 mm DIN Rail
◆Undervoltage/shunt trip
● Auxiliary contact (front mounted)
§ Auxiliary contact (side mounted)

Cat. No. 140M-F

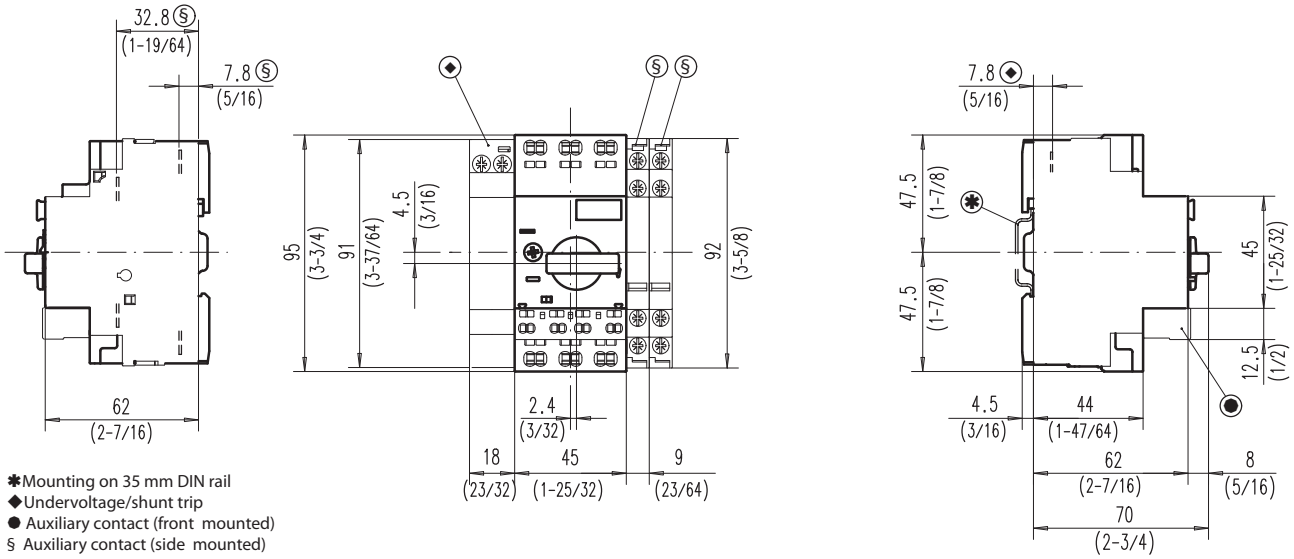
Cat. No. 140M-F8…



✱ Mounting on 35 mm DIN rail
◆ Undervoltage/shunt trip
● Auxiliary contact (front mounted)
§ Auxiliary contact (side mounted)

Cat. No. 140M-RC, Screwless

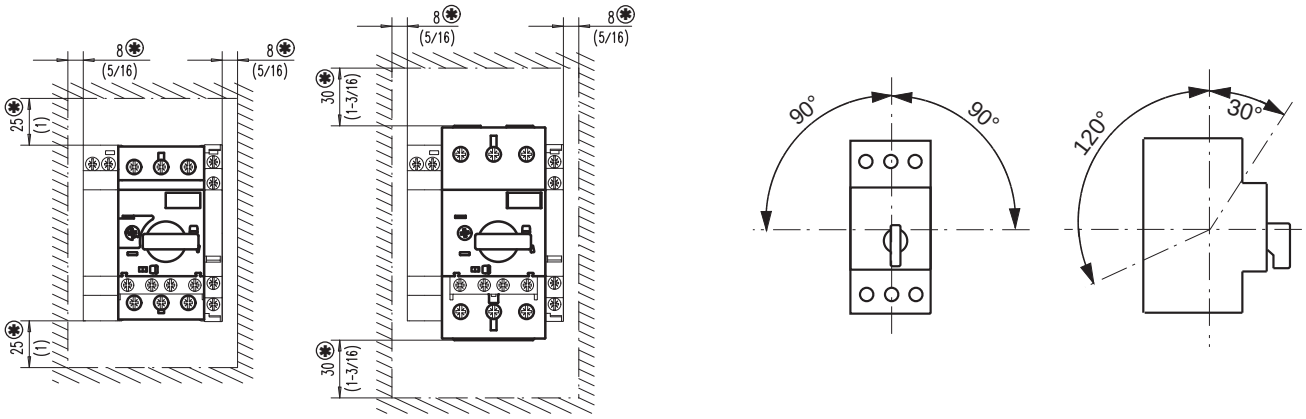
Cat. No. 140M-RC…



✱Mounting on 35 mm DIN rail
◆Undervoltage/shunt trip
● Auxiliary contact (front mounted)
§ Auxiliary contact (side mounted)

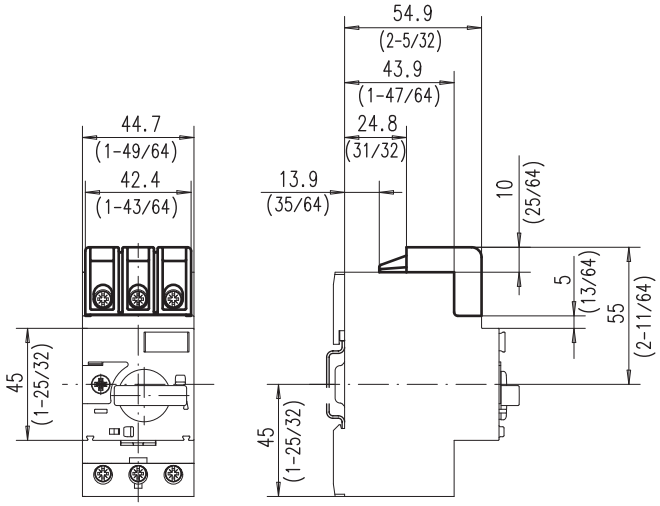
Mounting position/safety clearance of Cat. No. 140M-C…, 140M-D…, 140M-F…

Cat. No. 140M-C/D… *Cat. No. 140M-F…*

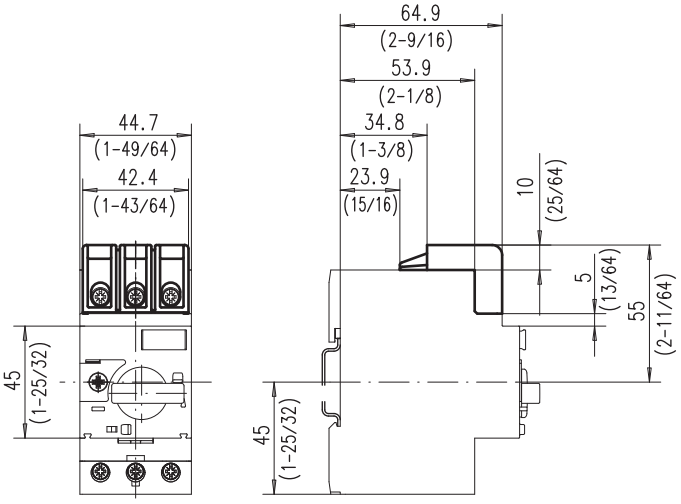


✱ Minimum distance to grounded parts or walls

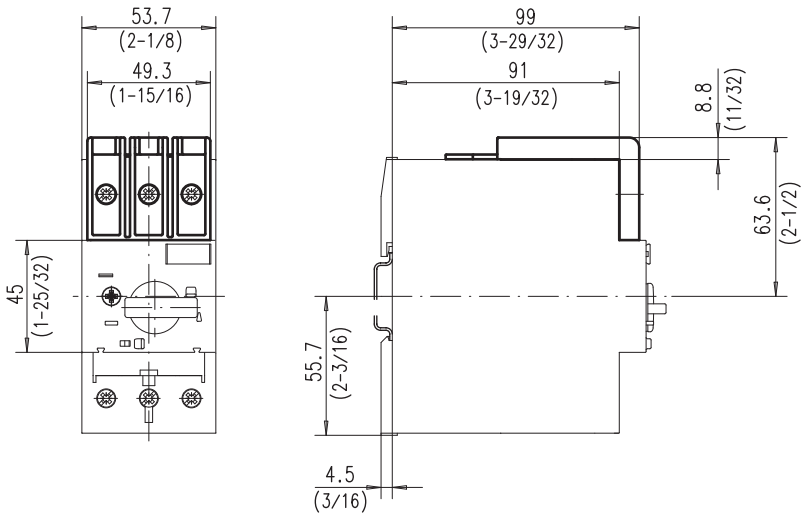
Cat. No. 140M-C-TE1 Type E adapter on Cat. No. 140M-C2E…



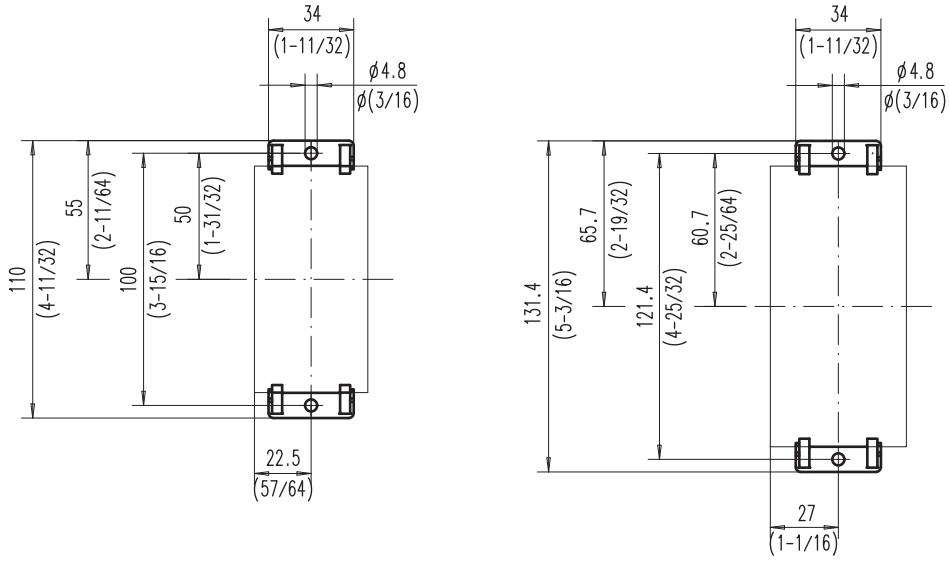
Cat. No. 140M-C-TE1 Type E adapter on Cat. No. 140M-D8E…



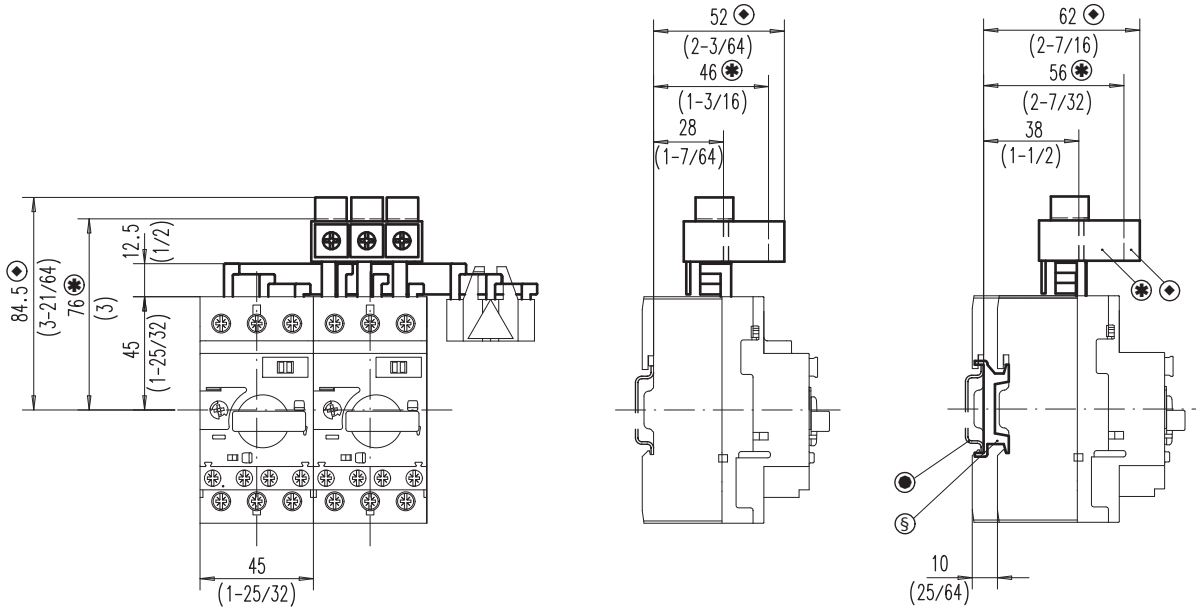
Cat. No. 140M-C-TE1 Type E adapter on Cat. No. 140M-F8E…



Screw Adapter 140M-C-N45 for 140M-C2/D8 and 140M-F8

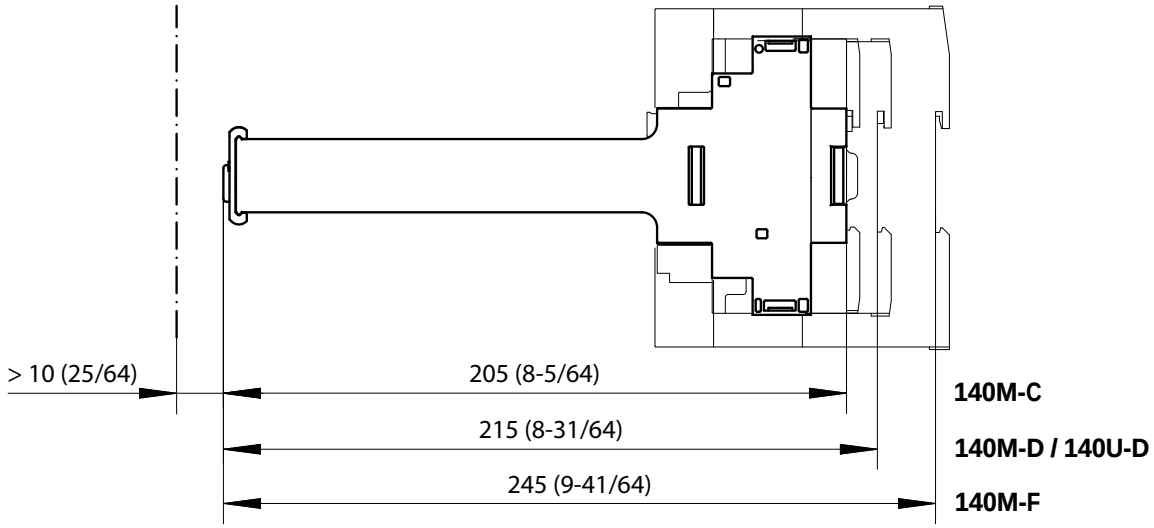


Cat. No. 140M-C with Busbar

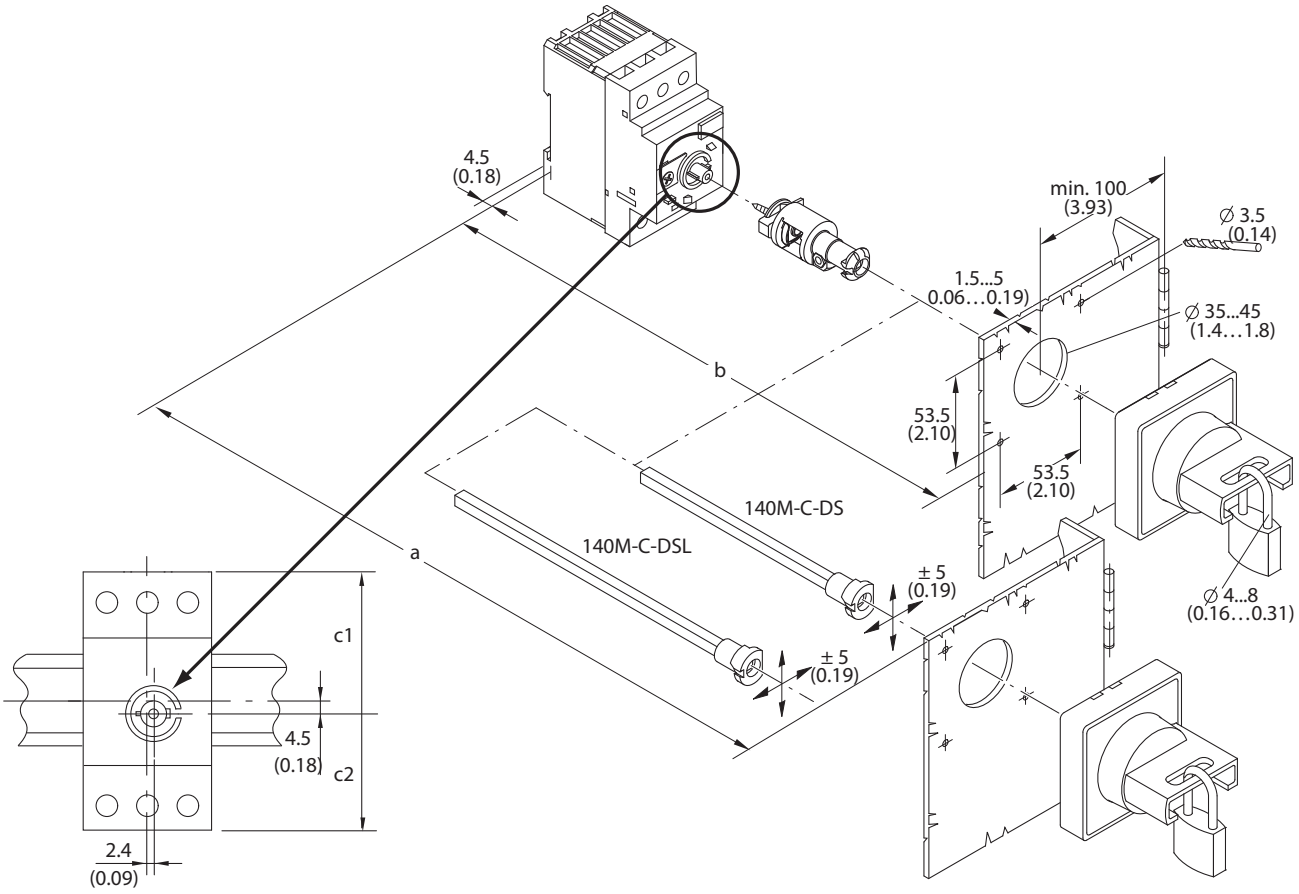


✱ Compact Busbar Feeder Terminal IEC
◆ Compact Busbar Feeder Terminal UL type E and IEC
● Mounting on 35 mm DIN Rail
§ Top Hat Rail Adapter 10 mm

140M-C-SHS Screw Adapter

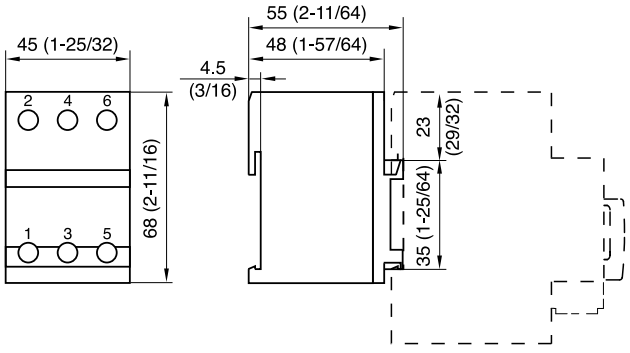


140M-C-D…66

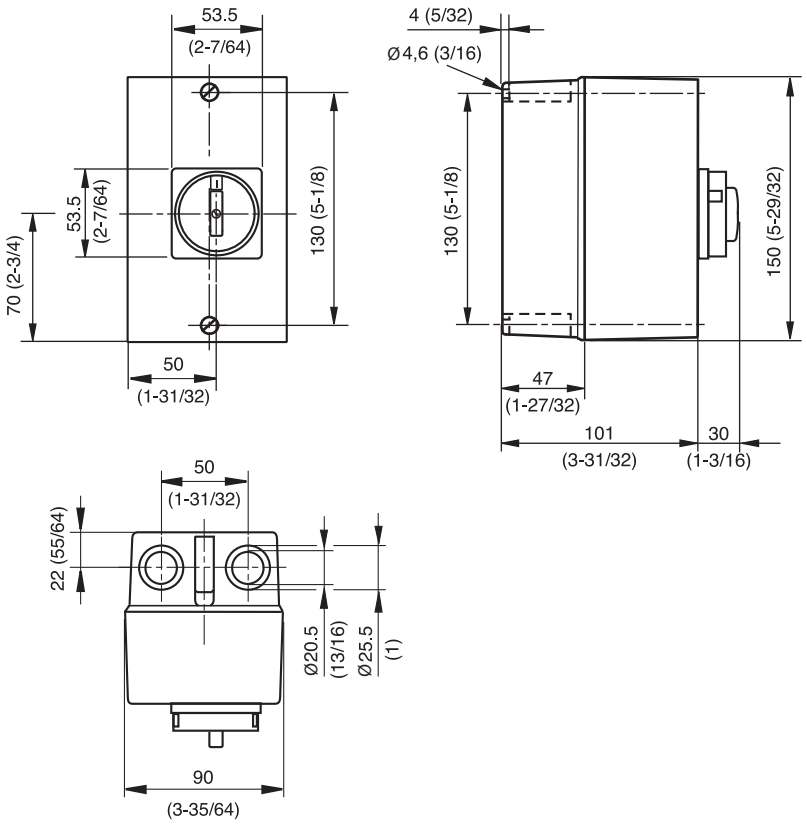


With Cat. No. 140-M-C-DS Shaft					With Cat. No. 140-M-C-DSL Shaft			
Cat. No.	**a**	**b**	**c1**	**c2**	**a**	**b**	**c1**	**c2**
140M-C	117…338 (4.6…13.3)	105.5 ±5 (4.15 ±0.19)	49.5 (1.95)	40.5 (1.6)	117…438 (4.6…17.2)	105.5 ±5 (4.15 ±0.19)	49.5 (1.95)	40.5 (1.6)
140M-D	126…347 (4.96…13.66)	114.5 ±5 (4.5 ±0.19)	49.5 (1.95)	40.5 (1.6)	126…497 (4.96…19.56)	114.5 ±5 (4.5 ±0.19)	49.5 (1.95)	40.5 (1.6)
140M-F	148.6…369.6 (5.85…14.55)	137.1 ±5 (5.39 ±0.19)	59.35 (2.34)	50.35 (1.98)	148.6…519 (5.85…20.43)	137.1 ±5 (5.39 ±0.19)	59.35 (2.34)	50.35 (1.98)

140M-C-WBE



Cat. No. 198E…


53.5
(2-7/64)
53.5
(2-7/64)
70 (2-3/4)
130 (5-1/8)
50
(1-31/32)
4 (5/32)
Ø4,6 (3/16)
130 (5-1/8)
150 (5-29/32)
47
(1-27/32)
101
(3-31/32)
30
(1-3/16)
50
(1-31/32)
22 (55/64)
Ø20.5
(13/16)
Ø25.5
(1)
90
(3-35/64)

ALLEN BRADLEY 140M

Notes:

ALLEN BRADLEY 140M

ALLEN BRADLEY 140M

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Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

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ALLEN BRADLEY 855P SIGNAL

Signaling Specifications

Bulletin 854J, 854K, 855B, 855BS/BM/BL, 855D, 855E, 855F, 855H/HM, 855L, 855P, 855T, 855W, 855X/XM

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Summary of Changes

This publication contains new and updated information in Table 53 on page 42 (ingress rating).

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
855 Metal Horns Selection Guide, publication 855-SG002	Provides product selection for 855XM and 855HM metal horns.
Bulletin 855 Signaling Solutions Brochure, publication 855-BR001	Provides information on the complete portfolio of signaling solutions for optimized monitoring
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

ALLEN BRADLEY 855P SIGNAL

Bulletin 855P — Panel Mount Signaling Alarms

Bulletin 855P — Panel Mount Sounder

855P	–	B	10	ME	22
		a	b	c	d

30 mm Panel Mount Sounder

45 mm Panel Mount Sounder

65 mm Panel Mount Sounder

a	
Housing Color	
Code	**Description**
B	Black

b	
Voltage	
Code	**Description**
30	12…24V AC/DC
10	120V AC
20	240V AC

c	
Size	
Code	**Description**
SE	30 mm, fully enclosed, smooth front, 72 dB
SH	30 mm, high output, 80 dB
ME	45 mm
LE	65 mm

d	
Mounting Hole	
Code	**Description**
22	22.5 mm

Bulletin 855PC — Panel Mount Combined Sounder with LED Beacon

855PC	–	B	10	ME	3	22
		a	b	c	d	e

45 mm Panel Mount Combined Sounder with LED Beacon

65 mm Panel Mount Combined Sounder with LED Beacon

a	
Housing Color	
Code	**Description**
B	Black

b	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	240V AC
20	240V AC

c	
Size	
Code	**Description**
ME	45 mm
LE	65 mm

d	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

e	
Mounting Hole	
Code	**Description**
22	22.5 mm

ALLEN BRADLEY 855P SIGNAL

Bulletin 855PS — Panel Mount Strobe

855PS	–	B	10	ME	3	22
		a	b	c	d	e

30 mm Panel Mount Strobe

45 mm Panel Mount Strobe

65 mm Panel Mount Strobe

a	
Housing Color	
Code	Description
B	Black

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	240V AC
20	240V AC
30	12…24V AC/DC

c	
Size	
Code	Description
SE	30 mm (1) (2)
ME	45 mm (3) (4)
LE	65 mm (3) (4)

d	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

e	
Mounting Hole	
Code	Description
22	22.5 mm

(1) 30 mm units are LED type.
(2) Only available in 12V AC/DC, 24V AC/DC, 120V AC, or 240V AC.
(3) 45 mm and 65 mm units are Xenon strobe.
(4) Only available in 12…24V AC/DC, 120V, or 240V AC.

Bulletin 855PB — Panel Mount Selectable Steady or Flashing LED Beacon

855PB	–	B	10	ME	3	22
		a	b	c	d	e

30 mm Panel Mount LED Beacon

45 mm Panel Mount LED Beacon

65 mm Panel Mount LED Beacon

a	
Housing Color	
Code	Description
B	Black

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	240V AC
20	240V AC

c	
Size	
Code	Description
SE	30 mm
ME	45 mm
LE	65 mm

d	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

e	
Mounting Hole	
Code	Description
22	22.5 mm

ALLEN BRADLEY 855P SIGNAL

Bulletin 855PD — Panel Mount Dual Circuit Alarms

855PD	–	B	24	ME	F	3	4	22
		a	b	c	d	e	f	g

Half-lens Illumination

Full-lens Illumination

Combined Sounder with LED Beacon

a	
Housing Color	
Code	**Description**
B	Black

b	
Voltage	
Code	**Description**
12 (1)	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Size	
Code	**Description**
SE	30 mm (2) (3)
ME	45 mm
LE	65 mm

d	
Function	
Code	**Description**
F	2-color, full-lens illumination
H	2-color, half-lens illumination with barrier
C	Combined sounder with LED beacon (3)

(1) Voltage code 12 is only valid for sounder with LED devices.
(2) 30 mm available in 24V AC/DC only, for 2-color versions.
(3) The sounder with LED is not available in the 30 mm size.

e	
LED Color (1)/Sound	
Code	**Description**
1	Sound
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

f	
LED Color (2)	
Code	**Description**
3	Green
4	Red
5	Amber (3)
6	Blue
7	Clear
8	Yellow (3)

g	
Mounting Hole	
Code	**Description**
22	22.5 mm

(1) Voltage code 12 is only valid for sounder with LED devices.
(2) For two-color devices, the first color code listed in the cat. no. corresponds to the same side as the panel tab found on the housing. For example: catalog number 855PD-B24MEH4322 indicates that the Red color is on the same side as the panel tab and the Green color is on the opposite side as the panel tab.
(3) The color combination of Yellow and Amber is not allowed because of their similarity

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855P)

Panel Sounder and Single/Dual Circuit Panel Sounder with LED

Table 1 - Technical

Attribute		Value
Housing	Base Material	Polycarbonate, black
	Lens	Polycarbonate, red, amber, yellow, green, blue, and clear
Protection class		UL Type 4/4X/13, IP65
Terminals		Plug-in terminal block, up to 2.5 mm^2 (14 AWG), IP2X
Operation temperature range		-25…+60 °C (-13…+140 °F)
Storage temperature range		-25…+85 °C (-13…+185 °F)
Mounting		Central mounting for bore holes 22 mm or 30.5 mm with hole adapter kit (Cat. No. 855P-AHA1)
Mounting nut torque		1.7 N•m (15 lb•in)

Table 2 - Electrical

Attribute		Sounder			Sounder with Warning Light	
		65 mm	45 mm	30 mm	65 mm	45 mm
Supply voltage range	12V AC/DC - 50/60 Hz	—	—	—	±10%	±10%
	24V AC/DC - 50/60 Hz	—	—	—	±10%	±10%
	12…24V AC/DC - 50/60 Hz	8…26V AC/DC	8…26V AC/DC	10…26V AC/DC	—	—
	120V AC - 50/60 Hz	50…140V AC	50…140V AC	80…140V AC	±10%	±10%
	230/240V AC - 50/60 Hz	150…260V AC	150…260V AC	180…260V AC	±10%	±10%
Nominal current — single circuit (dual circuit)	12V AC/DC - 50/60 Hz	—	—	—	50 mA (62 mA)	35 mA (48 mA)
	24V AC/DC - 50/60 Hz	57 mA	20 mA	20 mA	73 mA (95 mA)	58 mA (73 mA)
	120V AC - 50/60 Hz	40 mA	40 mA	20 mA	60 mA (52 mA)	40 mA (51 mA)
	230/240V AC - 50/60 Hz	42 mA	42 mA	20 mA	63 mA (52 mA)	42 mA (51 mA)
Turn-on leakage current		≥3 mA	≥3 mA	≥3 mA	≥3 mA	≥3 mA
Sound level, max (average)		105 dB(A) @ 1 m	100 dB(A) @ 1 m	SE: 72 dB(A) @ 1 m SH: 80 dB(A) @ 1 m	103 dB(A) @ 1 m	98 dB(A) @ 1 m
Sound level, min		< 85 dB	< 85 dB	—	< 85 dB	< 85 dB
Sound level adjustment		Stepless	Stepless	—	Stepless	Stepless
Sound main frequency		3300 Hz	3300 Hz	3500 Hz	3300 Hz	3300 Hz
Sound types	Continuous	Yes	Yes	Yes	Yes	Yes
	Pulsing(1)	Yes	Yes	Yes	Yes	Yes
	Alternating frequency(1)	Yes	No	No	Yes	No
Sound selection		Externally by terminal connection				
Weight		65 g (2.3 oz)	35 g (1.2 oz)	25 g (0.9 oz)	85 g (3 oz)	55 g (1.9 oz)

(1) Single Circuit only.

Standards Compliance

- EN/IEC 60947-1
- EN/IEC 60947-5-1
- UL 508
- CSA C22.2 No. 14

Certifications

- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

Panel Strobe and Single/Two Color LED Lights

Table 3 - Technical

Attribute		Value
Housing	Base Material	Polycarbonate, black
	Lens	Polycarbonate, red, amber, yellow, green, blue, and clear
Protection class		UL Type 4/4X/13, IP2X, IP65
Terminals		Plug-in terminal block, up to 2.5 mm^2 (14 AWG), IP2X fingersafe
Operation temperature range		-25…+60 °C (-13…+140 °F)
Storage temperature range		-25…+85 °C (-13…+185 °F)
Mounting		Central mounting for bore holes 22 mm or 30.5 mm with hole adapter kit (Cat. No. 855P-AHA1)
Mounting nut torque		1.7 N•m (15 lb•in)

Table 4 - Electrical

Attribute		LED Beacon — Steady/Flashing			Strobe Light		
		65 mm	45 mm	30 mm	65 mm	45 mm	30 mm
Supply voltage range	12V AC/DC, 50/60 Hz	±10%	±10%	±10%	—	—	±10%
	24V AC/DC, 50/60 Hz	±10%	±10%	±10%	—	—	±10%
	12…24V AC/DC, 50/60 Hz	—	—	—	8…26V AC/DC	8…26V AC/DC	—
	120V AC, 50/60 Hz	±10%	±10%	±10%	±10%	±10%	±10%
	230/240V AC, 50/60 Hz	±10%	±10%	±10%	±10%	±10%	±10%
Nominal current — single circuit (dual circuit)	12V AC/DC, 50/60 Hz	75 mA	60 mA	30 mA	—	—	15 mA
	24V AC/DC, 50/60 Hz	54 mA (full: 71 mA half: 44 mA)	35 mA (full: 46 mA half: 39 mA)	25 mA (full: 28 mA half: 30 mA)	—	—	10 mA
	12…24V AC/DC, 50/60 Hz @ 12V	—	—	—	150 mA	110 mA	—
	12…24V AC/DC, 50/60 Hz @ 24V	—	—	—	140 mA	100 mA	—
	120V AC, 50/60 Hz	25 mA (full: 61 mA half: 41 mA)	25 mA (full: 35 mA half: 35 mA)	20 mA	30 mA	20 mA	10 mA
	230/240V AC, 50/60 Hz	25 mA (full: 61 mA half: 41 mA)	25 mA (full: 35 mA half: 34 mA)	20 mA	20 mA	12 mA	10 mA
Turn-on leakage current		≥3 mA	≥3 mA	≥3 mA	≥3 mA	≥3 mA	≥3 mA
Steady/Flashing light		Externally by terminal connection			—	—	—
Flashing frequency		2 Hz	2 Hz	2 Hz	min. 1.4 Hz	min. 1.4 Hz	min. 1.4 Hz
Light source		LED			Xenon tube		LED
Flash energy		—	—	—	1 J	1.5 J	—
Weight		60 g (2.1 oz)	40 g (1.4 oz)	40 g (1.4 oz)	80 g (2.8 oz)	60 g (2.1 oz)	40 g (1.4 oz)

ALLEN BRADLEY 855P SIGNAL

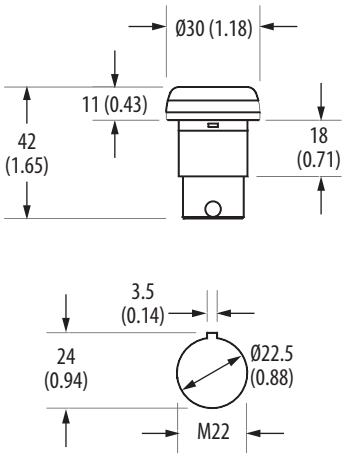
Approximate Dimensions (Bulletin 855P)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

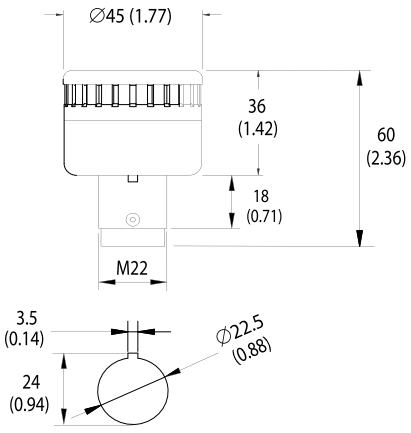
Terminal connector for 30 mm devices adds 14 mm (0.55 in.) to back-of-panel depth

Terminal connector for 45 mm and 65 mm devices adds 9 mm (0.35 in.) to back-of-panel depth

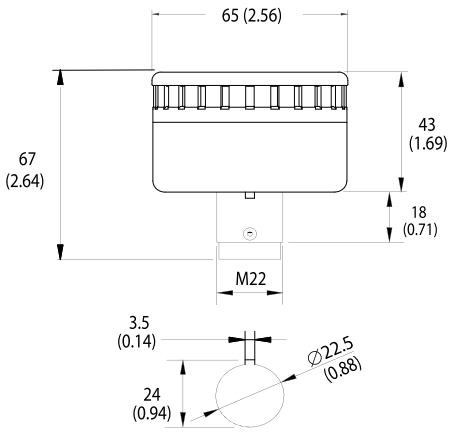
30 mm Sounder



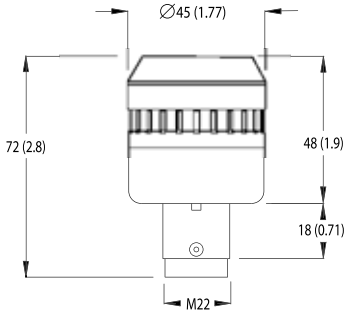
45 mm Sounder



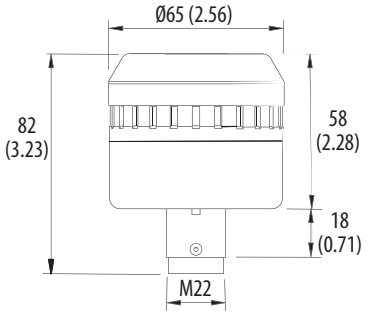
65 mm Sounder



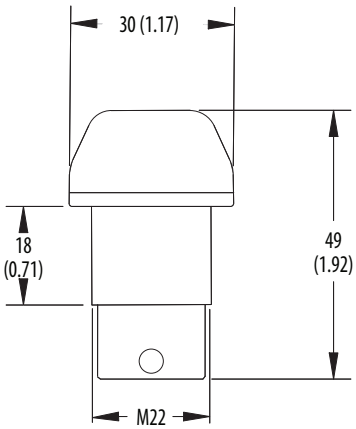
45 mm Combined Sounder with LED Beacon



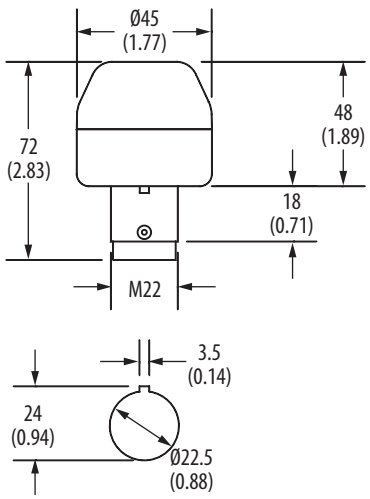
65 mm Combined Sounder with LED Beacon



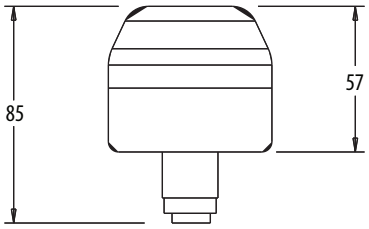
30 mm LED
30 mm Strobe



45 mm LED
45 mm Strobe



65 mm LED
65 mm Strobe



ALLEN BRADLEY 855P SIGNAL

Bulletin 855L — Panel Light Bars

Specifications (Bulletin 855L)

Cat. No. 855L-NX1

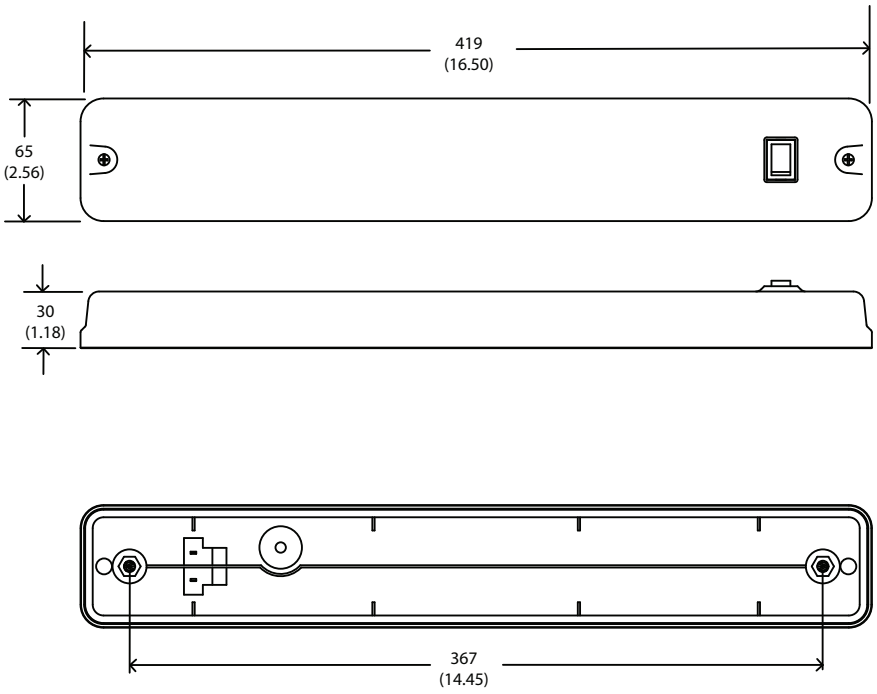
Cat. No. 855L-NX4

Attribute	855L-NX1 (24…48V with ON/OFF Switch) 855L-NX2 (24…48V - No Switch)	855L-NX3 (110…240V with ON/OFF Switch) 855L-NX4 (110…240V - No Switch)
Nominal Input Voltage	24…48V AC/DC, 50/60 Hz	855L-NX3: 110…240V AC, 50/60 Hz 855L-NX4: 110…240V AC/DC, 50/60 Hz
Input Voltage Limits	17…63V DC 17…53V AC, 50/60 Hz	90…320V DC (855L-NX4 only) 90…250V AC, 50/60 Hz
Nominal Current	~300 mA @ 24V DC/ ~150 mA @ 48V DC	<70 mA @ 120V AC/ <55 mA @ 240V AC
Inrush Current	1 A @ 24V DC, ~2 A @ 48V DC, 25 °C	~3.5 A @ 120V AC/ ~7 A @ 240V AC
Leakage Current Immunity	>8 mA DC	>3 mA AC/~1 mA DC
Ingress Protection	855L-NX1: NEMA 1, IP40 855L-NX2: NEMA 1, IP44	855L-NX3: NEMA 1, IP40 855L-NX4: NEMA 1, IP44
Operating Temperature Range	-35…+60 °C (-31…+140 °F)	
Storage Temperature Range	-35…+85 °C (-31…+185 °F)	
Wire Size	22…14 AWG (0.5…2.5 mm^2)	
Light Beam Angle	~70°	
LED Color	White	
Light Output	470 lumens, minimum	
Lens Material	Polycarbonate (clear)	
Base Material	Polycarbonate (light gray)	
Mounting Orientation	No restrictions	
Mounting Screws (not provided)	2 X 1/4 in. (M5/ M6)	
Weight	<1 lb (380 g)	
Standards Compliance	EN61000-6-2, EN61000-6-3, EN60947-5-1	
Certifications	CE Marked, cULus File No. E14840	
LED MTFB	50,000 hr	

ALLEN BRADLEY 855P SIGNAL

Approximate Dimensions (Bulletin 855L)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



ALLEN BRADLEY 855P SIGNAL

Bulletin 855H — General-purpose Electronic Horns

Single- or dual-circuit, selectable tone horns, with volume control, for use in general signaling applications.

855H – SG 10 GPA
a b c

a	
Mounting Type	
Code	**Description**
FG	Semi-flush wall plate, gray housing
SG	Surface base with two conduit entrances, gray housing

b	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC
30	10…30V DC
45	40…260V AC/DC, 50/60 Hz

c	
Horn Type	
Code	**Description**
GPA (1)	General-purpose, 108 dB(A) max, single stage/circuit, three tones
GPE (2)	Enhanced version, 113 dB(A) max @ 1 m, two stage, three tones, volume control

(1) Not valid with voltage codes 30 and 45 (Table b).
(2) Not valid with mounting type FG (Table a) or with voltage codes 24, 10, and 20 (Table b).

Specifications (Bulletin 855H)

Table 5 - Environmental

Attribute		Value
Ingress Ratings	Semi-flush Mount	UL Type 3R/13, IP54
	Surface Mount	UL Type 4/4X/13/3R, IP66
Temperature Ranges	Operating	-25…+55 °C (-13…+131 °F)
	Storage	-40…+70 °C (-40…+158 °F)

Table 6 - Materials

Part	Material
Housings including horn cover and base	Polycarbonate
O-ring	NBR
Gasket (mounting type FG)	EPDM/SBR closed cell foam

Table 7 - Performance Ratings

Attribute	Performance Rating
Sound Output	Standard: 105±3 dB(A) @ 1 m (3.3 ft) Enhanced: 110±3 dB(A) @ 1 m (3.3 ft)

Table 8 - Operating Voltage and Currents

Attribute	Horn Type	DC Voltage	AC Voltage		
Input Voltage Ranges	Standard (GPA)	24V DC (±25%)	24V AC 50/60 Hz (±10%)	120V AC 50/60 Hz (±10%)	240V AC 50/60 Hz (±10%)
	Enhanced (GPE)	10…30V DC	40…260V AC/DC		
Input Currents @ Nominal Voltage	Standard (GPA)	62 mA	220 mA	40 mA	50 mA
	Enhanced (GPE)	105 mA	—	36 mA	18 mA

ALLEN BRADLEY 855P SIGNAL

Standards Compliance

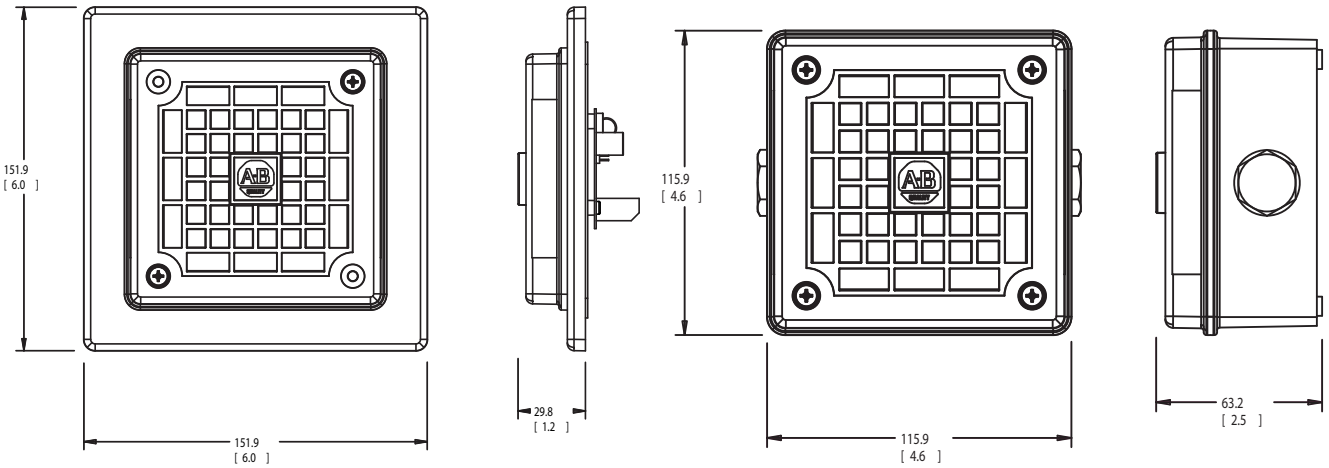
- UL 464
- CSA C22.2 No. 205
- EN/IEC 60947-1
- EN/IEC 60947-5-1
- EN 6100-6-2
- EN 6100-6-3

Certifications

- cULus Listed (File No. S6583, Guides UCST, UCST7)
- CE Marked

Approximate Dimensions (Bulletin 855H)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



Semi-flush Mount **Surface Mount**

ALLEN BRADLEY 855P SIGNAL

Bulletin 855H — High-performance Electronic Horns

High-performance Electronic Horns

855H	–	B	D30	B	D
		a	b	c	d

Range “A” Industrial Horn

Range “C” Industrial Horn

Range “E” Industrial Horn

a	
Product Type	
Code	**Description**
B	Industrial horn, gray housing

b	
Voltage	
Code	**Description**
D30	10...30V DC
A24	24V AC, 50/60 Hz
A10	115V AC, 50/60 Hz
A20	230V AC, 50/60 Hz

c	
Horn Type	
Code	**Description**
A	100 dB, 10 tone, 2-stage (DC)
	100 dB, 10 tone, 1-stage (AC)
B	104 dB, 32 tone, 3-stage (DC)
	104 dB, 32 tone, 3-stage (AC)
C	112 dB, 32 tone, 3-stage (DC)
	112 dB, 32 tone, 3-stage (AC)
D	119 dB, 45 tone, 3-stage (DC)
	119 dB, 45 tone, 3-stage (AC)
E	126 dB, 45 tone, 3-stage (DC)
	126 dB, 45 tone, 3-stage (AC)

d	
Mount Option	
Code	**Description**
D	Standard base for surface or on-the-wall mounting with conduit openings and hole plugs

High-performance Electronic Horns with Attached Strobe Beacons

855H	–	BC	D12	E	D	R	3
		a	b	c	d	e	f

Range “A” Horn with Beacon

Range “C” Horn with Beacon

Range “E” Horn with Beacon

a	
Product Type	
Code	**Description**
BC	Electronic horn with Xenon strobe beacon, gray housing

b	
Voltage	
Code	**Description**
D12	12V DC
D24	24V DC
A24	24V AC, 50/60 Hz
A10	115V AC, 50/60 Hz
A20	230V AC, 50/60 Hz

c	
Horn Type	
Code	**Description**
A	100 dB, 10 tone, 2-stage (DC)
	100 dB, 10 tone, 1-stage (AC)
B	104 dB, 32 tone, 3-stage (DC)
	104 dB, 32 tone, 3-stage (AC)
C	112 dB, 32 tone, 3-stage (DC)
	112 dB, 32 tone, 3-stage (AC)
D	119 dB, 45 tone, 3-stage (DC)
	119 dB, 45 tone, 3-stage (AC)
E	126 dB, 45 tone, 3-stage (DC)
	126 dB, 45 tone, 3-stage (AC)

d	
Mount Option	
Code	**Description**
D	Standard base for surface or on-the-wall mounting with conduit openings and hole plugs

e	
Illuminated Function	
Code	**Description**
R	5 J strobe

f	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855H)

Table 9 - Mechanical

Device	Listed below are reference guidelines for maximum shock and vibration standards for the 855H horn.	
	Shock	Vibration
Range A Horn	15 G Peak	3 G Peak
Range B Horn	15 G Peak	3 G Peak
Range C Horn	15 G Peak	3 G Peak
Range D Horn	15 G Peak	3 G Peak
Range E Horn	15 G Peak	1 G Peak
Range A Horn with Strobe Beacon	15 G Peak	3 G Peak
Range B Horn with Strobe Beacon	15 G Peak	3 G Peak
Range C Horn with Strobe Beacon	15 G Peak	3 G Peak
Range D Horn with Strobe Beacon	15 G Peak	3 G Peak
Range E Horn with Strobe Beacon	15 G Peak	1 G Peak

Table 10 - Environmental

Attribute	Device	Value
Ingress Ratings	Electronic Horns	UL Type 13/3R, IP56
	Horn with Beacon	UL Type 13, IP56
Temperature Ranges	Operating	-25…+55 °C (-13…+131 °F)
	Storage	-40…+75 °C (-40…+167 °F)

Table 11 - Materials

Part	Material
Horn Cover and Base	ABS
Beacon Housing	Polycarbonate
Beacon Lens	Polycarbonate
Gasket (Cover to Base)	Nitrile 70
Gasket (Enclosure back to wall)	Nitrile 70
Gasket (Horn to Beacon)	Nitrile 70
Gasket (Screw Mounting Hole)	Fiber

Table 12 - Performance Ratings

Attribute	Device	Performance Rating
Sound Output	Range A Horn	100 dB max @ 1 m (3.3 ft)
	Range B Horn	104 dB max @ 1 m (3.3 ft)
	Range C Horn	112 dB max @ 1 m (3.3 ft)
	Range D Horn	119 dB max @ 1 m (3.3 ft)
	Range E Horn	126 dB max @ 1 m (3.3 ft)
Xenon Lamp Rating	Strobe Beacon	5 J output

Table 13 - Operating Voltage

Device	DC Voltage		AC Voltage		
	Range A	Range B	Range C	Range D	Range E
All Horns	10...30V DC	10...30V DC	24V AC, 50/60 Hz (±10%)	115V AC, 50/60 Hz (±10%)	230V AC, 50/60 Hz (±10%)
All Horns with Strobe Beacon	12V DC ±10%	24V DC ±10%			

ALLEN BRADLEY 855P SIGNAL

Table 14 - Current Consumption [mA]

Attribute		Range A	Range B	Range C	Range D	Range E
Horns	10...30V DC	25	25	25	200	950
	24V AC, 50/60 Hz	40	40	40	500	1000
	115V AC, 50/60 Hz	13	20	20	100	240
	240V AC, 50/60 Hz	13	15	15	60	120
Horns with Strobe Beacon	12V DC	525	525	525	700	1450
	24V DC	275	275	275	450	1200
	24V AC	405	405	405	865	1200
	115V AC	113	120	120	200	340
	240V AC	63	65	65	110	170

Table 15 - Flashing Frequency

Attribute	Range A	Range B	Range C	Range D	Range E
Strobe Beacon	1 Hz				

Standards Compliance

- UL 464
- CSA C22.2 No. 205
- EN/IEC 60947-1
- EN/IEC 60947-5-1
- EN 6100-6-2
- EN 6100-6-4

Certifications

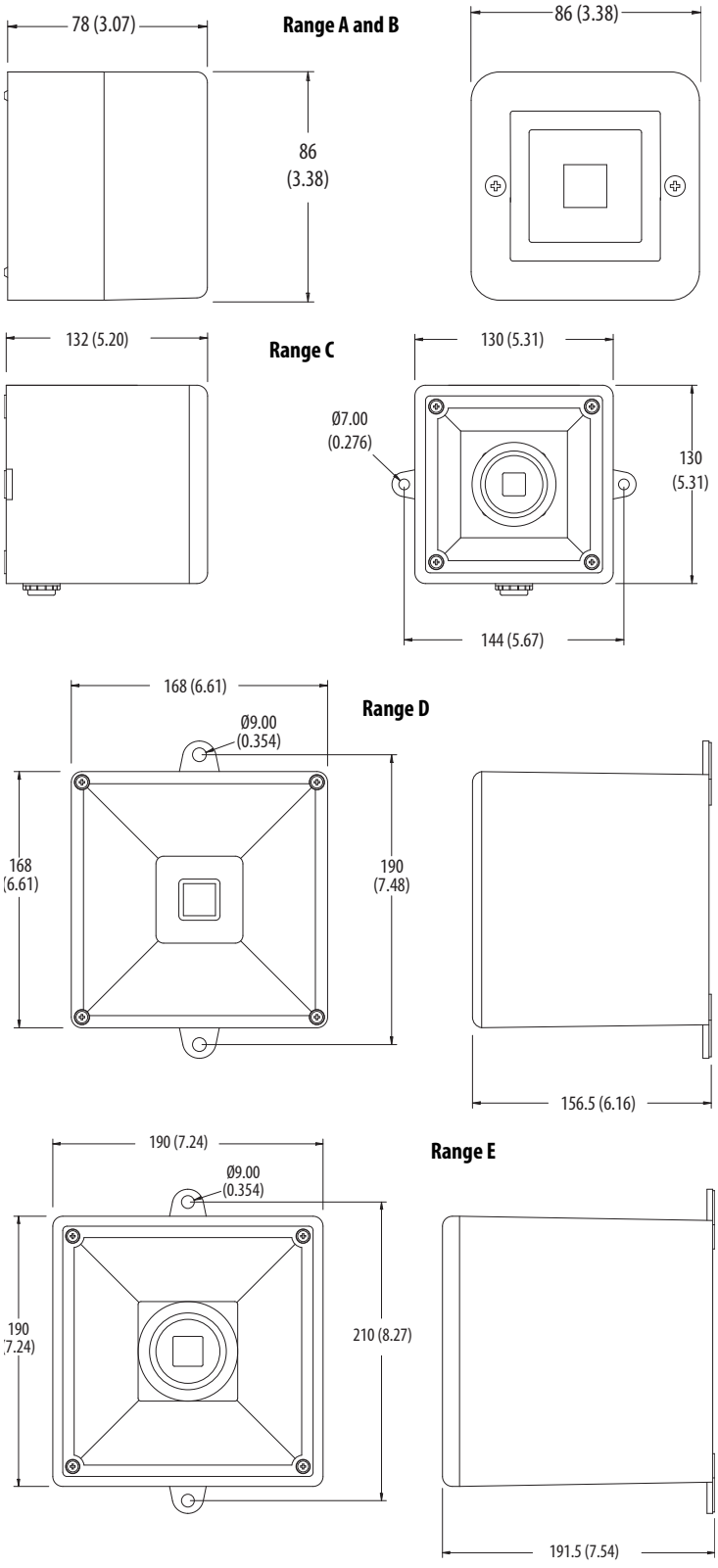
- cULus Listed (File No. S6583, Guides UCST, UCST7)
- CE Marked

ALLEN BRADLEY 855P SIGNAL

Approximate Dimensions (Bulletin 855H)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

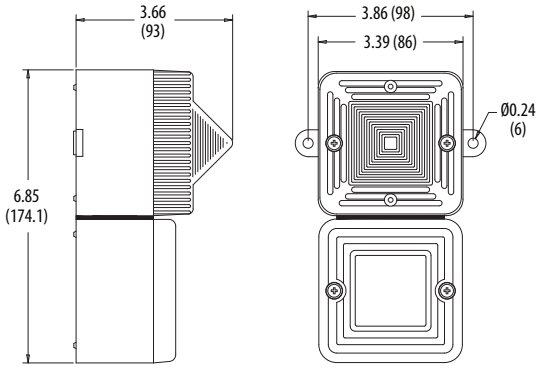
Horns



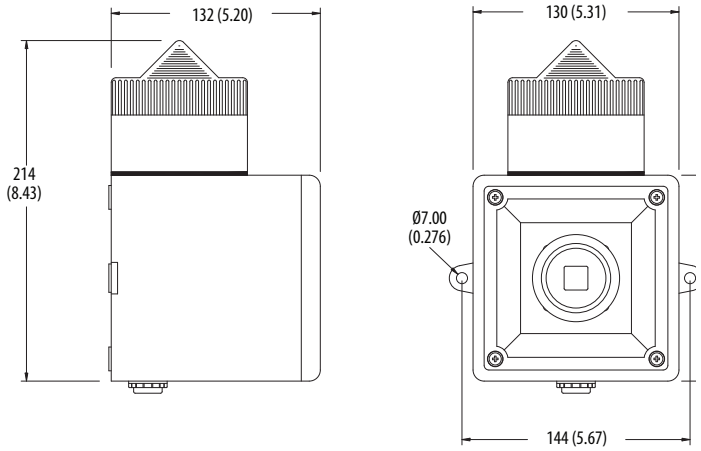
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Horns with Beacons

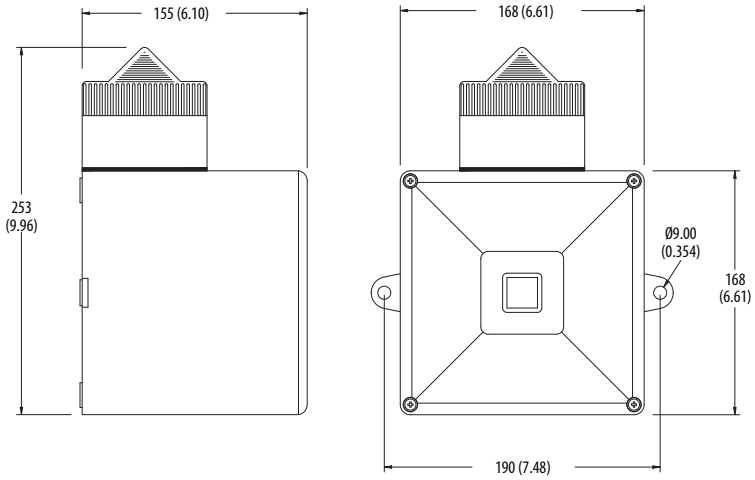
Range A and B



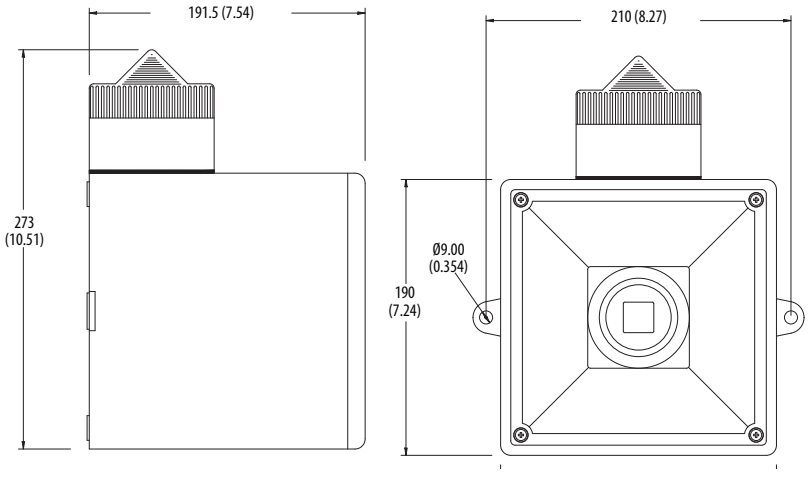
Range C



Range D



Range E



ALLEN BRADLEY 855P SIGNAL

Bulletin 855HM — High-performance Electronic Metal Horns

High-performance Electronic Metal Horns

855HM	–	G	M	D30	D
		a	b	c	d

a	
Housing Color	
Code	Description
G	Gray

b	
Conduit Entry	
Code	Description
M	Two M20 x 1.5 mm conduit entries

c	
Voltage	
Code	Description
D30	10…30V DC
A10	115V AC, 50/60 Hz
A20	230V AC, 50/60 Hz

d	
Horn Type	
Code	Description
D	119 dB, 45 tone, 3-stage

High-performance Electronic Metal Horns with Attached LED Beacons

855HM	–	C	G	M	D30	D	L	3
		a	b	c	d	e	f	g

a	
Product Type	
Code	Description
C	Electronic horn with LED steady/flashing beacon

b	
Housing Color	
Code	Description
G	Gray

c	
Conduit Entry	
Code	Description
M	Two M20 x 1.5 mm conduit entries

d	
Voltage	
Code	Description
D30	12…30V DC
A10	115V AC, 50/60 Hz
A20	230V AC, 50/60 Hz

e	
Horn Type	
Code	Description
D	119 dB, 45 tone, 3-stage

f	
Illumination Function	
Code	Description
L	Steady/flashing LED

g	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855HM)

Table 16 - Mechanical

Device	Listed below are reference guidelines for maximum shock and vibration standards for the 855XM horn.	
	Shock [G]	Vibration [G]
Metal horn	40	3
Metal horn with LED beacon	30	3

Table 17 - Environmental

Attribute	Device	Value	
Ingress rating	Electronic horn	UL Type 4/4X/13/3R, IP66	
	Horn with beacon	UL Type 4/4X/13/3R, IP66	
		Operating	Storage
Temperature range	Electronic horn	-25…+55 °C (-13…+131 °F)	-40…+70 °C (-40…+158 °F)
	Horn with beacon	-25…+55 °C (-13…+131 °F)	-40…+70 °C (-40…+158 °F)

Table 18 - Materials

Part	Material
Housing	Marine-grade aluminum Al Si 12 Cu (phosphated and powder-coated)
Screws	Stainless steel
Beacon lens	Clear polycarbonate over glass
Lens cage	Stainless steel
Gasket (Cover to Base)	O-ring nitrile UL
Gasket (Screw Mounting Hole)	Fiber washer

Table 19 - Performance Ratings

Device	Sound Output @ 1 m (3.3 ft)	Volume Control	No. of Tones	Stages
Metal Horn	119 dB max	Adjustable -12 dB	45	3
	LED Output [cd]			
Red LED Beacon	66			
Amber LED Beacon	78			
Green LED Beacon	176			
Blue LED Beacon	45			
Clear LED Beacon	120			

Table 20 - Operating Voltage

Device	DC Voltage	AC Voltage
Horn	10…30V DC	115V AC 50/60 Hz (±10%) 230V AC 50/60 Hz (±10%)
Horn with Beacon	12…30V DC	115V AC 50/60 Hz (±10%) 230V AC 50/60 Hz (±10%)

ALLEN BRADLEY 855P SIGNAL

Table 21 - Current Consumption

Device	Voltage	Current Consumption
Horns	10…30V DC	270 mA max. @ 30V 200 mA @ 24V 100 mA @ 12V
	115V AC 50/60 Hz	100 mA
	230V AC 50/60 Hz	60 mA
Horns with LED beacon	12…30V DC	436 mA max. @ 30V 357 mA @ 24V 220 mA @ 12V
	115V AC	160 mA
	230V AC	95 mA

Table 22 - Flashing Frequency

Device	Frequency
LED beacon	Steady or 2 Hz

Standards Compliance

- CSA C22.2 No. 205
- EN/IEC 60947-1
- EN/IEC 60947-5-1
- EN 61000-6-2
- EN 61000-6-4
- UL 464
- UL 1638

Certifications

- CE Marked
- cULus Listed (File No. E197159 and S6583, Guides UCST, UCST7)

Tone Table (Bulletin 855HM)

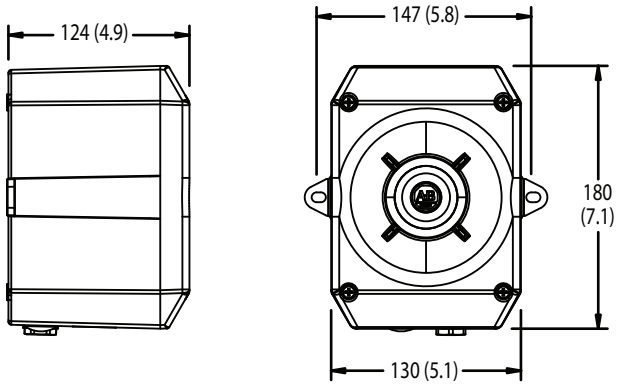
Tone Selection											
STAGE 1	FREQUENCY DESCRIPTION		Switch							Stage 2	Stage 3
Tone 1	340 Hz Continuous									Tone 2	Tone 5
Tone 2	800/1000Hz @ 0.25 sec Alternating		■							Tone 17	Tone 5
Tone 3	500/1200Hz @ 0.3Hz 0.5 sec Slow Whoop			■						Tone 2	Tone 5
Tone 4	800/1000Hz @ 1Hz Sweeping		■	■						Tone 6	Tone 5
Tone 5	2400Hz Continuous				■					Tone 3	Tone 20
Tone 6	2400/2900Hz @ 7Hz Sweeping		■		■					Tone 7	Tone 5
Tone 7	2400/2900Hz @ 1Hz Sweeping			■	■					Tone 10	Tone 5
Tone 8	500/1200/500Hz @ 0.3Hz Sweeping		■	■	■					Tone 2	Tone 5
Tone 9	1200/500Hz @ 1Hz - DIN / PFEER P.T.A.P.					■				Tone 15	Tone 2
Tone 10	2400/2900Hz @ 2Hz Alternating		■			■				Tone 7	Tone 5
Tone 11	1000Hz @ 1Hz Intermittent			■		■				Tone 2	Tone 5
Tone 12	800/1000Hz @ 0.875Hz Alternating		■	■		■				Tone 4	Tone 5
Tone 13	2400Hz @ 1Hz Intermittent				■	■				Tone 15	Tone 5
Tone 14	800Hz 0.25sec on, 1 sec off Intermittent		■		■	■				Tone 4	Tone 5
Tone 15	800Hz Continuous			■	■	■				Tone 2	Tone 5
Tone 16	660Hz 150mS on, 150mS off Intermittent		■	■	■	■				Tone 18	Tone 5
Tone 17	544Hz (100mS)/440Hz (400mS) - NF S 32-001						■			Tone 2	Tone 27
Tone 18	660Hz 1.8sec on, 1.8sec off Intermittent		■				■			Tone 2	Tone 5
Tone 19	1.4KHz-1.6KHz 1s, 1.6KHz-1.4KHz 0.5s -NFC48-265			■			■			Tone 2	Tone 5
Tone 20	660Hz Continuous		■	■			■			Tone 2	Tone 5
Tone 21	554Hz/440Hz @ 1Hz Alternating				■		■			Tone 2	Tone 5
Tone 22	544Hz @ 0.875 sec. Intermittent		■		■		■			Tone 2	Tone 5
Tone 23	800Hz @ 2Hz Intermittent			■	■		■			Tone 6	Tone 5
Tone 24	800/1000Hz @ 50Hz Sweeping		■	■	■		■			Tone 29	Tone 5
Tone 25	2400/2900Hz @ 50Hz Sweeping					■	■			Tone 29	Tone 5
Tone 26	Bell		■			■	■			Tone 2	Tone 15
Tone 27	554Hz Continuous			■		■	■			Tone 26	Tone 5
Tone 28	440Hz Continuous		■	■		■	■			Tone 2	Tone 5
Tone 29	800/1000Hz @ 7Hz Sweeping				■	■	■			Tone 7	Tone 5
Tone 30	300Hz Continuous		■		■	■	■			Tone 2	Tone 5
Tone 31	660/1200Hz @ 1Hz Sweeping			■	■	■	■			Tone 26	Tone 5
Tone 32	Two tone chime.		■	■	■	■	■			Tone 26	Tone 15
Tone 33	745Hz @ 1Hz Intermittent							■		Tone 2	Tone 5
Tone 34	1000 & 2000Hz @ 0.5 sec Alternating - Singapore		■					■		Tone 38	Tone 45
Tone 35	420Hz @ 0.625 sec Australian Alert			■				■		Tone 36	Tone 5
Tone 36	500-1200Hz 3.75sec /0.25sec. Australian Evac.		■	■				■		Tone 35	Tone 5
Tone 37	1000Hz Continuous - PFEER Toxic Gas				■			■		Tone 9	Tone 45
Tone 38	2000Hz Continuous		■		■			■		Tone 34	Tone 45
Tone 39	800Hz 0.25sec on, 1 sec off Intermittent			■	■			■		Tone 23	Tone 17
Tone 40	544Hz (100mS)/440Hz (400mS) - NF S 32-001		■	■	■			■		Tone 31	Tone 27
Tone 41	Motor Siren - slow rise to 1200 Hz					■		■		Tone 2	Tone 5
Tone 42	Motor Siren - slow rise to 800 Hz		■			■		■		Tone 2	Tone 5
Tone 43	1200 Hz Continuous			■		■		■		Tone 2	Tone 5
Tone 44	Motor Siren - slow rise to 2400 Hz		■	■		■		■		Tone 2	Tone 5
Tone 45	1KHz 1s on, 1s off Intermittent - PFEER Gen. Alarm				■	■		■		Tone 38	Tone 34

ALLEN BRADLEY 855P SIGNAL

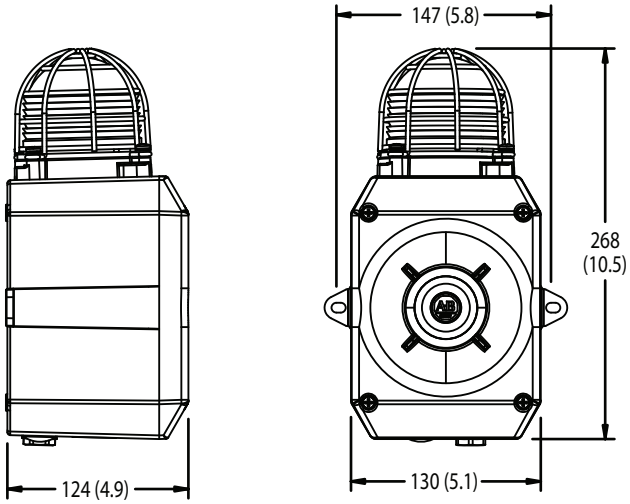
Approximate Dimensions (Bulletin 855HM)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

855HM Metal Horn



855HM-C Metal Horn with LED Beacon



ALLEN BRADLEY 855P SIGNAL

Bulletin 855B — Mini Square Beacons

855B	–	G	MS	12	R	3
		a	b	c	d	e

Mini Square Strobe Beacon

a	
Housing Color	
Code	Description
G	Gray

b	
Beacon Type	
Code	Description
MS	Mini square beacon

c	
Voltage	
Code	Description
24	24V AC/DC
10	115V AC, 50/60 Hz
20	230V AC, 50/60 Hz

d	
Illumination Type	
Code	Description
R	5 J Strobe

e	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

Specifications (Bulletin 855B)

Table 23 - Mechanical

Device	Listed below are reference guidelines for maximum shock and vibration standards for the 855B beacon lights.	
	Shock	Vibration
All strobe beacons	50 G Peak	5 G Peak

Table 24 - Environmental

Attribute	Value
Ingress Ratings	UL Type 13/3R, IP66
Operating Temperature Ranges	-25…+55 °C (-12…+131 °F)

Table 25 - Materials

Part	Material
Housing and Lens	Polycarbonate
Gasket	Nitrile 70

Table 26 - Performance Ratings

Attribute	Device	Performance Rating
Xenon Lamp Rating	All Strobe Beacons	5 J

Table 27 - Operating Voltage

Device	Operating Voltage		
All Strobe Beacon	24V AC/DC, 50/60 Hz (±20%)	120V AC, 50/60 Hz (±10%)	230V AC, 50/60 Hz (±10%)

ALLEN BRADLEY 855P SIGNAL

Table 28 - Current Consumption

Device		Current Consumption [mA]
All Strobe Beacons	24V AC/DC	365/250
	120V AC	100
	230V AC	50

Table 29 - Flashing Frequency

Device	Flashing Frequency
Strobe Beacon	1 Hz

Standards Compliance

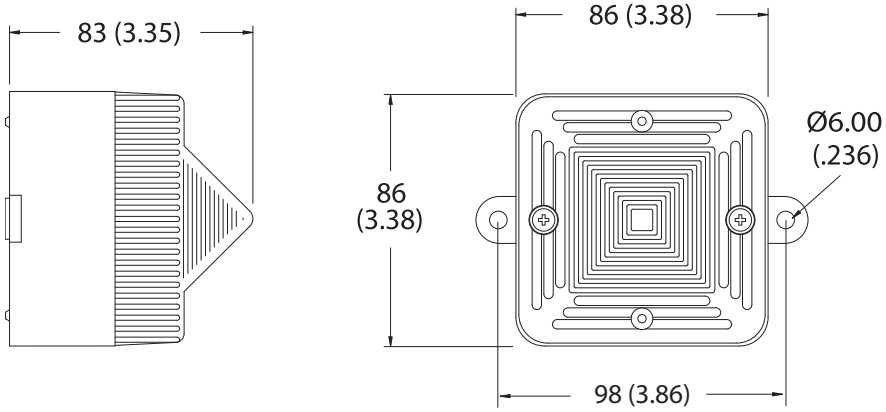
- UL 464
- UL 1638
- CSA C22.2 No. 205
- EN/IEC 60947-1
- EN/IEC 60947-5-1
- EN 6100-6-2
- EN 6100-6-4
- CAN/ULLC-S526-M87

Certifications

- cULus Listed (File No. E197159, Guides UUES, UEES7)
- CE Marked

Approximate Dimensions (Bulletin 855B)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



ALLEN BRADLEY 855P SIGNAL

Bulletin 855BS, 855BM, 855BL — Industrial Round Beacons

Bulletin 855BS — 90 mm Beacons

855BS – S 10 RH 3
a b c d

a	
Base Type	
Code	**Description**
S	Surface mount (1)
N	1/2 in. NPT conduit mount
T	25 mm tube mount (2)

b	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC
35	24/48V AC/DC
45	120/240V AC/DC

c	
Function	
Code	**Description**
DH	Steady halogen
FH	Flashing halogen
RH	Rotating halogen
BR	Xenon tube strobe (3)
SL	Single-color LED selectable steady/flash (4)
ML	Three-color LED (5) (6)
BL	LED strobe selectable single/double flash (7)

d	
Lens Color	
Code	**Description**
345	Green, red, amber (6)
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Surface mount base must be installed with rough wall plate for UL Type 4/4X/13 rating, otherwise UL Type 1 only.
(2) 25 mm tube mount is UL Recognized, other mounting types are UL Listed.
(3) Not available in 12V AC/DC.
(4) SL function uses 35 (16…60V AC/16…80V DC) and 45 (90…250V AC/DC) voltage codes only
(5) ML function uses 24, 10, and 20 voltage codes only.
(6) Green, Red, Amber color combination is only valid for the three color LED selection (ML).
(7) BL function uses 35 (19…52V AC/16…60V DC), 10, and 20 voltage codes only.

Bulletin 855BM — 120 mm Beacons

855BM – S 10 FH 4
a b c d

a	
Base Type	
Code	**Description**
S	Surface mount (1)
N	1/2 in. NPT conduit mount
T	25 mm tube mount

b	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Function	
Code	**Description**
DH	Steady halogen
FH	Flashing halogen
RH	Rotating halogen
BR	Xenon tube strobe (2)

d	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) When used outdoors surface mount base must be installed with rough wall plate for UL Type 4/4X/13 rating, otherwise UL Type 1 only.
(2) Not available in 12V AC/DC.

ALLEN BRADLEY 855P SIGNAL

Bulletin 855BL — 160 mm Beacons

855BL	–	N	24	DH	5
		a	b	c	d

a	
Base Type	
Code	Description
S	Surface mount (1)
N	1/2 in. NPT conduit mount
T	25 mm tube mount

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Function	
Code	Description
DH	Steady halogen
FH	Flashing halogen
RH	Rotating halogen
BR	Xenon tube strobe (2)

d	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) When used outdoors surface mount base must be installed with rough wall plate for UL Type 4/4X/13 rating, otherwise UL Type 1 only.
(2) Not available in 12V AC/DC.

Specifications (Bulletin 855BS, 855BM, 855BL)

Table 30 - Technical

Attribute		Value
Housing	Base material	Polycarbonate
	Lenses (all)	Polycarbonate, red, amber, yellow, green, blue, and clear
	Pole mount base	90 mm: polycarbonate 120 mm and 160 mm: aluminum die-cast, powder-coated
	Bracket	Powder-coated steel
Protection class		Type 4/4X/13 (surface mount base must be installed with rough wall plate for Type 4/4X/13 rating), IP65
Terminals (120 mm and 160 mm only)		Up to 2.5 mm^2 (14 AWG)
Temperature Ranges	Operating	-25…+60 °C (-13…+140 °F); -25…+50 °C (-13…+122 °F), 120 mm and 160 mm steady halogen, and 120/240V AC single-color LED
	Storage	-25…+85 °C (-13…+185 °F)
Mounting	Horizontal surfaces:	Indoor — direct to the surface, outdoor — with additional metal plate between surface and base part
	Vertical surfaces	With bracket, for indoor and outdoor
	Tube or NPT conduit	For indoor and outdoor

ALLEN BRADLEY 855P SIGNAL

Table 31 - Electrical and Mechanical

Attribute		Steady Halogen			Flashing Halogen			Strobe			Rotating Light		
		160 mm	120 mm	90 mm	160 mm	120 mm	90 mm	160 mm	120 mm	90 mm	160 mm	120 mm	90 mm
Halogen bulb	[W]	50	35	20	50	35	20	—	—	—	50	35	20
Bulb socket		GY6.35	GY6.35	GY6.35	GY6.35	GY6.35	GY6.35	—	—	—	GY6.35	GY6.35	GY6.35
Strobe energy	[J]	—	—	—	—	—	—	31	15	7	—	—	—
Xenon strobe tube		—	—	—				Helical	Helical	Helical	—	—	—
Strobe tube socket		—	—	—				Terminals	Terminals	Terminals	—	—	—
Flashing/Strobe frequency	[Hz]	—	—	—	1	1	1	1	1	1	—	—	—
Rotating speed - selectable via jumper wire	[rpm]	—	—	—	—	—	—	—	—	—	90/180	90/180	90/180
Nominal Current [A]	12V AC/DC	4	2.9	1.6	4.2	3	1.6	—	—	—	4.2	3.2	1.8
	24V AC/DC	2.1	1.5	0.8	2.1	1.5	0.8	1.9	1.3	0.48	2.3	1.7	0.95
	110/120V AC, 50/60 Hz	0.42	0.329	0.2	0.42	0.3	0.2	0.7	0.32	0.21	0.58	0.32	0.30
	230/240V AC, 50 Hz	0.21	0.15	0.09	0.21	0.15	0.09	0.35	0.15	0.12	0.39	0.17	0.27
Weight [g]	Surface Mount	900	500	251	900	500	251	900	500	296	900	500	378
	Tube Mount	900	500	424	900	500	424	900	500	469	900	500	551

Attribute		90 mm		
		Single-color LED	Three-color LED	Strobe LED
Nominal Current [mA]	24V AC/DC	—	155	—
	110/120V AC, 50/60 Hz	—	100	70
	230/240V AC, 50 Hz	—	105	70
	24/48V AC/DC, 50/60 Hz	230…270 (16…60V AC/ 16…80V DC)	—	300 (19…52V AC/ 16…60V DC)
	120/240V AC	38…43 mA (90…250V AC)	—	—
Weight [g]	Surface Mount	250		
	Tube Mount	450		

Standards Compliance

- UL 508
- EN/IEC 60947-1
- EN/IEC 60947-5-1
- CSA C22.2 No. 14

Certifications

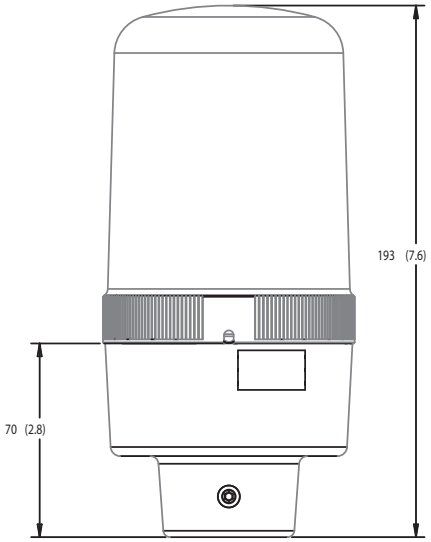
- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

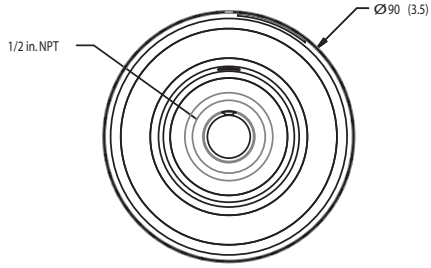
ALLEN BRADLEY 855P SIGNAL

Approximate Dimensions (Bulletin 855BS, 855BM, 855BL)

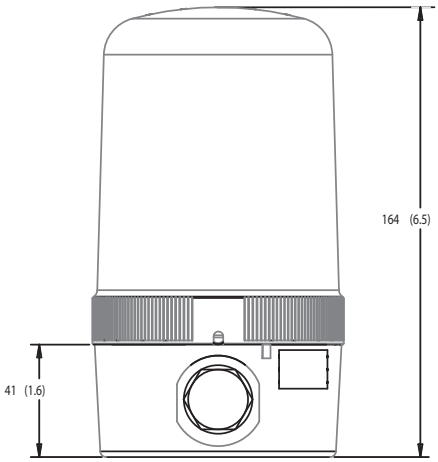
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

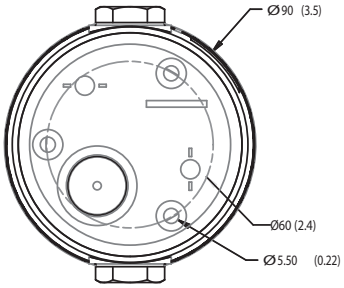
90 mm Beacon, NPT Conduit Mount



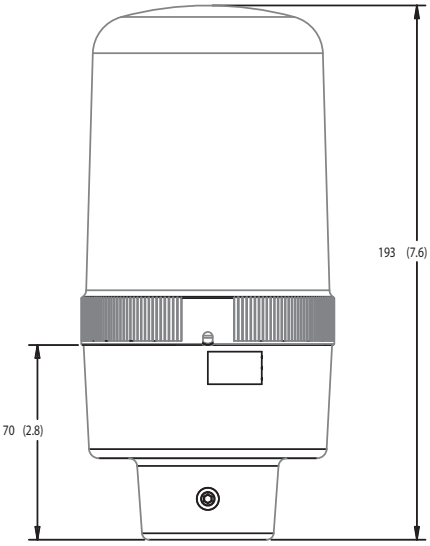


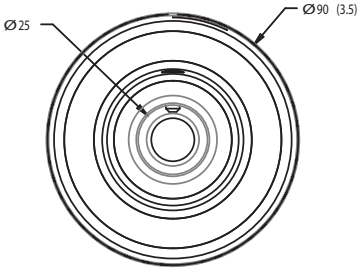
90 mm Beacon, Surface Mount



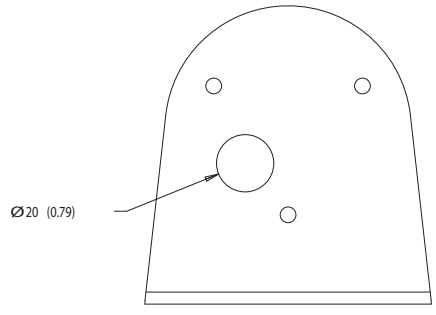


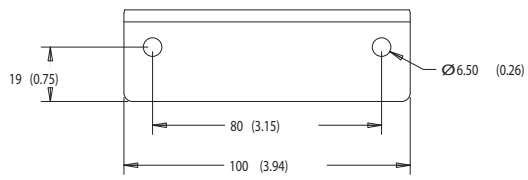
90 mm Beacon, Tube Mount



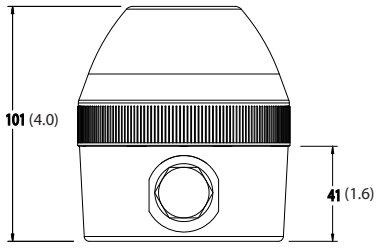


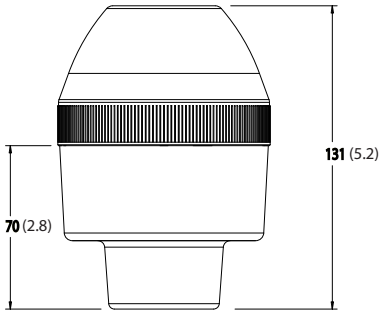
90 mm Beacon, Vertical Bracket





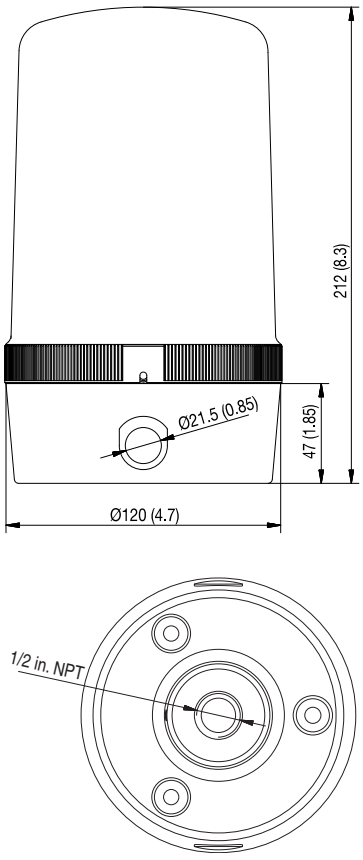
90 mm LED Beacon



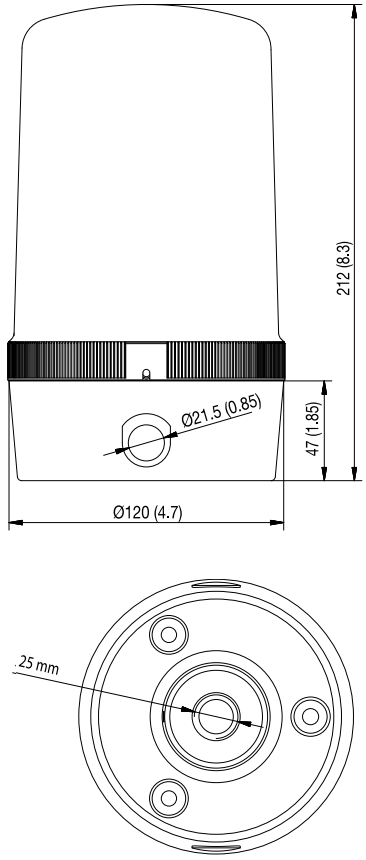


Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

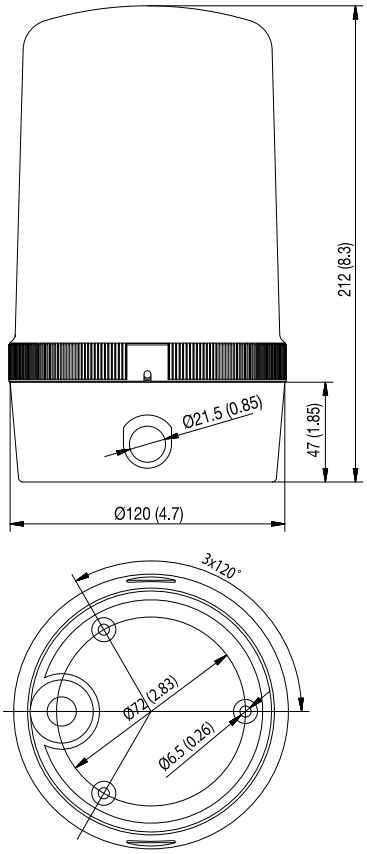
120 mm Beacon, NPT Conduit Mount



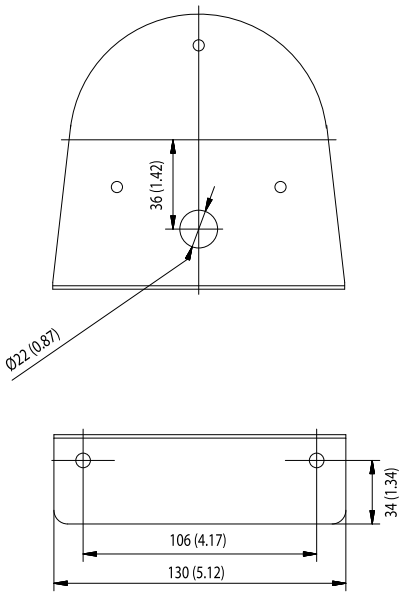
120 mm Beacon, Surface Mount



120 mm Beacon, Tube Mount



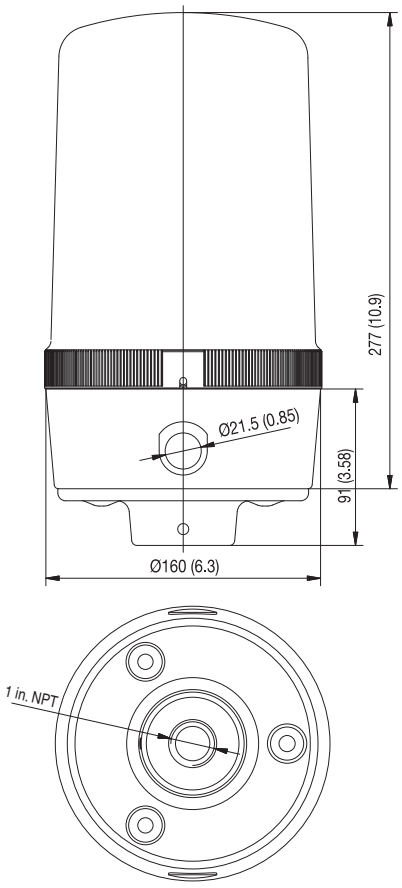
120 mm Beacon, Vertical Bracket



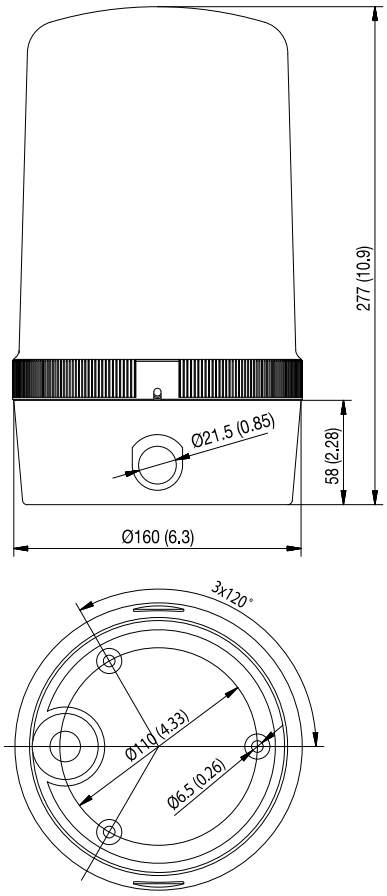
ALLEN BRADLEY 855P SIGNAL

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

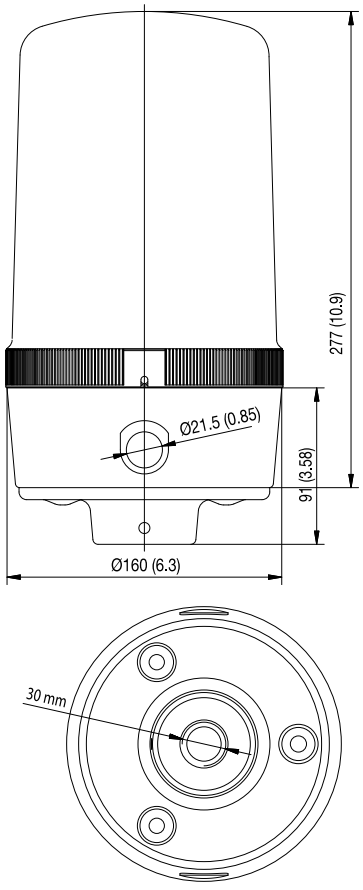
160 mm Beacon, NPT Conduit Mount



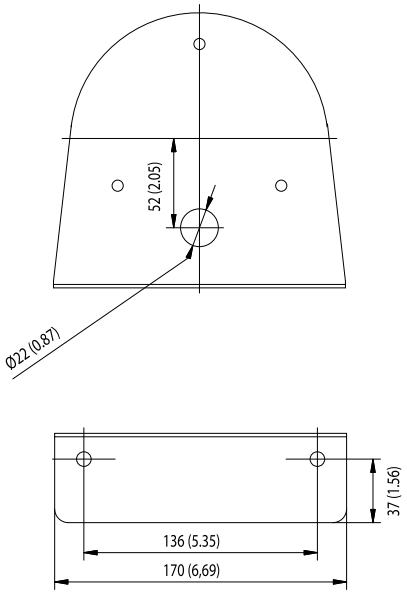
160 mm Beacon, Surface Mount



160 mm Beacon, Tube Mount



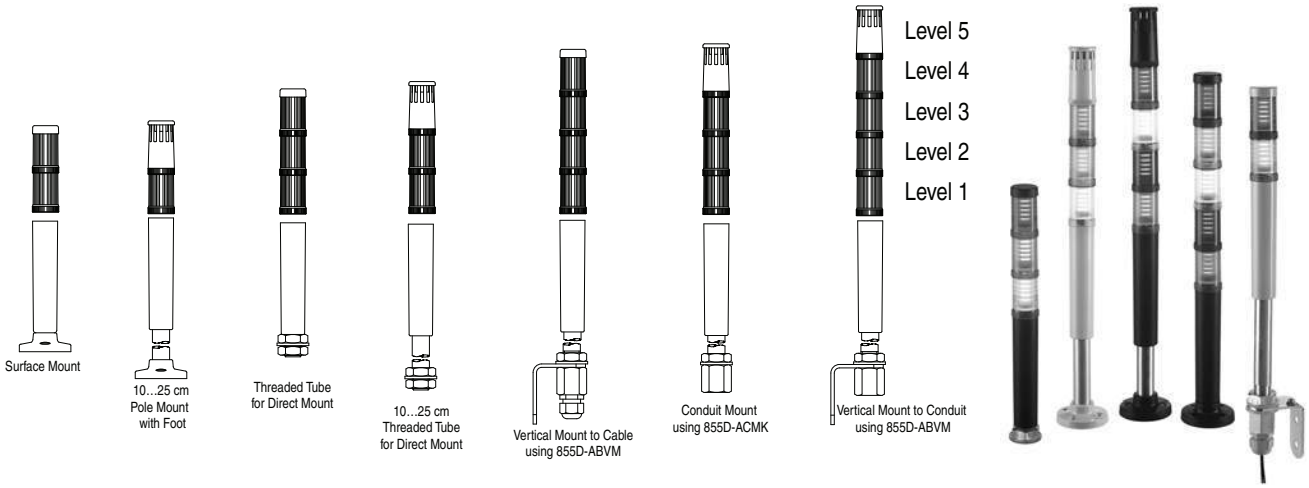
160 mm Beacon, Vertical Bracket



ALLEN BRADLEY 855P SIGNAL

Bulletin 855D — 30 mm Compact Control Tower™ Stack Lights

Pre-assembled and Pre-wired Tower Lights, 1…5 Modules



855D	–	P00		SC20	B	24	Y	3	Y	4	Y	5	L	7	P	1
		a	b	c	d	e	f	g	f	g	f	g	f	g	f	g
							(Level 1, f+g)		(Level 2, f+g)		(Level 3, f+g)		(Level 4, f+g)		(Level 5, f+g)	

a	
Base Type	
Code	**Description**
P00	Surface mount
P10	10 cm aluminum pole mount with foot
P25	25 cm aluminum pole mount with foot
T00	0 cm M20 metric threaded tube for direct mount
T10	10 cm M20 metric threaded tube for direct mount
T25	25 cm M20 metric threaded tube for direct mount
Q10	10 cm quick release mount pole
Q25	25 cm quick release mount pole

b	
Network Option	
Code	**Description**
Blank	No network option

c	
Cable Connector and Length (1)	
Code	**Description**
SC20	Stranded cable, 2 m, yellow jacket
Blank	No cable (only for Q10 or Q25 base types)

(1) The SC20 cable must be ordered for all bases, except the Q10 and Q25 bases.

d	
Housing Color	
Code	**Description**
B	Black
G	Gray

e	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC

f	
Module Type (1) (2)	
Code	**Description**
Y	Steady LED
L	Flashing LED
C	Piezo sound alarm, continuous tone
P	Piezo sound alarm, pulsing tone
Q	Dual-circuit piezo sound alarm (3)

g	
Lens Color/Sound	
Code	**Description**
1	Sound module
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Sound module types (C, P, Q) must be on the top-most level, they must be configured with Lens Color/Sound Code 1, and only one sound module is allowed per assembly.
(2) Light module types (Y, L) can only be configured with Lens Color/Sound Codes 3, 4, 5, 6, 7, or 8.
(3) If the dual circuit sound module (Q) is selected, the maximum number of light modules that are allowed is three (two circuits are required for the dual circuit sound module).

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855D)

Table 32 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base or 10cm or 25 cm Aluminum Pole Base	1 Module Stack	150	2.5
	3 Module Stack	45	2.5
	5 Module Stack	35	2.0

Table 33 - Environmental

Attribute		Value
Ingress Ratings	Light Modules	IP65/UL Type 4/4X/13
	Sound Modules	IP65/UL Type 4/4X/13
	Surface, Pole, Vertical, Tube Mount Bases	IP65/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+50 °C (-13…+122 °F)
	Storage	-25…+85 °C (-13…+185 °F)

Table 34 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Insulation Sleeve (for pole insulation)	PVC
Mounting Screw Washers	Polyamide

Table 35 - Estimated Light Output(1)

Attribute	Estimated Light Output [mcd]
Steady, Flashing, Red	1000
Steady, Flashing, Amber	800
Steady, Flashing, Green	1500
Steady, Flashing, Yellow	700
Steady, Flashing, Blue	250
Steady, Flashing, White	1000

(1) Light Output values are calculated from the LED Data Sheet and show typical values of luminous density. These values are not exact because the knurling in the lens affects the light distribution and because the viewing angle of the LED that directly relates to the Cd output value, is not identical for all LEDs.

Table 36 - Operating Voltage

Device	Operating Voltage		
	24V AC/DC	120V AC	240V AC
Light modules and sound modules	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 37 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating		
	24V AC/DC	120V AC	240V AC
LED modules	100,000 hr		
Sound modules	20,000 hr		

ALLEN BRADLEY 855P SIGNAL

Table 38 - Current Consumption

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light modules	Steady or flashing LED	20	22	21
Piezo-style sound modules	Single- and dual-circuit	40	22	21

Table 39 - Flashing Frequency (Light Only Modules)

Device	Flashing Frequency
Flashing LED Modules	Approximately 2 Hz

Table 40 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Piezo Sound Module	85 dB(A) (+2 dB/-5 dB)

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 41 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

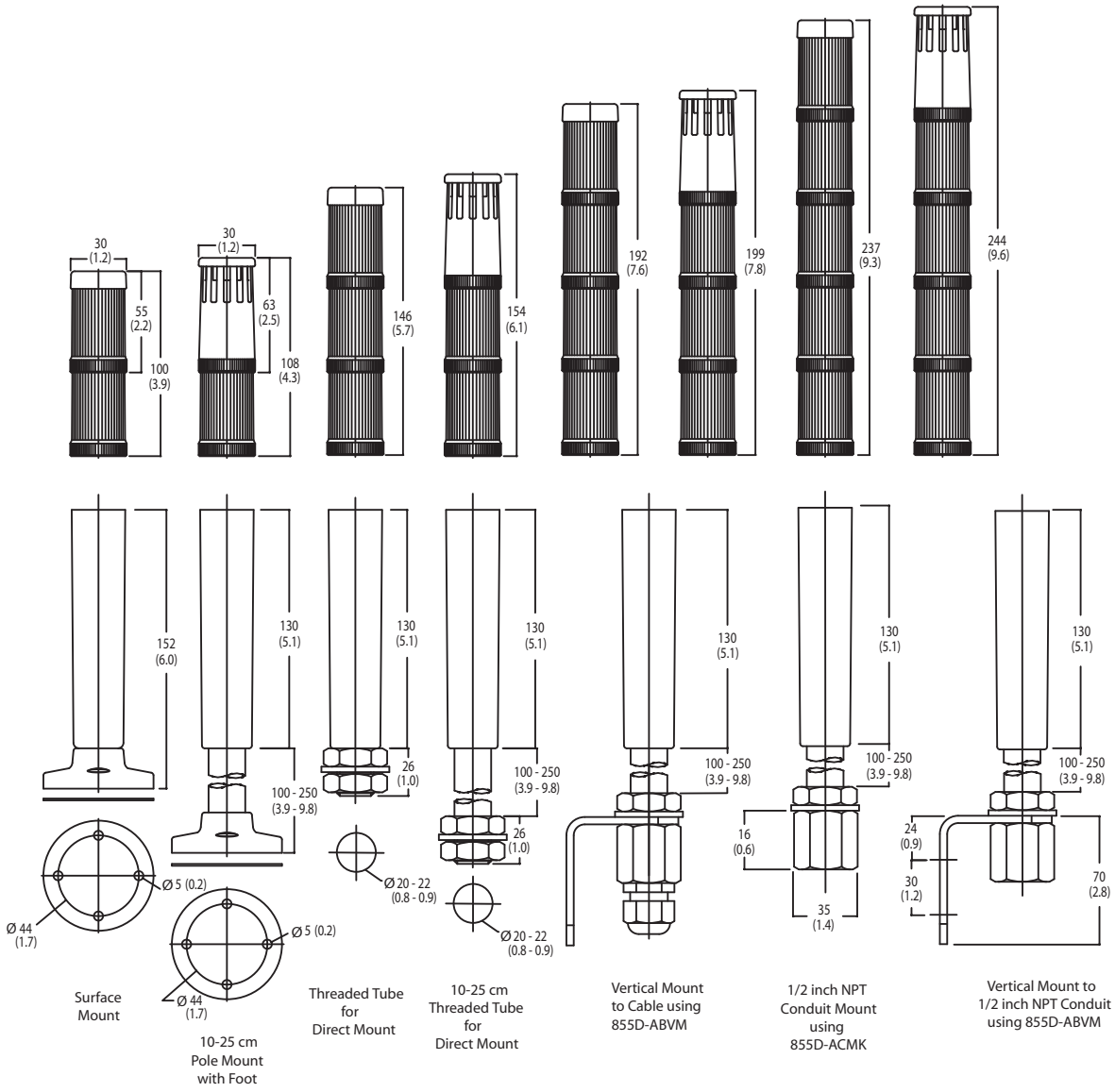
Certifications

- cULus Listed (File No. E14840, Guides NKCR, NKCR7)

ALLEN BRADLEY 855P SIGNAL

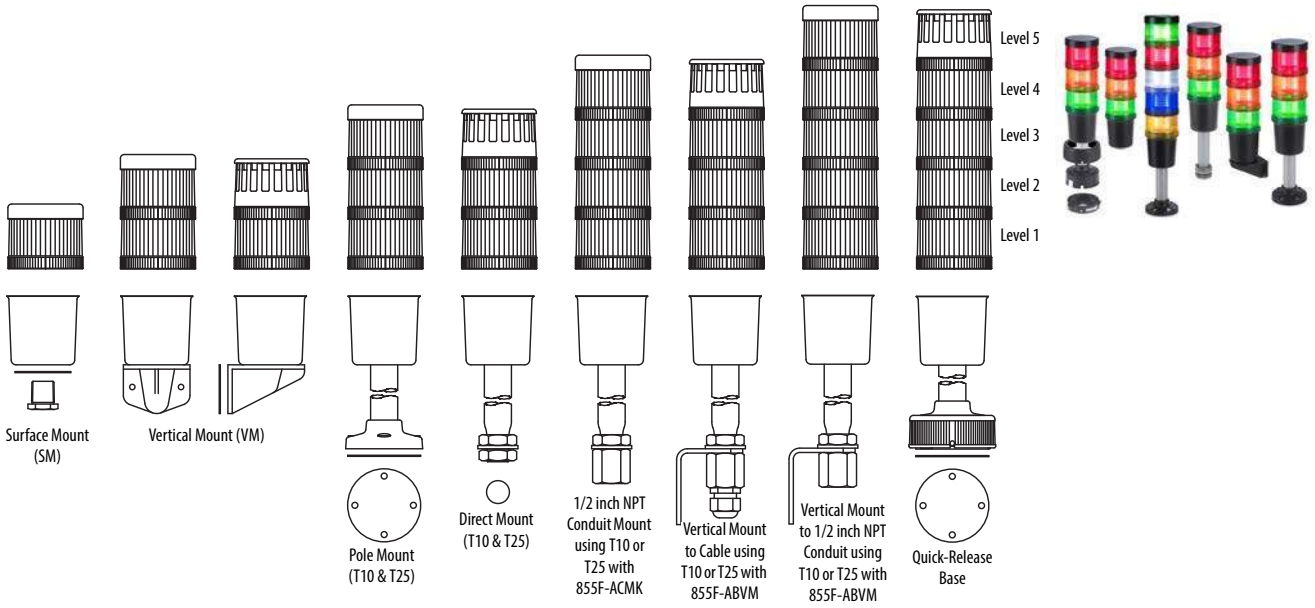
Approximate Dimensions (Bulletin 855D)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



Bulletin 855F — 70 mm Compact Control Tower Stack Lights

Pre-assembled and Pre-wired Tower Lights, 1…5 Modules



855F	–	P10	SC20	B	24	Y	3	Y	4	Y	5	L	7	P	1
		a	b	c	d	e	f	e	f	e	f	e	f	e	f
						(Level 1, e+f)		(Level 2, e+f)		(Level 3, e+f)		(Level 4, e+f)		(Level 5, e+f)	

a	
Base Type	
Code	**Description**
SB	Surface mount with 1/2 in. NPT threaded connector and mounting nut
P10	10 cm aluminum pole mount with foot
P25	25 cm aluminum pole mount with foot
T10	10 cm threaded tube for direct mount
T25	25 cm threaded tube for direct mount
VM	Vertical mount
Q10	10 cm quick release mount pole
Q25	25 cm quick release mount pole

b	
Cable Connector and Length (1)	
Code	**Description**
SC20	Stranded cable, 2 m, yellow jacket
Blank	No cable (only for Q10 or Q25 base types)

c	
Housing Color	
Code	**Description**
B	Black

(1) The SC20 cable must be ordered for all bases, except the Q10 and Q25 bases.

d	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC

e	
Module Type (1) (2)	
Code	**Description**
Y	Steady LED
L	Flashing LED
C	Piezo sound alarm, continuous tone
P	Piezo sound alarm, pulsing tone
Q	Dual-circuit piezo sound alarm (3)

f	
Lens Color/Sound	
Code	**Description**
1	Sound module
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Sound module types (C, P, Q) must be on the top-most level, they must be configured with Lens Color/Sound Code 1, and only one sound module is allowed per assembly.
(2) Light module types (Y, L) can only be configured with Lens Color/Sound Codes 3, 4, 5, 6, 7, or 8.
(3) If the dual circuit sound module (Q) is selected, the maximum number of light modules that are allowed is three (two circuits are required for the dual circuit sound module).

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855F)

Table 42 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base or 10 cm or 25 cm Aluminum Pole Base	1 Module Stack	150	2.5
	3 Module Stack	45	2.5
	5 Module Stack	35	2.0

Table 43 - Environmental

Attribute		Value
Ingress Ratings	Light Modules	IP65/UL Type 4/4X/13
	Sound Modules	IP65/UL Type 4/4X/13
	Surface, Pole, Vertical, Tube Mount Bases	IP65/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+60 °C (-13…+140 °F)
	Storage	-25…+85 °C (-13…+185 °F)

Table 44 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Insulation Sleeve (for pole insulation)	PVC
Mounting Screw Washers	Polyamide

Table 45 - Estimated Light Output (1)

Attribute	Estimated Light Output [mcd]
Steady, Flashing, Red	1000
Steady, Flashing, Amber	800
Steady, Flashing, Green	1500
Steady, Flashing, Yellow	700
Steady, Flashing, Blue	250
Steady, Flashing, White	1000

(1) Light Output values are calculated from the LED Data Sheet and show typical values of luminous density. These values are not exact because the knurling in the lens affects the light distribution and because the viewing angle of the LED that directly relates to the Cd output value, is not identical for all LEDs.

Table 46 - Operating Voltage

Device	Operating Voltage		
	24V AC/DC	120V AC	240V AC
Light modules and sound modules	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 47 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating		
	24V AC/DC	120V AC	240V AC
LED modules	100,000 hr		
Sound modules	20,000 hr		

ALLEN BRADLEY 855P SIGNAL

Table 48 - Current Consumption

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light modules	Steady or flashing LED	20	22	21
Piezo-style sound modules	Single- and dual-circuit	53	22	21

Table 49 - Flashing Frequency (Light Only Modules)

Device	Flashing Frequency
Flashing LED Modules	Approximately 2 Hz

Table 50 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Piezo Sound Module	100 dB(A) (+2 dB/-5 dB)

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 51 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

Certifications

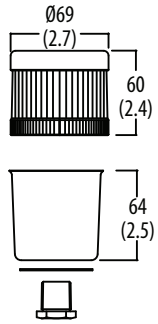
- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

ALLEN BRADLEY 855P SIGNAL

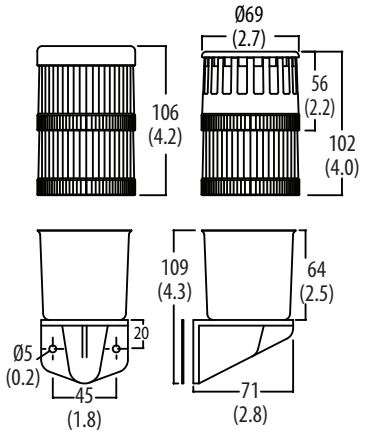
Approximate Dimensions (Bulletin 855F)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

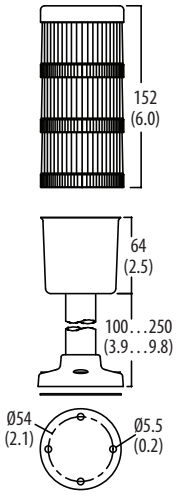
Assembled Stacks



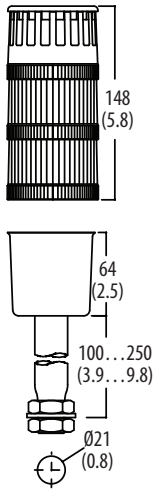
Surface Mount (SB)



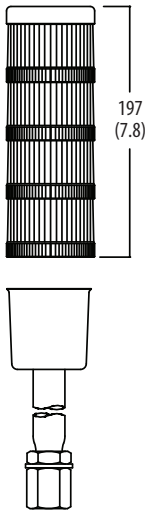
Vertical Mount (VM)



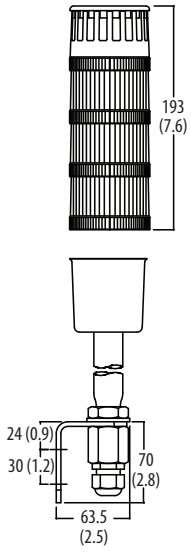
Pole Mount (P10 and P25)



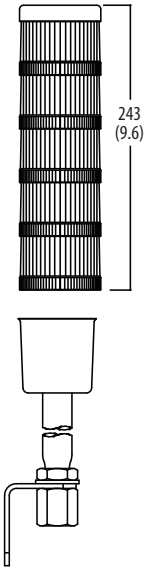
Direct Mount (T10 and T25)



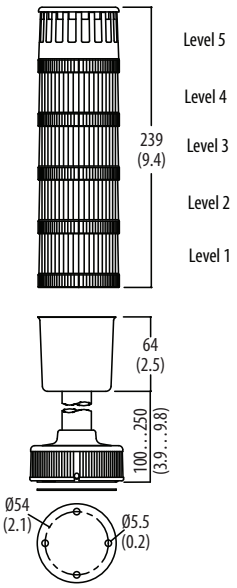
1/2 inch NPT Conduit Mount Using T10 or T25 with 855F-ACMK



Vertical Mount to Cable Using T10 or T25 with 855F-ABVM



Vertical Mount to 1/2 inch NPT Conduit Using T10 or T25 with 855F-ABV



Quick-release Base

Bulletin 854J — 40 mm Control Tower Stack Lights

Light Modules

Steady LED Module

854J – 10 TL 4
a b c

a	
Voltage	
Code	**Description**
00	0…250V AC/DC (no-lamp module) (1)
24	24V AC/DC (2)
10	120V AC (2)
20	240V AC (2)

b	
Light Module Type	
Code	**Description**
XN	Steady no lamp (3)
TL	Steady LED
GL	Flashing LED
BL	LED strobe, single flash

c	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Can only be selected with module type XN, voltage code 00. Accepts 4 W socket mount incandescent lamp types only.
(2) Not valid with module type XN.
(3) Incandescent lamps (catalog numbers 854J-L24, 854J-L10, and 854J-L20) must be purchased separately.

Sound Modules

Sound modules have continuous and pulsing tones selectable via DIP switch. Maximum sound output is 80 dB(A) @ 1 meter.

Sound Module

854J – B 10 SA3
a b c

a	
Housing Color	
Code	**Description**
B	Black

b	
Light Module Type	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	**Description**
SA3	Single-circuit piezo-style steady/pulsing DIP switch selectable

ALLEN BRADLEY 855P SIGNAL

Standard Stack Light Bases

Surface-mount Base with External Holes

Vertical-mount Base

Pole-mount Base

Double-sided Base

1/2 in. NPT Base

Quick Release Base

Flange Style with M12 Micro Connector (Male)

854J – B VM C
a b c

a	
Housing Color	
Code	**Description**
B	Black

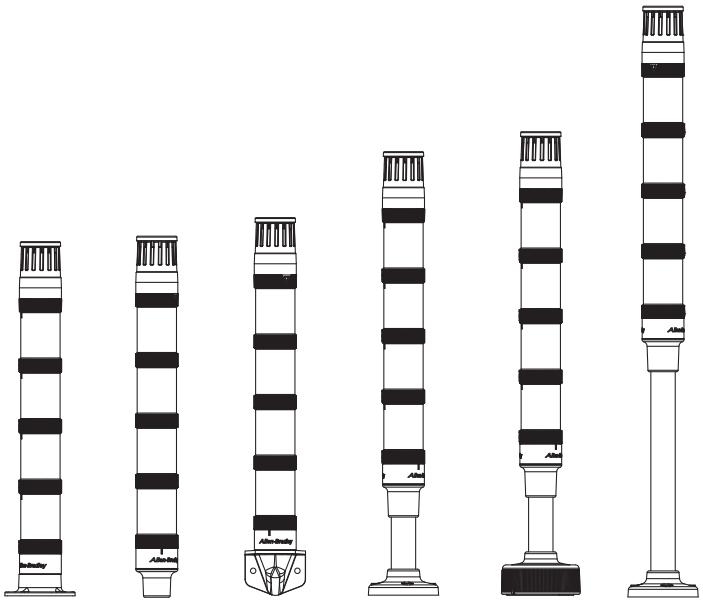
b	
Base Type [1]	
Code	**Description**
NPT	1/2 in. NPT
VM	Vertical mount
SH	Surface mount, preinstalled mounting hardware
SF	Surface mount, external mounting holes
PM10	10 cm aluminum pole mount base
PM25	25 cm aluminum pole mount base
T10	10 cm threaded tube (M20)
T25	25 cm threaded tube (M20)
DS	Double-sided base [2]
Q10	10 cm quick release base
Q25	25 cm quick release base
SFQD5	Flange-style base with M12 (5-pin DC) micro connector [3] [4] [5] [6] [7]

c	
Cap Option	
Code	**Description**
C	Cap included

(1) PM10, PM25, T10, T25, Q10, and Q25 bases have powder-coated aluminum tubes
(2) Double-sided base can accommodate up to ten modules per base divided in two groups up to five levels each.
(3) For vertical mounting of the base use catalog number 855T-AVM.
(4) Maximum number of levels that are allowed in the stack is four.
(5) For use with Bulletin 889D cordsets.
(6) Cannot be used with 10 cm plastic base extension (catalog number 854J-ABBE).
(7) Maximum 250V AC/DC UL / 60V AC/DC IEC.

ALLEN BRADLEY 855P SIGNAL

Pre-configured Tower Lights, 1…5 Modules



854JC	–	SF	B	10	Y	3	L	5	B	3	L	7	Y	6
		a		b	c	d	c	d	c	d	c	d	c	d
					(Level 1, c+d)		(Level 2, c+d)		(Level 3, c+d)		(Level 4, c+d)		(Level 5, c+d)	

a	
Base Type (1)	
Code	**Description**
NPT	1/2 in. NPT
VM	Vertical mount
SF	Surface mount —external mounting holes
P10	10 cm aluminum pole mount with foot
P25	25 cm aluminum pole mount with foot
Q10	10 cm quick release mount pole
Q25	25 cm quick release mount pole

b	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC

c	
Module Type	
Code	**Description**
Y	Steady LED
L	Flashing LED
B	Strobe LED—single flash
P	Piezo sound alarm, continuous/pulsing tone

d	
Lens Color/Sound	
Code	**Description**
1	Sound module (2)
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) P10, P25, Q10, Q25 bases have powder-coated aluminum tubes.
(2) Sound module option can only be selected with Module Type option P in Table e. They must be located in the top position of the stack.

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 854J)

Table 52 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base or 10 cm Aluminum Pole Base	1 Module Stack	50	5
	3 Module Stack	50	5
	5 Module Stack	40	5
Vertical Base or 25 cm Aluminum Pole Base	1 Module Stack	55	5
	3 Module Stack	55	5
	5 Module Stack	35	5
Recommended Wire Sizes		0.2…1.5 mm^2 (24…16 AWG)	
Recommended Terminal Torque		Screwless terminal blocks	

Table 53 - Environmental

Attribute		Value
Ingress Ratings	Light Modules	IP66/UL Type 4/4X/13
	Sound Modules	
	Surface, Vertical, Tube Mount Bases	
	Pole Mount Bases	
	Flange-style Base with M12 Micro Connector (1)	
Temperature Ranges	Operating	-30…+60 °C (-22…+140 °F) For Cat. No. 854J-BSFQD5C only: -30...+45 °C (-22...+113 °F)
	Storage	-30…+85 °C (-22…+185 °F)

(1) UL Type 1 when used with Cat. No. 855T-AVM mounting bracket.

Table 54 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings	Polycarbonate
Lamp Socket	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Mounting Screw Washers	Polypropylene

ALLEN BRADLEY 855P SIGNAL

Table 55 - Estimated Light Output

Device		Estimated Light Output [mcd]	
		24V AC/DC	120V AC, 240V AC
Strobe LED	Red	4430	3915
	Green	4216	4080
	Amber	4430	3915
	Blue	1673	1619
	Clear	4464	4320
	Yellow	3715	3283
Steady/Flashing LED	Red	1793	2392
	Green	1714	3400
	Amber	1793	2391
	Blue	680	1349
	Clear	1814	3600
	Yellow	1503	2006

Table 56 - Operating Voltage

Device	Operating Voltage		
	24V AC/DC	120V AC	240V AC
Light modules and sound modules	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 57 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating		
	24V AC/DC	120V AC	240V AC
LED modules	50,000 hr		
Sound modules	20,000 hr		

Table 58 - Current Consumption [mA]

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light only modules	Steady LED	22 (red, amber, and yellow) 33 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Flashing LED	28 (red, amber, and yellow) 36 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Strobe LED	35 (red, amber, and yellow) 65 (green, blue, and white)	10	
Sound modules	Single-tone	65	31	32

Table 59 - Flashing Frequency (Light Only Modules)

Device	Flashing Frequency
Flashing LED Modules	Approximately 1.5 Hz; Time On/Time OFF = 1:1
LED Strobe Modules	Approximately 2 Hz (flash duration 1/50,000 second)

Table 60 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Single-tone Sound Module	80 dB(A) (non-adjustable)

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 61 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

ALLEN BRADLEY 855P SIGNAL

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

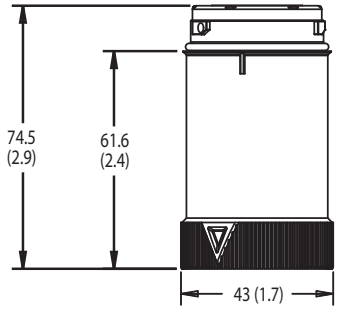
Certifications

- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked
- RoHS Compliant

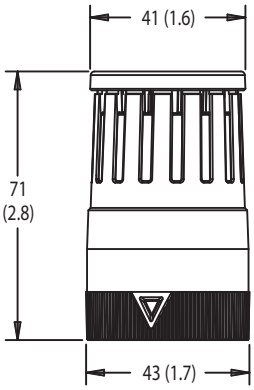
Approximate Dimensions (Bulletin 854J)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

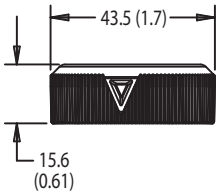
Light Module



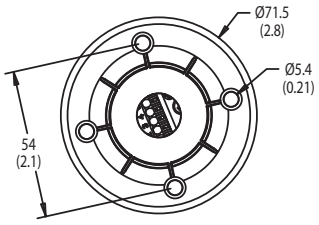
Sound Module



Cap

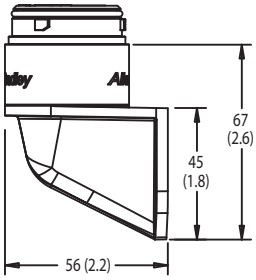


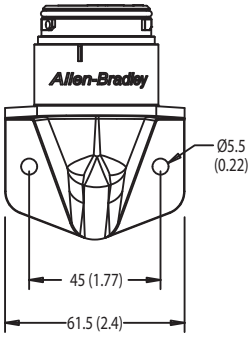
Surface Mount Base

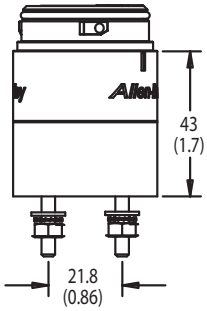


External Mounting Holes

Vertical Mount Base







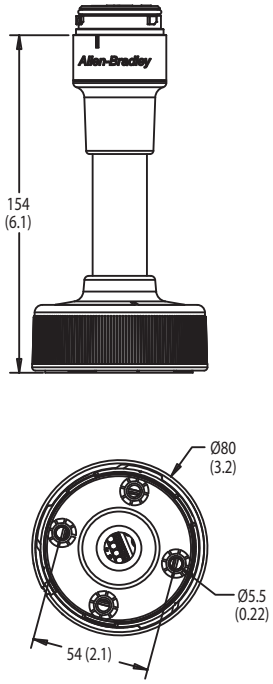
Pre-installed Hardware

ALLEN BRADLEY 855P SIGNAL

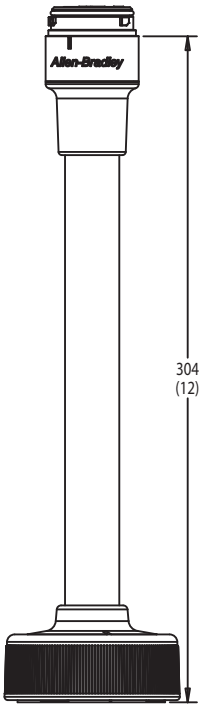
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Quick-release Bases

10 cm Base

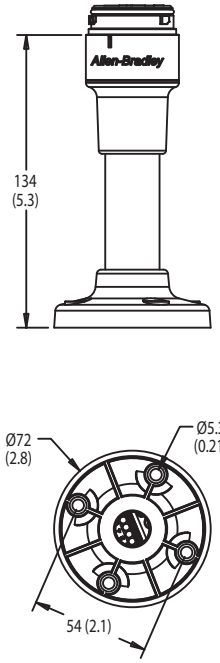


25 cm Base

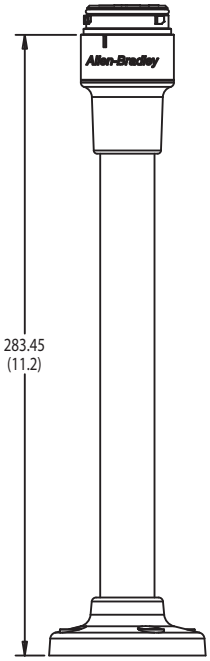


Pole-mount Bases

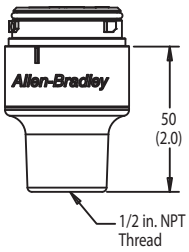
10 cm Base



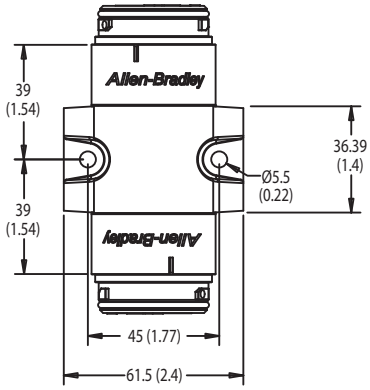
25 cm Base



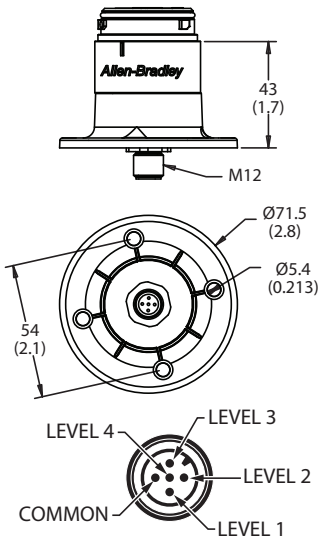
1/2 in. NPT Thread Base



Double-sided Base



Flange-style Base with M12 Micro Connector (Male)



5-Pin DC Micro Configuration

ALLEN BRADLEY 855P SIGNAL

Bulletin 855E — 50 mm Control Tower Stack Lights

Light Modules

Flashing Incandescent

855E – 10 FN 4
a b c

a	
Voltage	
Code	**Description**
00	0…250V AC/DC (no lamp module) (1)
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

b	
Light Module Type	
Code	**Description**
XN	Steady no lamp (1)
DN	Steady incandescent
FN	Flashing incandescent
TL	Steady socket-mount LED
GL	Flashing socket-mount LED
BL	Strobe

c	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Can only be selected with module type XN, voltage code 00. Accepts socket mount incandescent lamp types only.

Sound Modules

Sound modules have continuous and pulsing tones. Maximum sound output is 103 dB at 1 m (3.3 ft). A reduced volume setting is available by changing the position of the volume DIP switch, which produces a sound output of 88 dB(A) at 1 (3.3 ft). Maximum sound output is 80 dB(A) at 1 m (3.3 ft).

Black Two-tone Sound Module

855E – B 10 TA3
a b c

a	
Housing Color	
Code	**Description**
B	Black
G	Gray

b	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	**Description**
SA3	Single circuit/single tone piezo style steady/pulsing DIP switch selectable
TA	Two circuit/two-tone piezo style steady/pulsing DIP switch selectable

Standard Stack Light Bases

Surface-mount Base with Cap

Vertical-mount Base with Cap

Pole-mount Bases

Quick-release Base

855E – B VM C
a b c

a	
Housing Color	
Code	**Description**
B	Black
G	Gray

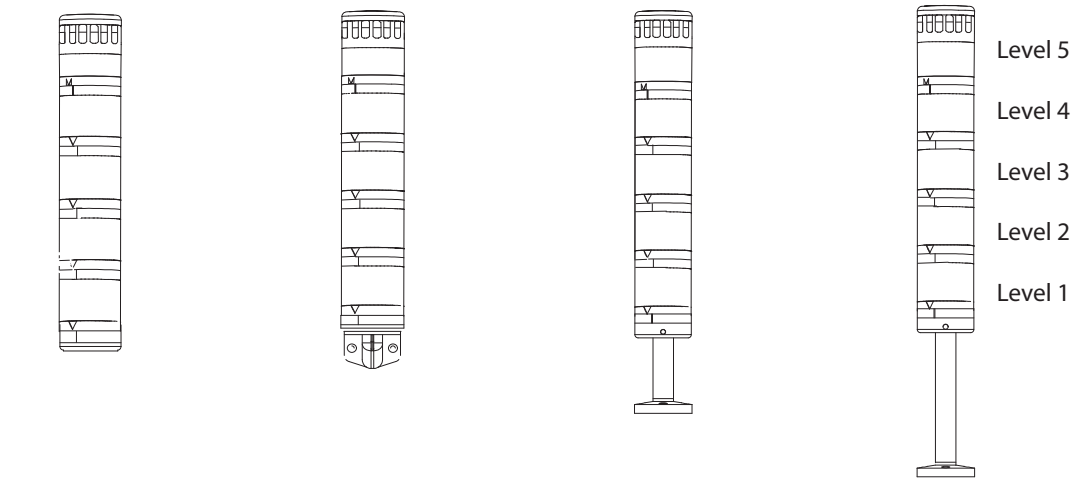
b	
Base Type	
Code	**Description**
CB	Surface mount with 1/2 in. NPT threading
RB	Surface mount with M20 metric threading
SB	Surface mount with PG16 threading
TM	25 mm tube mount
VM	Vertical mount
PM10	10 cm aluminum pole-mount base
PM25	25 cm aluminum pole-mount base
PM40	40 cm aluminum pole-mount base
PM60	60 cm aluminum pole-mount base
PM80	80 cm aluminum pole-mount base
MM10	10 cm quick-release base
MM25	25 cm quick-release base
MM40	40 cm quick-release base

c	
Cap Option (1)	
Code	**Description**
Blank	No cap
C	Cap included

(1) Quick-release bases always include a cap.

ALLEN BRADLEY 855P SIGNAL

Pre-configured Tower Lights, 1…5 Modules



Surface Mount | Vertical Mount | 10 cm Pole Mount | 25 cm Pole Mount

855	EC	–	B	10	Y	3	L	5	B	3	F	7	Y	6
	a		b	c	d	e	d	e	d	e	d	e	d	e
					(Level 1, d+e)		(Level 2, d+e)		(Level 3, d+e)		(Level 4, d+e)		(Level 5, d+e)	

a	
Base Type	
Code	**Description**
EC	Surface mount - 1/2 in. NPT threading
ES	Surface mount - PG16
EV	Vertical mount
EM	25 mm tube mount
EP	10 cm pole mount
EE	25 cm pole mount

b	
Base & Cap Color	
Code	**Description**
B	Black
G	Gray

c	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

d	
Module Type	
Code	**Description**
D	Steady incandescent
F	Flashing incandescent
Y	Steady LED
L	Flashing LED
B	Strobe
P	Single-circuit piezo sound module
Q	Two-circuit piezo sound module(1)

e	
Lens Color/Sound	
Code	**Description**
1	Sound module (2)
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) If the two-circuit sound module (option Q in Table d) is selected, the maximum number of light modules that are allowed is three.
(2) Sound module option can only be selected with Module Type option P or Q in Table d. They must be located in the top position of the stack.

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855E)

Table 62 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base or 10 cm Aluminum Pole Base	1 module stack	150	5
	3 module stack	45	1.5
	5 module stack	35	0.75
Vertical Base or 25 cm Aluminum Pole Base	1 module stack	95	3.5
	3 module stack	30	1.25
	5 module stack	20	0.5
Recommended Wire Sizes		0.5…1.5 mm^2 (22…16 AWG)	
Recommended Terminal Torque		0.87 N•m (7 lb•in)	

Table 63 - Environmental

Attribute		Value
Ingress Ratings	Light Modules with Cap	IP66/UL Type 4/4X/13
	Sound Modules	IP66/UL Type 4/4X/13
	Surface, Vertical, Tube Mount Bases	IP66/UL Type 4/4X/13
	Pole Mount Bases	IP66/UL Type 4/4X/13
	Flange-style Base with M12 Micro Connector(1)	IP66/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+50 °C (-13…+122 °F)
	Storage	-40…+85 °C (-40…+185 °F)

(1) UL Type 1 when used with Cat. No. 855T-AVM mounting bracket.

Table 64 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings, Lenses	Polycarbonate
Lamp Socket	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Insulation Sleeve (for pole insulation)	Polyolefin
Mounting Screw Washers	Polypropylene

Table 65 - Light Output

Device		Light Output			
		12V AC/DC	24V AC/DC	120V AC	240V AC
Steady Incandescent		0.5 MSCP 6.3 Lumens	2.5 MSCP 31.4 Lumens	3.0 MSCP 37.7 Lumens	0.49 MSCP 6.2 Lumens
Flashing Incandescent					
Strobe		1 J per lamp			
Steady, Flashing Socket Mount LED	Red	900…2240 mcd			
	Green	900…1800 mcd			
	Amber	1400…3550 mcd			
	Blue	224…560 mcd			
	White and Yellow	900…1800 mcd			

ALLEN BRADLEY 855P SIGNAL

Table 66 - Operating Voltage

Device	Operating Voltage			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Light modules and sound modules	12V AC/DC (±10%)	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 67 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Incandescent Modules(1) (2)	8000 hr	7000 hr	3000 hr	1600 hr
LED Modules	100,000 hr			
Strobe Modules	15,000 hr			
Sound modules	20,000 hr			

(1) First failures at about 35% of average life. Severe vibration can reduce life to 44% of average life.
(2) Flashing applications can reduce life to 50% of average life.

Table 68 - Current Consumption

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light only modules	Steady LED	22 (red, amber, and yellow) 33 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Flashing LED	28 (red, amber, and yellow) 36 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Strobe LED	35 (red, amber, and yellow) 65 (green, blue, and white)	10	
Sound modules	Single-tone	65	31	32

Table 69 - Flashing and Tone Frequency

Attribute	Value
Flashing Frequency (Light Only Modules)	
Flashing Incandescent Modules	12V module approximately 1.5 Hz 24V, 120V, and 240V modules approximately 2 Hz Time ON/Time OFF = 1:1
Flashing LED Modules	Approximately 1.5 Hz; Time On/Time OFF = 1:1
LED Strobe Modules	Approximately 2 Hz (flash duration 1/50,000 second)
Flashing and Tone Frequency (Light Modules/with Sound Set at Continuous Tone)	
Tone Frequency	Tone frequency is preset at 2800 Hz
Flashing and Tone Pulsing Frequencies (Light Modules/with Sound Set at Pulsing Tone)	
Tone Frequency	Tone frequency is preset at 2800 Hz

Table 70 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Single-tone Sound Module (SA3)	Maximum volume ranges from 88 dB(A) or 103 dB(A) (volume adjustable by DIP switch)
Two-tone Sound Module (TA3)	

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 71 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

Certifications

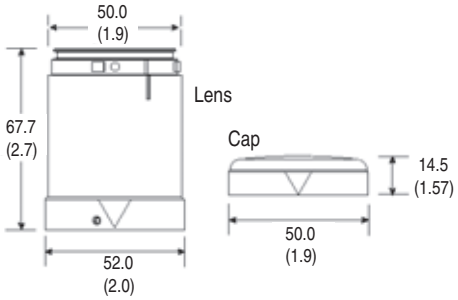
- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

ALLEN BRADLEY 855P SIGNAL

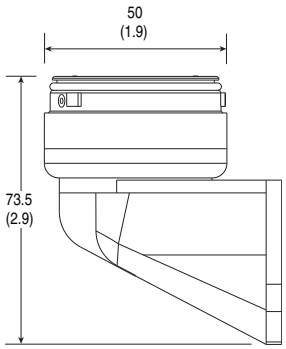
Approximate Dimensions (Bulletin 855E)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

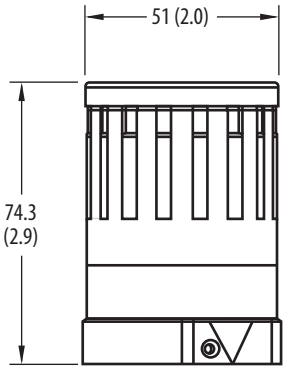
Light Modules



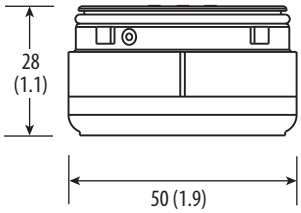
Vertical Mount Base



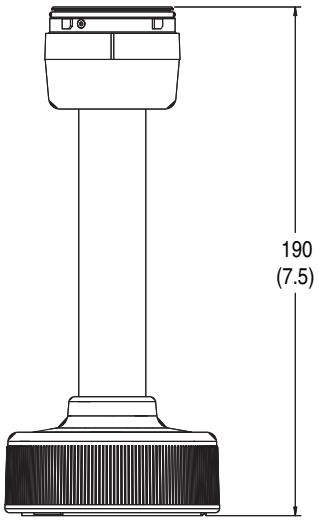
Sound Module



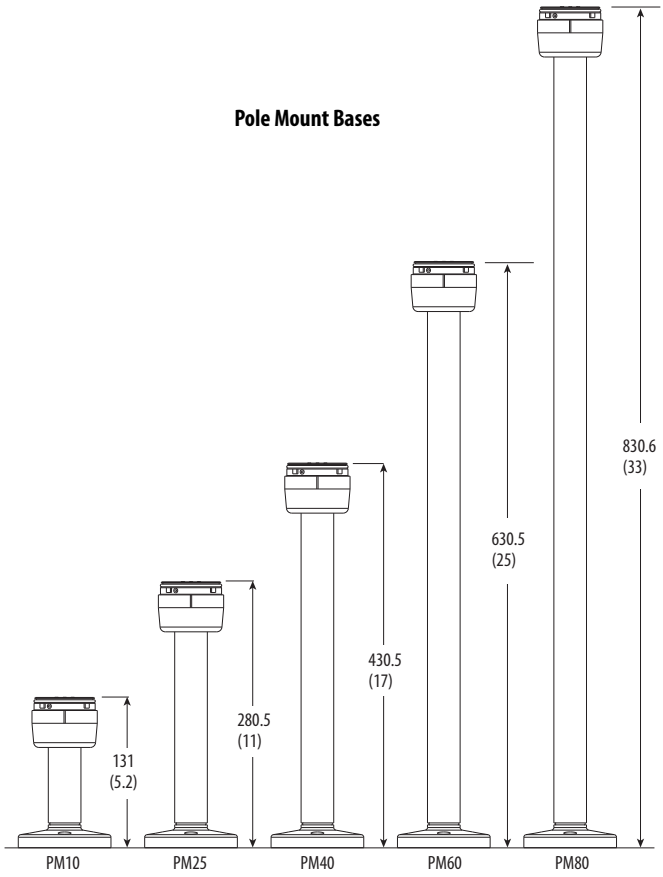
Surface Mount Base



Quick Release Base



Pole Mount Bases



ALLEN BRADLEY 855P SIGNAL

Bulletin 854K— 60 mm Control Tower Stack Lights

Light Modules

Steady LED Module

854K	–	10	TL	4
		a	b	c

a	
Voltage	
Code	**Description**
00	0…250V AC/DC (no lamp module) (1)
24	24V AC/DC (2)
10	120V AC (2)
20	240V AC (2)

b	
Light Module Type	
Code	**Description**
XN	Steady no lamp (3)
TL	Steady socket-mount LED
GL	Flashing socket-mount LED
BL	LED strobe, single flash

c	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Can only be selected with module type XN, voltage code 00. Accepts socket mount incandescent lamp types only.
(2) Not valid with module type XN.
(3) Incandescent lamps (catalog numbers 854J-L24, 854J-L10, and 854J-L20) must be purchased separately.

Sound Modules

Sound modules have continuous and pulsing tones selectable via DIP switch. Maximum sound output is 90 dB(A) at 1 m (3.3 ft) and the volume is adjustable.

Sound Module

854K	–	B	10	SA3
		a	b	c

a	
Housing Color	
Code	**Description**
B	Black

b	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	**Description**
SA3	Single-circuit/single-tone piezo-style steady/pulsing DIP switch selectable

ALLEN BRADLEY 855P SIGNAL

Standard Stack Light Bases

Surface-mount Base with External Holes

Vertical-mount Base

Pole-mount Base

Double-sided Base

1/2 in. NPT Base

Quick-release Base

Flange-style with M12 Micro Connector (Male)

854K – B VM C

a b c

a	
Housing Color	
Code	**Description**
B	Black

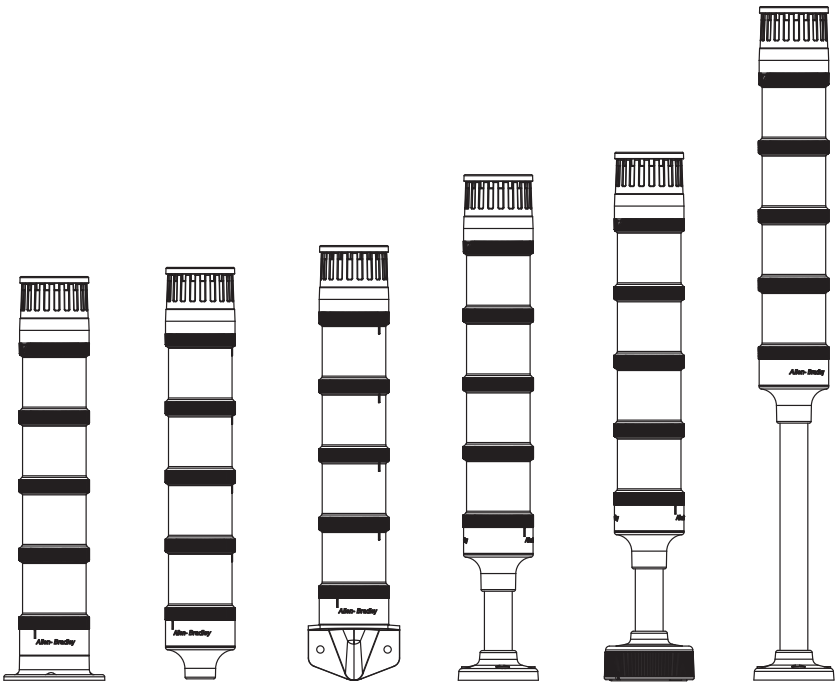
b	
Base Type [1]	
Code	**Description**
NPT	1/2 in. NPT threading
VM	Vertical mount
SH	Surface mount, preinstalled mounting hardware
SF	Surface mount, external mounting holes
PM10	10 cm aluminum pole-mount base
PM25	25 cm aluminum pole-mount base
T10	10 cm threaded tube (M20)
T25	25 cm threaded tube (M20)
DS	Double-sided base [2]
Q10	10 cm quick-release base
Q25	25 cm quick-release base
SFQD5	Flange-style base with M12 (5-pin DC) micro connector [3] [4] [5] [6] [7]

c	
Cap Option	
Code	**Description**
C	Cap included

(1) PM10, PM25, T10, T25, Q10, and Q25 bases have powder-coated aluminum tubes.
(2) Double-sided base can accommodate up to ten modules per base divided in two groups up to five levels each.
(3) For vertical mounting of the base use catalog number 854K-AVM.
(4) Maximum number of levels that are allowed in the stack is four.
(5) For use with Bulletin 889D cordsets.
(6) Cannot be used with 10 cm plastic base extension (catalog number 854K-ABBE).
(7) Maximum 250V AC/DC UL / 60V AC/DC IEC.

ALLEN BRADLEY 855P SIGNAL

Pre-configured Tower Lights, 1…5 Modules



Surface Mount | 1/2 in. NPT Thread | Vertical Mount | 10 cm Pole Mount | 10 cm Quick Release | 25 cm Pole Mount

854KC	–	SF	B	10	Y	3	L	5	B	3	F	7	Y	6
		a		b	c	d	c	d	c	d	c	d	c	d
					(Level 1, c+d)		(Level 2, c+d)		(Level 3, c+d)		(Level 4, c+d)		(Level 5, c+d)	

a	
Base Type [1]	
Code	**Description**
NPT	1/2 in. NPT
VM	Vertical mount
SF	Surface mount — external mounting holes
P10	10 cm aluminum pole mount
P25	25 cm aluminum pole mount
Q10	10 cm quick release base
Q25	25 cm quick release base

b	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC

c	
Module Type	
Code	**Description**
Y	Steady LED
L	Flashing LED
B	Strobe
P	Single-circuit piezo sound module

d	
Lens Color/Sound	
Code	**Description**
1	Sound module [2]
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) P10, P25, Q10, and Q25 bases have powder-coated aluminum tubes.
(2) Sound module option can only be selected with Module Type option P in Table c. They must be located in the top position of the stack.

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 854K)

Table 72 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base with external holes or 10 cm Aluminum Pole Base	1 Module Stack	50	5
	3 Module Stack	50	5
	5 Module Stack	40	5
Vertical Base or 25 cm Aluminum Pole Base	1 Module Stack	55	5
	3 Module Stack	55	5
	5 Module Stack	35	5
Recommended Wire Sizes		0.2…1.5 mm^2 (24…16 AWG)	
Recommended Terminal Torque		Screwless terminal blocks	

Table 73 - Environmental

Attribute		Value
Ingress Ratings	Light Modules with Cap	IP66/UL Type 4/4X/13
	Sound Modules	IP66/UL Type 4/4X/13
	Surface, Vertical, Tube Mount Bases	IP66/UL Type 4/4X/13
	Pole Mount Bases	IP66/UL Type 4/4X/13
	Flange-style Base with M12 Micro Connector(1)	IP66/UL Type 4/4X/13
Temperature Ranges	Operating	-30…+60 °C (-22…+140 °F) For Cat. No. 854J-BSFQD5C only: -30...+45 °C (-22...+113 °F)
	Storage	-30…+85 °C (-22…+185 °F)

(1) UL Type 1 when used with Cat. No. 855K-AVM mounting bracket.

Table 74 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings, Lenses	Polycarbonate
Lamp Socket	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Mounting Screw Washers	Polypropylene

Table 75 - Light Output

Device		Light Output [mcd]	
		24V AC/DC	120V AC, 240V AC
Strobe LED	Red	4430	3915
	Green	4216	4080
	Amber	4430	3915
	Blue	1673	1619
	White	4464	4320
	Yellow	3715	3283
Steady/Flashing LED	Red	1793	2392
	Green	1714	3400
	Amber	1793	2392
	Blue	680	1349
	White	1814	3600
	Yellow	1503	2006

ALLEN BRADLEY 855P SIGNAL

Table 76 - Operating Voltage

Device	Operating Voltage		
	24V AC/DC	120V AC	240V AC
Light modules and sound modules	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 77 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating		
	24V AC/DC	120V AC	240V AC
LED Modules	50,000 hr		
Sound modules	20,000 hr		

Table 78 - Current Consumption

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light only modules	Steady LED	22 (red, amber, and yellow) 33 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Flashing LED	28 (red, amber, and yellow) 36 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Strobe LED	35 (red, amber, and yellow) 65 (green, blue, and white)	10	
Sound modules	Single-tone	65	31	32

Table 79 - Flashing Frequency (Light Only Modules)

Device	Flashing Frequency
Flashing LED Modules	Approximately 1.5 Hz; Time On/Time OFF = 1:1
LED Strobe Modules	Approximately 2 Hz (flash duration 1/50,000 second)

Table 80 - Tone Frequency

Attribute	Value
Tone Frequency	Preset at 2500 Hz

Table 81 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Single-tone Sound Module (SA3)	Maximum volume output is 80 dB(A) (non-adjustable)

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 82 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

Certifications

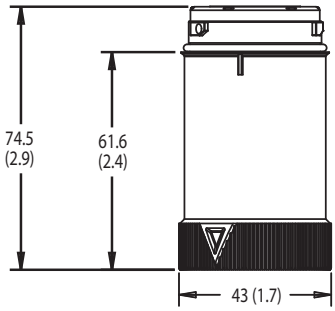
- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked
- RoHS Compliant

ALLEN BRADLEY 855P SIGNAL

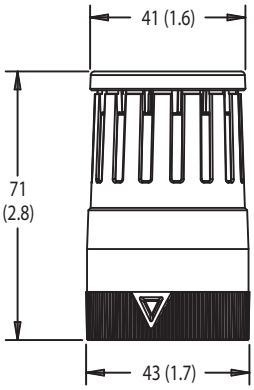
Approximate Dimensions (Bulletin 854K)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

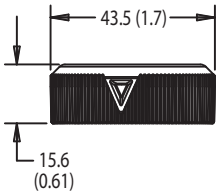
Light Module



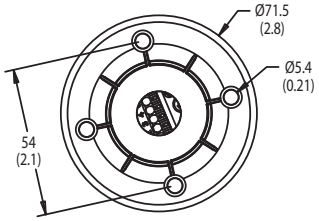
Sound Module



Cap

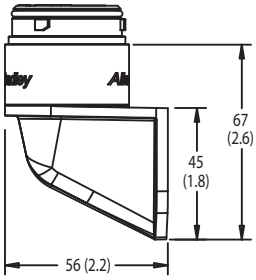


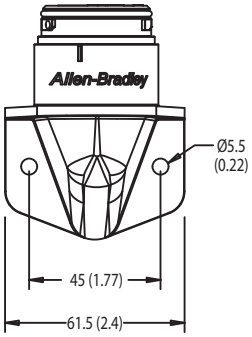
Surface-mount Base

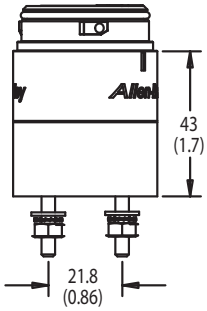


External Mounting Holes

Vertical-mount Base







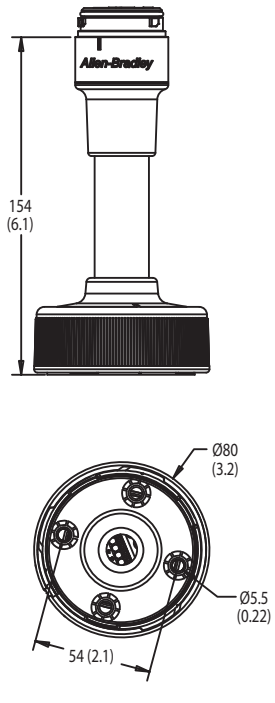
Pre-installed Hardware

ALLEN BRADLEY 855P SIGNAL

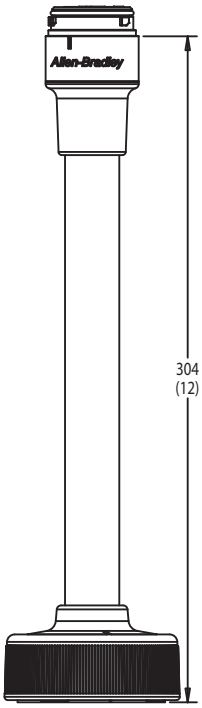
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Quick-release Base

10 cm Base

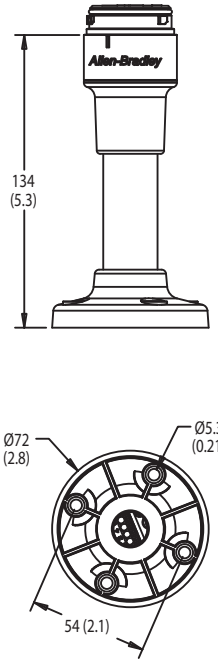


25 cm Base

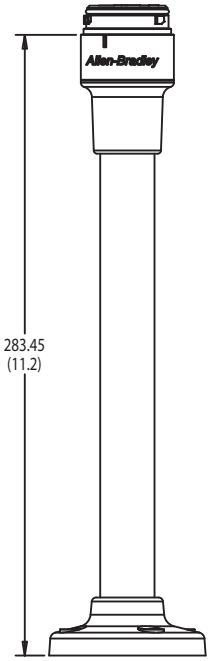


Pole-mount Bases

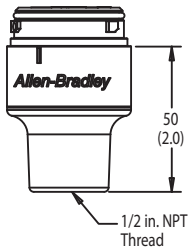
10 cm Base



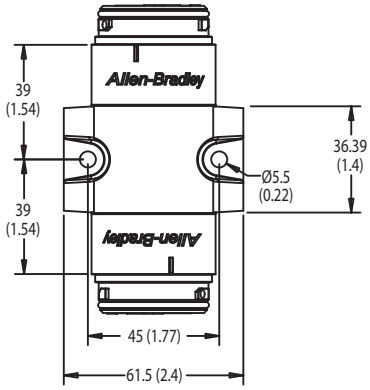
25 cm Base



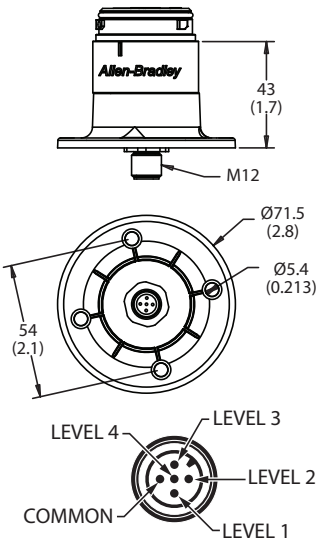
1/2 in. NPT Thread Base



Double-sided Base



Flange-style Base with M12 Micro Connector (Male)



5-Pin DC Micro Configuration

ALLEN BRADLEY 855P SIGNAL

Bulletin 855T— 70 mm Control Tower Stack Lights

Light Modules

Red Flashing Incandescent (Black Housing)

855T	–	B	10	FN	4
		a	b	c	d

a	
Housing Color	
Code	**Description**
B	Black
G	Gray

b	
Voltage	
Code	**Description**
00	0…250V AC/DC (use only with module code XN)
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Light Module Type	
Code	**Description**
XN	Steady no lamp(1)
DN	Steady incandescent
FN	Flashing incandescent
TL	Steady LED
GL	Flashing LED
RL	Rotating LED, simulated with fixed LEDs(2)
BR	Strobe

d	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Use only with Voltage Code 00. Accepts LED module or incandescent lamp.
(2) Only available with Voltage Codes 10 or 24, and Color Codes 3, 4, or 5.

ALLEN BRADLEY 855P SIGNAL

Combined Light Modules with Piezo Sounder

All single-circuit modules contain a selected light option with a sound device that operates simultaneously. All two-circuit modules contain two circuits which allows for separate operation of light or sound. The piezo-style sound modules can be switched to pulsing or continuous sound with a DIP switch. Additionally, the volume can be adjusted to either low (92 dB(A)) or high (107 dB(A)), via a DIP switch. UL Type 4/4X/13, IP65.

Combination Module

855T	–	B	10	DC	3
		a	b	c	d

a	
Housing Color	
Code	Description
B	Black
G	Gray

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Combined Module Type (1) (2)	
Code	Description
DC	Steady incandescent with sound
DD	Two-circuit steady incandescent with sound
FC	Flashing incandescent with sound
TC	Steady LED with sound
GC	Flashing LED with sound
BC	Strobe with sound

d	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) The single-circuit combined light/with sound module uses one circuit in a stack. It can be used with a maximum of four light modules and must be placed in the top position of a stack.
(2) The two-circuit combined light/with sound module uses two circuits in a stack. It can be used with a maximum of three light modules and must be placed in the top position of a stack.

Transducer-style Sound Modules

- UL Type 12, IP54
- Up to 15 tones
- Adjustable volume from 85...103 dB at 1 m (3.3 ft)
- Adjustable frequency and speed tone

Sound Module

855T	–	B	10	SA1
		a	b	c

a	
Housing Color	
Code	Description
B	Black
G	Gray

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	Description
SA1	Single-tone sound module with 13 different tones (1)
TA1	Dual-tone sound module with 15 sets of dual-tone combinations (2)

(1) This module uses one circuit in a stack. It can be used with maximum of any four light modules and must be placed on top of stack.
(2) This module uses two circuits in a stack. It can be used with a maximum of any three light modules and must be placed on top of stack.

ALLEN BRADLEY 855P SIGNAL

Piezo-style Sound Modules

- Single or dual circuit versions
- High/low volume selectable via DIP switch

855T – G 24 TA2
a b c

a	
Housing Color	
Code	**Description**
B	Black
G	Gray

b	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	**Description**
SA2	• Single-tone/single-circuit piezo-style module with continuous or pulsing tones that are modified by a DIP switch • Type 12 • Volume 97 dB or 85 dB @ 1 m (3.3 ft)
TA2	• Dual-tone/dual-circuit piezo-style module with continuous or pulsing tone that is modified by energizing one or two circuits of sound modules • Type 12 • Volume 97 dB or 85 dB @ 1 m (3.3 ft)
SA3	• Single-circuit piezo-style module with continuous or pulsing tones that are modified by a DIP switch • Type 4/4X/13 • Volume 107 dB or 92 dB @ 1 m (3.3 ft)
TA3	• Dual-circuit piezo-style module with continuous or pulsing tone that is modified by energizing one or two circuits of sound modules • Type 4/4X/13 • Volume 107 dB or 92 dB @ 1 m (3.3 ft)

ALLEN BRADLEY 855P SIGNAL

Standard and DeviceNet™ Stack Light Bases

Surface-mount Base with Cap

Vertical-mount Base with Cap

80 cm Powder-coated Stainless Steel Pole-mount Base with Cap

40 cm Powder-coated Stainless Steel Pole-mount Base

25 cm Quick-release Base

10 cm Pole-mount Base

Surface-mount, Conduit-mount Base with Stranded Wire Cable

10 cm Pole-mount Base with Micro-connect Cable and Cap

Vertical-mount Base with Micro-connect Cable and Cap

855T	–	DL1	B	PM10	C
		a	b	c	c

a	
Network Connection Type	
Code	**Description**
Blank	No network connection
DM1	DeviceNet micro-connect with 1 m (3.3 ft) cable (1)
DS2	DeviceNet stranded wire connect with 2 m (6.6 ft) cable
DL1	DeviceNet mini-connect with 1 m (3.3 ft) cable

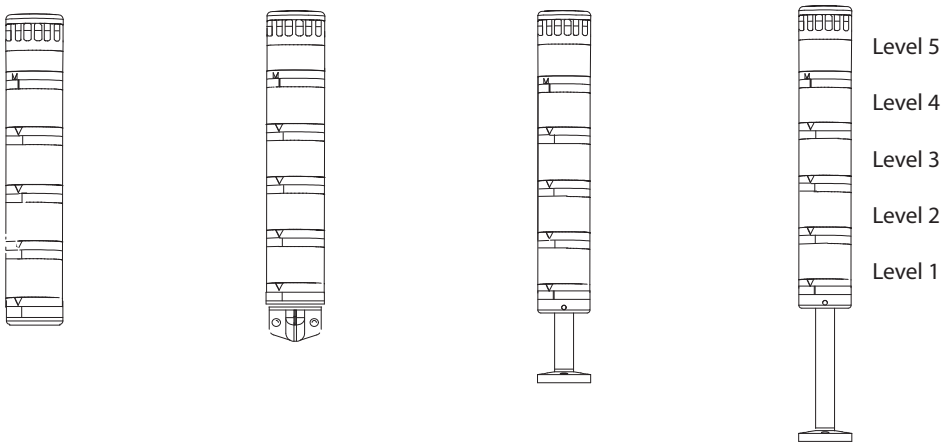
b	
Housing Color	
Code	**Description**
B	Black
G	Gray

c	
Base Type	
Code	**Description**
CB	Surface mount—1/2 in. NPT conduit mount
SB	Surface mount — PG16 conduit mount
RB	Surface mount — M20 x 1.5 conduit mount
VM	Vertical mount
TM	25 mm diameter tube mount
PM10	10 cm aluminum pole mount base
PM25	25 cm aluminum pole mount base
PM40	40 cm aluminum pole mount base
SPM10	10 cm stainless steel pole mount (2)
SPM25	25 cm stainless steel pole mount (2)
SPM40	40 cm stainless steel pole mount (2)
SPM60	60 cm stainless steel pole mount (2)
SPM80	80 cm stainless steel pole mount (2)
MM10	10 cm quick release base
MM25	25 cm quick release base
MM40	40 cm quick release base

d	
Cap Option	
Code	**Description**
Blank	No cap
C	Cap included

(1) DeviceNet bases DL1, DM1, or DS2 can only be used with 24V AC/DC and they are only available with Base Types CB, SB, VM, TM, PM10, or PM25.
(2) Stainless Steel tube is powder-coated in black.

Pre-configured Control Tower Lights, 1…5 Modules



Surface Mount | Vertical Mount | 10 cm Pole Mount | 25 cm Pole Mount

855	TS	–	DL1	B	24	Y	4	L	5	B	3	F	7	Y	6
	a		b	c	d	e	f	e	f	e	f	e	f	e	f
						(Level 1, e+f)		(Level 2, e+f)		(Level 3, e+f)		(Level 4, e+f)		(Level 5, e+f)	

a	
Base Type	
Code	**Description**
TC	Surface mount 1/2 in. NPT conduit
TS	Surface mount PG16 conduit
TV	Vertical mount
TP	10 cm pole mount
TE	25 cm pole mount
TM	25 mm diameter tube mount

b	
Network Options (1)	
Code	**Description**
Blank	Standard
DL1	DeviceNet mini-connect with 1 m (3.3 ft) cable
DM1	DeviceNet micro-connect with 1 m (3.3 ft) cable
DS2	DeviceNet stranded wire connect with 2 m (6.6 ft) cable

c	
Housing Color	
Code	**Description**
B	Black
G	Gray

(1) DeviceNet bases DL1, DM1, or DS2 can only be used with 24V AC/DC.

d	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

e	
Module Type	
Code	**Description**
D	Steady incandescent
F	Flashing incandescent
Y	Steady LED
L	Flashing LED
B	Strobe
T	Steady incandescent with sound (1)
H	Flashing incandescent with sound (1)
J	Dual-circuit steady incandescent with sound
E	Steady LED with sound (1)
G	Flashing LED with sound (1)
Z	Strobe with sound (1)
A	Transducer single-circuit sounder UL Type 12, IP54 (1)
W	Transducer dual-circuit sounder UL Type 12, IP54 (1)
P	Single-circuit piezo alarm
Q	Dual-circuit piezo alarm

f	
Lens Color/Sound	
Code	**Description**
1	Sound module (2)
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Only one sound module or light module/with sound can be assembled per stack. These modules must always be placed in the top position.
(2) Sound module from Table f can only be selected with single-tone or two-tone module types from Table e.

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855T)

Table 83 - Mechanical

Attribute			Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
			Shock [G]	Vibration [G]
Standard Bases	Surface Mount Base or 10 cm Aluminum Pole Base	1 module stack	150	5
		3 module stack	45	1.5
		5 module stack	35	0.75
	Vertical Base or 25 cm Aluminum Pole Base	1 module stack	95	3.5
		3 module stack	30	1.25
		5 module stack	20	0.5
DeviceNet Bases	Surface Mount Base or 10 cm Aluminum Pole Base	1 module stack	50	5
		3 module stack	45	1.5
		5 module stack	35	0.75
	Vertical Base or 25 cm Aluminum Pole Base	1 module stack	50	3.5
		3 module stack	30	1.25
		5 module stack	20	0.5
Recommended Wire Sizes			0.5…2.5 mm^2 (22…14 AWG)	
Recommended Terminal Torque			0.8 N•m (7 lb•in)	

Table 84 - Environmental

Attribute		Value
Ingress Ratings	Light Modules with Cap and combined Light/Sound Modules	IP65/UL Type 4/4X/13
	Sound Modules (SA1, SA2, TA1, TA2)	IP54/UL Type 12
	Sound Modules (SA3, TA3)	IP65/UL Type 4/4X/13
	Surface, Vertical, Tube Mount, and On-Machine™ Bases	IP65/UL Type 4/4X/13
	Pole Mount Bases (Aluminum)	IP65/UL Type 4/13
	Pole Mount Bases (Stainless Steel)	IP65/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+70 °C (-13…+158 °F)
	Storage	-40…+85 °C (-40…+185 °F)

Table 85 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings, Lenses, Lamp Sockets	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Pole (for stainless steel assembly)	Powder-coated stainless steel
Pole Base Footing (for stainless steel pole base)	Zinc
Insulation Sleeve (for pole insulation)	Polyolefin
Surface and Vertical Mount Pole Connection Box and Magnetic Mount Housing	Polycarbonate
Mounting Screw Washers	Polypropylene
DeviceNet Base Grommet	Neoprene
DeviceNet Cable Jackets	CPR Chlorinated Polyethylene
DeviceNet Cable Connectors	Santoprene

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Table 86 - Light Output

Device		Light Output			
		12V AC/DC	24V AC/DC	120V ACC	240V AC
Steady Incandescent		0.5 MSCP 6.3 Lumens	2.5 MSCP 31.4 Lumens	3.0 MSCP 37.7 Lumens	0.49 MSCP 6.2 Lumens
Flashing Incandescent					
Strobe		3 J per lamp			
Steady/Flashing Socket Mount LED	Red	900…2240 mcd			
	Green	900…1800 mcd			
	Amber	1400…3550 mcd			
	Blue	224…560 mcd			
	White and Yellow	900…1800 mcd			

Table 87 - Operating Voltage

Device	Operating Voltage			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Light modules and sound modules	12V AC/DC (±10%)	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 88 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Incandescent Modules[1] [2]	8000 hr	7000 hr	3000 hr	1600 hr
LED Modules	100,000 hr			
Strobe Modules	15,000 hr			
Sound modules	20,000 hr			

(1) First failures at about 35% of average life. Severe vibration can reduce life to 44% of average life.
(2) Flashing applications can reduce life to 50% of average life.

Table 89 - Current Consumption

Device		Current Consumption [mA]			
		12V AC/DC	24V AC/DC	120V AC	240V AC
Light only modules	Steady Incandescent	208	271	58	23
	Steady or Flashing LED	42	29	21	20
	Strobe	240	170	50	35
Light modules with sound	Steady Incandescent/with Sound	218	281	78	43
	Flashing Incandescent/with Sound	218	281	78	43
	Steady or Flashing LED/with Sound (Red, Amber, Yellow)	100	62	22.5	20
	Steady or Flashing LED/with Sound (Green, Blue, White)	250	180	70	55
	Strobe/with Sound	250	180	70	55
Transducer Style Sound Modules	Single and Two Circuit Modules	30	65	110V/50 Hz 120V/60 Hz 60 mA	230V/50 Hz 240V/60 Hz 60 mA
Piezo Style Sound Modules	Single and Two Circuit Modules	27	45	43	40
DeviceNet Bases		—	70	—	—

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Table 90 - Flashing and Tone Frequency

Attribute	Value
Flashing Frequency (Light Only Modules)	
Flashing Incandescent Modules	12V module approximately 1.5 Hz 24V, 120V, and 240V modules approximately 2 Hz Time ON/Time OFF = 1:1
Flashing LED Modules	Approximately 1.5 Hz; Time On/Time OFF = 1:1
Strobe Modules	Approximately 2 Hz (flash duration 1/50,000 second)
Flashing and Tone Frequency (Light Modules/with Sound Set at Continuous Tone)	
Tone Frequency	Preset at 2400 Hz or 3300 Hz
Flashing Incandescent/ with sound	12V module approximately 1.5 Hz 24V, 120V, and 240V modules approximately 1.6 Hz
Flashing LED/ with sound	Flashing frequency approximately 1.5 Hz
Strobe/with Sound	Flashing frequency approximately 1.4 Hz
Flashing and Tone Pulsing Frequencies (Light Modules/with Sound Set at Pulsing Tone)	
Tone Frequency	Preset at 2400 Hz or 3300 Hz
Steady Incandescent/ with sound	Sound Pulsing Frequency — 1.5 Hz
Flashing Incandescent/ with sound	Flashing and Pulsing Frequency the same for 12V module approximately 1.5 Hz, for 24V, 120V, and 240V modules approximately 1.6 Hz
Steady LED/ with sound	Sound Pulsing Frequency — 1.5 Hz
Flashing LED/ with sound	Flashing and Pulsing Frequency the same at 1.5 Hz
Strobe/with Sound	Flashing and Pulsing Frequency the same at 1.4 Hz

Table 91 - Decibel Rating (Sound Modules) (1)

Device	Decibel Rating
Selectable Tone Sound Module (SA1, TA1)	Maximum volume ranges from 64…103 dB(A) (volume adjustable) Based on tone that is selected for all settings except signal horn, which has a maximum of 80 dB(A)
Piezo Sound Module (SA2, TA2)	High 97 dB/Low 85 dB, selectable via DIP switch
Piezo Sound Module (SA3, TA3)	High 107 dB/Low 95 dB, selectable via DIP switch
Piezo Light Modules and Light Modules/with Sound (set at continuous or pulsing tone)	High 107 dB/Low 95 dB, selectable via DIP switch

(1) All dB(A) ratings determined at a distance of 1 meter from sound module.

Table 92 - Leakage Current Impact

All light modules, sound modules, and light/sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation. Some light and light modules with sound may not turn off completely when connected to solid-state outputs that emit leakage current. The following modules can be affected by an output module emitting a maximum of 3 mA. A dry contact can be used to reduce the effect of leakage current.	
12V AC/DC, 24V AC/DC, 120V AC, 240V AC	All light/sound combination modules

Table 93 - DeviceNet Bases

Attribute	Value
Baud Rate Options	125K, 250K, 500K, Autobaud

Standards Compliance

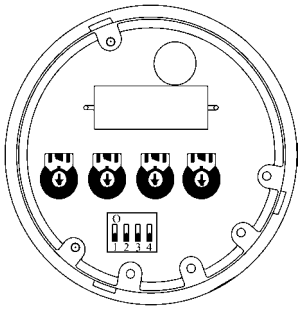
- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

Certifications

- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

ALLEN BRADLEY 855P SIGNAL

Transducer Style Single-circuit Sound Module (SA1)



Adjustable Sound Settings

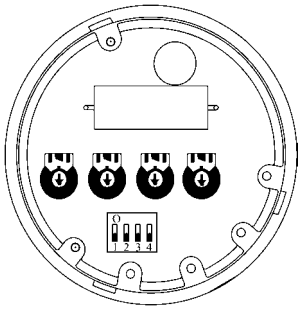
Rotated View of Sound Settings

DIP Switch Position	Tone Description		Speed [Hz]	Upper Frequency [Hz]	Lower Frequency [Hz]	Volume [dB(A)]
ON 1 2 3 4	Triangle Tone		7…22	1500	500	80…100
ON 1 2 3 4	Continuous Tone		—	(1)	500	83…100
ON 1 2 3 4	Interrupted Tone		0.5…1.5	(1)	500…1500	83…103
ON 1 2 3 4	Changing Tone		0.5…1.5	500…1500	500…1500	83…103
ON 1 2 3 4	Saw Tooth Tone Ascending		0.5…1.5	500…1500	500…1500	83…103
ON 1 2 3 4	Saw Tooth Tone Descending		0.5…1.5	500…1500	500…1500	83…103
ON 1 2 3 4	Sine-wave Tone		0.5…1.5	500…1500	500…1500	82…102
ON 1 2 3 4	DIN-Emergency Signal	DIN 33404	1	1200	500	82…102
ON 1 2 3 4	Siren (Non-Repeating)		2…4 s	1500	500	83…103
ON 1 2 3 4	Signal Horn Continuous Tone		—	(1)	100…350	64…80
ON 1 2 3 4	Three-Tone Gong		2…4 s	660 550 440		76…95
ON 1 2 3 4	Two-Tone Gong		2…4 s	550 440		75…93
ON 1 2 3 4	Gong		1…3 s	(1)	500…1500	75…93

(1) Set to maximum (+).

ALLEN BRADLEY 855P SIGNAL

Transducer Style Dual-circuit Sound Module (TA1)



Adjustable Sound Settings

Rotated View of Sound Settings

DIP Switch Position	Tone A		Tone B	
ON 1 2 3 4	Triangle Tone		Continuous Tone	
ON 1 2 3 4	Continuous Tone		Changing Tone	
ON 1 2 3 4	Continuous Tone		Interrupted Tone	
ON 1 2 3 4	Interrupted Tone		Three-Tone Gong	
ON 1 2 3 4	Interrupted Tone		Siren (Non- Repeating)	
ON 1 2 3 4	Changing Tone		DIN-Emergency Signal	DIN 33404
ON 1 2 3 4	Saw Tooth Tone Ascending		Continuous Tone	
ON 1 2 3 4	Saw Tooth Tone Descending		Interrupted Tone	
ON 1 2 3 4	Sine-wave Tone		DIN-Emergency Signal	DIN 33404
ON 1 2 3 4	DIN-Emergency Signal	DIN 33404	Three-Tone Gong	
ON 1 2 3 4	Siren (Non- Repeating)		Triangle Tone	
ON 1 2 3 4	Signal Horn Continuous Tone		Continuous Tone	
ON 1 2 3 4	Three-Tone Gong		Sine-wave Tone	
ON 1 2 3 4	Two-Tone Gong		Two-Tone Gong (Non-Repeating)	
ON 1 2 3 4	Gong		Continuous Tone	

ALLEN BRADLEY 855P SIGNAL

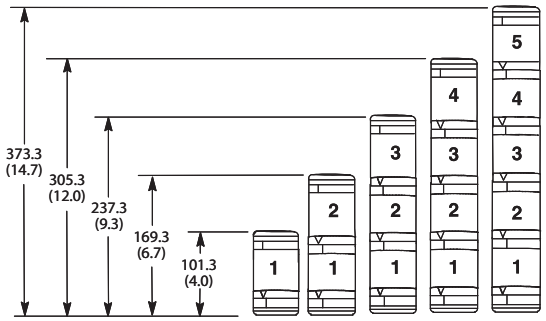
Approximate Dimensions (Bulletin 855T)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

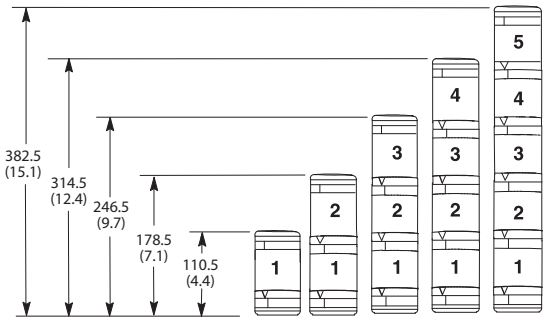
Assembled Control Tower Lights — Light Modules Only or Light Modules with Sound Module on Top Position

If a combined light/sound module is used, add 21.5 mm (0.8 in.) to vertical dimensions.

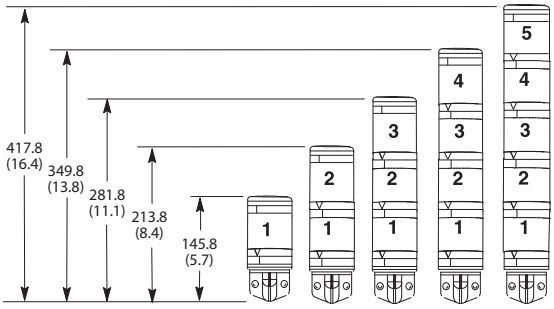
Surface Mount Base (SB and CB)



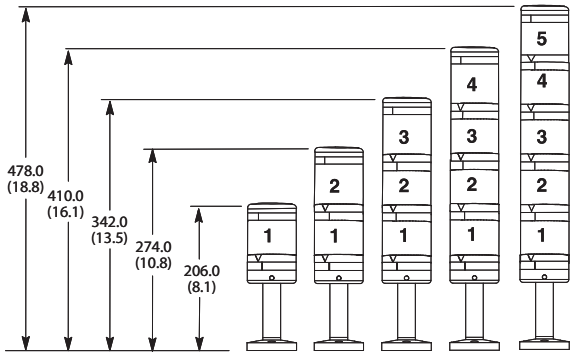
Tube Mount Base (TM)



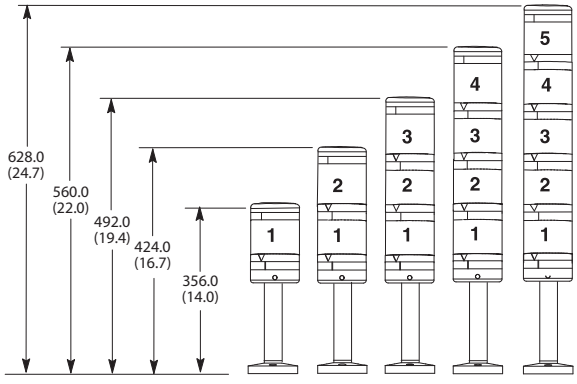
Vertical-mount Base (VM)



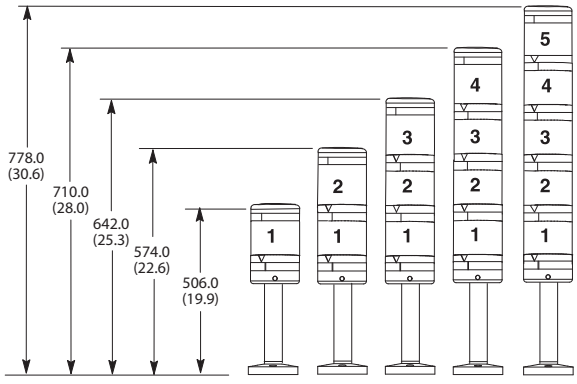
10 cm Pole-mount Base (PM10, SPM25)



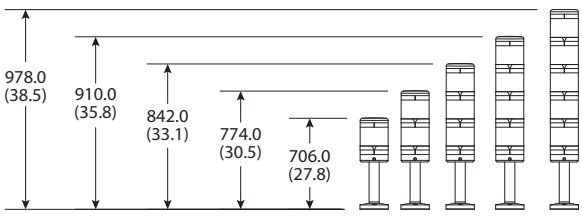
25 cm Pole-mount Base (PM25, SPM25)



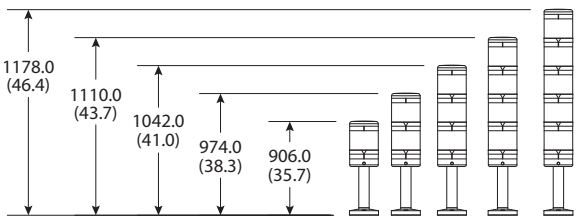
40 cm Pole-mount Base (PM40, SPM40)



60 cm Pole-mount Base (SPM60)



80 cm Pole-mount Base (SPM80)

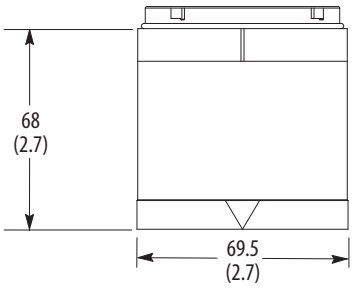


ALLEN BRADLEY 855P SIGNAL

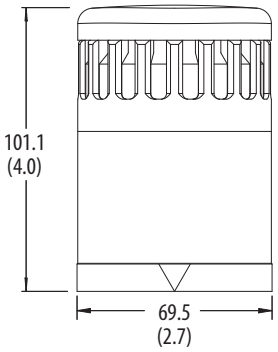
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Component and Accessory Dimensions

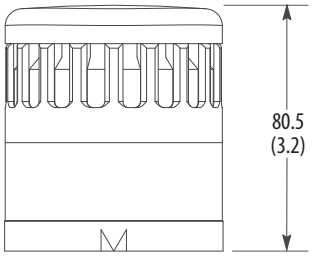
Light Module



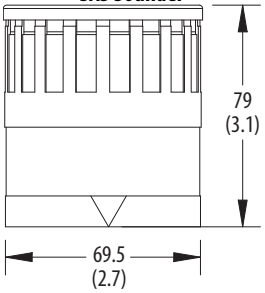
Combined Light/Sound Module



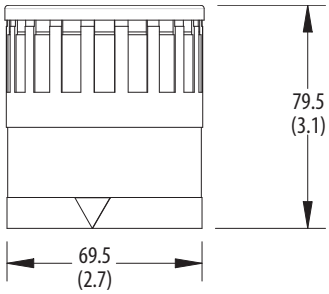
Transducer Style Sound Module



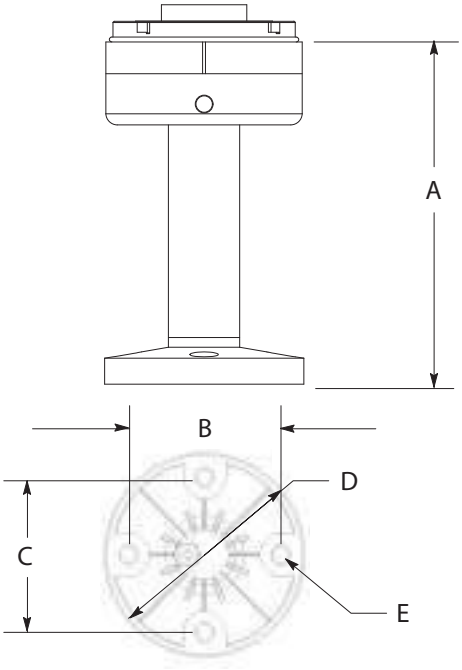
SA3 Sounder



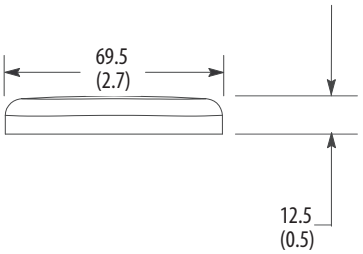
TA3 Sounder



Pole-mount Base (Aluminum or Stainless Steel)



Cap

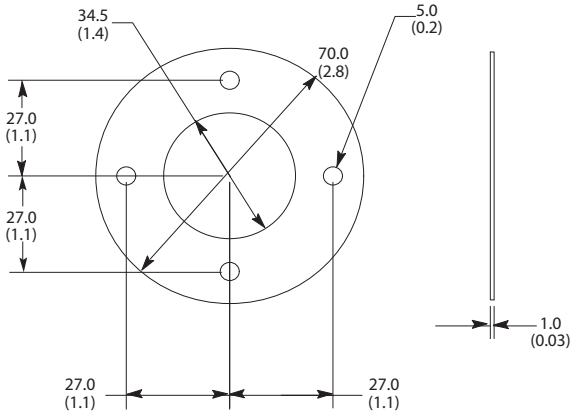


Base Size [cm]	mm (in.)				
	A	B	C	D	E
10	124.5 (4.9)	54.0 (2.1)	54.0 (2.1)	70.0 (2.8)	5.0 (0.2)
25	274.5 (10.8)				
40	424.5 (16.7)				
60	624.5 (24.6)				
80	824.5 (32.5)				

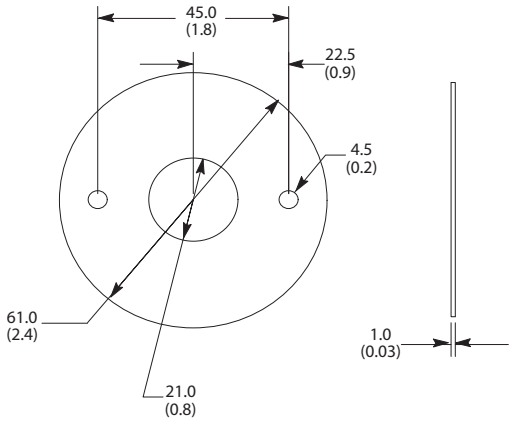
ALLEN BRADLEY 855P SIGNAL

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

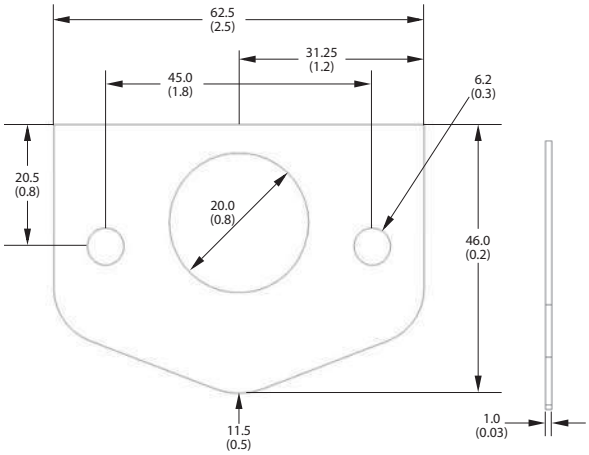
Pole-mount Gasket



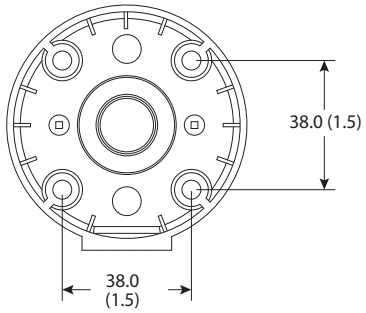
Surface-mount Gasket

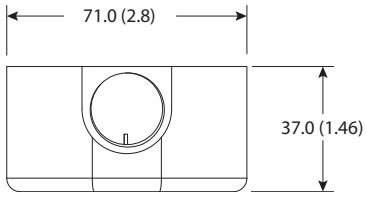


Vertical-mount Gasket

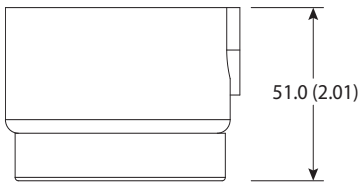


Standard Pole Connection Box

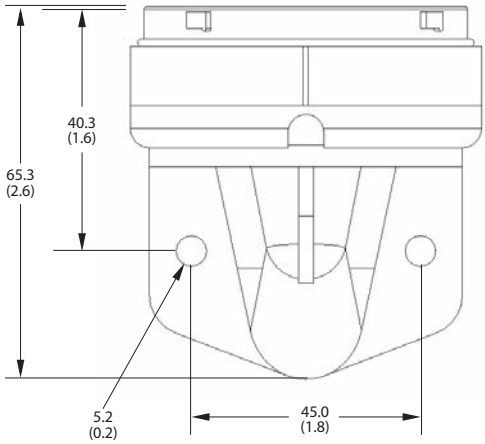




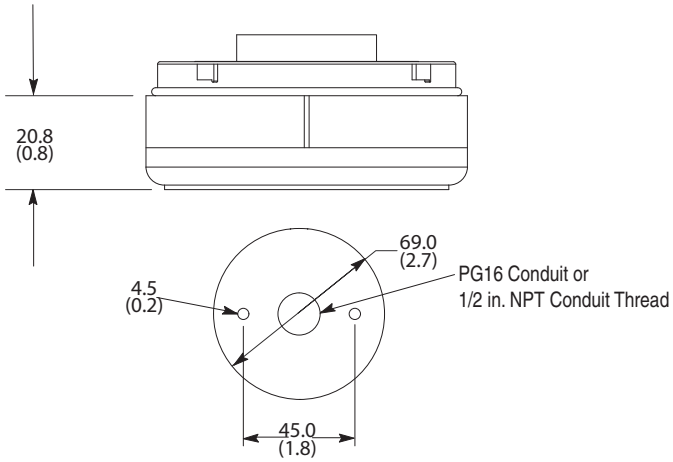
Magnetic Pole Connection Box



Vertical-mount Base



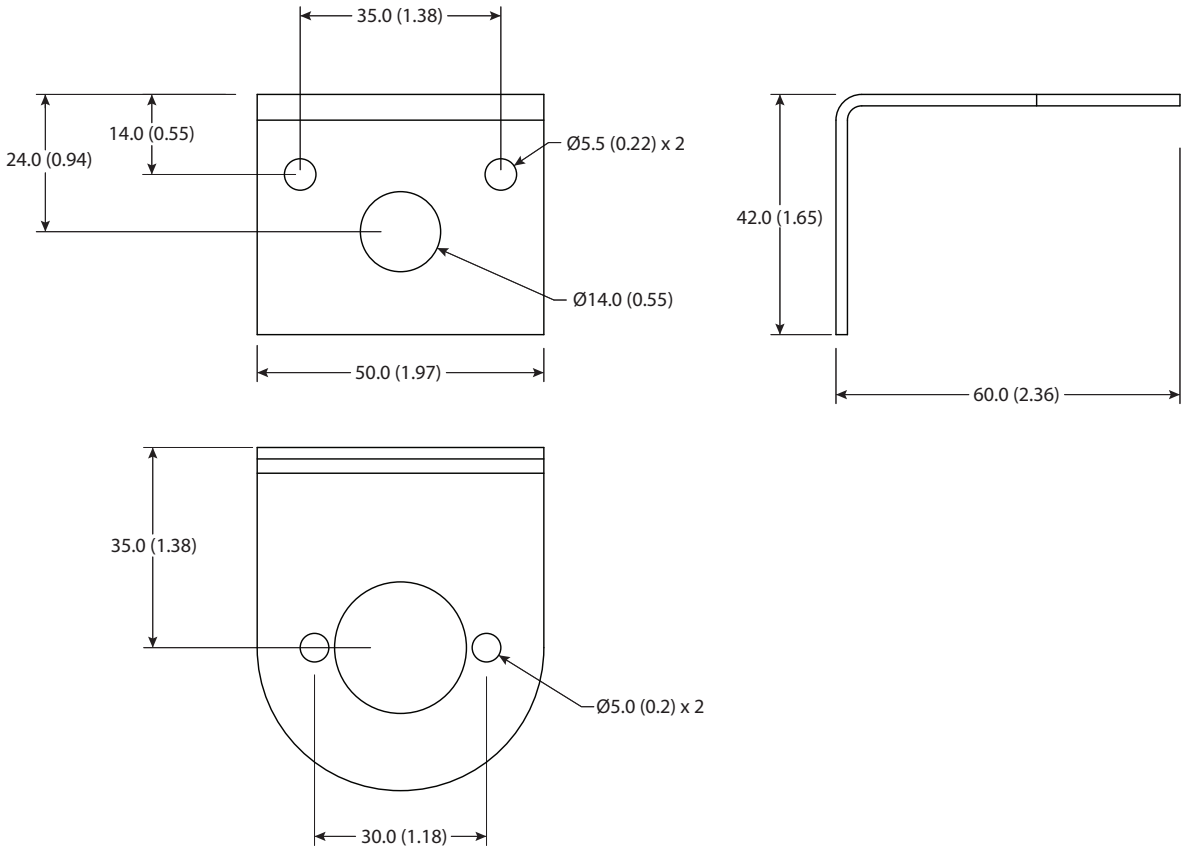
Surface-mount Base 855T-BSB or 855T-BCB



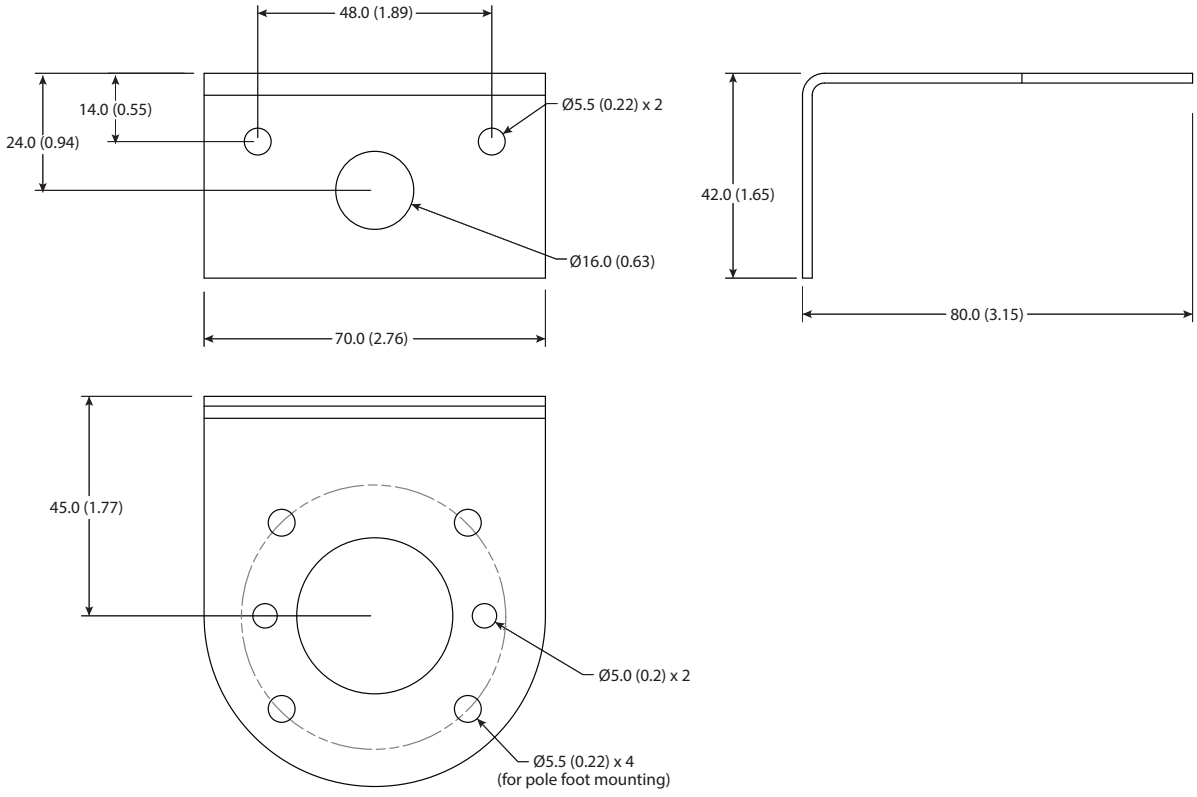
ALLEN BRADLEY 855P SIGNAL

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Catalog Number 855E-AVM Vertical-mount Bracket

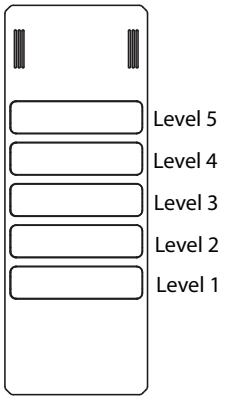


Catalog Number 855T-AVM Vertical Mount Bracket



Bulletin 855W—Wall Mount Signal Light

Pre-assembled Wall Mount Signal Lights, 2…5 Light Levels



855W		–	G	10	Y	7	Y	6	Y	3	Y	5	L	4	P1
	a		b	c	d	e	d	e	d	e	d	e	d	e	f
					(Level 1, d+e)		(Level 2, d+e)		(Level 3, d+e)		(Level 4, d+e)		(Level 5, d+e)		

a	
Network Option	
Code	**Description**
Blank	No network option

b	
Housing Color	
Code	**Description**
C	Chrome plated
G	Gray

c	
Voltage	
Code	**Description**
24	24V AC/DC
10	120V AC
20	240V AC

d	
Module Type	
Code	**Description**
Y	Steady LED
L	Flashing LED

e	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

f	
Sound	
Code	**Description**
Blank	No sound
P1	Piezo sounder (continuous/pulsing)

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855W)

Table 94 - Environmental

Attribute		Value
Ingress Ratings	Light/sound modules	IP65/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+50 °C (-13…+122 °F)
	Storage	-25…+85 °C (-13…+185 °F)

Table 95 - Materials

Part	Material
Lenses and Base	Polycarbonate (94V-0)
Cover	ABS
Rubber Seals and Gaskets	NBR 70

Table 96 - Operating Voltage

Device	Operating Voltage		
	24V AC/DC	120V AC	240V AC
Light modules and sound modules	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 97 - Current Consumption

Device	Current Consumption [mA]		
	24V AC/DC	120V AC	240V AC
Steady or Flashing LED	43 mA per channel, max	33 mA per channel, max	30 mA per channel, max
Piezo sounder	62	24	24

Table 98 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

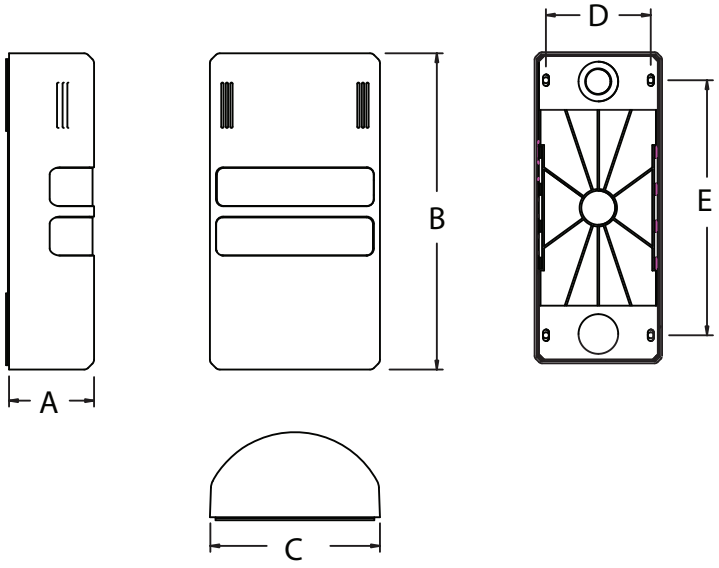
Table 99 - Mechanical

Attribute		Value
Design Life Rating (Average life under static, no vibration conditions)	Steady or Flashing LED	30,000…50,000 hr
	Piezo sounder	> 10,000 hr
Frequency	Flashing LED	2 Hz
Decibel Rating	Piezo sounder	90 dB(A) (potentiometer adjustable down to 70 dB(A)) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module

ALLEN BRADLEY 855P SIGNAL

Approximate Dimensions (Bulletin 855W)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.



Number of Levels	Dimension A [mm (in.)]	Dimension B [mm (in.)]	Dimension C [mm (in.)]	Dimension D [mm (in.)]	Dimension E [mm (in.)]
2	45 (1.77)	167.4 (6.59)	90 (3.54)	74 (2.91)	125 (4.92)
3		193.5 (7.62)			150 (5.91)
4		219.6 (8.65)			180 (7.09)
5		245.7 (9.67)			210 (8.27)

ALLEN BRADLEY 855P SIGNAL

Bulletin 855X — Hazardous Location Horns, Beacons, and Loudspeakers

Alarm Horn Sounders

855XH	–	BN	D30	B
		a	b	c

a	
Product Type	
Code	**Description**
BN	1/2 in. NPT conduit entrance, black housing

b	
Voltage	
Code	**Description**
D30	10...30V DC
D48	48V DC
A10	115...120V AC
A20	220...230V AC

c	
Horn Type	
Code	**Description**
A	110 dB @ 1 m (3.3 ft), 45 tone, 3 stage
B	117 dB @ 1 m (3.3 ft), 45 tone, 3 stage

Xenon Strobe Beacons

855XB	–	BN	A10	B	4
		a	b	c	d

a	
Product Type	
Code	**Description**
BN	1/2 in. NPT conduit entrance, black housing

b	
Voltage	
Code	**Description**
D24	24V DC
D48	48V DC
A10	115...120V AC
A20	220...230V AC

c	
Beacon Type	
Code	**Description**
A	Xenon strobe - 5 J, 1 Hz
B	Xenon strobe - 10 J, 1 Hz

c	
Lens Color	
Code	**Description**
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

ALLEN BRADLEY 855P SIGNAL

Combined Horn Sounder and Strobe Beacons

855XC	–	BN	A10	A	4
		a	b	c	d

a	
Product Type	
Code	Description
BN	1/2 in. NPT conduit entrance, black housing

b	
Voltage	
Code	Description
D24	24V DC
D48	48V DC
A10	115...120V AC
A20	220...230V AC

c	
Beacon Type	
Code	Description
A	Xenon strobe - 5 J, 110 dB @ 1 m (3.3 ft), 45 tones, 3 stages

c	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

Public Address Loudspeakers

855XL	–	BN	70	A
		a	b	c

a	
Product Type	
Code	Description
BN	1/2 in. NPT conduit entrance, black housing

b	
Voltage	
Code	Description
70	70V line (tappings: 15 W, 7.5 W, 3 W, 1 W)
100	100V line (tappings: 15 W, 7.5 W, 3 W, 1 W)
8R	8 Ω
16R	16 Ω

c	
Beacon Type	
Code	Description
A	15 W RMS

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855X)

Table 100 - Mechanical

Attribute	855XH Horn	855XB Beacon	855XC Horn/Beacon Combination	855XL Public Address Loudspeaker
Shock	30 G Peak			
Vibration	2 G Peak			

Table 101 - Environmental

Attribute		855XH Horn	855XB Beacon	855XC Horn/Beacon Combination	855XL Public Address Loudspeaker
Ingress Ratings		IP66/67 and UL Type 4/4X13, IP 66/67			
Temperature Ranges	Operating	-20…+55 °C (-4…+131 °F)			
	Storage	-20…+75 °C (-4…+167 °F)			

Table 102 - Materials

Part	855XH Horn	855XB Beacon	855XC Horn/Beacon Combination	855XL Public Address Loudspeaker
Covers	PPS glass-filled plastic			
Bases	PPS glass-filled plastic			
Mounting Bracket	Stainless Steel 304 (A2)			
Gaskets	Viton®			
Beacon Lens	Glass			
Beacon Housing	PPS glass-filled plastic			

Table 103 - Performance Ratings

Attribute		855XH Horn	855XB Beacon	855XC Horn/Beacon Combination	855XL Public Address Loudspeaker
Sound Output	dB @ 1 meter	110 or 117	—	110	—
Xenon Lamp Rating	[J]	—	5 or 10	5	—
Flashing Frequency	[Hz]	—	1	1	—

Table 104 - Voltage and Current Consumption

Device	Input Voltage	12V AC/DC	24V AC/DC	48V DC (I/P Volts, Max)	10V AC, 50/60 Hz	230V AC, 50/60 Hz
855XH Horn 110 dB @ 1 m (3.3 ft)	DC Units: 10…30V or 48V	—	284 mA (30V)	146 mA (58V)	—	—
	AC Units: 120V or 230V, 50/60 Hz	—	—	—	104 mA (132V)	54 mA (253V)
855XH Horn 117 dB @ 1 m (3.3 ft)	DC Units: 10…30V or 48V	—	280 mA (30V)	215 mA (58V)	—	—
	AC Units: 120V or 230V, 50/60 Hz	—	—	—	142 mA (132V)	76 mA (253V)
855XB Beacon, 5 J	DC Units: 12, 24, or 48V	520 mA (15V)	275 mA (30V)	145 mA (58V)	—	—
	AC Units: 120V or 230V, 50/60 Hz	—	—	—	80 mA (132V)	30 mA (253V)
855XB Beacon, 10 J	DC Units: 24V or 48V	—	560 mA (30V)	260 mA (58V)	—	—
	AC Units: 120V or 230V, 50/60 Hz	—	—	—	185 mA (132V)	107 mA (253V)
855XC Combined Horn (110 dB @ 1 m (3.3 ft)) and Strobe Beacon (5 J)	Horn Section DC Units: 24V or 48V	—	284 mA (30V)	146 mA (58V)	—	—
	Horn Section AC Units: 120V or 230V, 50/60 Hz	—	—	—	104 mA (132V)	54 mA (253V)
	Beacon Section DC Units: 24V or 48V	—	275 mA (30V)	145 mA (58V)	—	—
	Beacon Section AC Units: 120V or 230V, 50/60 Hz	—	—	—	80 mA (132V)	30 mA (253V)

ALLEN BRADLEY 855P SIGNAL

Table 105 - Operating Ratings

Device	Impedance	Input	Wattage	I/P Volts, Max
855XL PA Loudspeaker (1)	8 Ω	8 Ω	15 W	10.095V
	16 Ω	16 Ω	15 W	15.49V
	100V Line	100V Line	15 W	100V
	70V Line	70V Line	15 W	70V

(1) Power Amplifier Selection: It is important that loudspeakers are connected to power amplifiers that have outputs compatible to the type of loudspeaker being used. Loudspeakers with a 70V or 100V line-matching transformer fitted must be connected to a power amplifier with a 70V or 100V line output. Low impedance 8 Ω or 16 Ω loudspeakers must be connected to amplifiers with a suitable low-impedance output.

Table 106 - Temperature Ratings

Device	Hazardous Location	Code (Operating Temperature, Max) @ 55 °C (131 °F) Ambient	Code (Operating Temperature, Max) @ 40 °C (104 °F) Ambient
855XB- 5 J Beacon	Class I, Division 2, Groups A, B, C, D	T2D (215 °C [419 °F])	T3 (200 °C [392 °F])
	Class II, Division 2, Groups F and G	T5 (100 °C [212 °F])	T6 (85 °C [185 °F])
	Class III, Divisions 1 and 2	T5 (100 °C [212 °F])	T6 (85 °C [185 °F])
855XB- 10 J Beacon	Class I, Division 2, Groups A, B, C, D	T2A (280 °C [536 °F])	—
	Class II, Division 2, Groups F and G	T4A (120 °C [248 °F])	T5 (100 °C [212 °F])
	Class III, Divisions 1 and 2	T4A (120 °C [248 °F])	T5 (100 °C [212 °F])
855XH- 110 dB Sounder	Class I, Division 2, Groups A, B, C, D	T3C (160 °C [320 °F])	T4 (135 °C [275 °F])
	Class II, Division 2, Groups F and G	T6 (85 °C [185 °F])	—
	Class III, Divisions 1 and 2	T6 (85 °C [185 °F])	—
855XH- 117 dB Sounder	Class I, Division 2, Groups A, B, C, D	T3C (160 °C [320 °F])	T4 (135 °C [275 °F])
	Class II, Division 2, Groups F and G	T6 (85 °C [185 °F])	—
	Class III, Divisions 1 and 2	T6 (85 °C [185 °F])	—
855XC- Sound/Strobe Combination	Class I, Division 2, Groups A, B, C, D	T2D (215 °C [419 °F])	T3 (200 °C [392 °F])
	Class II, Division 2, Groups F and G	T5 (100 °C [212 °F])	T6 (85 °C [185 °F])
	Class III, Divisions 1 and 2	T5 (100 °C [212 °F])	T6 (85 °C [185 °F])
855XL- Loudspeaker	Class I, Division 2, Groups A, B, C, D	T4 (135 °C [275 °F])	T4A (120 °C [248 °F])
	Class II, Division 2, Groups F and G	T6 (85 °C [185 °F])	—
	Class III, Divisions 1 and 2	T6 (85 °C [185 °F])	—

Standards Compliance

- UL 508
- UL 1604
- CSA C22.2 No. 14
- CSA C22.2 No. 213
- EN/IEC 60947-1
- EN/IEC 60947-5-1

Certifications

- CE Marked
- cULus Listed (File No. E305538 for Beacons and File No. E305533 for Horns and Combination units) for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F & G, and Class III, Division 1 & 2

ALLEN BRADLEY 855P SIGNAL

Tone Selection Table for 855XH and 855XC Units

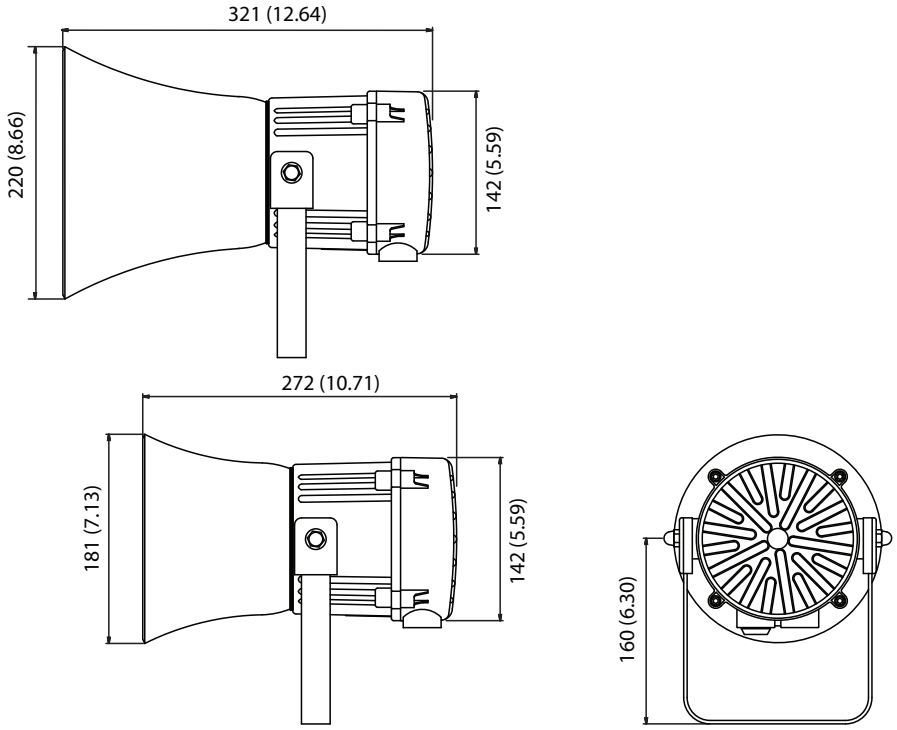
Stage 1	Frequency Description	Switch						Stage 2	Stage 3
		1	2	3	4	5	6		
1	340 Hz, Continuous	0	0	0	0	0	0	Tone 2	Tone 5
2	800/1000 Hz @ 0.25 s, Alternating	1	0	0	0	0	0	Tone 17	Tone 5
3	500/1200 Hz @ 0.3 Hz s, Slow Whoop	0	1	0	0	0	0	Tone 2	Tone 5
4	800/1000 Hz @ 1 Hz, Sweeping	1	1	0	0	0	0	Tone 6	Tone 5
5	2400 Hz, Continuous	0	0	1	0	0	0	Tone 3	Tone 20
6	2400/2900 Hz @ 7 Hz, Sweeping	1	0	1	0	0	0	Tone 7	Tone 5
7	2400/2900 Hz @ 1 Hz, Sweeping	0	1	1	0	0	0	Tone 10	Tone 5
8	500/1200/500 Hz @ 0.3 Hz, Sweeping	1	1	1	0	0	0	Tone 2	Tone 5
9	1200/500 Hz @ 1 Hz, - DIN *PFEER P.T.A.P.*	0	0	0	1	0	0	Tone 15	Tone 2
10	2400/2900 Hz @ 2 Hz, Alternating	1	0	0	1	0	0	Tone 7	Tone 5
11	1000 Hz @ 1 Hz, Intermittent	0	1	0	1	0	0	Tone 2	Tone 5
12	800/1000 Hz @ 0.875 Hz, Alternating	1	1	0	1	0	0	Tone 4	Tone 5
13	2400 Hz @ 1 Hz, Intermittent	0	0	1	1	0	0	Tone 15	Tone 5
14	800 Hz, 0.25 s ON, 1 s OFF, Intermittent	1	0	1	1	0	0	Tone 4	Tone 5
15	800 Hz, Continuous	0	1	1	1	0	0	Tone 18	Tone 5
16	660 Hz, 150 ms ON, 150 ms OFF, Intermittent	1	1	1	1	0	0	Tone 2	Tone 27
17	544 Hz (100 ms)/440 Hz (400 ms), - NF S 32-001	0	0	0	0	1	0	Tone 2	Tone 5
18	660 Hz, 1.8 s ON, 1.8 s OFF, Intermittent	1	0	0	0	1	0	Tone 2	Tone 5
19	1.4 kHz…1.6 kHz 1 s, 1.6 kHz…1.4 kHz 0.5 s, - NFC48-265	0	1	0	0	1	0	Tone 2	Tone 5
20	660 Hz, Continuous	1	1	0	0	1	0	Tone 2	Tone 5
21	554 Hz/440 Hz @ 1 Hz, Alternating	0	0	1	0	1	0	Tone 2	Tone 5
22	544 Hz @ 0.875 s, Intermittent	1	0	1	0	1	0	Tone 2	Tone 5
23	800 Hz @ 2 Hz, Intermittent	0	1	1	0	1	0	Tone 6	Tone 5
24	800/1000 Hz @ 50 Hz, Sweeping	1	1	1	0	1	0	Tone 29	Tone 5
25	2400/2900 Hz @ 50 Hz, Sweeping	0	0	0	1	1	0	Tone 29	Tone 5
26	Bell	1	0	0	1	1	0	Tone 2	Tone 15
27	554 Hz, Continuous	0	1	0	1	1	0	Tone 26	Tone 5
28	440 Hz, Continuous	1	1	0	1	1	0	Tone 2	Tone 5
29	800/1000 Hz @ 7 Hz, Sweeping	0	0	1	1	1	0	Tone 7	Tone 5
30	300 Hz, Continuous	1	0	1	1	1	0	Tone 2	Tone 5
31	660/1200 Hz @ 1 Hz, Sweeping	0	1	1	1	1	0	Tone 26	Tone 5
32	Two-tone chime	1	1	1	1	1	0	Tone 26	Tone 15
33	745 Hz @ 1 Hz, Intermittent	0	0	0	0	0	1	Tone 2	Tone 5
34	1000 Hz & 2000 Hz @ 0.5 s, Alternating - Singapore	1	0	0	0	0	1	Tone 38	Tone 45
35	420 Hz @ 0.625 s, Australian Alert	0	1	0	0	0	1	Tone 36	Tone 5
36	500…1200 Hz 3.75 s/0.25 s, Australian Evac.	1	1	0	0	0	1	Tone 35	Tone 5
37	1000 Hz, Continuous, - *PFEER Toxic Gas*	0	0	1	0	0	1	Tone 9	Tone 45
38	2000 Hz, Continuous	1	0	1	0	0	1	Tone 34	Tone 45
39	800 Hz 0.25 s ON, 1 sec OFF, Intermittent	0	1	1	0	0	1	Tone 23	Tone 17
40	544 Hz (100 ms)/440 Hz (400 ms), - NF S 32-001	1	1	1	0	0	1	Tone 31	Tone 27
41	Motor Siren - slow rise to 1200 Hz	0	0	0	1	0	1	Tone 2	Tone 5
42	Motor Siren - slow rise to 800 Hz	1	0	0	1	0	1	Tone 2	Tone 5
43	1200 Hz, Continuous	0	1	0	1	0	1	Tone 2	Tone 5
44	Motor Siren - slow rise to 2400 Hz	1	1	0	1	0	1	Tone 2	Tone 5
45	1 kHz 1 s ON, 1 s OFF, Intermittent, - *PFEER Gen. Alarm*	0	0	1	1	0	1	Tone 38	Tone 34

ALLEN BRADLEY 855P SIGNAL

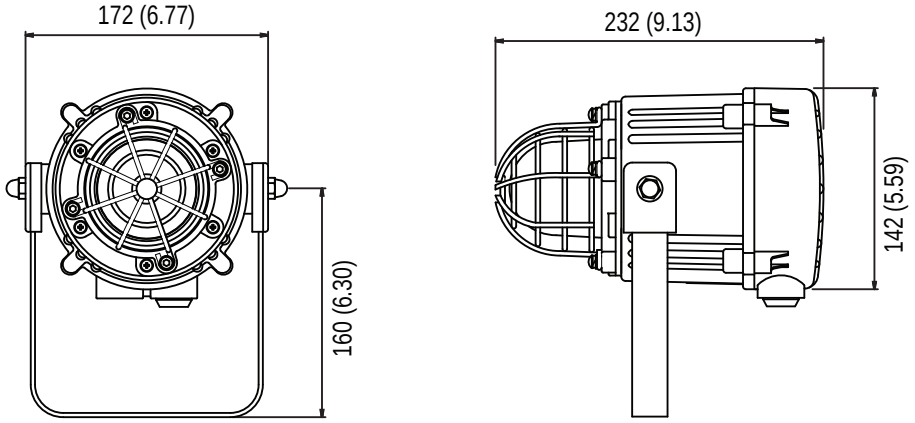
Approximate Dimensions (Bulletin 855X)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Horns



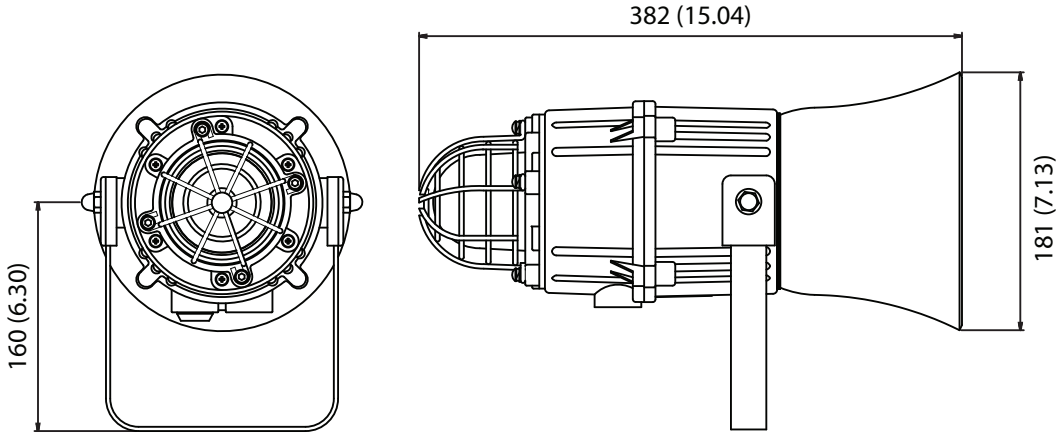
Beacons



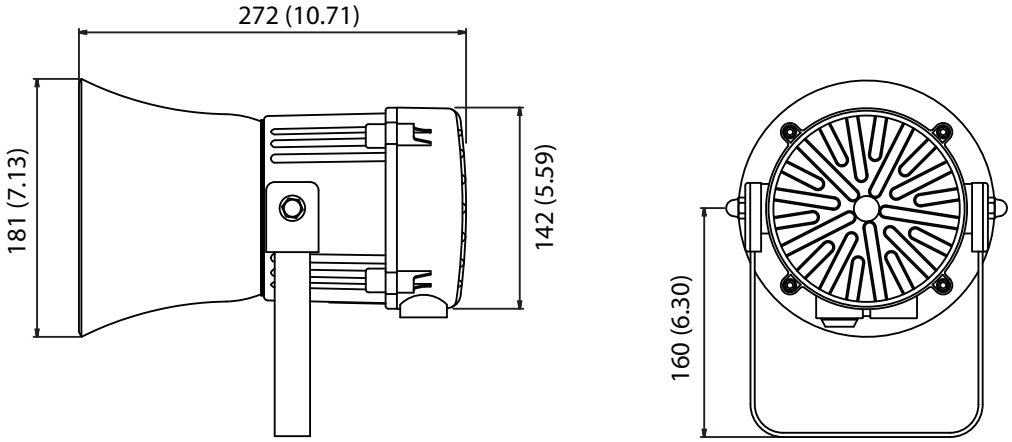
ALLEN BRADLEY 855P SIGNAL

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Horn and Beacon Combinations



Public Address Loudspeakers



ALLEN BRADLEY 855P SIGNAL

Bulletin 855XM — Hazardous Location Metal Horns

Alarm Horn Sounders

855XM	–	C	G	M	D24	D	A	4
		a	b	c	d	e	f	g

a	
Product Type	
Code	**Description**
H	Horn only
C	Horn with attached xenon strobe

b	
Housing Color	
Code	**Description**
G	Gray

c	
Conduit Entry	
Code	**Description**
M	Two M20 x 1.5 mm conduit entries

d	
Voltage	
Code	**Description**
D24	20…28V DC (3)
D30	10…30V DC (4)
A10	115…125V AC 60 Hz
A20	215…250V AC 50 Hz

e	
Horn Type	
Code	**Description**
D	116 dB (A) @ 1 m (3.3 ft), 64 tones, 4 stages

f	
Beacon Type (1) (2)	
Code	**Description**
Blank	No light
A	5 J, strobe
B	10 J, strobe

g	
Lens Color (1)(2)	
Code	**Description**
Blank	No light
4	Red
5	Amber
7	Clear

(1) Beacon type and lens color must be Blank for Cat. No. 855XM-H.
(2) Beacon type and lens color cannot be Blank for Cat. No. 855XM-C.
(3) Voltage code D24 only valid with beacon code A and B (Table f).
(4) Voltage code D30 not valid with beacon code A and B (Table f).

ALLEN BRADLEY 855P SIGNAL

Specifications (Bulletin 855XM)

Table 107 - Mechanical

Device	Listed below are reference guidelines for maximum shock and vibration standards for the 855XM horn.	
	Shock [G]	Vibration [G]
Metal horn	40	3
Metal horn with attached beacon	30	3

Table 108 - Environmental

Attribute	Device	Value	
Ingress rating	Horn and horn with attached beacon	UL Type 4/4X/13/3R, IP66	
		Operating	Storage
Temperature range	Electronic horn	-40…+50°C (-40…+122 °F) (1)	-40…+70 °C (-40…+158 °F)
	Horn with attached beacon	-40…+50 °C (-40…+122 °F)	-40…+70 °C (-40…+158 °F)

(1) -40…+158 °F (-40…+70 °C) for Class 1/Div.2

Table 109 - Materials

Part	Material
Housing (gray powder coat)	Marine grade aluminum (Al Si12 Cu)
Screws	Stainless steel
Beacon lens	Polycarbonate over glass
Lens cage	Stainless steel
Gasket (Cover to Base)	O-ring Fluorosilicone UL
Gasket (Screw Mounting Hole)	Fiber washer

Table 110 - Performance Ratings

Device	Sound Output @ 1 m (3.3 ft) (1)	Volume Control	No. of Tones	Stages
Metal Horn	116 dB(A), max	Adjustable -12 dB(A)	64	4
	Light Output (Xenon Strobe Beacon- 5 J)		Light Output (Xenon Strobe Beacon- 10 J)	
Red LED Beacon	14.6 cd eff/120,000 cd peak		42.83 cd eff/240,000 cd peak	
Amber LED Beacon	45.8 cd eff/350,000 cd peak		130.9 cd eff/700,000 cd peak	
Clear LED Beacon	80.6 cd eff/500,000 cd peak		243.1 cd eff/1,000,000 cd peak	

(1) SPL data ±3 dB(A). Measured at optimum voltage.

Table 111 - Operating Voltage and Current Consumption

Device	Operating Voltage	Nominal Maximum	Inrush	Leakage Immunity
Horns				
855XM-HGMD30D	10…30V DC	160 mA @ 12V DC	611 mA, 11 ms	>3 mA
		313 mA @ 24V DC	1809 mA, 9 ms	
		225 mA @ 30V DC	2483 mA, 7 ms @ 30V DC	
855XM-HGMA10D	115V AC 60 Hz ±10%	89 mA @ 115V AC 60 Hz	710 mA, 8 ms	
855XM-HGMA20D	230V AC 50 Hz ±10%	52 mA @ 230V AC 60 Hz	350 mA, 7 ms	
Horns with Beacon				
855XM-CGMD24DA***x***	20…28V DC	513 mA @ 24V DC (5 J)	1932 mA, 10 ms	>3 mA
855XM-CGMD24DB***x***	20…28V DC	876 mA @ 24V DC (10 J)	2074 mA, 11 ms	
855XM-CGMA10DA***x***	115…125V AC, 60 Hz	174 mA @ 115V AC (5 J)	975 mA, 3 ms	
855XM-CGMA10DB***x***	115…125V AC, 60 Hz	320 mA @ 115V AC (10 J)	1031 mA, 3 ms	
855XM-CGMA20DA***x***	215…250V AC, 50 Hz	63 mA @ 230V ACDC (5 J)	1607 mA, 3 ms	
855XM-CGMA20DB***x***	215…250V AC, 50 Hz	100 mA @ 230V AC (10 J)	1628 mA, 3 ms	

ALLEN BRADLEY 855P SIGNAL

Table 112 - Flashing Frequency

Device	Frequency
Horns with strobe	1 Hz

Table 113 - Miscellaneous

Attribute	Value
Cable entry	Two M20x 1.5 mm threaded holes
Terminal blocks	0.5…2.5 mm^2 (20…14 AWG)
Grounding stud	M5

Table 114 - ATEX/IECEx Certification

Zone	Group	Temperature Code
855XM Hazardous Location Metal Horn		
Zone 2	Group IIA (propane) Group IIB (ethylene) Group IIC (hydrogen/acetylene)	T1 (450 °C [842 °F]) T2 (300 °C [572 °F]) T3 (200 °C [392 °F]) T4 (135 °C [275 °F])
Zone 22 (1)	Group IIIA (combustible flyings) Group IIIB (non-conductive dust) Group IIIC (conductive dust)	—
855XM-C Hazardous Location Metal Horn with Strobe		
Zone 2	Group IIA (propane) Group IIB (ethylene) Group IIC (hydrogen/acetylene)	T1 (450 °C [842 °F]) T2 (300 °C [572 °F])
Zone 22 (2)	Group IIIA (combustible flyings) Group IIIB (non-conductive dust) Group IIIC (conductive dust)	—

(1) Maximum surface temperature for dust applications is 90 °C (194 °F).
(2) Maximum surface temperature for dust applications is 90 °C (194 °F) for Cat. No. 855XM-CGMxxxDA* and 230 °F (110 °C) for Cat. No. 855XM-CGMxxxDB*.

Table 115 - Class/Zone Ratings — US

Device	Rating
Horn	• Class I, Zone 2 AEx nA IIC T4 Gc (Ta -40…+50 °C [-40…+122 °F]) • Class I, Zone 22 AEx tc IIIC T90 °C Dc (Ta -40…+50 °C [-40…+122 °F])
Horn with 5 J strobe	• Class I, Zone 2 AEx nA IIC T2 Gc (Ta -40…+50 °C [-40…+122 °F]) • Class I, Zone 22 AEx tc IIIC 120 °C Dc (Ta -40…+50 °C [-40…+122 °F])
Horn with 10 J strobe	• Class I, Zone 2 AEx nA IIC T1 Gc (Ta -40…+50 °C [-40…+122 °F]) • Class I, Zone 2 AEx nA IIC T2 Gc for (Ta -40…+40 °C [-40…+104 °F]) • Class I, Zone 22 AEx tc IIIC 120 °C Dc (Ta -40…+50 °C [-40…+122 °F])

All horns (with and without strobe) comply with the following:

- ANSI/UL 60079-0-2013
- ANSI/UL 60079-15-2013
- ISA60079-31-2013

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Table 116 - Class/Zone Ratings — Canada

Device	Rating
Horn	• Ex nA IIC T4 Gc X (Ta -40…+50 °C [-40…+122 °F]) • Ex tc IIIC T90 °C Dc (Ta -40…+50 °C [-40…+122 °F]) • Class II Div 2 FG T5 (Ta -40…+50 °C [-40…+122 °F])
Horn with 5 J strobe	• Ex nA IIC T2B Gc X (Ta -40…+50 °C [-40…+122 °F]) • Ex nA IIC T2C Gc X (Ta -40…+45 °C [-40…+113 °F]) • Ex tc IIIC T120 °C Dc (Ta -40…+50 °C [-40…+122 °F]) • Class II, Div 2 FG T4A (Ta -40…+50 °C [-40…+122 °F])
Horn with 10 J strobe	• Ex nA IIC T1 Gc X (Ta -40…+50 °C [-40…+122 °F]) • Ex nA IIC T2 Gc X (Ta -40…+40 °C [-40…+104 °F]) • Ex tc IIIC T120 °C Dc (Ta -40…+50 °C [-40…+122 °F]) • Class II, Div 2 FG T4A (Ta -40…+50 °C [-40…+122 °F])

All horns (with and without strobe) comply with the following:

- CAN/CSA C22.2 No. 60079-0:11
- CAN/CSA C22.2 No. 60079-15:12
- CAN/CSA C22.2 No. 60079-31:12

Table 117 - Class/Division Ratings — US and Canada

Device	Rating
Horn	• Class I Div 2, ABCD T3C (Ta -40…+70 °C [-40…+158 °F]) • Class I Div 2, ABCD T4 (Ta -40…+65 °C [-40…+149 °F]) • Class I Div 2, ABCD T4A (Ta -40…+50 °C [-40…+122 °F]) • Class II Div 2, FG T5 (Ta -40…+50 °C [-40…+122 °F]) • Class II Div 2, FG T6 (Ta -40…+45 °C [-40…+113 °F]) • Class III Div 1 & 2 (Ta -40…+50 °C [-40…+122 °F])
Horn with 5 J strobe	• Class I Div 2, ABCD T2B (Ta -40…+70 °C [-40…+158 °F]) • Class I Div 2, ABCD T2C (Ta -40…+55 °C [-40…+131 °F]) • Class I Div 2, ABCD T2D (Ta -40…+40 °C [-40…+104 °F]) • Class II Div 2, FG T5 (Ta -40…+50 °C [-40…+122 °F]) • Class III Div 1&2 (Ta -40…+50 °C [-40…+122 °F])
Horn with 10 J strobe	• Class I Div 2, ABCD T1 (Ta -40…+70 °C [-40…+158 °F]) • Class I Div 2, ABCD T2 (Ta -40…+50 °C [-40…+122 °F]) • Class II Div 2, FG T4A (Ta -40…+50 °C [-40…+122 °F]) • Class II Div 2, FG T5 (Ta -40…+104 °F [-40…+40 °C]) • Class III Div 1&2 (Ta -40…+50 °C [-40…+122 °F])

All horns (with and without strobe) comply with the following:

- ANSI/ISA 12.12.01 – 2013
- CSA C22.2 No. 213-M1987
- CSA C22.2 No. 157-92:2006

Standards Compliance

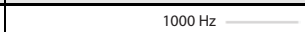
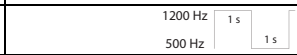
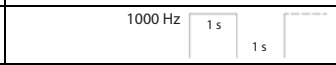
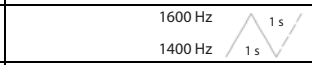
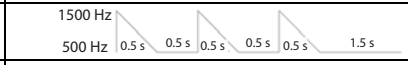
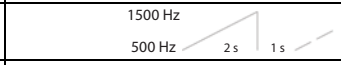
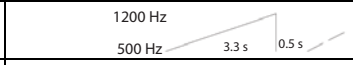
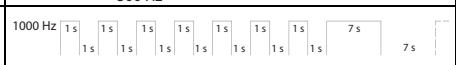
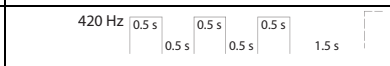
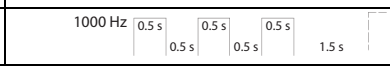
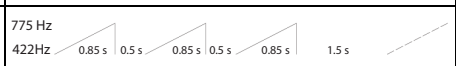
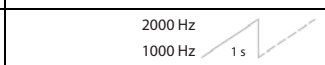
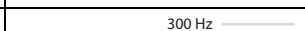
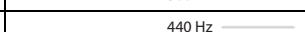
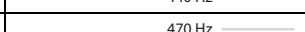
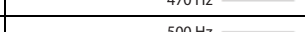
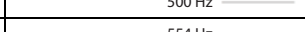
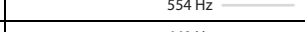
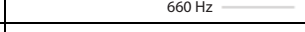
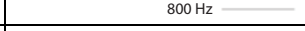
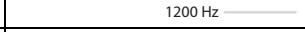
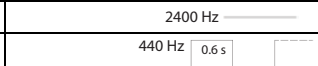
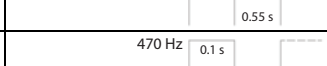
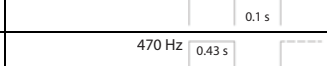
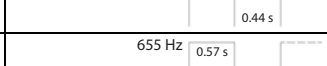
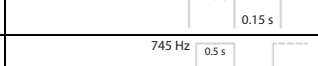
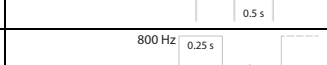
- cULus Listed UL464/UL 1608 File No. E305533
- CSA C22.2 No. 213-M1987
- CSA C22.2 No. 157-92: 2006
- CE — European Explosive Atmosphere Directive 94/9/EC and European EMC Directive 2004/108/EC
- EN60079-0:2012/IEC60079-0: ed. 6.0 (2011-06)
- EN60079-15:2010/IEC60079-15: ed. 4.0 (2010-01)
- EN60079-31:2009/IEC60079-31:2009 ed. 1.0 (corr. 1 2009)

Certifications

- CE Marked
- UL Listed for:
  - Class I, Division 2, Groups A, B, C, and D
  - Class II, Division 2, Groups F and G
  - Class III, Division 1 and 2 (see Temperature Codes on page 10)
- ATEX/IECEx: Zone 2 Groups IIA, B, C and Zone 22 Groups IIIA, B, and C
- Ex Rating (Horn): II 3G Ex nA IIC T4 Gc and II 3D Ex tc IIIC T90 °C Dc (Ta -40…+50 °C [-40…+122 °F])
- Ex Rating (Horn with 5 J Strobe): II 3G Ex nA IIC T2 Gc and II 3D Ex tc IIIC T90 °C Dc (Ta -40…+50 °C [-40…+122 °F])
- Ex Rating (Horn with 10 J Strobe): II 3G Ex nA IIC T1 Gc and II 3D Ex tc IIIC T110 °C Dc (Ta -40…+50 °C [-40…+122 °F]); [II 3G Ex nA IIC T2 Gc for Ta -40…+40 °C (-40…+104 °F)]

Tone Selection Table for 855XM

Tone Selection – To select the required first stage tone, set the tone switches 1…6 to the tone setting shown in the following table. The table also shows which 2nd, 3rd, and 4th stage tones are available for use with the selected first stage tone if more that one tone output is required.

Stage 1 Tone No.	Tone Description	Tone Visual	Switch						Stage 2 Alarm (S2)	Stage 3 Alarm (S3)	Stage 4 Alarm (S2+S3)
			1	2	3	4	5	6			
1	1000 Hz PFEER toxic gas		0	0	0	0	0	0	3	2	44
2	1200/500 @ 1 Hz DIN / PFEER P.T.A.P.		1	0	0	0	0	0	1	3	44
3	1000 @ 0.5 Hz(1 s on/1 s off) PFEER gen. alarm		0	1	0	0	0	0	1	2	44
4	1.4…1.6 kHz 1 s, 1.6…1.4 kHz 0.5 s NF C 48-265		1	1	0	0	0	0	44	24	1
5	544 (100 ms)/440 (400 ms) NF S 32-001		0	0	1	0	0	0	52	19	1
6	1500/500 - (0.5 s on/0.5 s off) x3 + 1 s gap AS4428		1	0	1	0	0	0	7	44	1
7	500…1500 Hz sweeping 2 s on/1 s off AS4428		0	1	1	0	0	0	6	44	1
8	500/1200 Hz @ 0.26 Hz(3.3 s on/0.5 s off) Netherlands - NEN 2575		1	1	1	0	0	0	44	24	35
9	1000 (1 s on/1 s off) x7 + (7 s on/1 s off) IMO Code 1a		0	0	0	1	0	0	18	34	1
10			1	0	0	1	0	0	21	34	1
11	420 (0.5 s on/0.5 s off) x3 + 1 s gap ISO 8201 temporal pattern		0	1	0	1	0	0	44	1	8
12	1000 (0.5 s on/0.5 s off) x3 + 1 s gap ISO 8201 temporal pattern		1	1	0	1	0	0	44	1	8
13	422/775 - (0.85 s on/0.5 s off) x3 + 1 s gap NFPA - temporal		0	0	1	1	0	0	44	1	8
14	1000/2000 @ 1 Hz Singapore		1	0	1	1	0	0	23	3	35
15	300 continuous		0	1	1	1	0	0	44	24	35
16	440 continuous		1	1	1	1	0	0	44	24	35
17	470 continuous		0	0	0	0	1	0	44	24	35
18	500 continuous IMO Code 2 (low)		1	0	0	0	1	0	44	24	35
19	554 continuous		0	1	0	0	1	0	64	24	35
20	660 continuous		1	1	0	0	1	0	44	24	35
21	800 IMO Code 2 (high)		0	0	1	0	1	0	44	24	35
22	1200 continuous		1	0	1	0	1	0	44	24	35
23	2000 continuous		0	1	1	0	1	0	15	3	35
24	2400 continuous		1	1	1	0	1	0	48	20	35
25	440 @ 0.83 Hz (50 cycles/min) intermittent		0	0	0	1	1	0	1	44	8
26	470 @ 0.9 Hz - 1.1 s intermittent		1	0	0	1	1	0	1	44	8
27	470 @ 5 Hz - (5 cycles/s) intermittent		0	1	0	1	1	0	1	44	8
28	544 @ 1.14 Hz - 0.875 s intermittent		1	1	0	1	1	0	44	24	8
29	655 @ 0.875 Hz intermittent		0	0	1	1	1	0	1	44	8
30	660 @ 0.28 Hz - 1.8 s on/1.8 s off intermittent		1	0	1	1	1	0	44	24	8
31	660 @ 3.34 Hz - 150 ms on/150 ms off intermittent		0	1	1	1	1	0	30	24	8
32	745 @ 1 Hz intermittent		1	1	1	1	1	0	44	24	8
33	800 - 0.25 s on/1 s off intermittent		0	0	0	0	0	1	53	24	8

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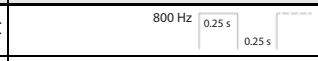
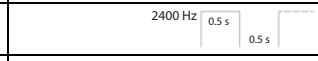
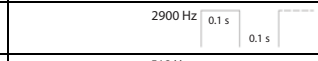
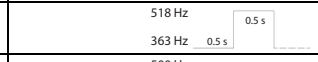
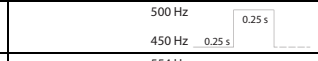
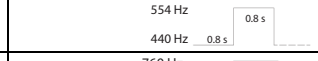
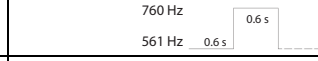
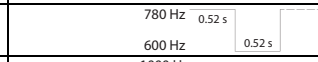
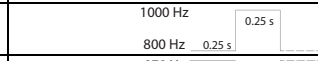
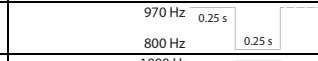
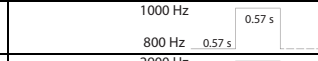
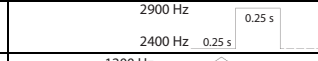
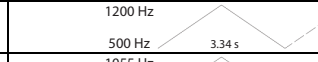
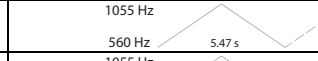
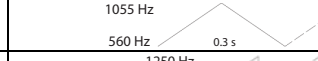
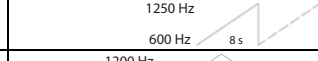
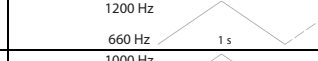
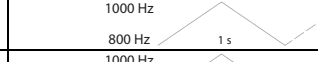
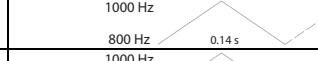
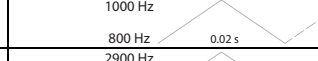
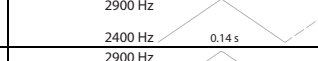
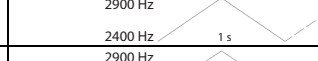
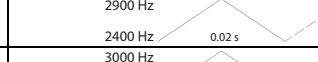
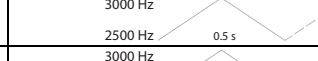
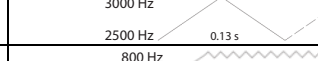
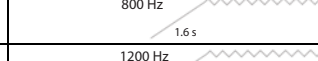
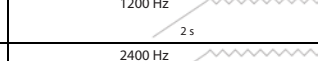
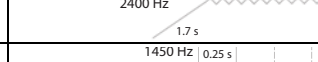
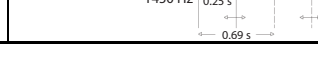
Tone Selection – To select the required first stage tone, set the tone switches 1…6 to the tone setting shown in the following table. The table also shows which 2nd, 3rd, and 4th stage tones are available for use with the selected first stage tone if more that one tone output is required.

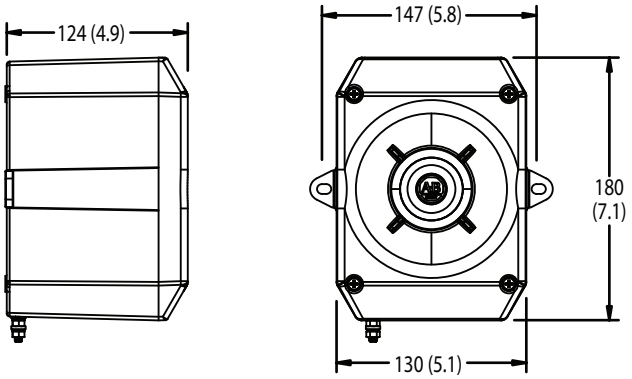
Stage 1 Tone No.	Tone Description	Tone Visual	Switch						Stage 2	Stage 3	Stage 3
			1	2	3	4	5	6			
34	800 @ 2 Hz IMO Code 3.a (high) intermittent		1	0	0	0	0	1	56	24	8
35	1000 @ 1 Hz intermittent		0	1	0	0	0	1	44	24	8
36	2400 @ 1 Hz intermittent		1	1	0	0	0	1	21	24	8
37	2900 @ 5 Hz intermittent		0	0	1	0	0	1	53	24	8
38	363/518 @ 1 Hz alternating		1	0	1	0	0	1	1	8	19
39	450/500 @ 2 Hz alternating		0	1	1	0	0	1	1	8	19
40	554/440 @ 1 Hz alternating		1	1	1	0	0	1	44	24	19
41	554/440 @ 0.625 Hz alternating		0	0	0	1	0	1	1	8	19
42	561/760 @ 0.83 Hz (50 cycles/min) alternating		1	0	0	1	0	1	1	8	19
43	780/600 @ 0.96 Hz alternating		0	1	0	1	0	1	1	8	19
44	800/1000 @ 2 Hz alternating		1	1	0	1	0	1	5	24	19
45	970/800 @ 2 Hz alternating		0	0	1	1	0	1	1	8	19
46	800/1000 @ 0.875 Hz alternating		1	0	1	1	0	1	53	24	19
47	2400/2900 @ 2 Hz alternating		0	1	1	1	0	1	57	24	19
48	500/1200 @ 0.3 Hz sweeping		1	1	1	1	0	1	44	24	12
49	560/1055 @ 0.18 Hz sweeping		0	0	0	0	1	1	44	24	12
50	560/1055 @ 3.3 Hz sweeping		1	0	0	0	1	1	44	24	12
51	600/1250 @ 0.125 Hz sweeping		0	1	0	0	1	1	44	24	12
52	660/1200 @ 1 Hz sweeping		1	1	0	0	1	1	64	24	12
53	800/1000 @ 1 Hz sweeping		0	0	1	0	1	1	56	24	12
54	800/1000 @ 7 Hz sweeping		1	0	1	0	1	1	57	24	12
55	800/1000 @ 50 Hz sweeping		0	1	1	0	1	1	54	24	12
56	2400/2900 @ 7 Hz sweeping		1	1	1	0	1	1	57	24	12
57	2400/2900 @ 1 Hz sweeping		0	0	0	1	1	1	47	24	12
58	2400/2900 @ 50 Hz sweeping		1	0	0	1	1	1	54	24	12
59	2500/3000 @ 2 Hz sweeping		0	1	0	1	1	1	44	24	12
60	2500/3000 @ 7.7 Hz sweeping		1	1	0	1	1	1	44	24	12
61	800 motor siren		0	0	1	1	1	1	44	24	12
62	1200 motor siren		1	0	1	1	1	1	44	24	12
63	2400 motor siren		0	1	1	1	1	1	44	24	12
64	Simulated bell		1	1	1	1	1	1	44	21	12

ALLEN BRADLEY 855P SIGNAL

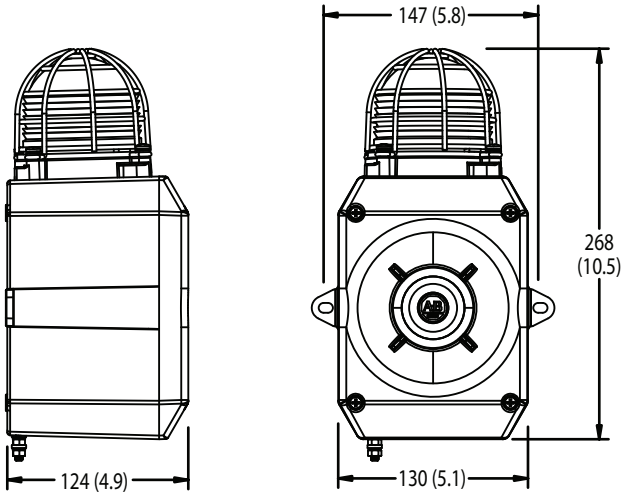
Approximate Dimensions (Bulletin 855X)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

855XM Hazardous Location Metal Horn



855XM-C Hazardous Location Metal Horn with Xenon Strobe



ALLEN BRADLEY 855P SIGNAL

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Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

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ALLEN BRADLEY 1492-GH

Selection Guide

Allen-Bradley

Control Circuit and Load Protection Products

Bulletin Numbers 188, 1489, 1492, 1692

LISTEN. THINK. SOLVE.®

Circuit Protection Portfolio

ROCKWELL AUTOMATION ALLEN-BRADLEY 1492-GH

1489-M Circuit Breakers
Approved for branch circuit protection in the United States and Canada, and certified as Miniature Circuit Breakers for IEC applications.

1492-SP Supplementary Protectors
Overcurrent protection for equipment where branch circuit protection is already provided, or is not required. Also Miniature Circuit Breakers as defined by IEC Standards.

1492-D Circuit Breakers
Overcurrent and short circuit protection for higher voltage DC circuits. Also Miniature Circuit Breakers as defined by IEC Standards.

188-J 10 kA Regional Circuit Breakers
Protective devices applied at the equipment level. Regional certifications only. Available for purchase in China and Europe.

188-K 6 kA Regional Circuit Breakers
Protective devices applied at the equipment level. Regional certifications only. Available for purchase in China and Europe.

Rockwell Automation offers a wide range of Allen-Bradley circuit protection products designed for a variety of applications.

Miniature Circuit Breakers, Supplementary Protectors, and Residual Current Devices

Product	Certifications						Poles						Trip												
	cULus	cURus	CSA	CE	VDE	CCC	1	1+N	2	3	3+N	4	B	C	D	0.2	0.5	0.8	1	1.2	1.5	1.6	2	2.5
1489-M	●		●	●	●	●	●		●	●				●	●		●		●			●	●	
1492-SP		✪	●	●	●	●	●	♣	●	●	♣		●	●	●		●		●				●	
1492-D		✪	●	●	●		●		●					●			●		●			●	●	
188-J,-K				●	●	●	●	●	●	●	●	●	●	●	●		●		●				●	
1492-RCD		●		●	●	●			●			●												
1492-MC	●		●				●		●	●														
1492-GH,-GS		●	●	●	●		●		●	●						●	●	●	●	●	●		●	●

✪ UL Recognized only.
♣ 1+N and 3+N devices are not cURus or CSA certified.

Electronic Circuit Protectors

Product	Certifications				Circuits		Output Current Rating [A]							
	cULus	CE	C1D2	NEC C2	4	2x2	1	2	3	4	6	10	3/6	6/12
1692	●	●	●	●	●	●	●	●	●	●	●	●	●	●

1492-RCD Residual Current Devices
By detecting small leakage currents and disconnecting all ungrounded connectors quickly, RCDs can prevent injury to exposed personnel and damage to equipment.

1692 Electronic Circuit Protectors
Protection for secondary circuits of 24V DC switched mode power supplies. These modules monitor both supply voltage and load currents, and can be monitored and controlled locally and remotely.

1492-MC Circuit Breakers and Ground Fault Protectors
Thermal magnetic circuit protection and sensing thresholds for personnel and equipment protection.

1492-GH, -GS High-density Supplementary Protectors
Thermal magnetic circuit breakers with a high density design useful when DIN Rail space is a premium.

1492-FB Fuse Holders
Designed for use in many OEM applications. Provides safe and convenient installation of Midget, Class CC, and Class J fuses.

- **Test equipment**
- **Automotive systems**
- **Controller I/O points**
- **Power supplies**
- **Relay and contractor coils**
- **Medical equipment**
- **Control instrumentation**
- **Computers**
- **Solenoids**
- **Transformers**

Rated Current [A]

3	4	5	6	7	8	10	12	13	15	16	20	25	30	32	35	40	45	50	55	60	63	70	80	90	100
●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●		●		●	●				
●	●	●	●	●	●	●		●	●	●	●	●	●	●		●		●			●				
●	●		●		●	●		●		●	●	●		●		●		●			●				
●	●		●		●	●		●		●	●	●		●		●		●			●				
												●				●					●		●		
						●			●		●	●	●		●	●	●	●	●	●		●	●	●	●
●	●	●	●	●	●	●	●		●	●	●	●													

Typical North America Current Ratings: 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 10, 15, 20, 25, 30, 40, 50, 60, 63 A.
Typical IEC Current Ratings: 0.5, 1, 1.6, 2, 3, 4, 6, 8, 10, 13, 16, 20, 25, 32, 40, 50, 63 A.

Fuse Holders

Product	Certifications			Poles			Indication			Fuse Types			
	cULus	CSA	CE	1	2	3	none	L	D1	M30	C30	J30	J60
1492-FB	●	●	●	●	●	●	●	●	●	●	●	●	●

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1492-D
Circuit Breakers

1492-RCD
Residual Current
Devices

1492-MC
Branch and
Ground Fault
Circuit Breakers

1492-FB
Fuse Holders

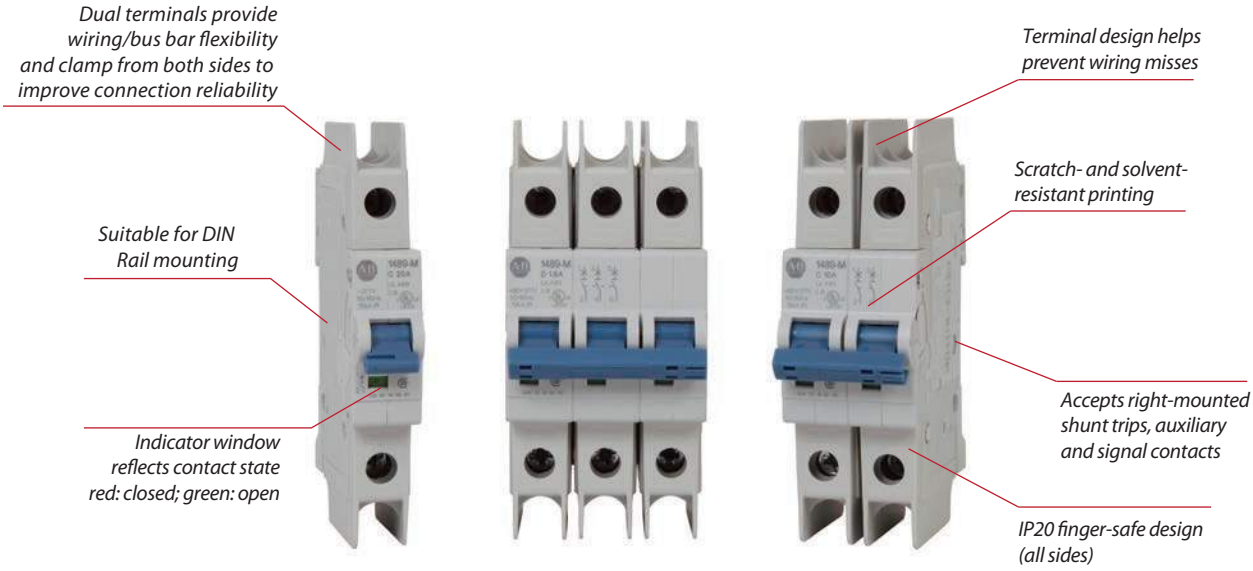
1492-SP
Supplementary
Protectors

188-J, -K
Regional
Circuit Breakers

1692
Electronic Circuit
Protectors

1492-GH, -GS
High-density
Supplementary
Protectors

1489-M Circuit Breakers



Bulletin 1489-M thermal-magnetic Circuit Breakers are approved for branch circuit protection in the United States and Canada, and are certified as Miniature Circuit Breakers for IEC applications.

These branch protectors are compatible with many accessories to meet diverse application needs, including UL 508 Listed bus bars for convenience in panel assembly, auxiliary contacts, signal contacts and shunt trips for versatility, and lockout attachments for safety during maintenance.

Features

- Current limiting
- Fast breaking time
- High rated voltage
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Superior shock and vibration resistance to help prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully recyclable device
- Suitable for extreme ambient conditions

1489-M Circuit Breakers	
Rated Voltage	UL/CSA: Max. 480Y/277V AC IEC: U_e 230/400V AC
Interrupting Capacity	UL/CSA: 10 kA IEC: 15 kA
Current Ratings	0.5...63 A
Poles	1, 2, 3
Trip Curves	C, D
Standards Compliance	UL 489 CSA C22.2 No. 5.1 EN 60947-2 GB 14048.2
Certifications	UL Listed, File No. E197878 CSA Certified, File No. 259391 CE Marked VDE Certified CCC Certified RoHS Compliant

ALLEN BRADLEY 1492-GH

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1489	-	M	1	C	005
		a	*b*	*c*	*d*

a

Voltage Type	
Code	**Description**
M	AC Circuit Breaker

b

Poles	
Code	**Description**
1	1-Pole
2	2-Pole
3	3-Pole

c

Trip Curve	
Code	**Trip Curve**
C	Trip Curve C
D	Trip Curve D

d

Rated Current (I_n)	
Code	**Current [A]**
005	0.5
010	1
016	1.6
020	2
030	3
040	4
050	5
060	6
070	7
080	8
100	10
130	13
150	15
160	16
200	20
250	25
300	30
320	32
350	35
400	40
500	50
600	60
630	63

ALLEN BRADLEY 1492-GH

Product Selection

1-Pole Circuit Breakers

Photo/Wiring Diagram	UL/CSA Max. Voltage	IEC/EN Max. Voltage	Continuous Current Rating (I_n) [A]	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
	277V AC, 48V DC	230V AC	0.5	1489-M1C005	1489-M1D005
			1	1489-M1C010	1489-M1D010
			1.6	1489-M1C016	1489-M1D016
			2	1489-M1C020	1489-M1D020
			3	1489-M1C030	1489-M1D030
			4	1489-M1C040	1489-M1D040
			5	1489-M1C050	1489-M1D050
			6	1489-M1C060	1489-M1D060
			7	1489-M1C070	1489-M1D070
			8	1489-M1C080	1489-M1D080
			10	1489-M1C100	1489-M1D100
			13	1489-M1C130	1489-M1D130
			15	1489-M1C150	1489-M1D150
			16	1489-M1C160	1489-M1D160
			20	1489-M1C200	1489-M1D200
			25	1489-M1C250	1489-M1D250
			30	1489-M1C300	1489-M1D300
			32	1489-M1C320	1489-M1D320
			35	1489-M1C350	1489-M1D350
1-pole	C Curve: 277V AC, 48V DC D Curve: 240V AC, 48V DC		40	1489-M1C400	1489-M1D400
	240V AC, 48V DC		50	1489-M1C500	1489-M1D500
			60	1489-M1C600	1489-M1D600
			63	1489-M1C630	1489-M1D630

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Product Selection

2-Pole Circuit Breakers

Photo/Wiring Diagram	UL/CSA Max. Voltage	IEC/EN Max. Voltage	Continuous Current Rating (I_n) [A]	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
	480Y/277V AC, 96V DC	400V AC	0.5	1489-M2C005	1489-M2D005
			1	1489-M2C010	1489-M2D010
			1.6	1489-M2C016	1489-M2D016
			2	1489-M2C020	1489-M2D020
			3	1489-M2C030	1489-M2D030
			4	1489-M2C040	1489-M2D040
			5	1489-M2C050	1489-M2D050
			6	1489-M2C060	1489-M2D060
			7	1489-M2C070	1489-M2D070
			8	1489-M2C080	1489-M2D080
			10	1489-M2C100	1489-M2D100
			13	1489-M2C130	1489-M2D130
			15	1489-M2C150	1489-M2D150
			16	1489-M2C160	1489-M2D160
			20	1489-M2C200	1489-M2D200
			25	1489-M2C250	1489-M2D250
			30	1489-M2C300	1489-M2D300
			32	1489-M2C320	1489-M2D320
			35	1489-M2C350	1489-M2D350
2-pole	C Curve: 480Y/277V AC, 96V DC D Curve: 240V AC, 96V DC		40	1489-M2C400	1489-M2D400
	240V AC, 96V DC		50	1489-M2C500	1489-M2D500
			60	1489-M2C600	1489-M2D600
			63	1489-M2C630	1489-M2D630

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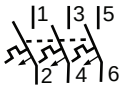
Product Selection

3-Pole Circuit Breakers

Photo/Wiring Diagram	UL/CSA Max. Voltage	IEC/EN Max. Voltage	Continuous Current Rating (I_n) [A]	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
 3-pole	480Y/277V AC	400V AC	0.5	1489-M3C005	1489-M3D005
			1	1489-M3C010	1489-M3D010
			1.6	1489-M3C016	1489-M3D016
			2	1489-M3C020	1489-M3D020
			3	1489-M3C030	1489-M3D030
			4	1489-M3C040	1489-M3D040
			5	1489-M3C050	1489-M3D050
			6	1489-M3C060	1489-M3D060
			7	1489-M3C070	1489-M3D070
			8	1489-M3C080	1489-M3D080
			10	1489-M3C100	1489-M3D100
			13	1489-M3C130	1489-M3D130
			15	1489-M3C150	1489-M3D150
			16	1489-M3C160	1489-M3D160
			20	1489-M3C200	1489-M3D200
			25	1489-M3C250	1489-M3D250
			30	1489-M3C300	1489-M3D300
			32	1489-M3C320	1489-M3D320
			35	1489-M3C350	1489-M3D350
	C Curve: 480Y/277V AC D Curve: 240V AC		40	1489-M3C400	1489-M3D400
	240V AC		50	1489-M3C500	1489-M3D500
			60	1489-M3C600	1489-M3D600
			63	1489-M3C630	1489-M3D630

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Specifications

Electrical Ratings					
Poles					1, 2, 3
Tripping characteristics					C, D
Rated current (I_n)					0.5...63 A
Rated frequency [f]					50/60 Hz
Rated insulation voltage U_i per IEC/EN 60664-1					250V AC (phase to ground) 440V AC (phase to phase)
Overvoltage category					III
Pollution degree					3
Data per UL/CSA					
Rated voltage	AC	1-pole	C Curve	0.5...40 A	277V AC
				50...63 A	240V AC
			D Curve	0.5...35 A	277V AC
				40...63 A	240V AC
		2-, 3-pole	C Curve	0.5...40 A	480Y/277V AC
				50...63 A	240V AC
			D Curve	0.5...35 A	480Y/277V AC
				40...63 A	240V AC
	DC	1-pole			48V DC
		2-pole			96V DC (2-pole in series)
Rated interrupting capacity per UL 489					10 kA
Reference temperature for tripping characteristics					40 °C
Electrical endurance					6,000 operations (AC and DC); 1 cycle (1s - ON, 9s - OFF)
Data per IEC/EN 60947-2					
Rated operational voltage (U_e)	1-pole				230V AC
	2-, 3-pole				400 V AC
Highest supply or utilization voltage (U_{max})	AC	1-pole			253/440V AC
		2-, 3-pole			440V AC
	DC ★	1-pole			48V DC
		2-pole			96V DC
Min. operating voltage					12V AC, 12V DC
Rated ultimate short-circuit breaking capacity (I_{cu})					15 kA
Rated service short-circuit breaking capacity (I_{cs})					≤40 A: 11.25 kA >40 A: 7.5 kA
Rated impulse withstand voltage Uimp. (1.2/50µs)					4 kV (test voltage 6.2kV at sea level, 5kV at 2,000m)
Dielectric test voltage					2 kV (50/60Hz, 1 min.)
Reference temperature for tripping characteristics					30 °C
Electrical endurance 1 cycle (2s - ON, 13s - OFF, $I_n \leq 32A$), 1 cycle (2s - ON, 28s - OFF, $I_n > 32A$)					$I_n < 30A$:20,000 ops.(AC) $I_n \geq 30A$:10,000 ops. (AC) 1,000 ops. (DC)

★ Self-declared IEC DC ratings.

Mechanical Data		
Housing		Insulation group II, RAL 7035
Indicator window		red ON/green OFF
Protection degree per EN 60529		IP20, IP40 in enclosure with cover
Mechanical endurance		20,000 operations
Shock resistance per IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance per IEC/EN 60068-2-6		5g - 20 cycles at 5…150…5 Hz with load 0.8 In
Environmental		
Environmental conditions (damp heat) per IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature Δ		-25…+55 °C
Storage temperature		-40…+70 °C
Installation		
Terminal		Dual terminal
Cross-section of wire ◆ – solid, stranded (front/back terminal slot)		35/35 mm^2
		18…4/18…10 AWG
Cross-section of wire – flexible (front/back terminal slot)		25/10 mm^2
Multi-wire rating per UL, CSA		1 wire, 18…4 AWG
		2-4 wires‡, 18…10 AWG
Cross-section of bus bars (back terminal slot)		10 mm^2
Tightening torque	IEC	2.8 N•m
	UL/CSA	AWG 18...16: 13.3 in•lb, AWG 14...10: 17.7 in•lb, AWG 8...4: 39.8 in•lb
Screwdriver		No. 2 Pozidrive
Mounting		DIN Rail (EN 60715, 35 mm) with fast clip
Mounting position		Any
Supply		Optional
Approximate Dimensions and Weight		
Pole dimensions (H x D x W)		111 x 69 x 17.5 mm (4.37 x 2.72 x .69")
Pole weight		125 g (4.4 oz.)
Combination with Auxiliary Elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

◆ 35 mm self-declared, not included in IEC/EN approval.

Δ Refer to the ambient temperature derating tables.

‡ Wires must be of like size and stranding. Up to two wires per terminal slot.

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Power Loss Due to Current

Rated Current [A]	Power Loss Per Pole [W]		Rated Current [A]	Power Loss Per Pole [W]
0.5	1.4		15	2.4
1	1.4		16	2.5
1.6	1.8		20	2.5
2	1.8		25	3.2
3	1.6		30	3.5
4	1.8		32	3.7
5	1.9		35	4.1
6	2.0		40	4.5
7	1.1		50	4.5
8	1.5		60	4.9
10	2.1		63	5.4
13	2.3		—	—

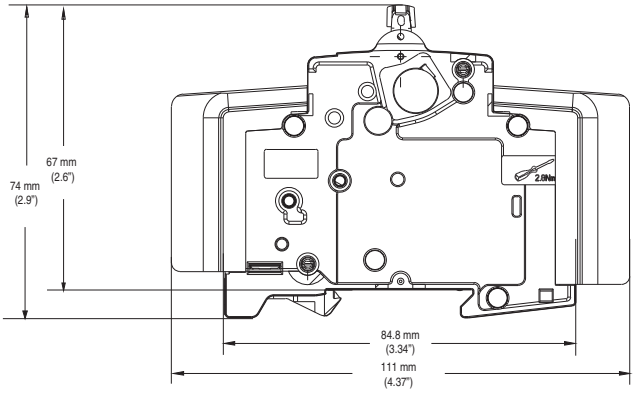
Zero-stack Derating

The installation of several miniature circuit breaker side by side with rated current on all poles requires a correction factor to the rated current (not required if spacers are used).

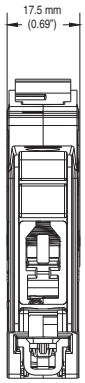
No. of Adjacent Devices	Factor
1	1
2,3	0.9
4,5	0.8
≥6	0.75

Approximate Dimensions

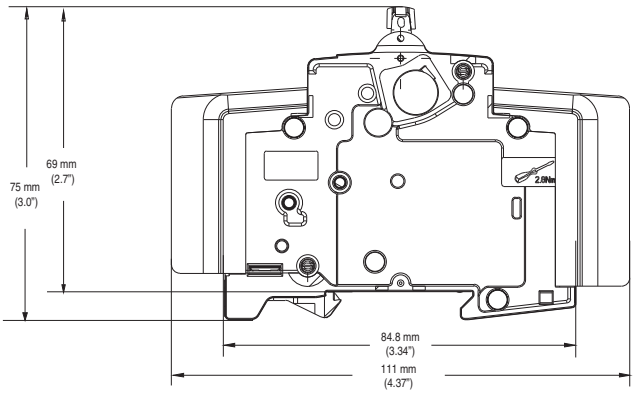
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



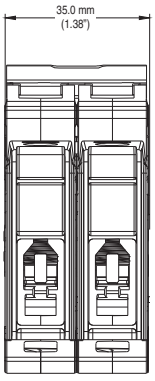
1-Pole



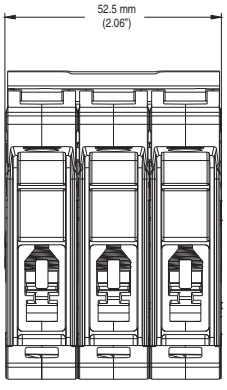
1-Pole



2-, 3-Pole



2-Pole



3-Pole

Application Information

Circuit Voltage

The Bulletin 1489-M circuit breakers are rated by voltage class. Applications should not exceed the listed voltage and current range.

Circuit Frequency

The Bulletin 1489-M circuit breakers may be applied to frequencies of 50 Hz and 60 Hz without derating. For applications above 60 Hz, contact Rockwell Automation with specific application information for the derating of the circuit breakers.

Available Short Circuit Current

The Bulletin 1489-M circuit breakers should only be applied in those applications in which the available short-circuit (or fault) current is less than or equal to 10 kA (US/Canada) and 15 kA (IEC).

Tripping Characteristics

The trip curve characteristics are shown on the following pages. The trip bands shown for each breaker represent current tripping limits for a circuit breaker and are within the limits established by UL.

The standard tripping characteristic for Bulletin 1489-M is Type C. Type C has a magnetic trip activated at 5-10 times the rated current of the circuit breaker. The reference temperature for the thermal tripping characteristics is 30 °C. The Type C characteristic will suit most applications.

In rare occurrences when the Type C characteristic does not fully meet the application, Type D magnetic trip characteristic is available, allowing for transients approximately twice as high as the standard Type C.

For a specific current at 30 °C, a circuit breaker will open ("clear the circuit") automatically at some total time that will be within the minimum and maximum time shown on the curves. For example, a one-pole, 15 A, Bulletin 1489-M circuit breaker trips in not less than 1 s and not more than 200 s on a 30 A current. Because the UL standard defines this time spread, users should not specify exact tripping time. The lower current portion of the curves (upper left) depicts the time to trip due to thermal action and reflect overload protection of the wire and connect load. The higher current portion of the curves (lower right) depicts the trip due to magnetic action of the circuit breaker and reflects protection due to short circuit level currents.

Application Considerations

The following is a discussion of application considerations related to North American applications. When applying product to IEC regional requirements, follow IEC practices and guidelines.

The selection of a specific ampere rating for a specific application is dependent on the type of load and duty cycle and is governed by the National Electrical Code (Canadian Electrical Code) and UL/CSA. In general, the codes require that overcurrent protection is at the current supply and at points where wire sizes are reduced. In addition, the codes state that conductors be protected according to their current carrying capacity. There are specific situations that require application consideration, such as motor circuit, and guidelines for the selection for transformer protection.

The Bulletin 1489-M circuit breakers are "non-100% rated" as defined by UL 489, para 7.1.4.2. As such, the circuit breaker's rating should be loaded to no more than 80% if used with continuous loads.

Line and load may be reversed. The Bulletin 1489-M circuit breaker may be bottom fed.

Branch Circuits

Bulletin 1489-M circuit breakers may be used to protect branch circuits. A branch circuit is the wiring portion of a system extending beyond the final overcurrent device protecting the circuit. Guidelines established in NEC, CEC, UL, and CSA should be used to determine the specific device. For example:

Motor Branch Circuit
Bulletin 1489-M circuit breakers are not horsepower rated because they are able to safely interrupt currents far in excess of the locked rotor value for a selected motor. This ability is recognized in the codes and standards and is also established by the UL and CSA tests described in UL 489 and CSA C22.2 No. 5 standards.

The size of a Bulletin 1489-M circuit breaker should be determined following the guidelines for an Inverse Time Circuit Breaker.

References: NEC 430.51 and UL 489. Also see CEC and appropriate Canadian Standards.

Transformer Protection
Bulletin 1489-M circuit breakers may be used for transformer protection following the guidelines established.

References: NEC 450 and UL 489. Also see CEC and appropriate Canadian Standards.

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Heater Load, Lighting, and Other Load Protection
Bulletin 1489-M circuit breakers may be used for protection of heater loads, lighting loads, and other loads following the guidelines established.

References: NEC Article 31 and UL 508A. Also see CEC and appropriate Canadian Standards.

SWD Rating

The Bulletin 1489-M breakers (0.5 … 20 A) are rated as Switch Duty (SWD) and as such may be applied to switch fluorescent lighting loads up to their current and voltage maximum.

Coordinated Overcurrent Protection

Where an orderly shutdown is required to minimize the hazards to personnel and equipment, a system of coordination based upon the faulted or overloaded circuit is isolated by selective operation of only the overcurrent protective device closest to the overcurrent condition. The user should select devices that meet this requirement.
References: NEC 240.12. Also see CEC.

HACR Rating

Bulletin 1489-M Circuit Breakers are rated as Heating, Air Conditioning and Refrigeration circuit breakers as defined by UL 489, paragraph 6.7 and may used in this type of application.

Current Limiting

Bulletin 1489-M Circuit Breakers are rated as current limiting circuit breakers as defined by UL 489, paragraph 8.6.

The Bulletin 1489-M line features the ability to achieve short circuit interruptions far more effectively than conventional breakers. In conventional circuit breakers, the short circuit interruption time required is approximately one or two half cycles of an AC sine wave. When the contacts open, the resulting arc continues to burn until the current level passes through zero. The arc may re-ignite because of the insufficient width of the contact gap. The current that flows until the arc is extinguished produces a heating effect proportional to the I^2t value (let-through-energy) of the fault current.

The Bulletin 1489-M device is designed to substantially reduce the amount of let-through-current and the resulting let-through-energy that can damage protected components. The Bulletin 1489-M has the ability to interrupt short circuit current within the first half cycle of the fault. Limiting let-through current and energy will protect against the harmful effects of overcurrent and is focused primarily on avoiding excessive heat and mechanical damage.

Both of these factors are proportional to the square of the current. Thermal energy is proportional to the square of the RMS value and magnetic forces are proportional to the square of the peak value. The most effective way to provide protection is to substantially limit let-through-energy. This provides the following advantages:

- Far less damage at the location of the short circuit.
- Fast electric separation of a faulty unit from the system, especially power supplies connected in parallel that are switched off when the voltage of the power bus drops below a certain level.
- Far less wear on the miniature circuit breaker itself. This means more safe interruptions.
- Better protection of all components in the short circuit path.
- Far wider range of selective action when used with an upstream protective device. (No nuisance shut downs from feeder line interruptions, causing a blackout in all connected branches.)

Ambient Temperature Derating

The Bulletin 1489-M circuit breakers are rated in RMS amperes at a 40 °C (104 °F) ambient temperature per UL 489/CSA C22.2 No. 5. This temperature is used as the ambient temperature external to an industrial enclosure. If a circuit breaker is applied in a temperature that exceeds the 40 °C (104 °F) ambient rating, then the circuit breaker should be derated using the table below. For IEC 60947-2 standard, the products carry an ambient rating of 30 °C. Follow standard IEC application considerations for temperature rating in different ambient temperatures.

Note: Application below 0º C is for non-condensing atmosphere. Care should be taken for applications below 0 °C. These devices are not certified to operate correctly in the presence of ice.

Bulletin 1489-M
Temperature Derating, UL
Reference temperature = 40 °C

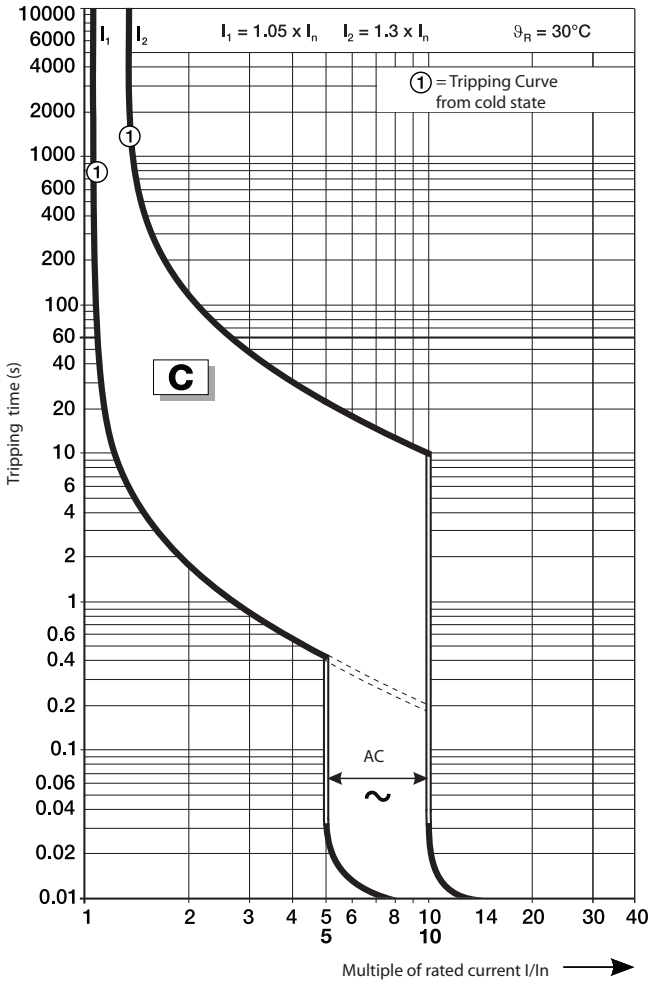
Current Rating	Ambient temperature (°C)									
(A)	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1	1.0	0.9
1.6	2.0	2.0	1.9	1.8	1.8	1.7	1.7	1.6	1.5	1.5
2	2.5	2.4	2.4	2.3	2.2	2.1	2.1	2	1.9	1.9
3	3.7	3.7	3.6	3.4	3.3	3.2	3.1	3	2.9	2.8
4	5.0	4.9	4.7	4.6	4.4	4.3	4.1	4	3.9	3.8
5	6.2	6.1	5.9	5.7	5.6	5.4	5.2	5	4.8	4.7
6	7.4	7.3	7.1	6.9	6.7	6.4	6.2	6	5.8	5.7
7	8.7	8.6	8.3	8.0	7.8	7.5	7.3	7	6.7	6.6
8	9.9	9.8	9.5	9.2	8.9	8.6	8.3	8	7.7	7.6
10	12.4	12.2	11.9	11.5	11.1	10.7	10.4	10	9.6	9.4
13	16.1	15.9	15.4	14.9	14.4	14.0	13.5	13	12.5	12.3
15	18.6	18.3	17.8	17.2	16.7	16.1	15.6	15	14.4	14.2
16	19.8	19.6	19.0	18.4	17.8	17.2	16.6	16	15.4	15.1
20	24.8	24.4	23.7	23.0	22.2	21.5	20.7	20	19.3	18.9
25	31.0	30.6	29.6	28.7	27.8	26.9	25.9	25	24.1	23.6
30	37.2	36.7	35.6	34.4	33.3	32.2	31.1	30	28.9	28.3
32	39.7	39.1	37.9	36.7	35.6	34.4	33.2	32	30.8	30.2
35	43.4	42.8	41.5	40.2	38.9	37.6	36.3	35	33.7	33.1
40	49.6	48.9	47.4	45.9	44.4	43.0	41.5	40	38.5	37.8
50	62.0	61.1	59.3	57.4	55.6	53.7	51.9	50	48.2	47.2
60	74.4	73.3	71.1	68.9	66.7	64.4	62.2	60	57.8	56.7
63	78.2	77.0	74.7	72.3	70.0	67.7	65.3	63	60.7	59.5

Bulletin 1489-M
Temperature Derating, IEC
Reference temperature = 30 °C

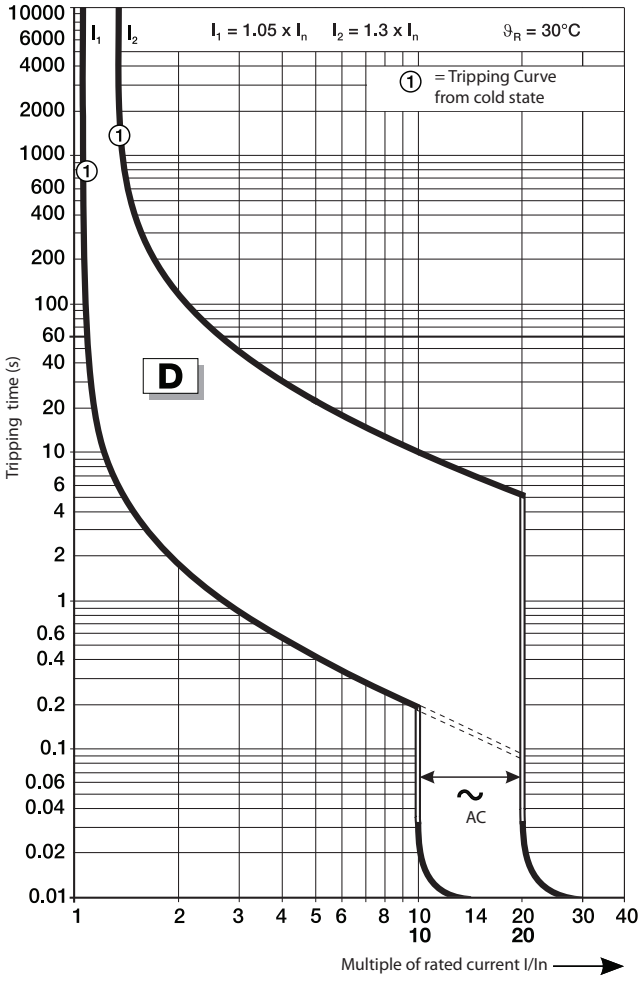
Current Rating	Ambient temperature (°C)									
(A)	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.1	1.1	1.1	1.0	1	1.0	0.9	0.9
1.6	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.5	1.5	1.5
2	2.4	2.4	2.3	2.2	2.1	2.1	2	1.9	1.9	1.8
3	3.6	3.6	3.4	3.3	3.2	3.1	3	2.9	2.8	2.7
4	4.8	4.7	4.6	4.4	4.3	4.1	4	3.9	3.7	3.6
5	6.0	5.9	5.7	5.6	5.4	5.2	5	4.8	4.6	4.5
6	7.2	7.1	6.9	6.7	6.4	6.2	6	5.8	5.6	5.4
7	8.4	8.3	8.0	7.8	7.5	7.3	7	6.7	6.5	6.4
8	9.6	9.5	9.2	8.9	8.6	8.3	8	7.7	7.4	7.3
10	12.0	11.9	11.5	11.1	10.7	10.4	10	9.6	9.3	9.1
13	15.6	15.4	14.9	14.4	14.0	13.5	13	12.5	12.0	11.8
15	18.1	17.8	17.2	16.7	16.1	15.6	15	14.4	13.9	13.6
16	19.3	19.0	18.4	17.8	17.2	16.6	16	15.4	14.8	14.5
20	24.1	23.7	23.0	22.2	21.5	20.7	20	19.3	18.5	18.2
25	30.1	29.6	28.7	27.8	26.9	25.9	25	24.1	23.2	22.7
30	36.1	35.6	34.4	33.3	32.2	31.1	30	28.9	27.8	27.2
32	38.5	37.9	36.7	35.6	34.4	33.2	32	30.8	29.6	29.0
35	42.1	41.5	40.2	38.9	37.6	36.3	35	33.7	32.4	31.8
40	48.1	47.4	45.9	44.4	43.0	41.5	40	38.5	37.0	36.3
50	60.2	59.3	57.4	55.6	53.7	51.9	50	48.2	46.3	45.4
60	72.2	71.1	68.9	66.7	64.4	62.2	60	57.8	55.6	54.5
63	75.8	74.7	72.3	70.0	67.7	65.3	63	60.7	58.3	57.2

Tripping Characteristics*

C Curve



D Curve



*DC trip curves:
When using 1489-M.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For C trip curve = 7.5 to 15 multiple of the rated current (I/ In).
For D trip curve = 15 to 30 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

ALLEN BRADLEY 1492-GH

Accessories

Right Mount

Photo	Product Description ★‡§	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Shunt Trip		UL 489 CSA 22.2 No. 5 EN 60947-5-2	UL Listed CSA Certified CE Marked	110...415V AC 110...250V DC	—	1489-AMST1
			UL 489 CSA 22.2 No. 5 EN 60947-5-2	UL Listed CSA Certified CE Marked	12...60V AC/DC	—	1489-AMST2
	Signal Contact	1 N.O./N.C. (1 C.O.) 	UL 489 CSA 22.2 No. 5 EN 60947-5-1 GB 14048.5	UL Listed CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480V AC 2A @ 277V AC 1.5A @ 125V DC 2A @ 60V DC 4A @ 24V DC	2A @ 230V (AC-14) 1A @ 400V (AC-14) 1.5A @ 110V (DC-12) 1A @ 220V (DC-12) 4A @ 24V (DC-13) 2A @ 60V (DC-13)	1489-AMRS3
	Auxiliary Contact	1 N.O./N.C. (1 C.O.) 	UL 489 CSA 22.2 No. 5 EN 60947-5-1 GB 14048.5	UL Listed CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480V AC 2A @ 277V AC 1.5A @ 125V DC 2A @ 60V DC 4A @ 24V DC	2A @ 230V (AC-14) 1A @ 400V (AC-14) 1.5A @ 110V (DC-12) 1A @ 220V (DC-12) 4A @ 24V (DC-13) 2A @ 60V (DC-13)	1489-AMRA3

★ A maximum of two auxiliary contacts ***OR*** one signal contact and one auxiliary contact may installed with or without one shunt trip per 1489-M. If a shunt trip is not used, two signal contacts may be installed per 1489-M.

‡ A maximum of three accessories may be installed per 1489-M. The shunt trip must be mounted closest to the 1489-M, then the signal contact, then the auxiliary contact(s). For allowed combinations, and installation instructions please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

§ The shunt trips are allowed two wires per terminal (one wire per terminal slot). The signal and auxiliary contacts are allowed up to two wires per terminal.

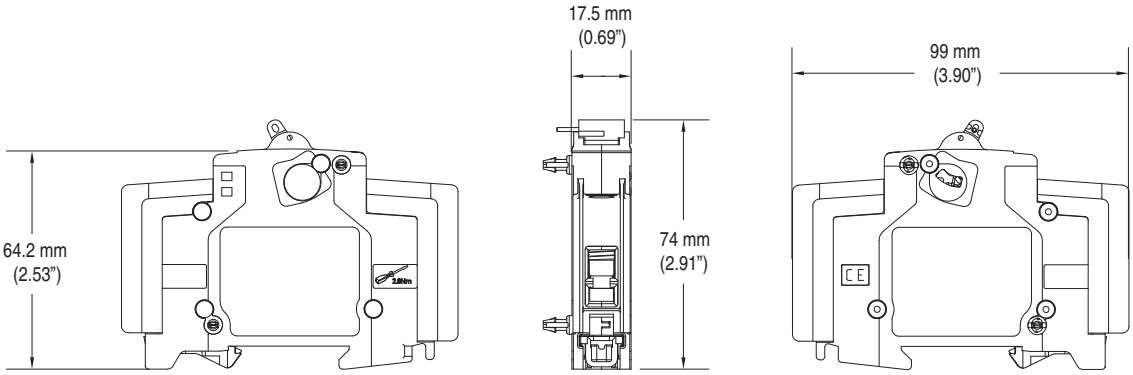
Toggle Mount

Photo	Product Description	Cat. No.
	Lock-out attachment for 1-pole MCB	189-ALOA1
	Lock-out attachment for multi-pole MCB	189-ALOA2

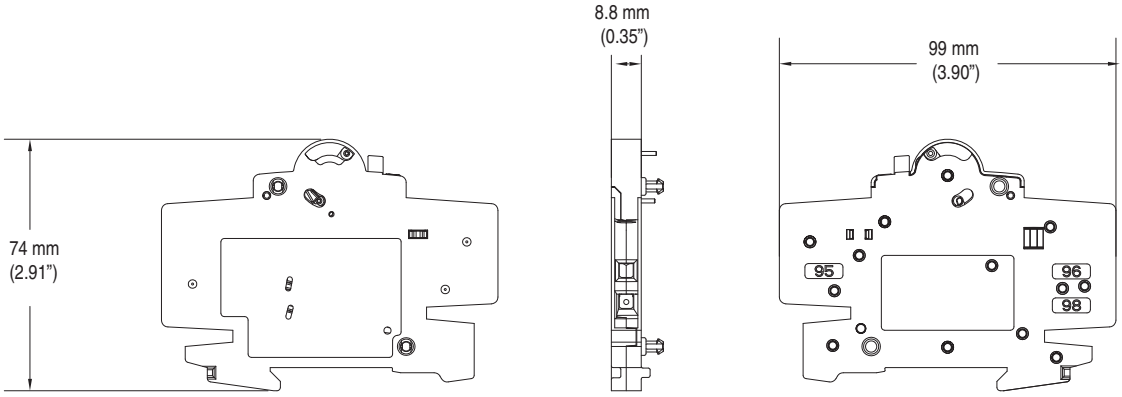
ALLEN BRADLEY 1492-GH

Accessory Approximate Dimensions

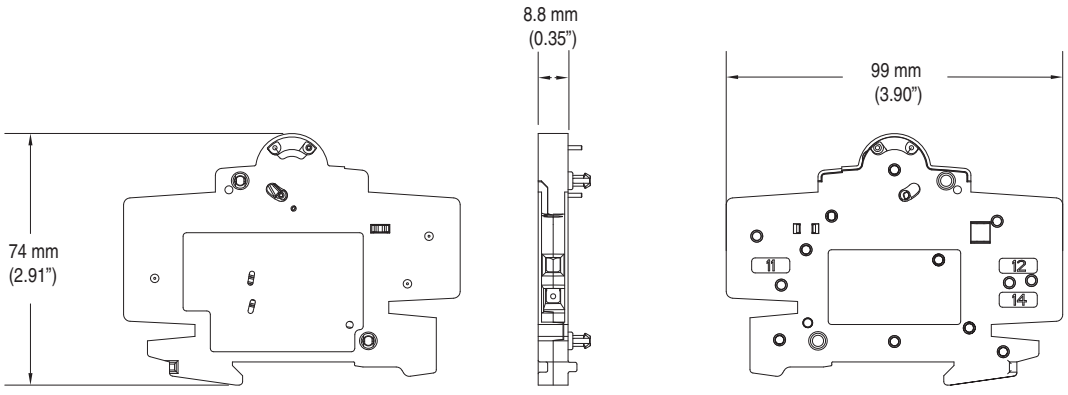
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



1489-AMST1 and 1489-AMST2



1489-AMRS3



1489-AMRA3

Bus Bars

1489-M Bus Bars

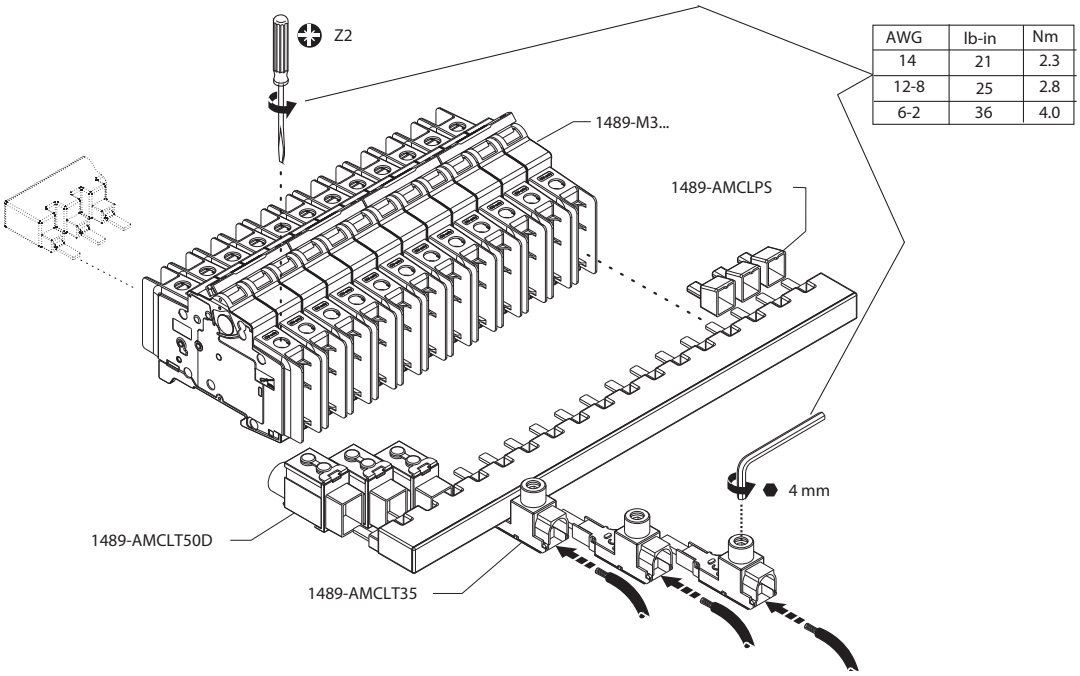
Phase	No. of Pins	No. of Circuit Breakers	Pkg Qty.	Cat. No. ★‡
1-Phase	6	6	10	1489-AMCL106
	12	12	10	1489-AMCL112
	18	18	10	1489-AMCL118
2-Phase	6	3	10	1489-AMCL206
	12	6	10	1489-AMCL212
	18	9	10	1489-AMCL218
3-Phase	6	2	10	1489-AMCL306
	12	4	10	1489-AMCL312
	18	6	10	1489-AMCL318

★ cULus, UL 508, EN 60947-1, CE Marked
‡ Maximum of three bus bars allowed

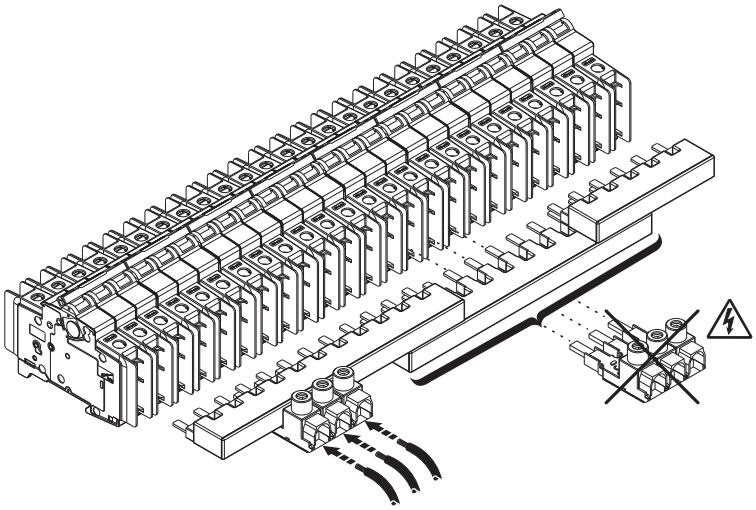
1489-M Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 35 mm²	10	1489-AMCLT35
Dedicated Power Feed, 50 mm²	10	1489-AMCLT50D
Protective Shroud (for unused pins)	10	1489-AMCLPS

★ cULus, UL 508, EN 60947-1, CE Marked



AWG	lb-in	Nm
14	21	2.3
12-8	25	2.8
6-2	36	4.0



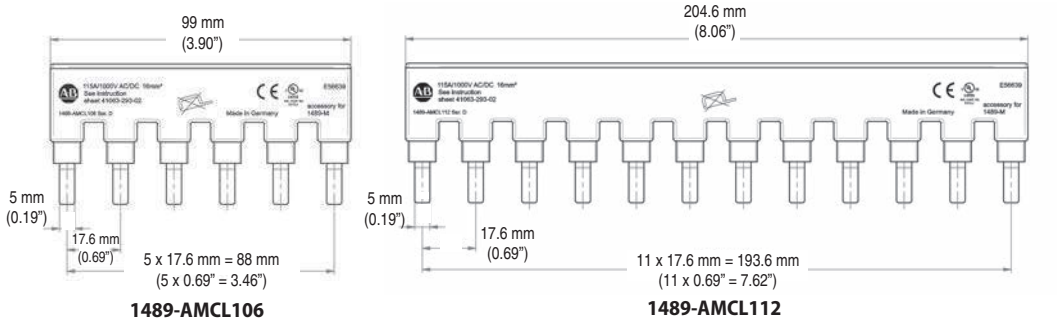
Note: Do not cut bus bars. Maximum of 3 bus bars allowed in any combination of the same phase configuration. Multiple bus bars must be installed back-to-back.

ALLEN BRADLEY 1492-GH

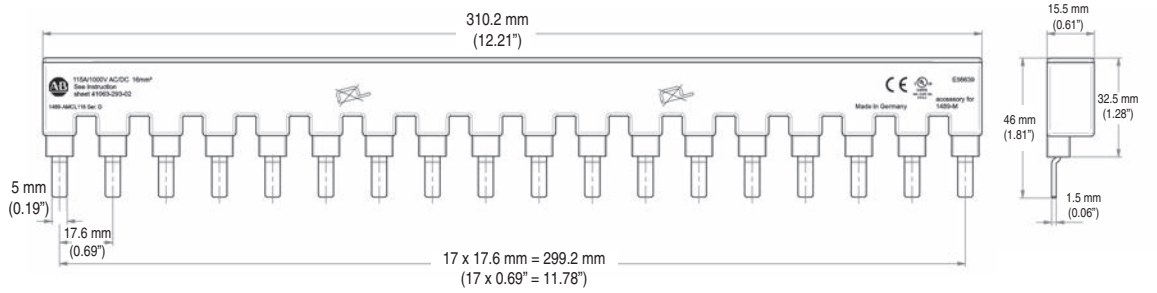
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars



1489-AMCL106 **1489-AMCL112**



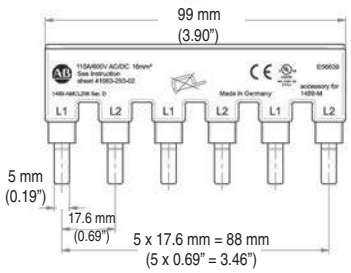
1489 -AMCL118

ALLEN BRADLEY 1492-GH

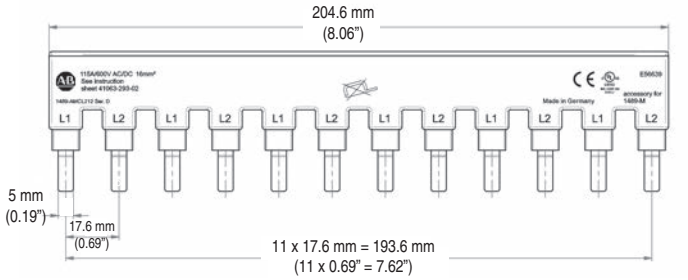
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

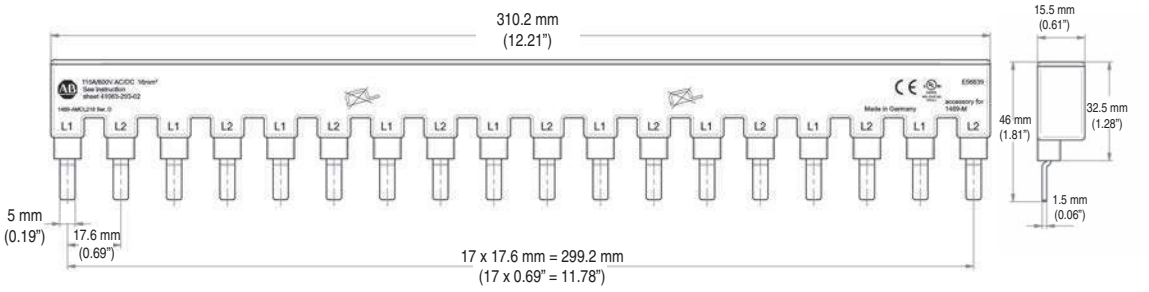
2-Phase Bus Bars



1489-AMCL206



1489 -AMCL212



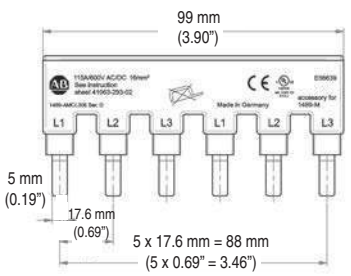
1489-AMCL218

ALLEN BRADLEY 1492-GH

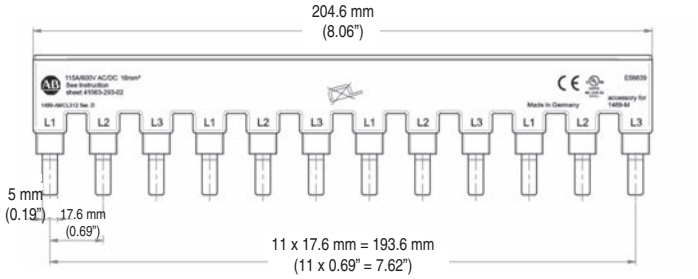
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

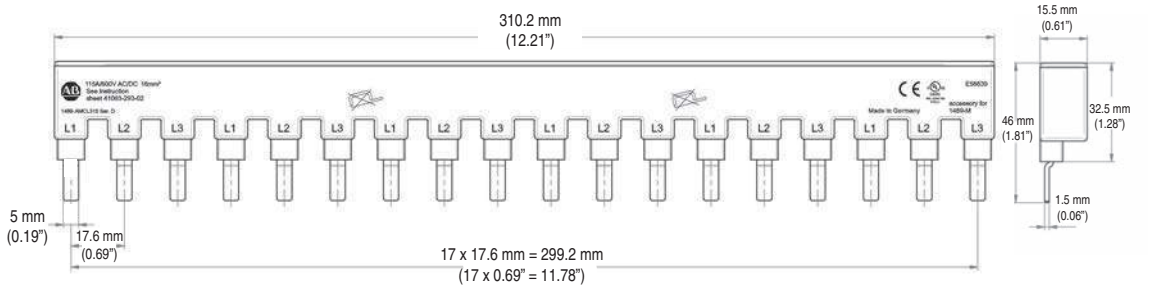
3-Phase Bus Bars



1489-AMCL306



1489 -AMCL312

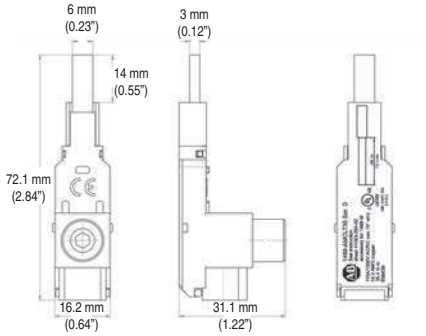


1489-AMCL318

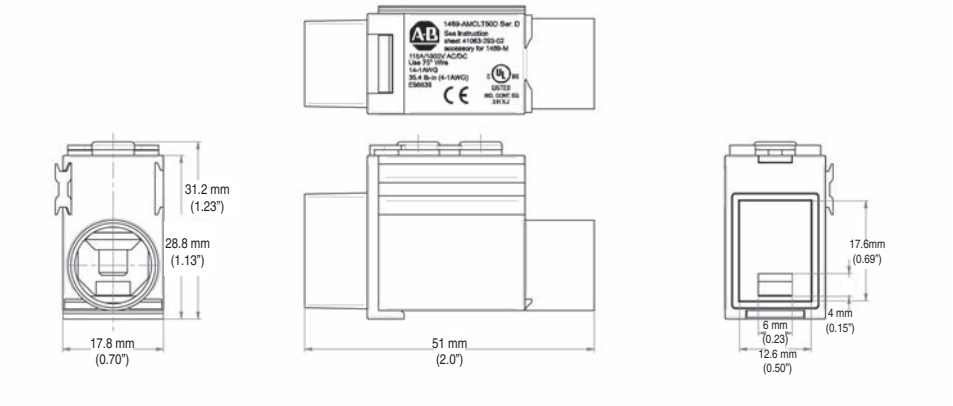
ALLEN BRADLEY 1492-GH

Bus Bar Accessory Approximate Dimensions

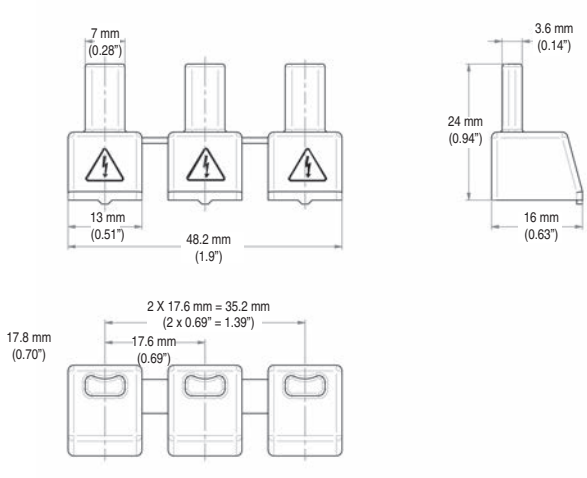
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



1489-AMCLT35

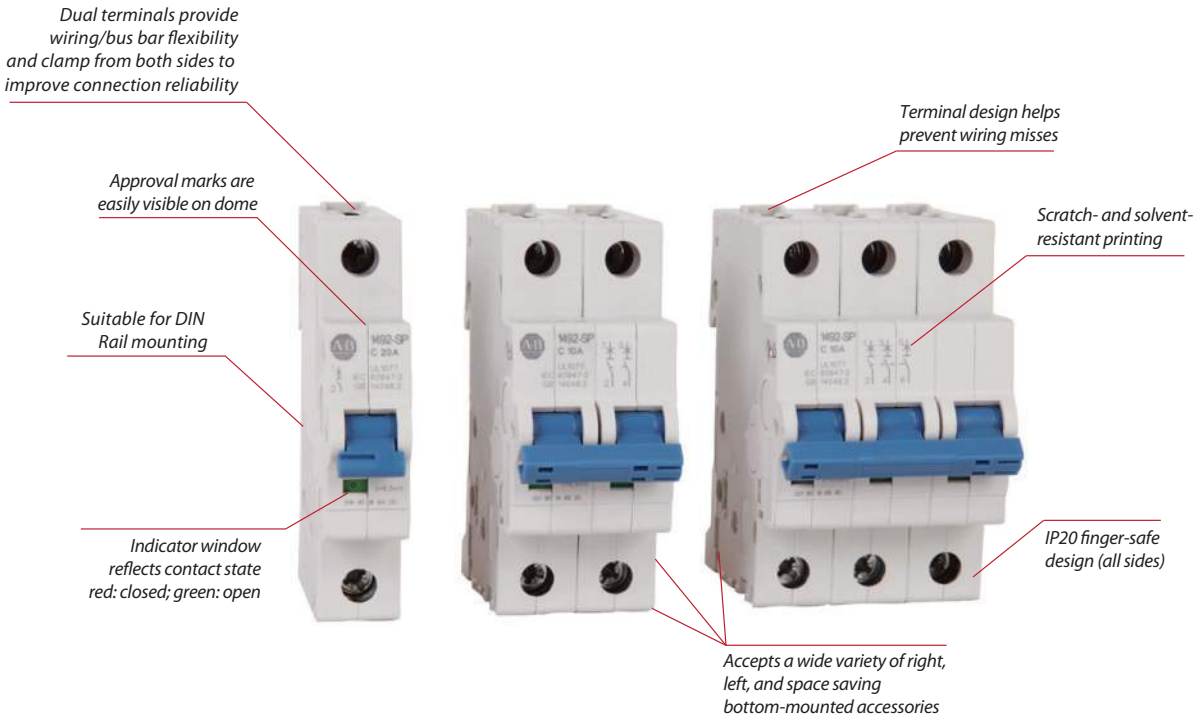


1489-AMCLT50D



1489-AMCLPS

1492-SP Supplementary Protectors



Bulletin 1492-SP thermal magnetic Supplementary Protectors provide overcurrent protection for equipment where branch circuit protection is already provided, or is not required. These devices are also Miniature Circuit Breakers as defined by IEC Standards.

These supplementary protectors are offered as a broad portfolio of pole variants, current ratings, and trip curves to match the appropriate level of protection for your application. They may be used with UL 508 Listed bus bars for convenience in panel assembly, a wide range of left-, right- and space saving bottom-mount accessories, and lock out attachments for safety during maintenance.

1492-SP Supplementary Protectors

Rated Voltage	UL/CSA: Max. 480Y/277V AC IEC: U_e 230/400V AC
Interrupting Capacity	UL/CSA: 5...10 kA IEC: 15 kA
Current Ratings	0.5...63 A
Poles	1, 2, 3, 1+N, 3+N
Trip Curves	B, C, D
Standards Compliance	UL 1077 CSA C22.2 No. 235 EN 60947-2 GB 14048.2
Certifications	UL Recognized, File No. E65138 ★ CSA Certified, File No. 259391 ★ CE Marked CCC Certified VDE Certified RoHS Compliant

★ 1+N and 3+N devices are not UL recognized or CSA certified.

Features

- Current limiting
- Fast breaking time
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options, which require no DIN Rail space
- 40 °C calibration temperature (UL/CSA) eliminates need to derate for 508A industrial control panel installations
- Installation of up to six accessories on the same circuit breaker
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Superior shock and vibration resistance to prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device
- Suitable for extreme ambient conditions

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492	-	SPM	1	C	010	-	N
		a	***b***	***c***	***d***		***e***

a

Voltage Type	
Code	**Description**
SPM	AC Supplementary Protector

b

Poles	
Code	**Description**
1	1-Pole
2	2-Pole
3	3-Pole

c

Trip Curve	
Code	**Trip Curve**
B	Trip Curve B
C	Trip Curve C
D	Trip Curve D

d

Rated Current (I_n)	
Code	**Current [A]**
005	0.5
010	1
020	2
030	3
040	4
050	5
060	6
070	7
080	8
100	10
130	13
150	15
160	16
200	20
250	25
300	30
320	32
400	40
500	50
630	63

e

+ Neutral (available for 1+N and 3+N configurations)	
Code	**Description**
	Can be left blank
N	+ Neutral

ALLEN BRADLEY 1492-GH

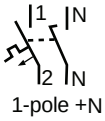
Product Selection

1-Pole Supplementary Protectors

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve B Resistive or Slightly Inductive 3...5 I_n Cat. No.	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
1-pole	0.5	1492-SPM1B005	1492-SPM1C005	1492-SPM1D005
	1	1492-SPM1B010	1492-SPM1C010	1492-SPM1D010
	2	1492-SPM1B020	1492-SPM1C020	1492-SPM1D020
	3	1492-SPM1B030	1492-SPM1C030	1492-SPM1D030
	4	1492-SPM1B040	1492-SPM1C040	1492-SPM1D040
	5	1492-SPM1B050	1492-SPM1C050	1492-SPM1D050
	6	1492-SPM1B060	1492-SPM1C060	1492-SPM1D060
	7	1492-SPM1B070	1492-SPM1C070	1492-SPM1D070
	8	1492-SPM1B080	1492-SPM1C080	1492-SPM1D080
	10	1492-SPM1B100	1492-SPM1C100	1492-SPM1D100
	13	1492-SPM1B130	1492-SPM1C130	1492-SPM1D130
	15	1492-SPM1B150	1492-SPM1C150	1492-SPM1D150
	16	1492-SPM1B160	1492-SPM1C160	1492-SPM1D160
	20	1492-SPM1B200	1492-SPM1C200	1492-SPM1D200
	25	1492-SPM1B250	1492-SPM1C250	1492-SPM1D250
	30	1492-SPM1B300	1492-SPM1C300	1492-SPM1D300
	32	1492-SPM1B320	1492-SPM1C320	1492-SPM1D320
	40	1492-SPM1B400	1492-SPM1C400	1492-SPM1D400
	50	1492-SPM1B500	1492-SPM1C500	1492-SPM1D500
	63	1492-SPM1B630	1492-SPM1C630	1492-SPM1D630

Product Selection

1-Pole + Neutral Supplementary Protectors★

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve B Resistive or Slightly Inductive 3...5 I_n Cat. No.	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
 1-pole +N	0.5	1492-SPM1B005-N	1492-SPM1C005-N	1492-SPM1D005-N
	1	1492-SPM1B010-N	1492-SPM1C010-N	1492-SPM1D010-N
	2	1492-SPM1B020-N	1492-SPM1C020-N	1492-SPM1D020-N
	3	1492-SPM1B030-N	1492-SPM1C030-N	1492-SPM1D030-N
	4	1492-SPM1B040-N	1492-SPM1C040-N	1492-SPM1D040-N
	5	1492-SPM1B050-N	1492-SPM1C050-N	1492-SPM1D050-N
	6	1492-SPM1B060-N	1492-SPM1C060-N	1492-SPM1D060-N
	7	1492-SPM1B070-N	1492-SPM1C070-N	1492-SPM1D070-N
	8	1492-SPM1B080-N	1492-SPM1C080-N	1492-SPM1D080-N
	10	1492-SPM1B100-N	1492-SPM1C100-N	1492-SPM1D100-N
	13	1492-SPM1B130-N	1492-SPM1C130-N	1492-SPM1D130-N
	15	1492-SPM1B150-N	1492-SPM1C150-N	1492-SPM1D150-N
	16	1492-SPM1B160-N	1492-SPM1C160-N	1492-SPM1D160-N
	20	1492-SPM1B200-N	1492-SPM1C200-N	1492-SPM1D200-N
	25	1492-SPM1B250-N	1492-SPM1C250-N	1492-SPM1D250-N
	30	1492-SPM1B300-N	1492-SPM1C300-N	1492-SPM1D300-N
	32	1492-SPM1B320-N	1492-SPM1C320-N	1492-SPM1D320-N
	40	1492-SPM1B400-N	1492-SPM1C400-N	1492-SPM1D400-N
	50	1492-SPM1B500-N	1492-SPM1C500-N	1492-SPM1D500-N
	63	1492-SPM1B630-N	1492-SPM1C630-N	1492-SPM1D630-N

★ 1+N configurations are not UL or CSA certified.

ALLEN BRADLEY 1492-GH

Product Selection

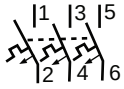
2-Pole Supplementary Protectors

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve B Resistive or Slightly Inductive 3...5 I_n Cat. No.	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
2-pole	0.5	1492-SPM2B005	1492-SPM2C005	1492-SPM2D005
	1	1492-SPM2B010	1492-SPM2C010	1492-SPM2D010
	2	1492-SPM2B020	1492-SPM2C020	1492-SPM2D020
	3	1492-SPM2B030	1492-SPM2C030	1492-SPM2D030
	4	1492-SPM2B040	1492-SPM2C040	1492-SPM2D040
	5	1492-SPM2B050	1492-SPM2C050	1492-SPM2D050
	6	1492-SPM2B060	1492-SPM2C060	1492-SPM2D060
	7	1492-SPM2B070	1492-SPM2C070	1492-SPM2D070
	8	1492-SPM2B080	1492-SPM2C080	1492-SPM2D080
	10	1492-SPM2B100	1492-SPM2C100	1492-SPM2D100
	13	1492-SPM2B130	1492-SPM2C130	1492-SPM2D130
	15	1492-SPM2B150	1492-SPM2C150	1492-SPM2D150
	16	1492-SPM2B160	1492-SPM2C160	1492-SPM2D160
	20	1492-SPM2B200	1492-SPM2C200	1492-SPM2D200
	25	1492-SPM2B250	1492-SPM2C250	1492-SPM2D250
	30	1492-SPM2B300	1492-SPM2C300	1492-SPM2D300
	32	1492-SPM2B320	1492-SPM2C320	1492-SPM2D320
	40	1492-SPM2B400	1492-SPM2C400	1492-SPM2D400
	50	1492-SPM2B500	1492-SPM2C500	1492-SPM2D500
	63	1492-SPM2B630	1492-SPM2C630	1492-SPM2D630

ALLEN BRADLEY 1492-GH

Product Selection

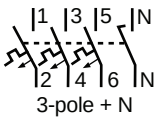
3-Pole Supplementary Protectors

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve B Resistive or Slightly Inductive 3...5 I_n Cat. No.	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
 3-pole	0.5	1492-SPM3B005	1492-SPM3C005	1492-SPM3D005
	1	1492-SPM3B010	1492-SPM3C010	1492-SPM3D010
	2	1492-SPM3B020	1492-SPM3C020	1492-SPM3D020
	3	1492-SPM3B030	1492-SPM3C030	1492-SPM3D030
	4	1492-SPM3B040	1492-SPM3C040	1492-SPM3D040
	5	1492-SPM3B050	1492-SPM3C050	1492-SPM3D050
	6	1492-SPM3B060	1492-SPM3C060	1492-SPM3D060
	7	1492-SPM3B070	1492-SPM3C070	1492-SPM3D070
	8	1492-SPM3B080	1492-SPM3C080	1492-SPM3D080
	10	1492-SPM3B100	1492-SPM3C100	1492-SPM3D100
	13	1492-SPM3B130	1492-SPM3C130	1492-SPM3D130
	15	1492-SPM3B150	1492-SPM3C150	1492-SPM3D150
	16	1492-SPM3B160	1492-SPM3C160	1492-SPM3D160
	20	1492-SPM3B200	1492-SPM3C200	1492-SPM3D200
	25	1492-SPM3B250	1492-SPM3C250	1492-SPM3D250
	30	1492-SPM3B300	1492-SPM3C300	1492-SPM3D300
	32	1492-SPM3B320	1492-SPM3C320	1492-SPM3D320
	40	1492-SPM3B400	1492-SPM3C400	1492-SPM3D400
	50	1492-SPM3B500	1492-SPM3C500	1492-SPM3D500
	63	1492-SPM3B630	1492-SPM3C630	1492-SPM3D630

ALLEN BRADLEY 1492-GH

Product Selection

3-Pole + Neutral Supplementary Protectors★

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve B Resistive or Slightly Inductive 3...5 I_n Cat. No.	Trip Curve C Inductive 5...10 I_n Cat. No.	Trip Curve D Highly Inductive 10...20 I_n Cat. No.
 3-pole + N	0.5	1492-SPM3B005-N	1492-SPM3C005-N	1492-SPM3D005-N
	1	1492-SPM3B010-N	1492-SPM3C010-N	1492-SPM3D010-N
	2	1492-SPM3B020-N	1492-SPM3C020-N	1492-SPM3D020-N
	3	1492-SPM3B030-N	1492-SPM3C030-N	1492-SPM3D030-N
	4	1492-SPM3B040-N	1492-SPM3C040-N	1492-SPM3D040-N
	5	1492-SPM3B050-N	1492-SPM3C050-N	1492-SPM3D050-N
	6	1492-SPM3B060-N	1492-SPM3C060-N	1492-SPM3D060-N
	7	1492-SPM3B070-N	1492-SPM3C070-N	1492-SPM3D070-N
	8	1492-SPM3B080-N	1492-SPM3C080-N	1492-SPM3D080-N
	10	1492-SPM3B100-N	1492-SPM3C100-N	1492-SPM3D100-N
	13	1492-SPM3B130-N	1492-SPM3C130-N	1492-SPM3D130-N
	15	1492-SPM3B150-N	1492-SPM3C150-N	1492-SPM3D150-N
	16	1492-SPM3B160-N	1492-SPM3C160-N	1492-SPM3D160-N
	20	1492-SPM3B200-N	1492-SPM3C200-N	1492-SPM3D200-N
	25	1492-SPM3B250-N	1492-SPM3C250-N	1492-SPM3D250-N
	30	1492-SPM3B300-N	1492-SPM3C300-N	1492-SPM3D300-N
	32	1492-SPM3B320-N	1492-SPM3C320-N	1492-SPM3D320-N
	40	1492-SPM3B400-N	1492-SPM3C400-N	1492-SPM3D400-N
	50	1492-SPM3B500-N	1492-SPM3C500-N	1492-SPM3D500-N
	63	1492-SPM3B630-N	1492-SPM3C630-N	1492-SPM3D630-N

★ 3+N configurations are not UL or CSA certified.

ALLEN BRADLEY 1492-GH

Specifications

Electrical Ratings			
Poles			1, 2, 3, 1+N, 3+N
Tripping characteristics			B, C, D
Rated current (I_n)			0.5 . . . 63 A
Rated frequency (f)			50/60 Hz
Rated insulation voltage U_i per IEC/EN 60664-1			250 V AC (phase to ground), 440V AC (phase to phase)
Overvoltage category			III
Pollution degree			3
Data per UL/CSA			
Rated voltage	1-pole	AC	277V AC
		DC	48V DC
	2-pole	AC	480Y/277V AC
		DC	96V DC
	3-pole	AC	480Y/277V AC
Rated interrupting capacity per UL 1077			≤ 32 A: 10 kA (AC); > 32 A: 5 kA (AC); 0.5...63 A: 10 kA (DC)
Application			Supplementary protector for general use; application codes: TC1: [1P] OL0 277V AC, [2P, 3P] OL0 480Y/277V AC; SC: 10 kA (0.5...32 A), 5 kA (35...63 A), U2 480Y/277V AC; FW3
Reference temperature for tripping characteristics			40 °C
Electrical endurance			6,000 ops (AC), 6,000 ops. (DC) 1 cycle (1s - ON, 9s - OFF)
Data per IEC/EN 60947-2			
Rated operational voltage (U_e)		1-pole, 1+N	230V AC
		2-pole, 3-pole, 3+N	400V AC
Highest supply or utilization voltage (U_{max})	AC	1-pole, 1+N	253V AC
		2-pole, 3-pole, 3+N	440V AC
	DC★	1-pole	48V DC
		2-pole	96V DC
Min. operating voltage			12V AC, 12V DC
Rated ultimate short-circuit breaking capacity (I_{CU})			15 kA
Rated service short-circuit breaking capacity (I_{CS})			≤40 A: 11.25 kA >40 A: 7.5 kA
Rated impulse withstand voltage Uimp. (1.2/50µs)			4 kV (test voltage 6.2kV at sea level, 5kV at 2,000m)
Dielectric test voltage			2 kV (50/60Hz, 1 min.)
Reference temperature for tripping characteristics			30 °C
Electrical endurance 1 cycle (2s - ON, 13s - OFF, I_n ≤ 32A), 1 cycle (2s - ON, 28s - OFF, I_n > 32A)			I_n < 30A: 20,000 ops (AC) I_n ≥ 30A: 10,000 ops. (AC) 1,000 ops. (DC)

★ IEC DC ratings self-declared.

♣ 2-pole/3-pole single pole load: TC2.

Mechanical Data	
Housing	Insulation group II, RAL 7035
Indicator window	red ON/green OFF
Protection degree per EN 60529	IP20, IP40 in enclosure with cover
Mechanical endurance	20,000 operations
Shock resistance per IEC/EN 60068-2-27	25 g - 2 shocks - 13 ms
Vibration resistance per IEC/EN 60068-2-6	5g - 20 cycles at 5...150...5 Hz with load 0.8In
Environmental	
Environmental conditions (damp heat) per IEC/EN 60068-2-30	28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature∆	-25...+55 °C
Storage temperature	-40...+70 °C
Installation	
Terminal	Dual terminal
Cross-section of wire ♦ – solid, stranded (front/back terminal slot)	35/35 mm^2
	18...4/18...10 AWG
Cross-section of wire – flexible (front/back terminal slot)	25/10 mm^2
Multi-wire rating per UL, CSA	1 wire, 18 . . . 4 AWG
	2-4 wires‡, 18 . . . 10 AWG
Cross-section of bus bars (back terminal slot)	10 mm^2
Tightening torque IEC	2.8 N•m
Tightening torque UL/CSA	AWG 18...16: 13.3 in•lb. AWG 14...10: 17.7 in•lb. AWG 8...4: 39.8 in•lb.
Screwdriver	No. 2 Pozidrive
Mounting	DIN rail (EN 60715, 35mm) with fast clip
Mounting position	Any
Supply	Optional
Approximate Dimensions and Weight	
Pole dimension (H x D x W)	88 x 69 x 17.5 mm
Pole weight	115 g (4.1 oz.)
Combination with Auxiliary Elements	
Auxiliary contact	Yes
Signal contact	Yes
Shunt trip	Yes

♦ 35mm^2 self-declared, not included in IEC/EN approval.

∆ Refer to the ambient temperature derating tables.

‡ Wires must be of like size and stranding. Up to two wires per terminal slot.

ALLEN BRADLEY 1492-GH

Power Loss Due to Current

Rated Current [A]	Power Loss Per Pole [W]	Rated Current [A]	Power Loss Per Pole [W]
0.5	1.4	13	2.3
1	1.4	15	2.4
2	1.8	16	2.5
3	1.6	20	2.5
4	1.8	25	3.2
5	1.9	30	3.5
6	2.0	32	3.7
7	1.1	40	4.5
8	1.5	50	4.5
10	2.1	63	5.4

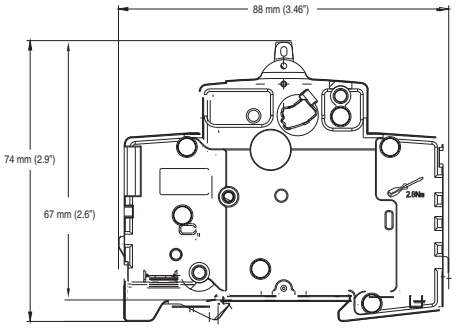
Zero-stack Derating

The installation of several miniature circuit breaker side by side with rated current on all poles requires a correction factor to the rated current (not required if spacers are used).

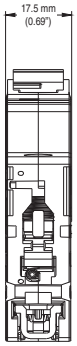
No. of Adjacent Devices	Factor
1	1
2,3	0.9
4,5	0.8
≥6	0.75

Approximate Dimensions

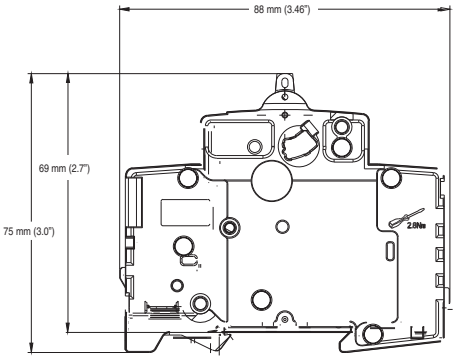
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



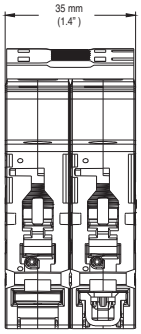
1-Pole



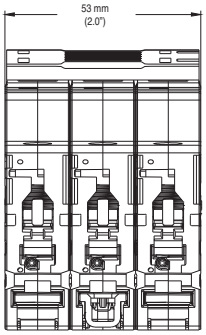
1-Pole



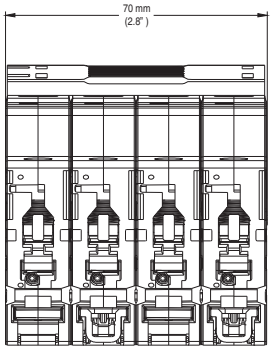
1 Pole + N, 2-, 3-, 3 Pole + N



1 Pole + N, 2-Pole



3-Pole



3-Pole + N

ALLEN BRADLEY 1492-GH

Ambient Temperature Derating

Note: Application below 0º C is for non-condensing atmosphere. Care should be taken for applications below 0 °C. These devices are not certified to operate correctly in the presence of ice.

Bulletin 1492-SP
Temperature Derating, UL
Reference temperature = 40 °C

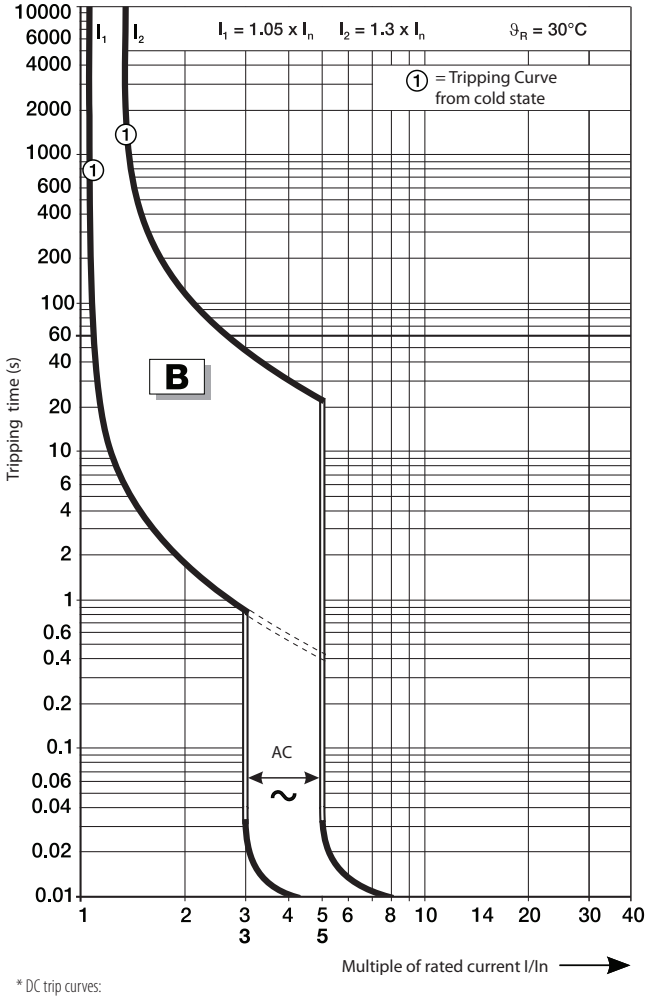
Current Rating	Ambient temperature (°C)									
(A)	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1	1.0	0.9
2	2.5	2.4	2.4	2.3	2.2	2.1	2.1	2	1.9	1.9
3	3.7	3.7	3.6	3.4	3.3	3.2	3.1	3	2.9	2.8
4	5.0	4.9	4.7	4.6	4.4	4.3	4.1	4	3.9	3.8
5	6.2	6.1	5.9	5.7	5.6	5.4	5.2	5	4.8	4.7
6	7.4	7.3	7.1	6.9	6.7	6.4	6.2	6	5.8	5.7
7	8.7	8.6	8.3	8.0	7.8	7.5	7.3	7	6.7	6.6
8	9.9	9.8	9.5	9.2	8.9	8.6	8.3	8	7.7	7.6
10	12.4	12.2	11.9	11.5	11.1	10.7	10.4	10	9.6	9.4
13	16.1	15.9	15.4	14.9	14.4	14.0	13.5	13	12.5	12.3
15	18.6	18.3	17.8	17.2	16.7	16.1	15.6	15	14.4	14.2
16	19.8	19.6	19.0	18.4	17.8	17.2	16.6	16	15.4	15.1
20	24.8	24.4	23.7	23.0	22.2	21.5	20.7	20	19.3	18.9
25	31.0	30.6	29.6	28.7	27.8	26.9	25.9	25	24.1	23.6
30	37.2	36.7	35.6	34.4	33.3	32.2	31.1	30	28.9	28.3
32	39.7	39.1	37.9	36.7	35.6	34.4	33.2	32	30.8	30.2
40	49.6	48.9	47.4	45.9	44.4	43.0	41.5	40	38.5	37.8
50	62.0	61.1	59.3	57.4	55.6	53.7	51.9	50	48.2	47.2
63	78.2	77.0	74.7	72.3	70.0	67.7	65.3	63	60.7	59.5

Bulletin 1492-SP
Temperature Derating, IEC
Reference temperature = 30 °C

Current Rating	Ambient temperature (°C)									
(A)	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.1	1.1	1.1	1.0	1	1.0	0.9	0.9
2	2.4	2.4	2.3	2.2	2.1	2.1	2	1.9	1.9	1.8
3	3.6	3.6	3.4	3.3	3.2	3.1	3	2.9	2.8	2.7
4	4.8	4.7	4.6	4.4	4.3	4.1	4	3.9	3.7	3.6
5	6.0	5.9	5.7	5.6	5.4	5.2	5	4.8	4.6	4.5
6	7.2	7.1	6.9	6.7	6.4	6.2	6	5.8	5.6	5.4
7	8.4	8.3	8.0	7.8	7.5	7.3	7	6.7	6.5	6.4
8	9.6	9.5	9.2	8.9	8.6	8.3	8	7.7	7.4	7.3
10	12.0	11.9	11.5	11.1	10.7	10.4	10	9.6	9.3	9.1
13	15.6	15.4	14.9	14.4	14.0	13.5	13	12.5	12.0	11.8
15	18.1	17.8	17.2	16.7	16.1	15.6	15	14.4	13.9	13.6
16	19.3	19.0	18.4	17.8	17.2	16.6	16	15.4	14.8	14.5
20	24.1	23.7	23.0	22.2	21.5	20.7	20	19.3	18.5	18.2
25	30.1	29.6	28.7	27.8	26.9	25.9	25	24.1	23.2	22.7
30	36.1	35.6	34.4	33.3	32.2	31.1	30	28.9	27.8	27.2
32	38.5	37.9	36.7	35.6	34.4	33.2	32	30.8	29.6	29.0
40	48.1	47.4	45.9	44.4	43.0	41.5	40	38.5	37.0	36.3
50	60.2	59.3	57.4	55.6	53.7	51.9	50	48.2	46.3	45.4
63	75.8	74.7	72.3	70.0	67.7	65.3	63	60.7	58.3	57.2

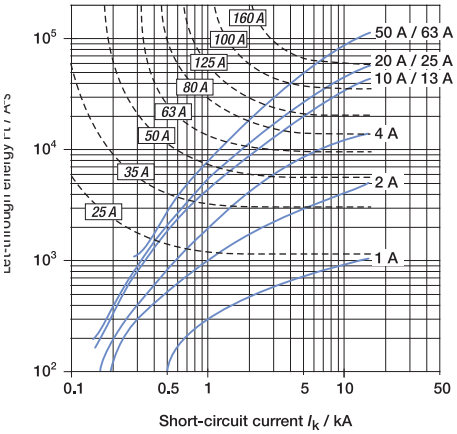
Tripping Characteristics*

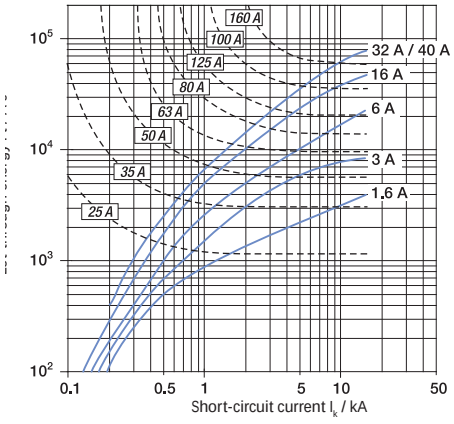
B Curve



* DC trip curves:
When using 1492-SPM.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For B trip curve = 4.5 to 7.5 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

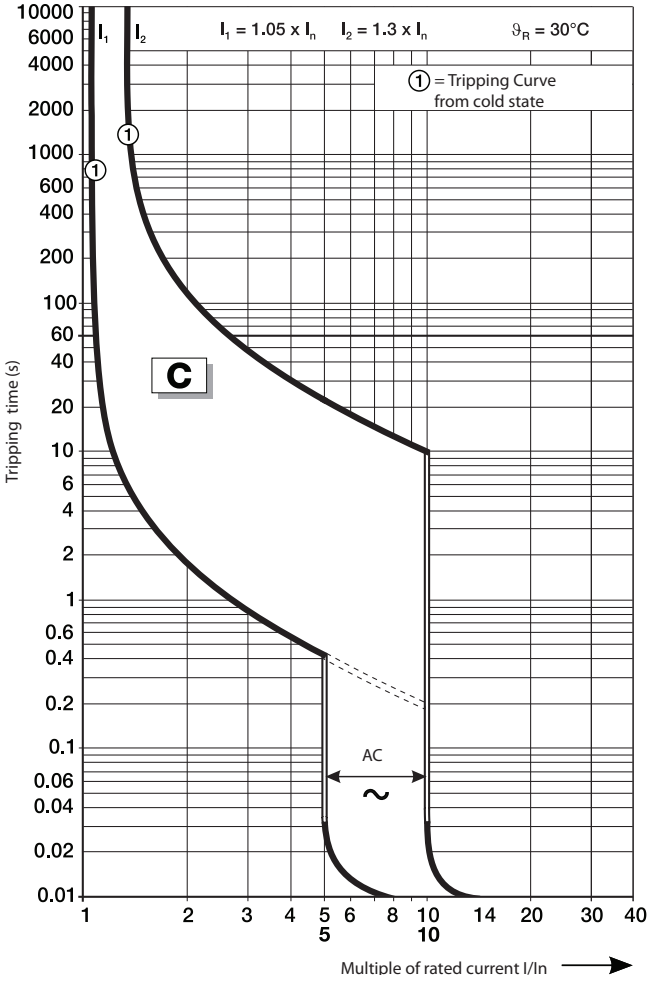
B and C Curve - 230/400V AC Let-through Energy





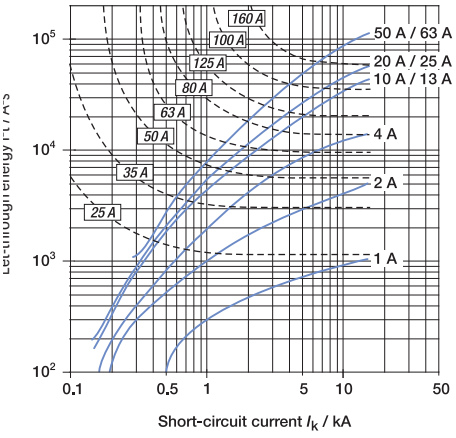
Tripping Characteristics*

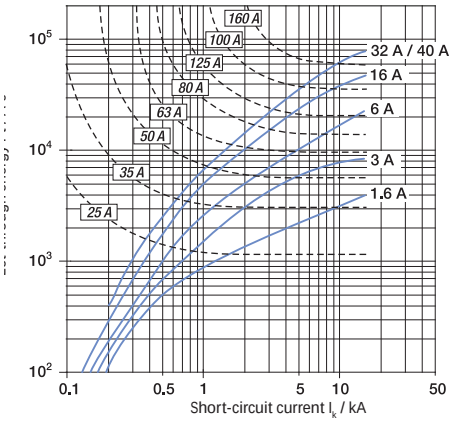
C Curve



* DC trip curves:
When using 1492-SPM.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For C trip curve = 7.5 to 15 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

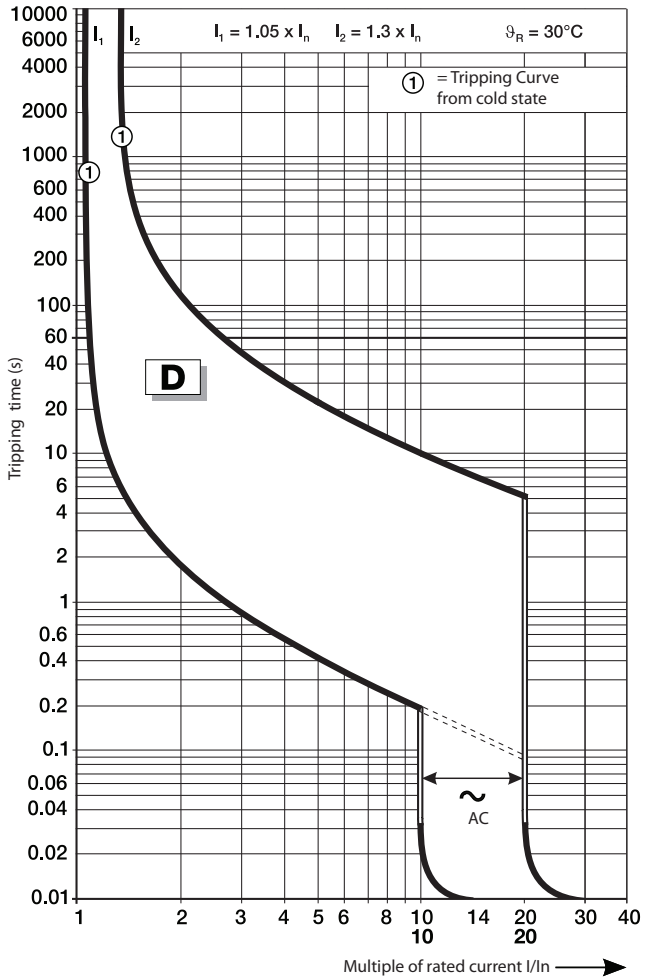
B and C Curve - 230/400V AC Let-through Energy





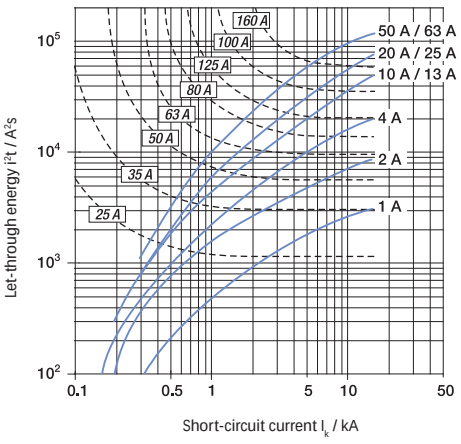
Tripping Characteristics*

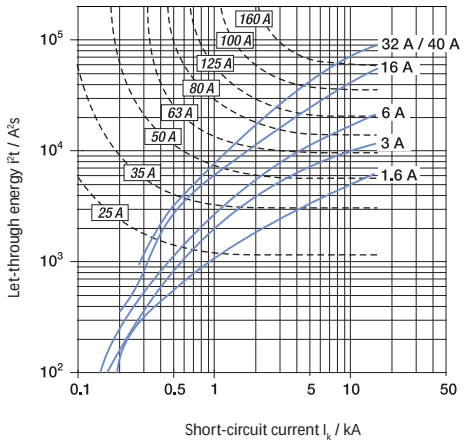
D Curve



* DC trip curves:
When using 1492-SPM.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For D trip curve = 15 to 30 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

D Curve - 230/400V AC Let-through Energy

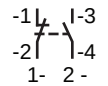
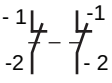
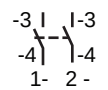




ALLEN BRADLEY 1492-GH

Accessories

Right Mount

Photo	Product Description ‡★Δ	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Shunt Trip		UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	110...415V AC 110-250V DC	110...415V AC 110-250V DC	189-AST1
			UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	12...60V AC/DC	12...60V AC/DC	189-AST2
	Auxiliary/Signal Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-ASCR3
	Auxiliary Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AR3
		1 N.O. + 1 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30V DC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR11
		2 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR02
		2 N.O. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR20

‡ A maximum of one C.O. type signal contact, and two C.O. type auxiliary contacts ***OR*** three C.O. type auxiliary contacts may be installed with or without one shunt trip per 1492-SP.

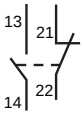
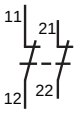
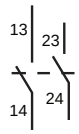
★ A maximum of two 189-AR11, -AR02, or -AR20 auxiliary contacts may be installed per 1492-SP. They may not be combined with shunt trips or C.O. type contacts.

Δ A maximum of four right mount accessories of any type may be installed per 1492-SP. The shunt trip must be mounted closest to 1492-SP, then the signal contact, then the auxiliary contact(s). For allowed combinations, and installation instructions please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

ALLEN BRADLEY 1492-GH

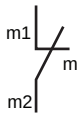
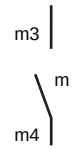
Accessories

Left Mount

Photo	Product Description ★	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.O. + 1 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL11
		2 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL02
		2 N.O. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL20

★ Only one left mount auxiliary contact may be installed per 1492-SP.

Bottom Mount

Photo	Product Description Δ	Contacts	Standards	Certifications‡	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.C. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 50V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB01
		1 N.O. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 50V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB10

Δ Only one bottom mount auxiliary contact may be installed per 1492-SP.

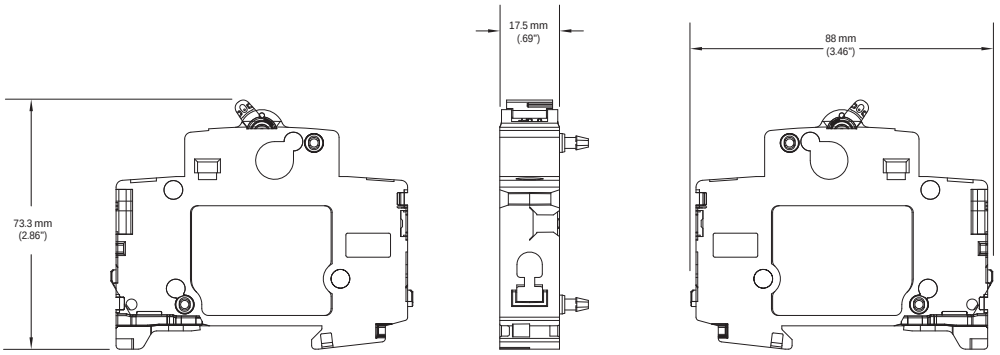
‡ Bottom mount auxiliaries show a CE Mark on the product instruction sheet and packaging, but not on the product itself.

Toggle Mount

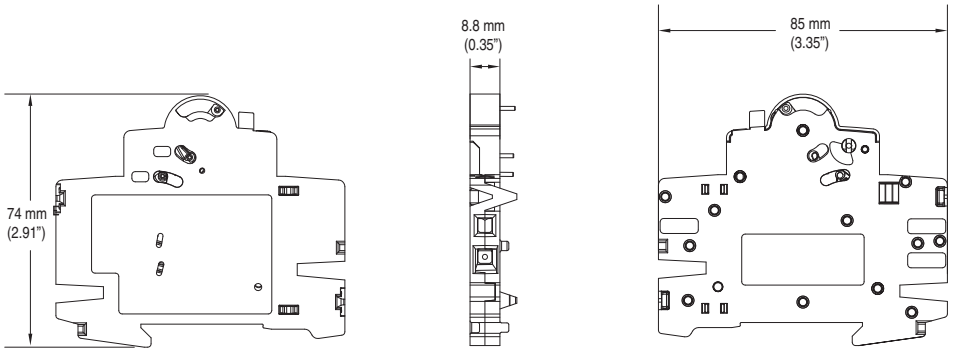
Photo	Product Description	Cat. No.
	Lock-out attachment for 1-pole MCB	189-ALOA1
	Lock-out attachment for multi-pole MCB	189-ALOA2

Accessory Approximate Dimensions

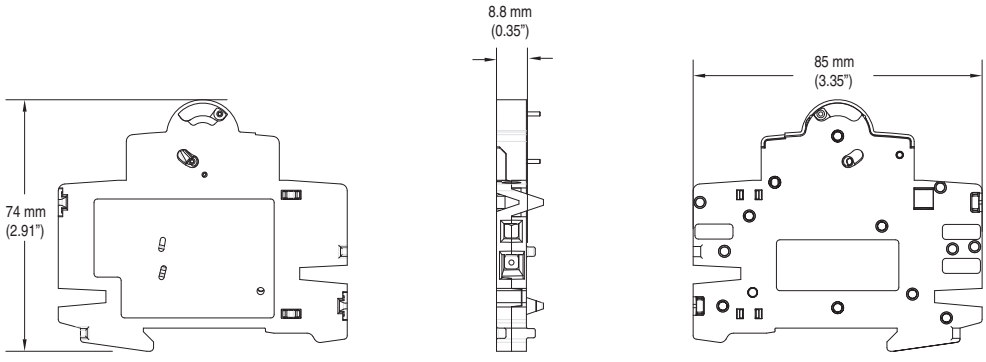
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-AST1 and 189-AST2



189-ASCR3

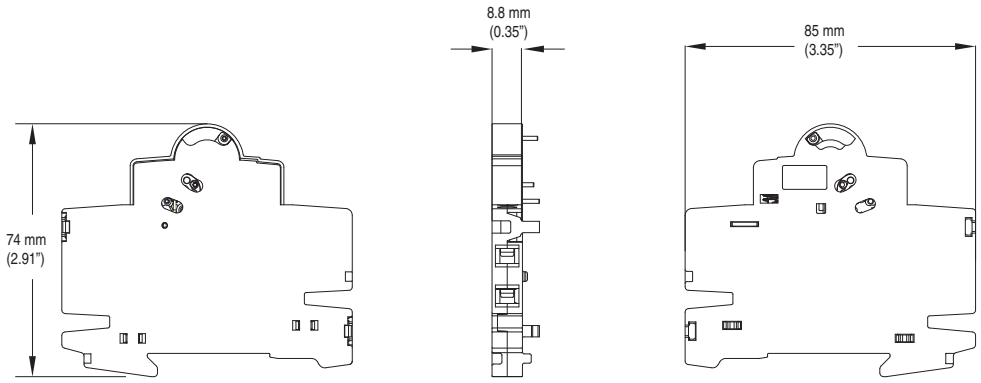


189-AR3

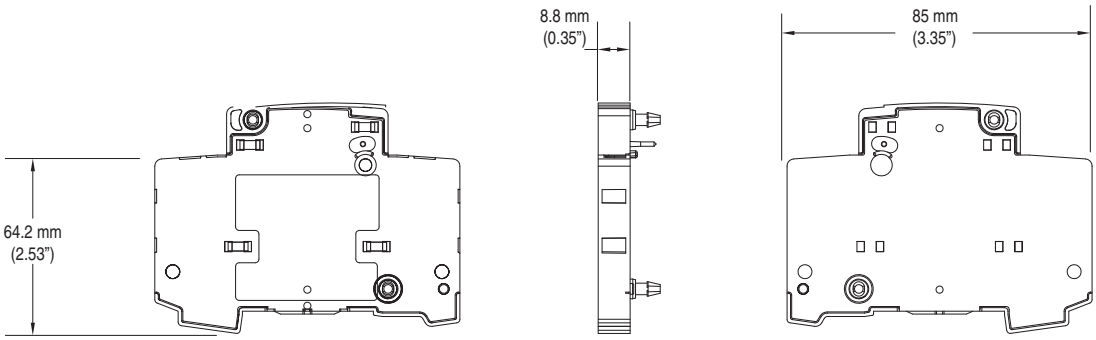
ALLEN BRADLEY 1492-GH

Accessory Approximate Dimensions

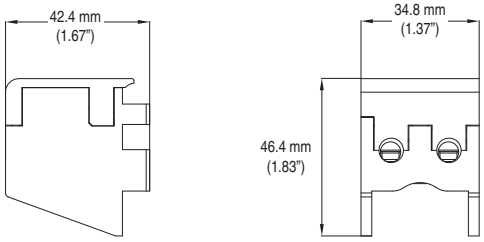
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-AR11, 189-AR02, 189-AR20



189-AL11, 189-AL02, and 189-AL20



189-AB01 and 189-AB10

Bus Bars

1492-SP Bus Bars

Description	Pins	Rated Current [A] ‡	Pkg. Qty.	Cat. No. ★
1-Phase	57	100 A	1	1492-A1B1
	57	80 A	1	1492-A1B8
1-Phase with aux. contact	37	100 A	1	1492-A1B1H
	37	80 A	1	1492-A1B8H
2-Phase	56	100 A	1	1492-A2B1
	56	80 A	1	1492-A2B8
2-Phase with aux. contact	46	100 A	1	1492-A2B1H
	46	80 A	1	1492-A2B8H
3-Phase	57	100 A	1	1492-A3B1
	57	80 A	1	1492-A3B8
3-Phase with aux. contact	48	100 A	1	1492-A3B1H
	48	80 A	1	1492-A3B8H

★ cULus, UL508, EN 60947-1, CE Marked

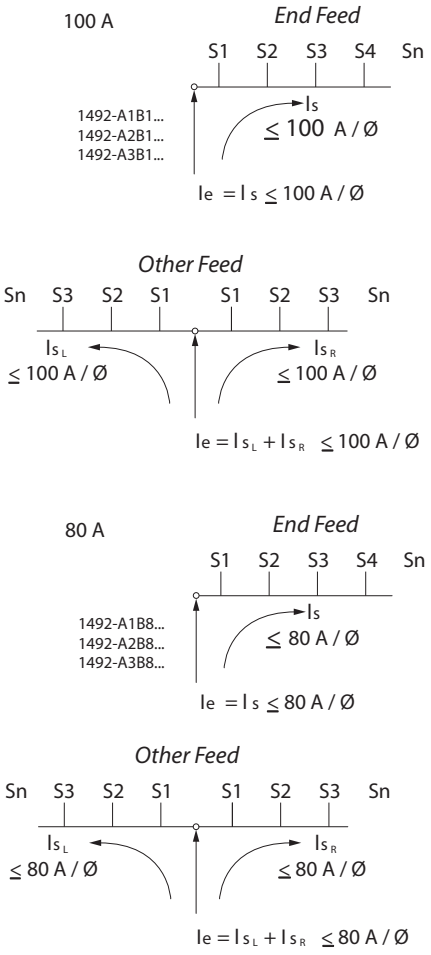
‡ Refer to the diagrams below for Feeder Terminal & Bus Bar Current Distribution

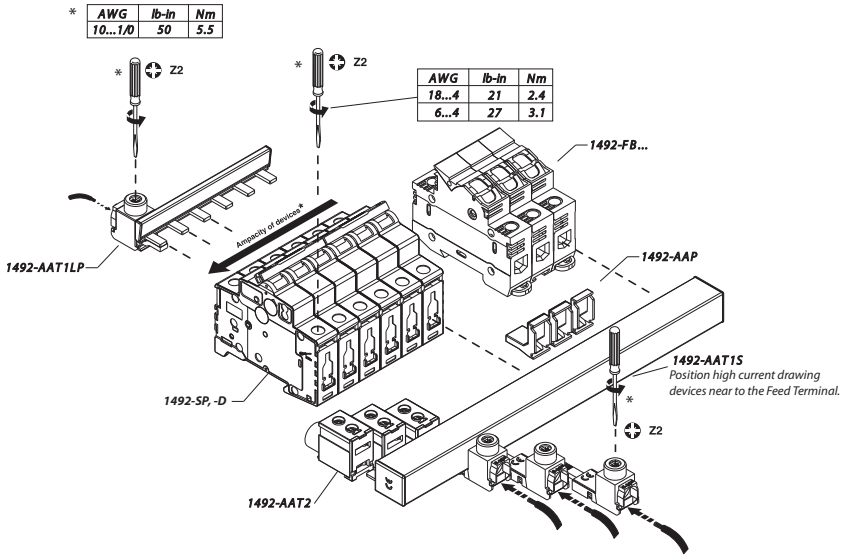
1492-SP Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 35 mm^2, for 1-phase bus bar	10	1492-AAT1LP
Terminal Power Feed, 35 mm^2, for 2- and 3-phase bus bar	10	1492-AAT1S
Dedicated Power Feed, 50 mm^2	10	1492-AAT2
End Cover for 1-phase bus bar	10	1492-A1E
End Cover for 2- or 3-phase bus bar	10	1492-AME
Protective Shroud for unused pins	10	1492-AAP

★ cULus, UL508, EN 60947-1, CE Marked

Feeder Terminal & Bus Bar Current Distribution

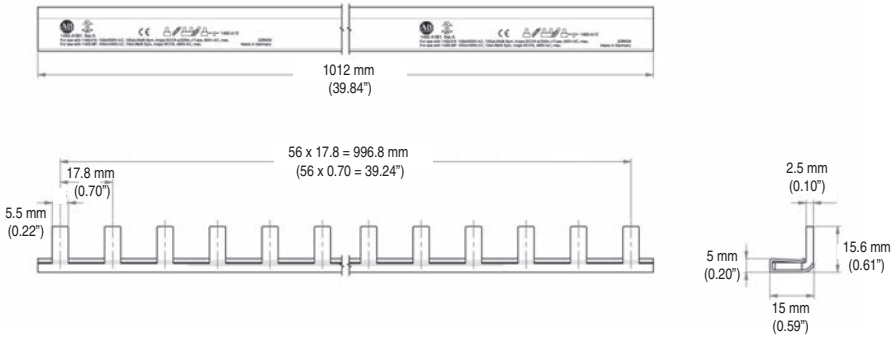




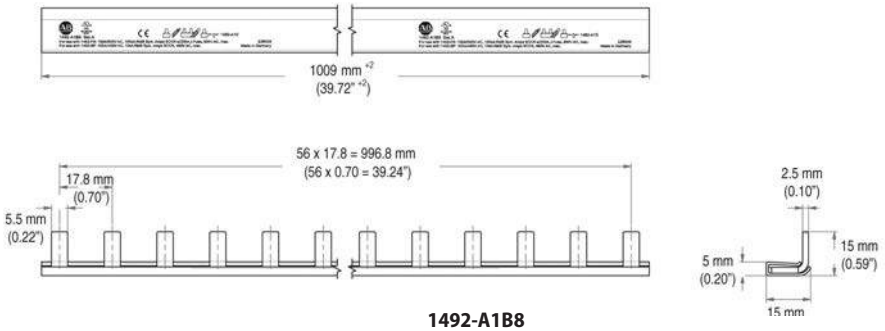
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars

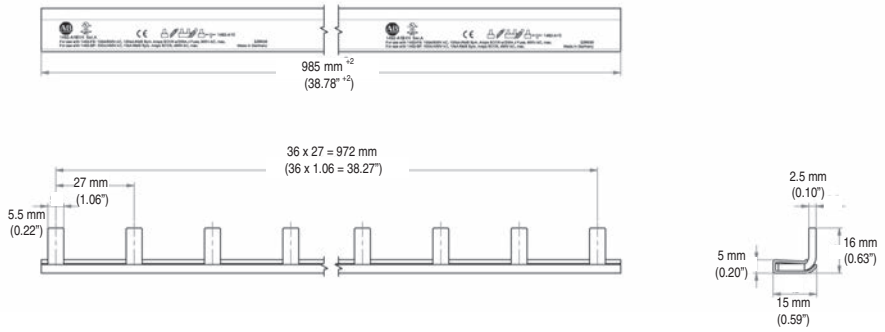


1492-A1B1

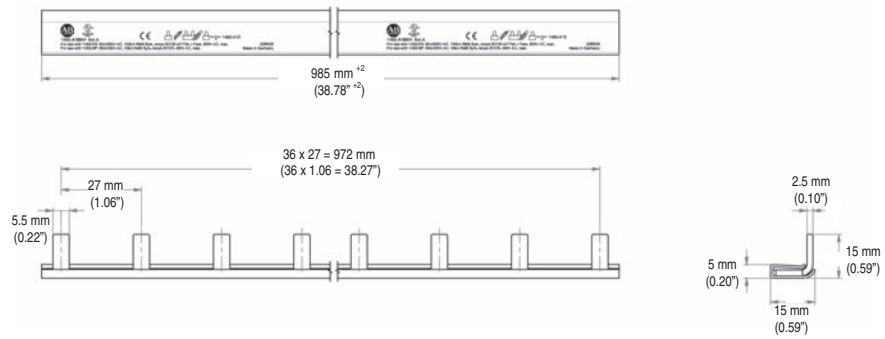


1492-A1B8

1-Phase Bus Bars, with Auxiliary Contact



1492-A1B1H

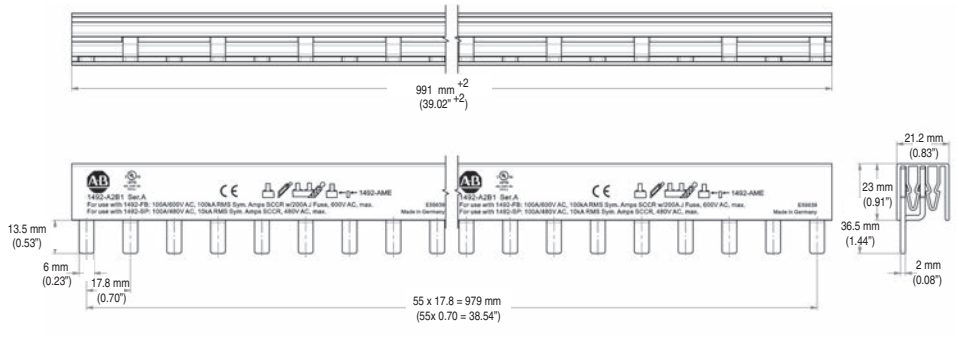


1492-A1B8H

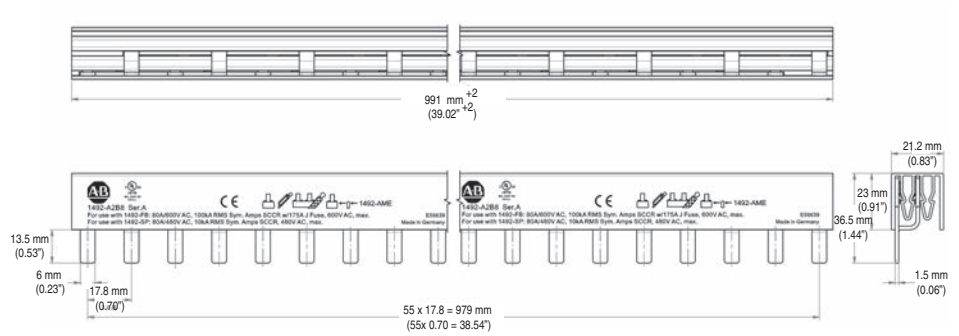
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

2-Phase Bus Bars

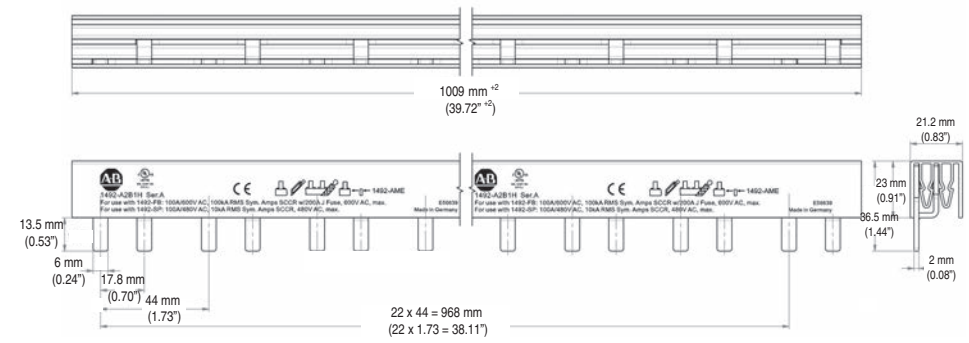


1492-A2B1

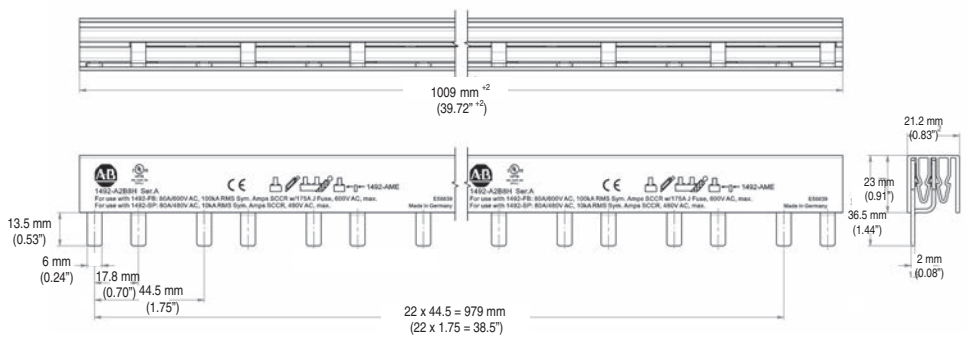


1492-A2B8

2-Phase Bus Bars, with Auxiliary Contact



1492-A2B1H

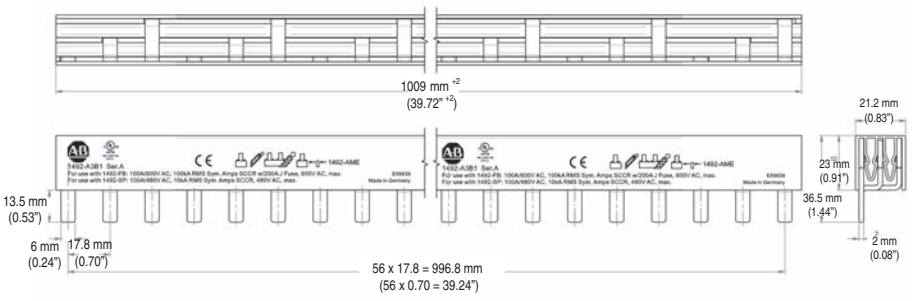


1492-A2B8H

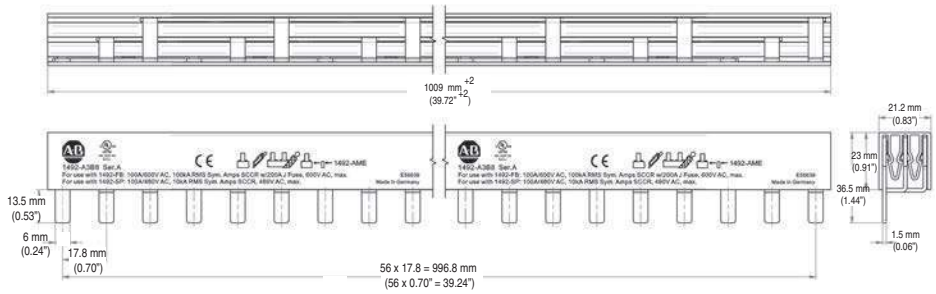
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.

3-Phase Bus Bars

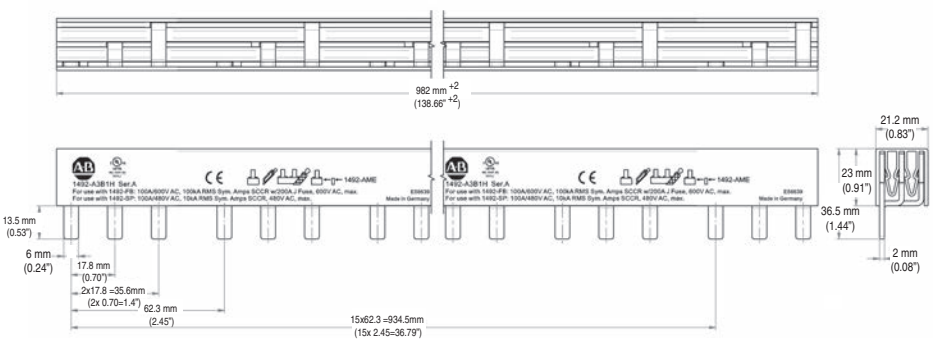


1492-A3B1

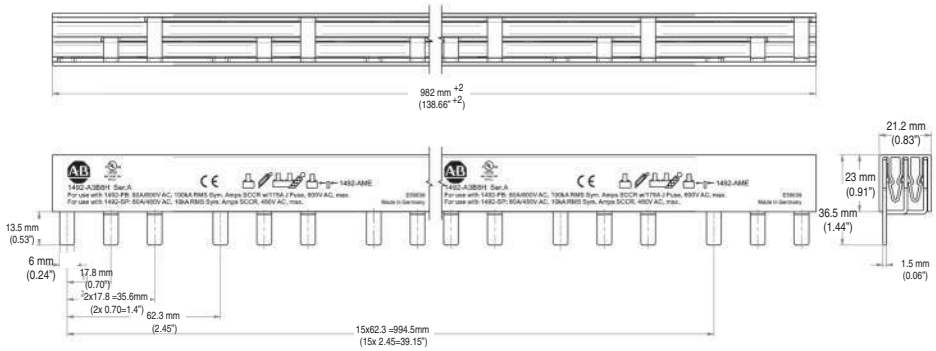


1492-A3B8

3-Phase Bus Bars, with Auxiliary Contact



1492-A3B1H

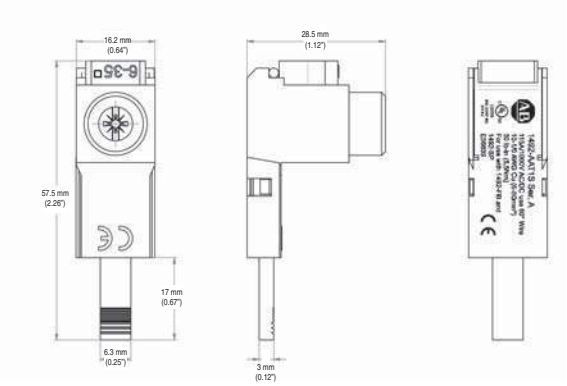


1492-A3B8H

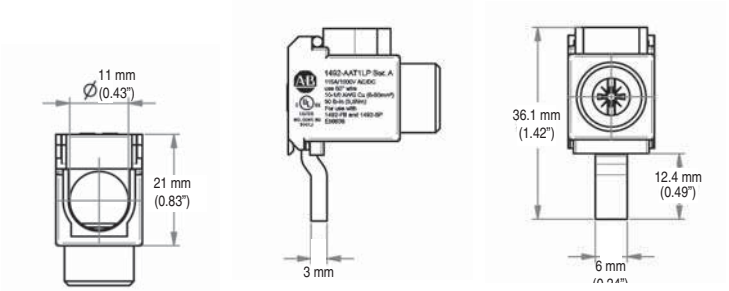
ALLEN BRADLEY 1492-GH

Bus Bar Accessory Approximate Dimensions

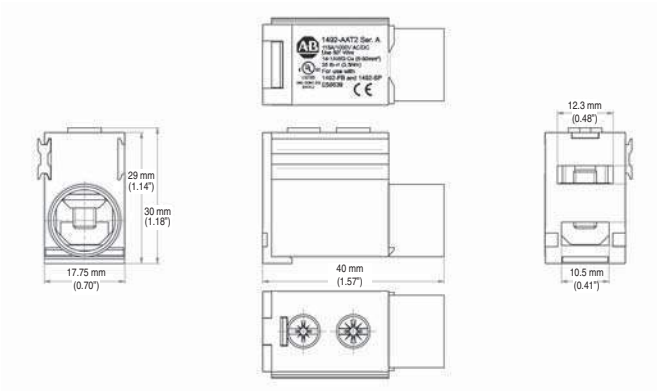
Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



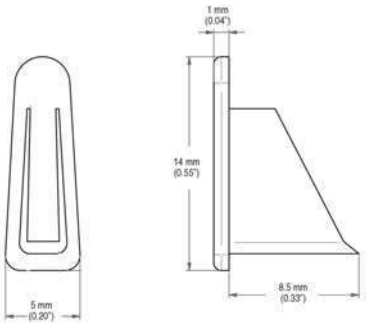
1492-AAT1S



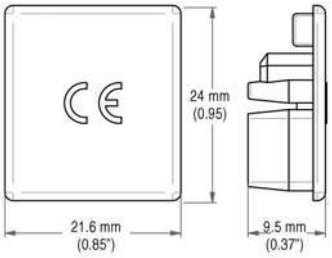
1492-AAT1LP



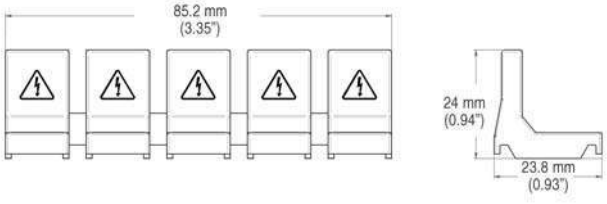
1492-AAT2



1492-A1E

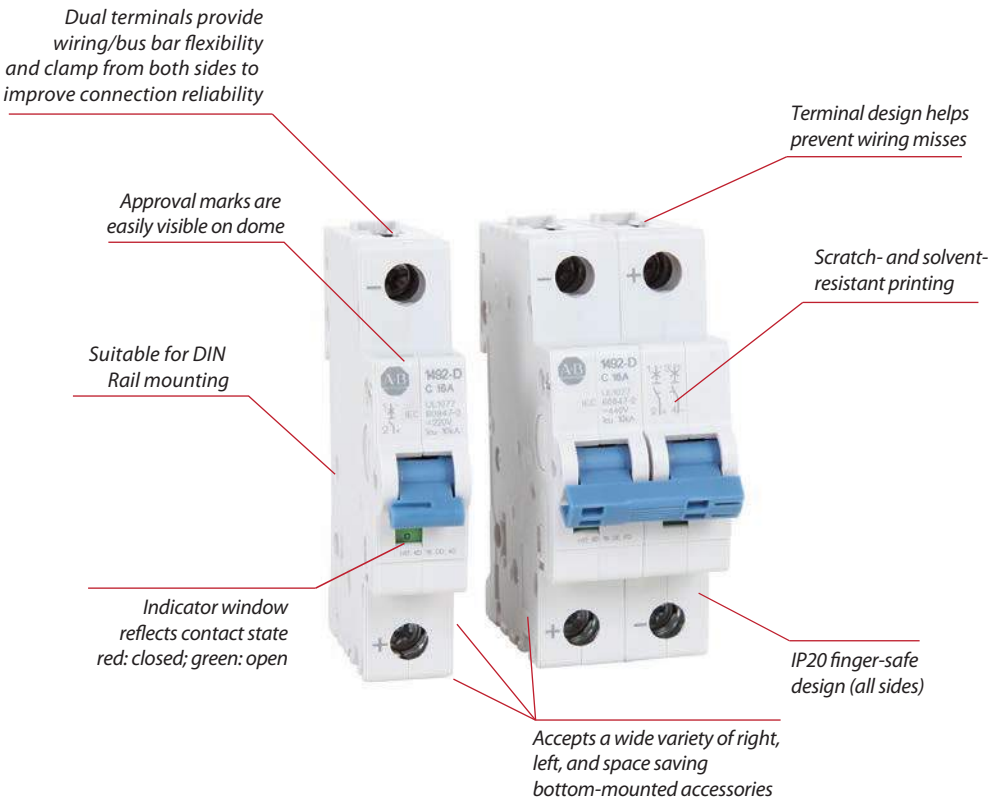


1492-AME



1492-AAP

1492-D Circuit Breakers



Bulletin 1492-D Miniature Circuit Breakers provide overcurrent and short circuit protection for higher voltage DC circuits. These devices are also Miniature Circuit Breakers as defined by IEC Standards.

These thermal magnetic breakers are offered in two pole variants and a wide range of current ratings to match the appropriate level of protection for your application. They may be used with UL 508 Listed bus bars for convenience in panel assembly, a wide range of left-, right- and space saving bottom-mount accessories, and lock out attachments for safety during maintenance.

1492-D Circuit Breakers	
Rated Voltage	UL/CSA: Max. 500V DC (2-pole) IEC: U_e : Max. 440V DC (2-pole)
Interrupting Capacity	UL/CSA: 10 kA IEC: 10 kA
Current Ratings	0.5...63 A
Poles	1, 2
Trip Curves	C
Standards Compliance	UL 1077 CSA C22.2 No. 235 EN 60947-2
Certifications	UL Recognized, File No. E65138 CSA Certified, File No. 259391 CE Marked VDE Certified RoHS Compliant

Features

- Specially designed for higher voltage DC circuits with a permanent magnet to direct the arc into the arc splitters
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options, which require no DIN Rail space
- Installation of up to six accessories on the same circuit breaker
- Superior shock and vibration resistance to prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device

ALLEN BRADLEY 1492-GH

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492	-	D	1	C	010
		a	*b*	*c*	*d*

a

Voltage Type	
Code	**Description**
D	DC Circuit Breaker

b

Poles	
Code	**Description**
1	1-Pole
2	2-Pole

c

Trip Curve	
Code	**Trip Curve**
C	Trip Curve C

d

Rated Current (I_n)	
Code	**Current [A]**
005	0.5
010	1
016	1.6
020	2
030	3
040	4
060	6
080	8
100	10
130	13
160	16
200	20
250	25
320	32
400	40
500	50
630	63

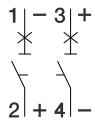
ALLEN BRADLEY 1492-GH

Product Selection

1-Pole DC Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve C Inductive 5…10 I_n Cat. No.
	0.5	1492-D1C005
	1	1492-D1C010
	1.6	1492-D1C016
	2	1492-D1C020
	3	1492-D1C030
	4	1492-D1C040
	6	1492-D1C060
	8	1492-D1C080
	10	1492-D1C100
	13	1492-D1C130
	16	1492-D1C160
	20	1492-D1C200
	25	1492-D1C250
	32	1492-D1C320
	40	1492-D1C400
	50	1492-D1C500
	63	1492-D1C630

2-Pole DC Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	Trip Curve C Inductive 5…10 I_n Cat. No.
	0.5	1492-D2C005
	1	1492-D2C010
	1.6	1492-D2C016
	2	1492-D2C020
	3	1492-D2C030
	4	1492-D2C040
	6	1492-D2C060
	8	1492-D2C080
	10	1492-D2C100
	13	1492-D2C130
	16	1492-D2C160
	20	1492-D2C200
	25	1492-D2C250
	32	1492-D2C320
	40	1492-D2C400
	50	1492-D2C500
	63	1492-D2C630

ALLEN BRADLEY 1492-GH

Specifications

Electrical Ratings		
Poles		1, 2
Tripping characteristics		C
Rated current (I_n)		0.5…63 A
Rated frequency (f)		0 Hz (DC only)
Rated insulation voltage U_i per IEC/EN 60664-1		250V AC (phase to ground), 440V AC (phase to phase)
Overvoltage category		III
Pollution degree		3
Data per UL/CSA		
Rated voltage	1-pole	250V DC
	2-pole	500V DC
Rated interrupting capacity per UL 1077		10 kA
Application		Supplementary Protector for DC application use; application codes: TC2, OL0, SC: U1, 250V dc, 10kA (1 pole); TC2, OL0, SC: U1, 500V dc, 10kA (2 pole)
Reference temperature for tripping characteristics		25 °C
Electrical endurance		6,000 ops
Data per IEC/EN 60947-2		
Rated operational voltage (U_e)	1-pole	220V DC
	2-pole	440V DC
Highest supply or utilization voltage (U_{max})	1-pole	250V DC
	2-pole	500V DC
Min. operating voltage		12V DC
Rated ultimate short-circuit breaking capacity (I_{cu})		10 kA
Rated service short-circuit breaking capacity (I_{cs})		10 kA
Rated impulse withstand voltage Uimp. (1.2/50µs)		4 kV (test voltage 6.2kV at sea level, 5kV at 2,000m)
Dielectric test voltage		2 kV (50/60Hz, 1 min.)
Reference temperature for tripping characteristics		55 °C
Electrical endurance 1 cycle (2s - ON, 13s - OFF, $I_n \leq 32A$), 1 cycle (2s - ON, 28s - OFF, $I_n > 32A$)		1,500 ops.

Mechanical Data		
Housing		Insulation group II, RAL 7035
Indicator window		red ON/green OFF
Protection degree per EN 60529		IP20, IP40 in enclosure with cover
Mechanical endurance		20,000 operations
Shock resistance per IEC/EN 60068-2-27		25 g - 2 shocks - 13 ms
Vibration resistance per IEC/EN 60068-2-6		5g - 20 cycles at 5...150...5 Hz with load 0.8In
Environmental		
Environmental conditions (damp heat) per IEC/EN 60068-2-30		28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature Δ		-25...+55 °C
Storage temperature		-40...+70 °C
Installation		
Terminal		Dual terminal
Cross-section of wire ◆ – solid, stranded (front/back terminal slot)		35/35 mm^2
		18...4/18...10 AWG
Cross-section of wire – flexible (front/back terminal slot)		25/10 mm^2
Multi-wire rating per UL, CSA		1 wire, 18…4 AWG
		2-4 wires‡, 18…10 AWG
Cross-section of bus bars (back terminal slot)		10 mm^2
Tightening torque	IEC	2.8 N•m
	UL/CSA	AWG 18...16: 13.3 in•lb. AWG 14...10:17.7 in•lb. AWG 8...4: 39.8 in•lb.
Screwdriver		No. 2 Pozidrive
Mounting		DIN rail (EN 60715, 35mm) with fast clip
Mounting position		Any
Supply		Note polarity of device
Approximate Dimensions and Weight		
Pole dimension (H x D x W)		88 x 69 x 17.5 mm
Pole weight		125 g (4.5 oz.)
Combination with Auxiliary Elements		
Auxiliary contact		Yes
Signal contact		Yes
Shunt trip		Yes

◆ 35mm^2 self-declared, not included in IEC/EN approval.

Δ Refer to the ambient temperature derating tables.

‡ Wires must be of like size and stranding. Up to two wires per terminal slot.

ALLEN BRADLEY 1492-GH

Power Loss Due to Current

Rated Current [A]	Power Loss Per Pole [W]		Rated Current [A]	Power Loss Per Pole [W]
0.5	1.4		13	2.3
1	1.4		15	2.4
2	1.8		16	2.5
3	1.6		20	2.5
4	1.8		25	3.2
5	1.9		30	3.5
6	2.0		32	3.7
7	1.1		40	4.5
8	1.5		50	4.5
10	2.1		63	5.4

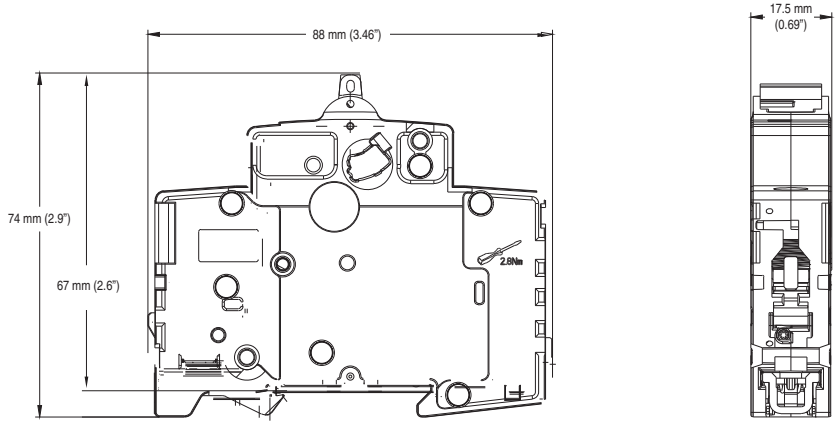
Zero-stack Derating

The installation of several miniature circuit breaker side by side with rated current on all poles requires a correction factor to the rated current (not required if spacers are used).

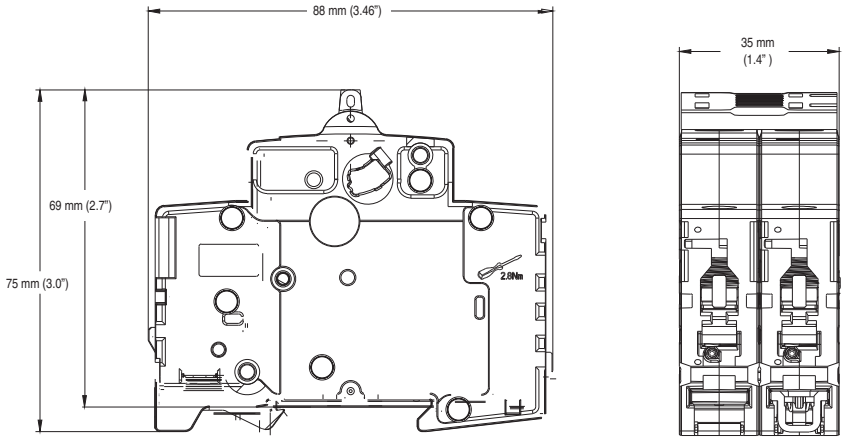
No. of Adjacent Devices	Factor
1	1
2,3	0.9
4,5	0.8
≥6	0.75

Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



1-Pole



2-Pole

ALLEN BRADLEY 1492-GH

Ambient Temperature Derating

Note: Application below 0º C is for non-condensing atmosphere. Care should be taken for applications below 0 °C. These devices are not certified to operate correctly in the presence of ice.

Bulletin 1492-D
Temperature Derating, UL
Reference temperature = 25 °C

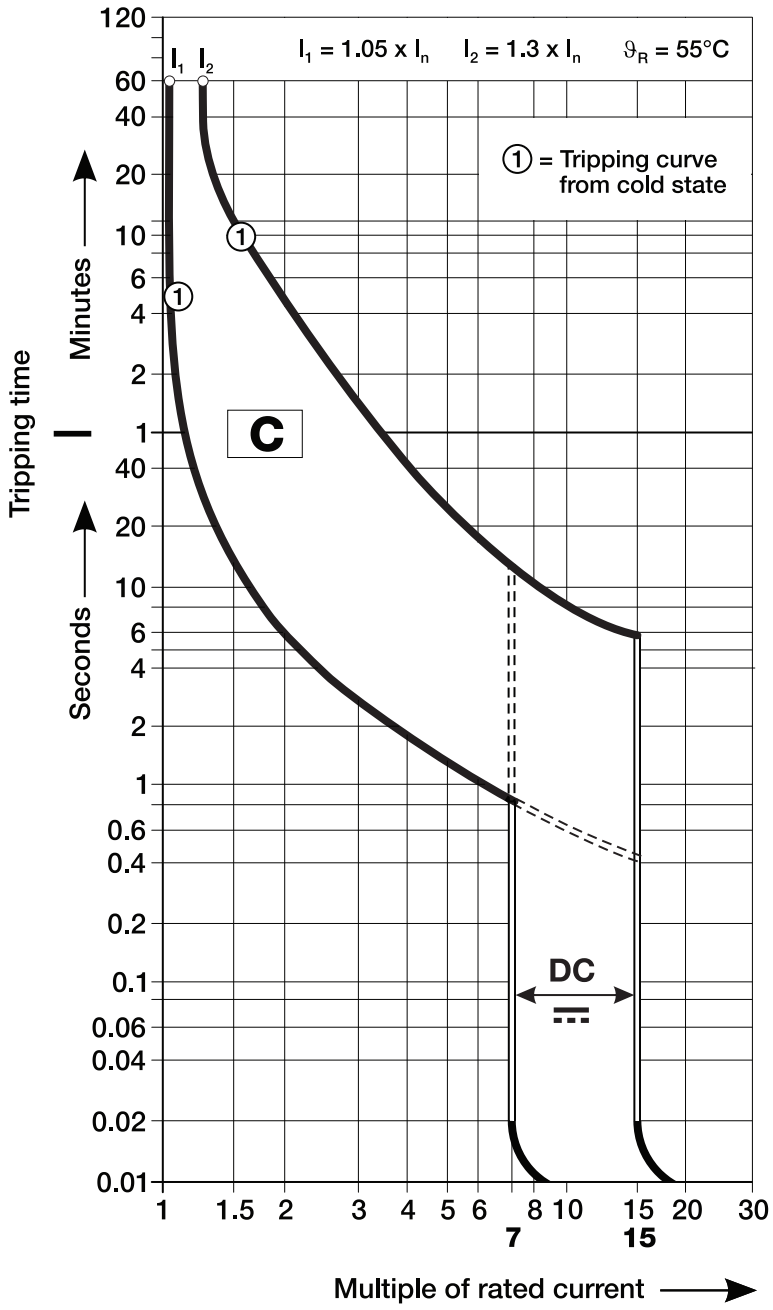
Current Rating (A)	Ambient temperature (°C)										
	-25	-20	-10	0	10	20	25	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.2	1.2	1.1	0.9	1	1.0	1.0	0.9	0.9
1.6	1.8	1.8	1.8	1.8	1.8	1.5	1.6	1.6	1.5	1.5	1.5
2	2.3	2.3	2.3	2.3	2.3	1.9	2	2.0	1.9	1.9	1.8
3	3.5	3.5	3.5	3.5	3.4	2.8	3	3.0	2.9	2.8	2.7
4	4.6	4.6	4.6	4.6	4.5	3.8	4	3.9	3.8	3.7	3.6
6	6.9	6.9	6.9	6.9	6.8	5.6	6	5.9	5.7	5.6	5.5
8	9.2	9.2	9.2	9.2	9.1	7.5	8	7.9	7.6	7.4	7.3
10	11.5	11.5	11.5	11.5	11.4	9.4	10	9.9	9.6	9.3	9.1
13	15.0	15.0	15.0	15.0	14.8	12.2	13	12.8	12.4	12.0	11.8
16	18.4	18.4	18.4	18.4	18.2	15.0	16	15.8	15.3	14.8	14.6
20	23.0	23.0	23.0	23.0	22.7	18.8	20	19.7	19.1	18.5	18.2
25	28.8	28.8	28.8	28.8	28.4	23.5	25	24.6	23.9	23.1	22.8
32	36.8	36.8	36.8	36.8	36.3	30.1	32	31.5	30.6	29.6	29.1
40	46.0	46.0	46.0	46.0	45.4	37.6	40	39.4	38.2	37.0	36.4
50	57.5	57.5	57.5	57.5	56.8	47.0	50	49.3	47.8	46.3	45.5
63	72.5	72.5	72.5	72.5	71.5	59.2	63	62.1	60.2	58.3	57.3

Bulletin 1492-D
Temperature Derating, IEC
Reference temperature = 55 °C

Current Rating (A)	Ambient temperature (°C)									
	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
1	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1
1.6	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6
2	2.5	2.5	2.4	2.3	2.3	2.2	2.2	2.1	2.0	2
3	3.7	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0	3
4	5.0	4.9	4.8	4.7	4.5	4.4	4.3	4.2	4.1	4
6	7.4	7.4	7.2	7.0	6.8	6.6	6.5	6.3	6.1	6
8	9.9	9.8	9.6	9.3	9.1	8.8	8.6	8.4	8.1	8
10	12.4	12.3	12.0	11.7	11.4	11.1	10.8	10.5	10.2	10
13	16.1	15.9	15.5	15.1	14.8	14.4	14.0	13.6	13.2	13
16	19.8	19.6	19.1	18.6	18.2	17.7	17.2	16.7	16.2	16
20	24.8	24.5	23.9	23.3	22.7	22.1	21.5	20.9	20.3	20
25	31.0	30.6	29.9	29.1	28.4	27.6	26.9	26.1	25.4	25
32	39.7	39.2	38.2	37.3	36.3	35.4	34.4	33.4	32.5	32
40	49.6	49.0	47.8	46.6	45.4	44.2	43.0	41.8	40.6	40
50	62.0	61.3	59.8	58.3	56.8	55.3	53.8	52.3	50.8	50
63	78.1	77.2	75.3	73.4	71.5	69.6	67.7	65.8	63.9	63

Tripping Characteristics

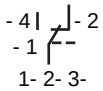
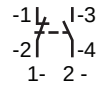
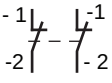
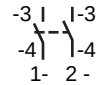
C Curve



ALLEN BRADLEY 1492-GH

Accessories

Right Mount

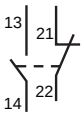
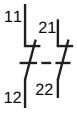
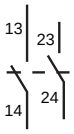
Photo	Product Description ‡★Δ	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Shunt Trip		UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	110...415V AC 110-250V DC	110...415V AC 110-250V DC	189-AST1
			UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	12...60V AC/DC	12...60V AC/DC	189-AST2
	Auxiliary/Signal Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-ASCR3
	Auxiliary Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AR3
		1 N.O. + 1 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30V DC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR11
		2 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR02
		2 N.O. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR20

‡ A maximum of one C.O. type signal contact, and two C.O. type auxiliary contacts ***OR*** three C.O. type auxiliary contacts may be installed with or without one shunt trip per 1492-D.

★ A maximum of two 189-AR11, -AR02, or -AR20 auxiliary contacts may be installed per 1492-D. They may not be combined with shunt trips or C.O. type contacts.

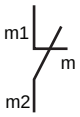
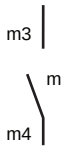
Δ A maximum of four right mount accessories of any type may be installed per 1492-D. The shunt trip must be mounted closest to 1492-D, then the signal contact, then the auxiliary contact(s). For allowed combinations, and installation instructions please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Left Mount

Photo	Product Description ★	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.O. + 1 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL11
		2 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL02
		2 N.O. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL20

★ Only one left mount auxiliary contact may be installed per 1492-D.

Bottom Mount

Photo	Product Description Δ	Contacts	Standards	Certifications‡	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.C. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 50V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB01
		1 N.O. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 50V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB10

Δ Only one bottom mount auxiliary contact may be installed per 1492-D.

‡ Bottom mount auxiliaries show a CE Mark on the product instruction sheet and packaging, but not on the product itself.

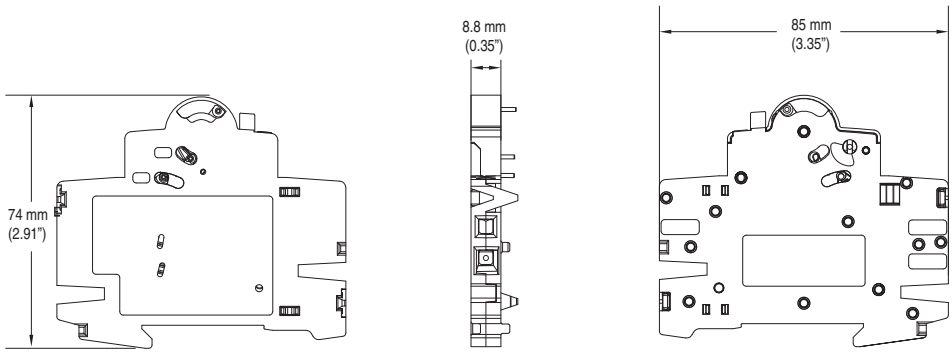
Toggle Mount

Photo	Product Description	Cat. No.
	Lock-out attachment for 1-pole MCB	189-ALOA1
	Lock-out attachment for multi-pole MCB	189-ALOA2

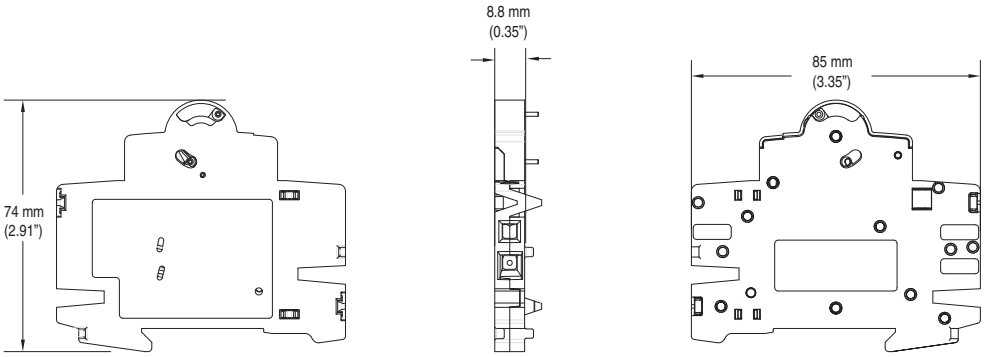
ALLEN BRADLEY 1492-GH

Circuit Breaker Accessory Approximate Dimensions

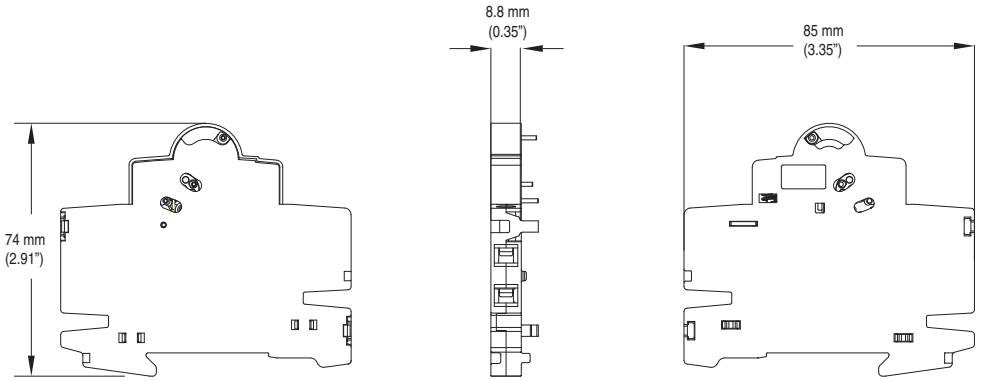
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-ASCR3

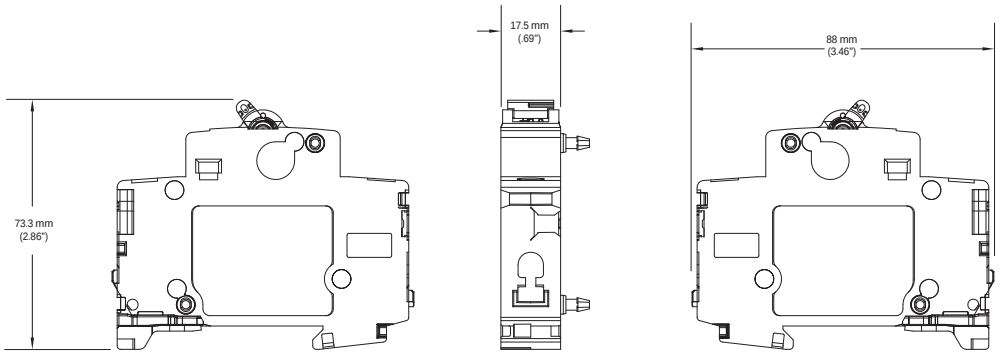


189-AR3

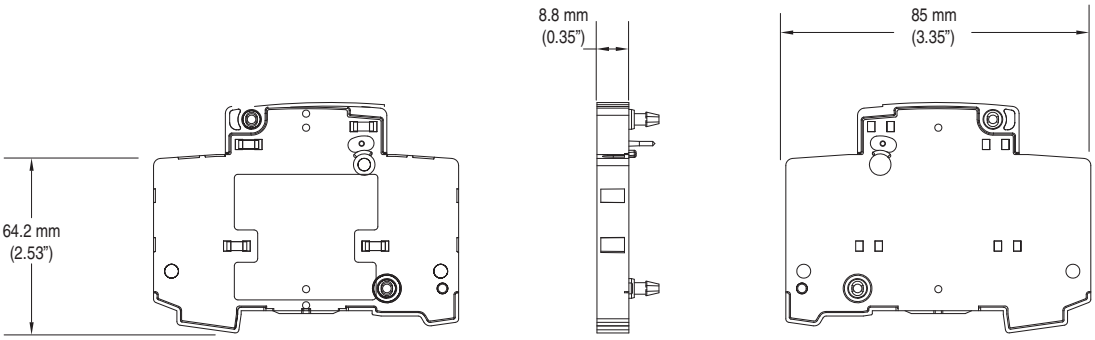


189-AR11, 189-AR02, 189-AR20

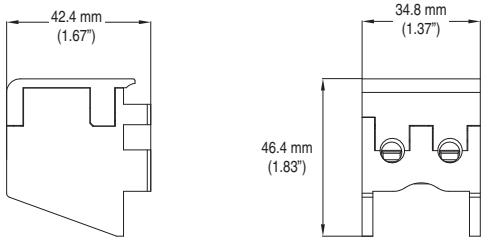
ALLEN BRADLEY 1492-GH



189-AST1 and 189-AST2



189-AL11, 189-AL02, and 189-AL20



189-AB01 and 189-AB10

ALLEN BRADLEY 1492-GH

Bus Bars

1492-D Bus Bars

Description	Pins	Rated Current [A] ‡	Pkg. Qty.	Cat. No. ★
1-Phase	57	100 A	1	1492-A1B1
	57	80 A	1	1492-A1B8
1-Phase with aux. contact	37	100 A	1	1492-A1B1H
	37	80 A	1	1492-A1B8H
2-Phase	56	100 A	1	1492-A2B1
	56	80 A	1	1492-A2B8
2-Phase with aux. contact	46	100 A	1	1492-A2B1H
	46	80 A	1	1492-A2B8H

★ cULus, UL508, EN 60947-1, CE Marked

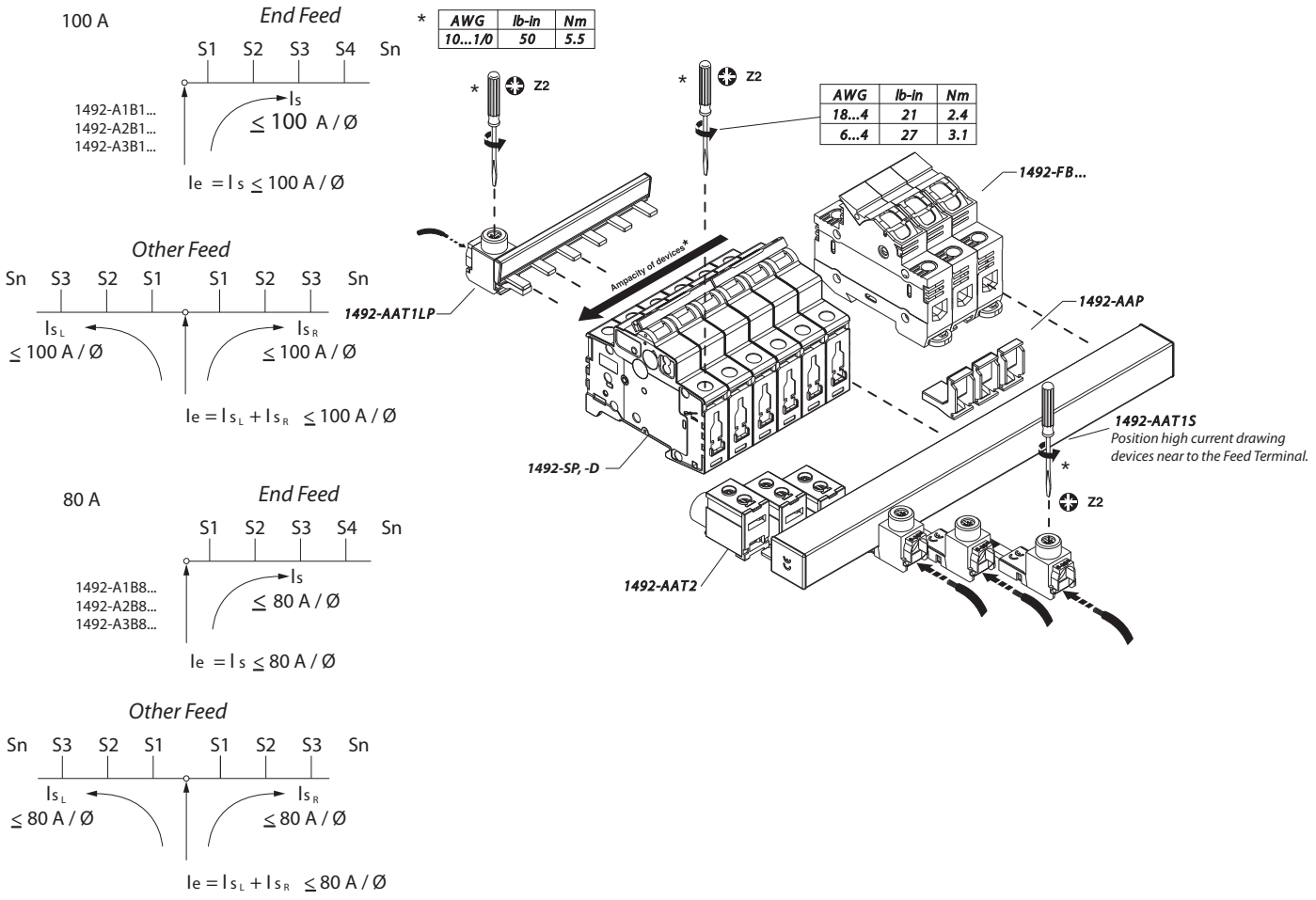
‡ Refer to the diagrams below for Feeder Terminal & Bus Bar Current Distribution

1492-D Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 35 mm^2, straight lug	10	1492-AAT1S
Terminal Power Feed, 35 mm^2, offset lug, low profile	10	1492-AAT1LP
Dedicated Power Feed, 50 mm^2	10	1492-AAT2
End Cover for 1-phase bus bar	10	1492-A1E
End Cover for 2- or 3-phase bus bar	10	1492-AME
Protective Shroud for unused pins	10	1492-AAP

★ cULus, UL508, EN 60947-1, CE Marked

Feeder Terminal & Bus Bar Current Distribution

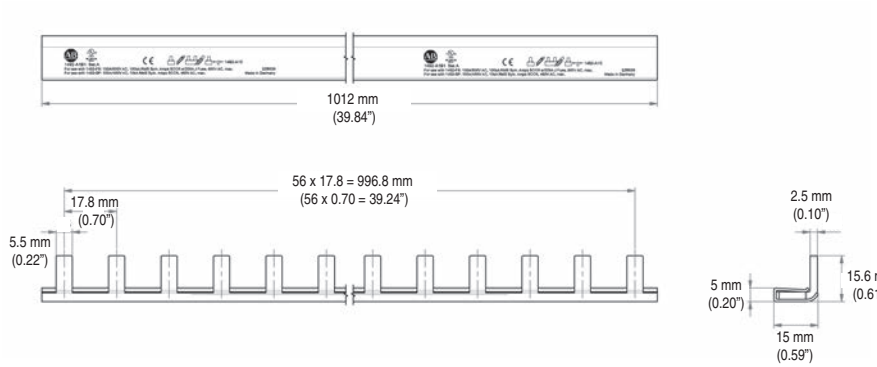


ALLEN BRADLEY 1492-GH

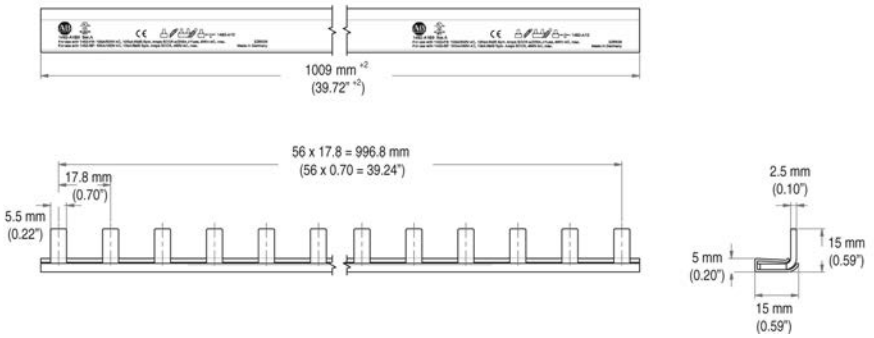
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars

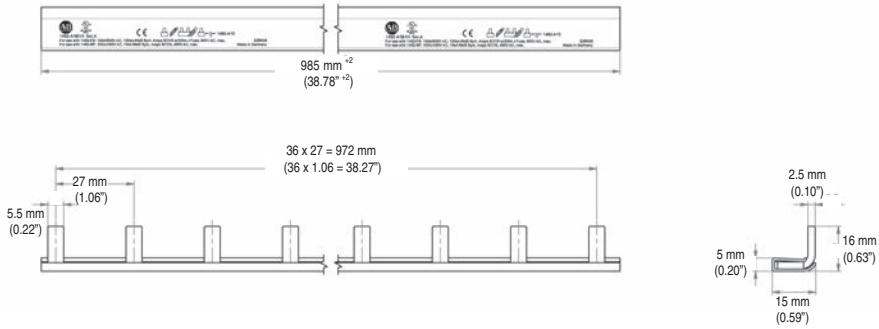


1492-A1B1

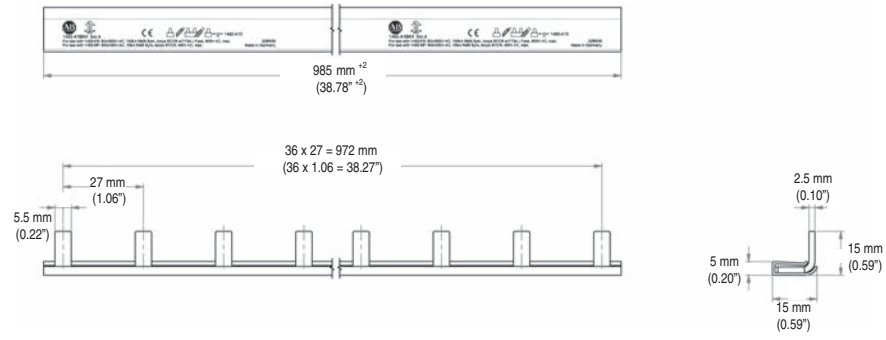


1492-A1B8

1-Phase Bus Bars, with Auxiliary Contact

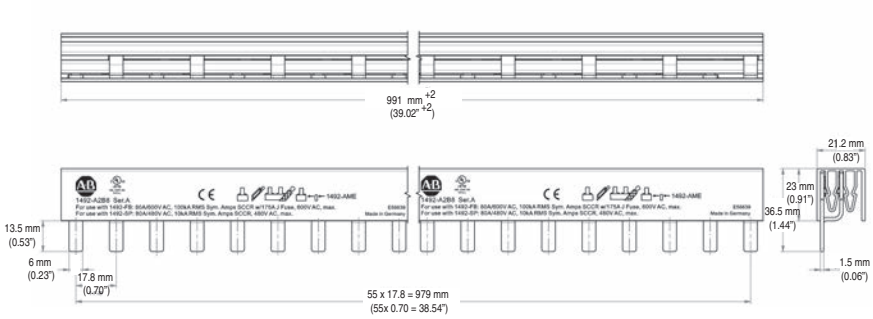


1492-A1B1H

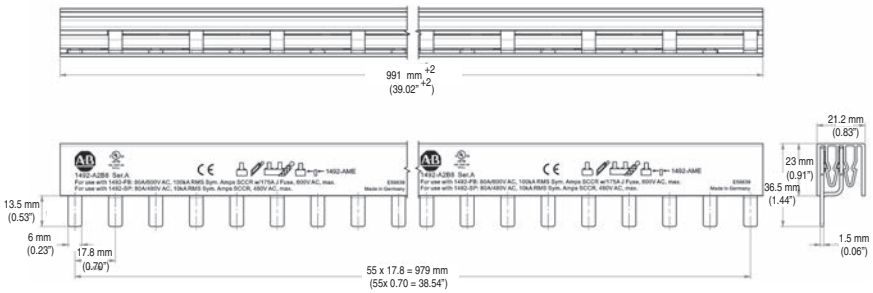


1492-A1B8H

2-Phase Bus Bars



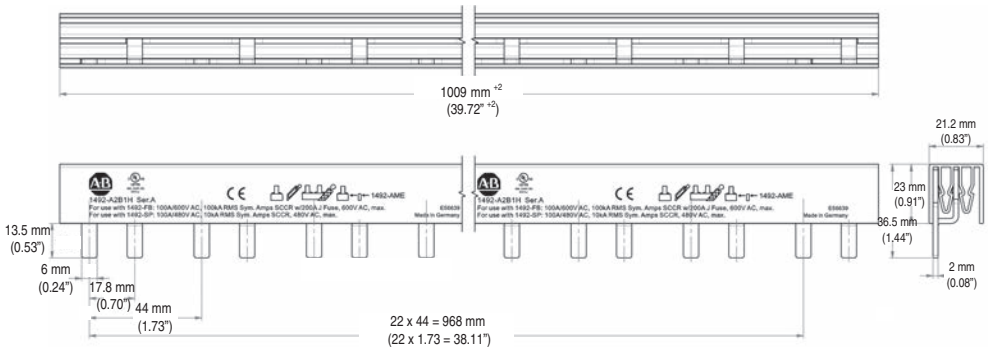
1492-A2B1



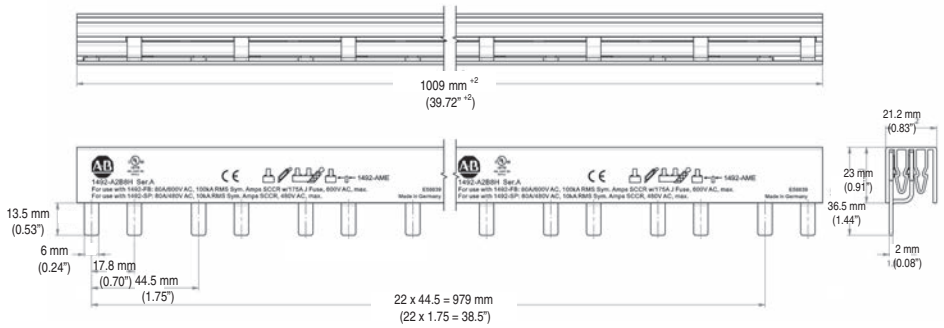
1492-A2B8

ALLEN BRADLEY 1492-GH

2-Phase Bus Bars, with Auxiliary Contact



1492-A2B1H



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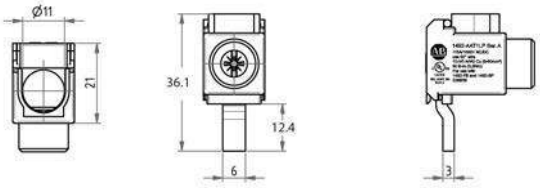
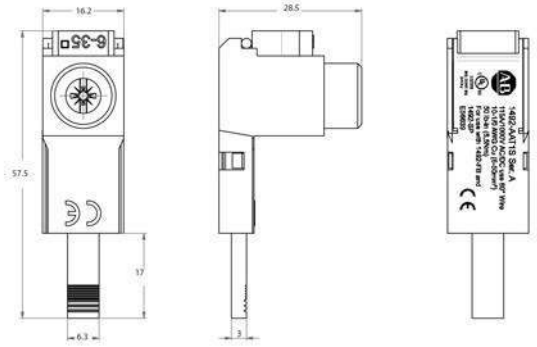
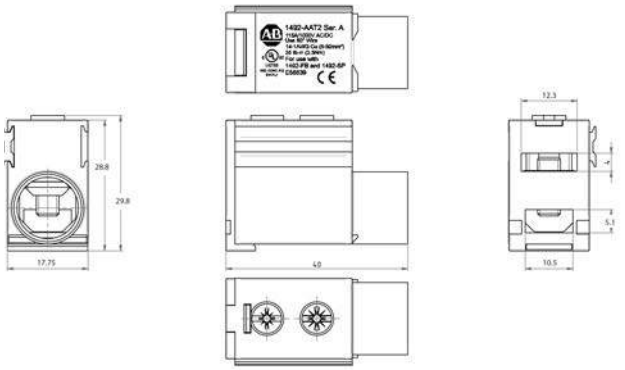


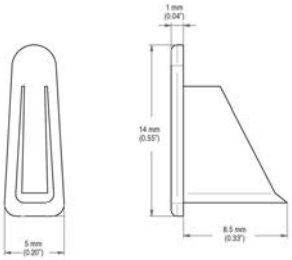
1492-AAT1LP



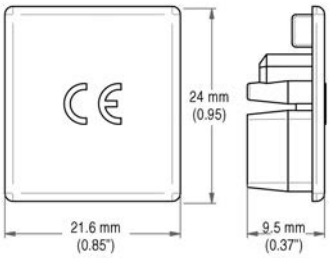
1492-AAT1S



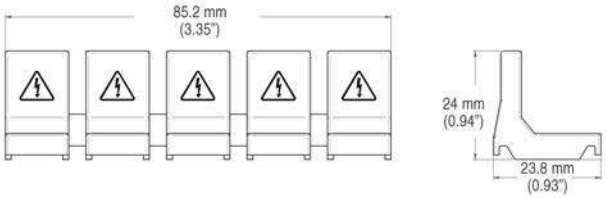
1492-AAT2



1492-A1E

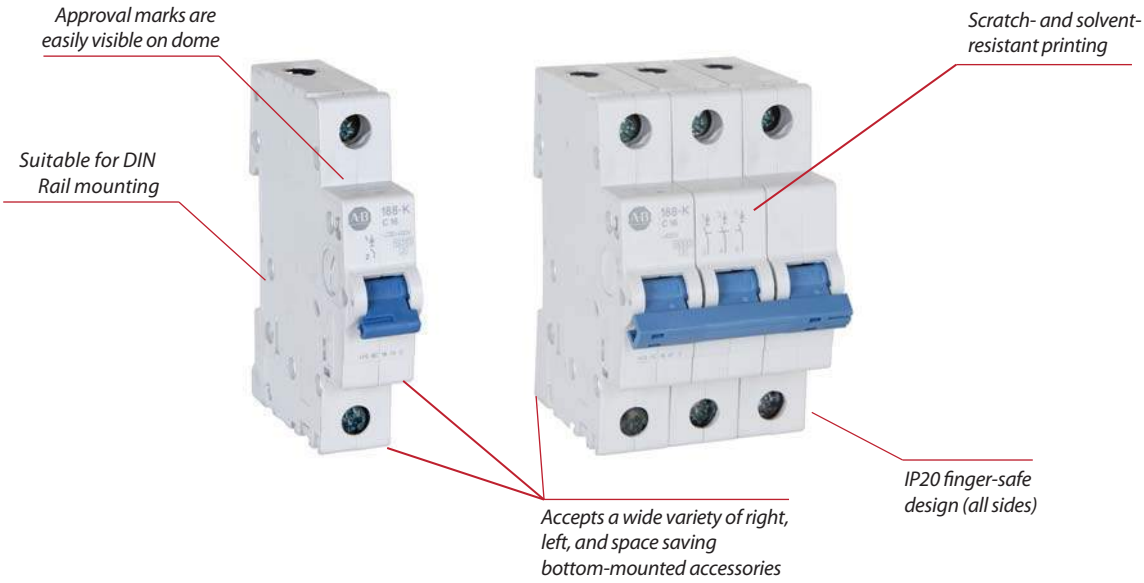


1492-AME



1492-AAP

188 Regional Circuit Breakers



Bulletin 188 thermal magnetic Circuit Breakers are protective devices applied at the equipment level. They are offered as a broad portfolio of pole variants, current ratings and trip curves to match the appropriate level of protection for your application. They may be used with IEC rated bus bars for convenience in panel assembly. A wide range of left-, right- and space saving bottom-mount accessories (common to the Bulletin 1492-SP devices) are available.

Note: Bulletin 188 Regional Circuit Breakers have regional certifications only. They are available in China and Europe.

188 Regional Circuit Breakers	
Rated Voltage	IEC: U_e 230/400V AC
Interrupting Capacity	IEC: 6 kA, 10 kA
Current Ratings	0.5...63 A
Poles	1, 2, 3, 4, 1+N, 3+N
Trip Curves	B, C, D
Standards Compliance	EN 60898-1 GB 10963
Certifications	CE Marked CCC Certified VDE Certified RoHS Compliant

Features

- Current limiting
- Fast breaking time
- Broad portfolio of pole variants, current ratings and trip curves
- Available with 6 kA (188-K) and 10 kA (188-J) interrupting capacity
- Installation of up to six accessories on the same circuit breaker
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options
- Superior shock and vibration resistance to help prevent nuisance tripping
- Reversible line and load connections
- Single and multi-pole lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully recyclable device
- Suitable for extreme ambient conditions

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

188	-	J	1	C	010	-	N
		a	*b*	*c*	*d*		*e*

a

Interrupt Rating	
Code	**Description**
J	Regional Circuit Breaker, 10 kA
K	Regional Circuit Breaker, 6 kA

b

Poles	
Code	**Description**
1	1-Pole
2	2-Pole
3	3-Pole
4	4-Pole

c

Trip Curve	
Code	**Trip Curve**
B	Trip Curve B
C	Trip Curve C
D	Trip Curve D

d

Rated Current (I_n)	
Code	**Current [A]**
005	0.5
010	1
020	2
030	3
040	4
060	6
080	8
100	10
130	13
160	16
200	20
250	25
320	32
400	40
500	50
630	63

e

+ Neutral (for 1+N and 3+N configurations)	
Code	**Description**
	Can be left blank
N	+ Neutral

ALLEN BRADLEY 1492-GH

Product Selection

1-Pole Regional Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
	0.5	—	188-J1C005	188-J1D005	—	188-K1C005	188-K1D005
	1	—	188-J1C010	188-J1D010	—	188-K1C010	188-K1D010
	2	—	188-J1C020	188-J1D020	—	188-K1C020	188-K1D020
	3	—	188-J1C030	188-J1D030	—	188-K1C030	188-K1D030
	4	—	188-J1C040	188-J1D040	—	188-K1C040	188-K1D040
	6	188-J1B060	188-J1C060	188-J1D060	188-K1B060	188-K1C060	188-K1D060
	8	188-J1B080	188-J1C080	188-J1D080	188-K1B080	188-K1C080	188-K1D080
	10	188-J1B100	188-J1C100	188-J1D100	188-K1B100	188-K1C100	188-K1D100
	13	188-J1B130	188-J1C130	188-J1D130	188-K1B130	188-K1C130	188-K1D130
	16	188-J1B160	188-J1C160	188-J1D160	188-K1B160	188-K1C160	188-K1D160
	20	188-J1B200	188-J1C200	188-J1D200	188-K1B200	188-K1C200	188-K1D200
	25	188-J1B250	188-J1C250	188-J1D250	188-K1B250	188-K1C250	188-K1D250
1-pole	32	188-J1B320	188-J1C320	188-J1D320	188-K1B320	188-K1C320	188-K1D320
	40	188-J1B400	188-J1C400	188-J1D400	188-K1B400	188-K1C400	188-K1D400
	50	188-J1B500	188-J1C500	188-J1D500	188-K1B500	188-K1C500	188-K1D500
	63	188-J1B630	188-J1C630	188-J1D630	188-K1B630	188-K1C630	188-K1D630

1-Pole + Neutral Regional Circuit Breakers

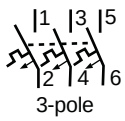
Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
	0.5	—	188-J1C005-N	188-J1D005-N	—	188-K1C005-N	188-K1D005-N
	1	—	188-J1C010-N	188-J1D010-N	—	188-K1C010-N	188-K1D010-N
	2	—	188-J1C020-N	188-J1D020-N	—	188-K1C020-N	188-K1D020-N
	3	—	188-J1C030-N	188-J1D030-N	—	188-K1C030-N	188-K1D030-N
	4	—	188-J1C040-N	188-J1D040-N	—	188-K1C040-N	188-K1D040-N
	6	188-J1B060-N	188-J1C060-N	188-J1D060-N	188-K1B060-N	188-K1C060-N	188-K1D060-N
	8	188-J1B080-N	188-J1C080-N	188-J1D080-N	188-K1B080-N	188-K1C080-N	188-K1D080-N
	10	188-J1B100-N	188-J1C100-N	188-J1D100-N	188-K1B100-N	188-K1C100-N	188-K1D100-N
	13	188-J1B130-N	188-J1C130-N	188-J1D130-N	188-K1B130-N	188-K1C130-N	188-K1D130-N
	16	188-J1B160-N	188-J1C160-N	188-J1D160-N	188-K1B160-N	188-K1C160-N	188-K1D160-N
	20	188-J1B200-N	188-J1C200-N	188-J1D200-N	188-K1B200-N	188-K1C200-N	188-K1D200-N
	25	188-J1B250-N	188-J1C250-N	188-J1D250-N	188-K1B250-N	188-K1C250-N	188-K1D250-N
1-pole +N	32	188-J1B320-N	188-J1C320-N	188-J1D320-N	188-K1B320-N	188-K1C320-N	188-K1D320-N
	40	188-J1B400-N	188-J1C400-N	188-J1D400-N	188-K1B400-N	188-K1C400-N	188-K1D400-N
	50	188-J1B500-N	188-J1C500-N	188-J1D500-N	188-K1B500-N	188-K1C500-N	188-K1D500-N
	63	188-J1B630-N	188-J1C630-N	188-J1D630-N	188-K1B630-N	188-K1C630-N	188-K1D630-N

Product Selection

2-Pole Regional Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
	0.5	—	188-J2C005	188-J2D005	—	188-K2C005	188-K2D005
	1	—	188-J2C010	188-J2D010	—	188-K2C010	188-K2D010
	2	—	188-J2C020	188-J2D020	—	188-K2C020	188-K2D020
	3	—	188-J2C030	188-J2D030	—	188-K2C030	188-K2D030
	4	—	188-J2C040	188-J2D040	—	188-K2C040	188-K2D040
	6	188-J2B060	188-J2C060	188-J2D060	188-K2B060	188-K2C060	188-K2D060
	8	188-J2B080	188-J2C080	188-J2D080	188-K2B080	188-K2C080	188-K2D080
	10	188-J2B100	188-J2C100	188-J2D100	188-K2B100	188-K2C100	188-K2D100
	13	188-J2B130	188-J2C130	188-J2D130	188-K2B130	188-K2C130	188-K2D130
	16	188-J2B160	188-J2C160	188-J2D160	188-K2B160	188-K2C160	188-K2D160
	20	188-J2B200	188-J2C200	188-J2D200	188-K2B200	188-K2C200	188-K2D200
	25	188-J2B250	188-J2C250	188-J2D250	188-K2B250	188-K2C250	188-K2D250
2-pole	32	188-J2B320	188-J2C320	188-J2D320	188-K2B320	188-K2C320	188-K2D320
	40	188-J2B400	188-J2C400	188-J2D400	188-K2B400	188-K2C400	188-K2D400
	50	188-J2B500	188-J2C500	188-J2D500	188-K2B500	188-K2C500	188-K2D500
	63	188-J2B630	188-J2C630	188-J2D630	188-K2B630	188-K2C630	188-K2D630

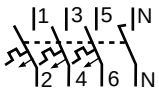
3-Pole Regional Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
	0.5	—	188-J3C005	188-J3D005	—	188-K3C005	188-K3D005
	1	—	188-J3C010	188-J3D010	—	188-K3C010	188-K3D010
	2	—	188-J3C020	188-J3D020	—	188-K3C020	188-K3D020
	3	—	188-J3C030	188-J3D030	—	188-K3C030	188-K3D030
	4	—	188-J3C040	188-J3D040	—	188-K3C040	188-K3D040
	6	188-J3B060	188-J3C060	188-J3D060	188-K3B060	188-K3C060	188-K3D060
	8	188-J3B080	188-J3C080	188-J3D080	188-K3B080	188-K3C080	188-K3D080
	10	188-J3B100	188-J3C100	188-J3D100	188-K3B100	188-K3C100	188-K3D100
	13	188-J3B130	188-J3C130	188-J3D130	188-K3B130	188-K3C130	188-K3D130
	16	188-J3B160	188-J3C160	188-J3D160	188-K3B160	188-K3C160	188-K3D160
	20	188-J3B200	188-J3C200	188-J3D200	188-K3B200	188-K3C200	188-K3D200
	25	188-J3B250	188-J3C250	188-J3D250	188-K3B250	188-K3C250	188-K3D250
 3-pole	32	188-J3B320	188-J3C320	188-J3D320	188-K3B320	188-K3C320	188-K3D320
	40	188-J3B400	188-J3C400	188-J3D400	188-K3B400	188-K3C400	188-K3D400
	50	188-J3B500	188-J3C500	188-J3D500	188-K3B500	188-K3C500	188-K3D500
	63	188-J3B630	188-J3C630	188-J3D630	188-K3B630	188-K3C630	188-K3D630

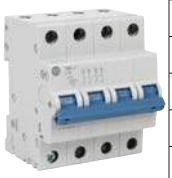
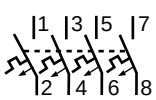
ALLEN BRADLEY 1492-GH

Product Selection

3-Pole + N Regional Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
 3-pole + N	0.5	—	188-J3C005-N	188-J3D005-N	—	188-K3C005-N	188-K3D005-N
	1	—	188-J3C010-N	188-J3D010-N	—	188-K3C010-N	188-K3D010-N
	2	—	188-J3C020-N	188-J3D020-N	—	188-K3C020-N	188-K3D020-N
	3	—	188-J3C030-N	188-J3D030-N	—	188-K3C030-N	188-K3D030-N
	4	—	188-J3C040-N	188-J3D040-N	—	188-K3C040-N	188-K3D040-N
	6	188-J3B060-N	188-J3C060-N	188-J3D060-N	188-K1D630-N	188-K3C060-N	188-K3D060-N
	8	188-J3B080-N	188-J3C080-N	188-J3D080-N	188-K3B060-N	188-K3C080-N	188-K3D080-N
	10	188-J3B100-N	188-J3C100-N	188-J3D100-N	188-K3B080-N	188-K3C100-N	188-K3D100-N
	13	188-J3B130-N	188-J3C130-N	188-J3D130-N	188-K3B100-N	188-K3C130-N	188-K3D130-N
	16	188-J3B160-N	188-J3C160-N	188-J3D160-N	188-K3B130-N	188-K3C160-N	188-K3D160-N
	20	188-J3B200-N	188-J3C200-N	188-J3D200-N	188-K3B160-N	188-K3C200-N	188-K3D200-N
	25	188-J3B250-N	188-J3C250-N	188-J3D250-N	188-K3B200-N	188-K3C250-N	188-K3D250-N
	32	188-J3B320-N	188-J3C320-N	188-J3D320-N	188-K3B250-N	188-K3C320-N	188-K3D320-N
	40	188-J3B400-N	188-J3C400-N	188-J3D400-N	188-K3B320-N	188-K3C400-N	188-K3D400-N
	50	188-J3B500-N	188-J3C500-N	188-J3D500-N	188-K3B400-N	188-K3C500-N	188-K3D500-N
	63	188-J3B630-N	188-J3C630-N	188-J3D630-N	188-K3B500-N	188-K3C630-N	188-K3D630-N

4-Pole Regional Circuit Breakers

Photo/Wiring Diagram	Continuous Current Rating (I_n) [A]	10 kA Interrupting Capacity			6 kA Interrupting Capacity		
		Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.	Trip Curve B Resistive or Slightly Inductive 3…5 I_n Cat. No.	Trip Curve C Inductive 5…10 I_n Cat. No.	Trip Curve D Highly Inductive 10…20 I_n Cat. No.
  4-pole	0.5	—	188-J4C005	188-J4D005	—	188-K4C005	188-K4D005
	1	—	188-J4C010	188-J4D010	—	188-K4C010	188-K4D010
	2	—	188-J4C020	188-J4D020	—	188-K4C020	188-K4D020
	3	—	188-J4C030	188-J4D030	—	188-K4C030	188-K4D030
	4	—	188-J4C040	188-J4D040	—	188-K4C040	188-K4D040
	6	188-J4B060	188-J4C060	188-J4D060	188-K4B060	188-K4C060	188-K4D060
	8	188-J4B080	188-J4C080	188-J4D080	188-K4B080	188-K4C080	188-K4D080
	10	188-J4B100	188-J4C100	188-J4D100	188-K4B100	188-K4C100	188-K4D100
	13	188-J4B130	188-J4C130	188-J4D130	188-K4B130	188-K4C130	188-K4D130
	16	188-J4B160	188-J4C160	188-J4D160	188-K4B160	188-K4C160	188-K4D160
	20	188-J4B200	188-J4C200	188-J4D200	188-K4B200	188-K4C200	188-K4D200
	25	188-J4B250	188-J4C250	188-J4D250	188-K4B250	188-K4C250	188-K4D250
	32	188-J4B320	188-J4C320	188-J4D320	188-K4B320	188-K4C320	188-K4D320
	40	188-J4B400	188-J4C400	188-J4D400	188-K4B400	188-K4C400	188-K4D400
	50	188-J4B500	188-J4C500	188-J4D500	188-K4B500	188-K4C500	188-K4D500
	63	188-J4B630	188-J4C630	188-J4D630	188-K4B630	188-K4C630	188-K4D630

Specifications

General Data			
Poles			1, 2, 3, 4, 1+N, 3+N
Tripping characteristics			B, C, D
Rated current (I_n)			0.5…63 A
Rated frequency (f)			50/60 Hz
Rated insulation voltage U_i per IEC/EN 60664-1			250 V AC (phase to ground), 440V AC (phase to phase)
Overvoltage category			III
Pollution degree			2
Data per IEC/EN 60898-1			
Rated operational voltage (U_e)	1-pole		230/400V AC
	1-pole +N		230V AC
	2-, 3-, 4-pole 3-pole +N		400V AC
Highest supply or utilization voltage (U_{max})	AC	1-pole	253/440V AC
		1-pole+N	253V AC
		2-, 3-, 4-, 3-pole+N	440V AC
	DC★	1-pole	48V DC
		2-pole	96V DC
Min. operating voltage			12V AC, 12V DC
Rated short-circuit capacity (I_{cn})		188-J	10 kA
		188-K	6 kA
Energy limiting class (B, C up to 40 A)			3
Rated impulse withstand voltage $U_{imp.}$ (1.2/50µs)			4 kV (test voltage 6.2kV at sea level, 5kV at 2,000m)
Dielectric test voltage			2 kV (50 / 60Hz, 1 min.)
Reference temperature for tripping characteristics			B, C, D: 30°C
Electrical endurance 1 cycle (2s - ON, 13s - OFF, $I_n \leq 32A$), 1 cycle (2s - ON, 28s - OFF, $I_n > 32A$)			$I_n < 30A$: 20,000 ops (AC) $I_n \geq 30A$: 10,000 ops. (AC); 1,000 ops. (DC);

★ IEC DC ratings self-declared.

Power Loss Due to Current

Rated Current [A]	Power Loss Per Pole [W]		Rated Current [A]	Power Loss Per Pole [W]
0.5	1.4		13	2.3
1	1.4		16	2.5
2	1.8		20	2.5
3	1.5		25	3.2
4	1.8		32	3.7
6	2.0		40	4.8
8	1.5		50	4.5
10	2.1		63	5.2

Mechanical Data	
Housing	Insulation group II, RAL 7035
Indicator window	None
Protection degree per EN 60529	IP20— IP40 in enclosure with cover
Mechanical endurance	20,000 operations
Shock resistance per IEC/EN 60068-2-27	25 g - 2 shocks - 13 ms
Vibration resistance per IEC/EN 60068-2-6	5g - 20 cycles at 5…150…5 Hz with load 0.8In
Environmental	
Environmental conditions (damp heat) per IEC/EN 60068-2-30	28 cycles with 55°C/90-96% and 25°C/95-100%
Ambient temperature★	-25 … +55°C
Storage temperature	-40 … +70°C
Installation	
Terminal	Cage terminal
Cross-section of wire solid, stranded	0.75...25 mm^2
Cross-section of wire flexible	0.75...16 mm^2
Tightening torque	2.0 N•m
Screwdriver	No. 2 Pozidrive
Mounting	DIN Rail (EN 60715, 35mm) with fast clip
Mounting position	Any
Supply	Optional
Approximate Dimensions and Weight	
Pole dimensions (H x D x W)	85 x 69 x 17.5 mm
Pole weight	115 g (4.4 oz.)
Combination with aux. elements	
Auxiliary contact	Yes
Signal contact	Yes
Shunt trip	Yes

★ Refer to the Ambient Temperature Derating tables.

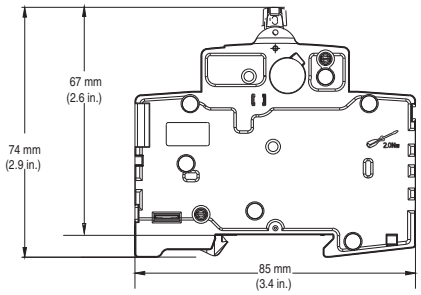
Zero-stack Derating

The installation of several miniature circuit breaker side by side with rated current on all poles requires a correction factor to the rated current (not required if spacers are used).

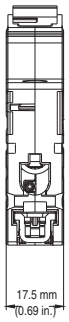
No. of Adjacent Devices	Factor
1	1
2,3	0.9
4,5	0.8
≥ 6	0.75

Approximate Dimensions

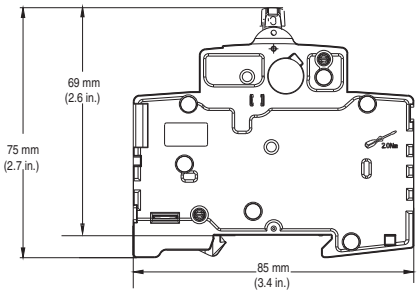
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



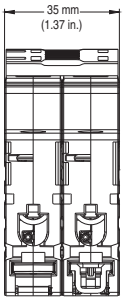
1-Pole



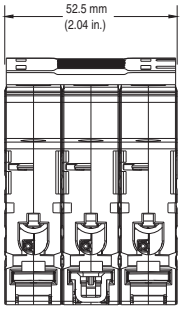
1-Pole



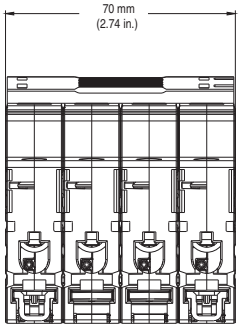
1+N, 2-, 3-,3+N, 4-Pole



1-Pole +N, 2-Pole



3-Pole



3-Pole +N, 4-Pole

ALLEN BRADLEY 1492-GH

Ambient Temperature Derating

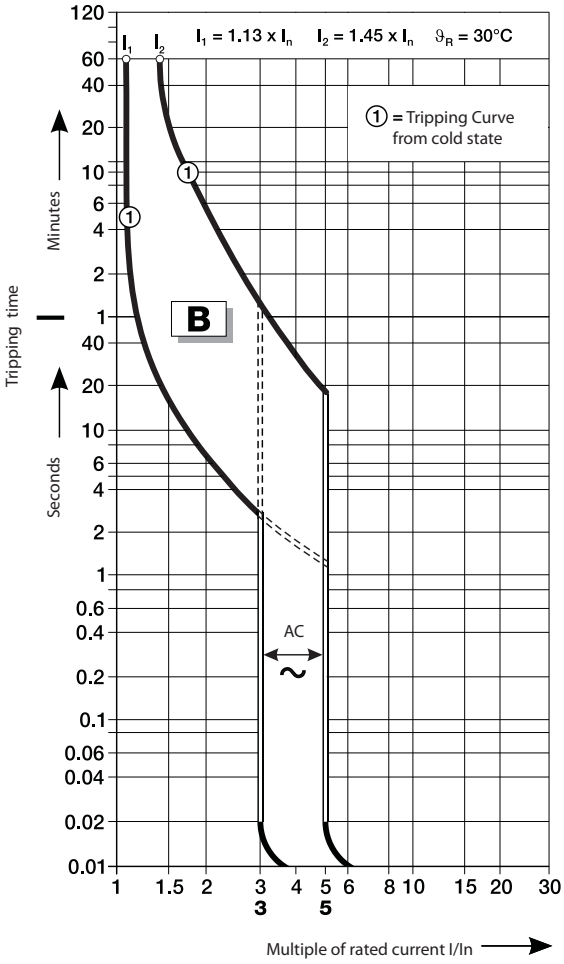
Note: Application below 0º C is for non-condensing atmosphere. Care should be taken for applications below 0 °C. These devices are not certified to operate correctly in the presence of ice.

Bulletin 188-J, -K
Temperature Derating, IEC
Reference temperature = 30 °C

Current Rating	Ambient temperature (°C)									
(A)	-25	-20	-10	0	10	20	30	40	50	55
0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9
2	2.3	2.3	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.9
3	3.5	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.8
4	4.7	4.6	4.5	4.4	4.2	4.1	4.0	3.9	3.8	3.7
6	7.0	6.9	6.7	6.5	6.4	6.2	6.0	5.8	5.6	5.6
8	9.3	9.2	9.0	8.7	8.5	8.2	8.0	7.8	7.5	7.4
10	11.7	11.5	11.2	10.9	10.6	10.3	10	9.7	9.4	9.3
13	15.1	15.0	14.6	14.2	13.8	13.4	13	12.6	12.2	12.0
16	18.6	18.4	17.9	17.4	17.0	16.5	16	15.5	15.0	14.8
20	23.3	23.0	22.4	21.8	21.2	20.6	20	19.4	18.8	18.5
25	29.1	28.8	28.0	27.3	26.5	25.8	25	24.3	23.5	23.1
32	37.3	36.8	35.8	34.9	33.9	33.0	32	31.0	30.1	29.6
40	46.6	46.0	44.8	43.6	42.4	41.2	40	38.8	37.6	37.0
50	58.3	57.5	56.0	54.5	53.0	51.5	50	48.5	47.0	46.3
63	73.4	72.5	70.6	68.7	66.8	64.9	63	61.1	59.2	58.3

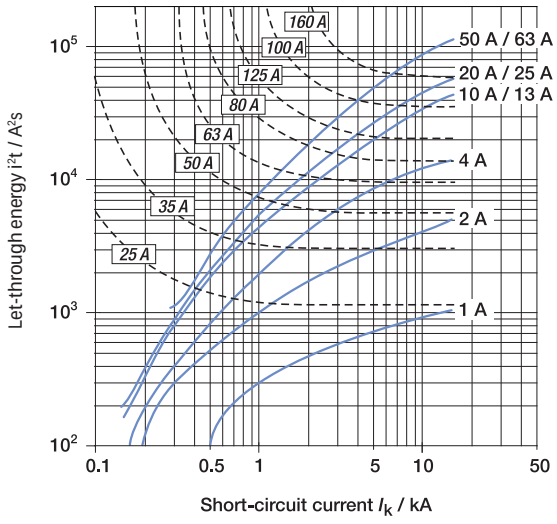
Tripping Characteristics*

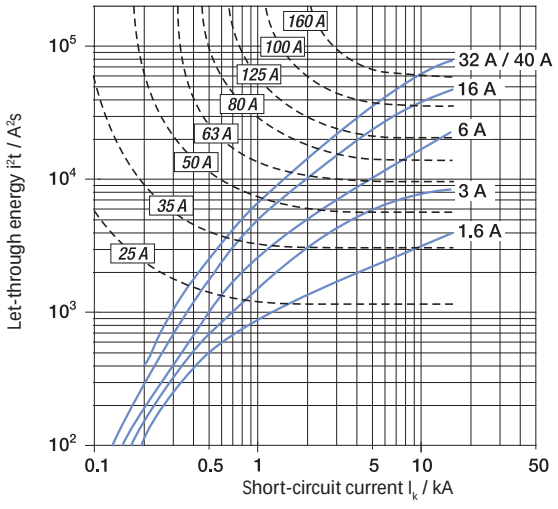
B Curve



* DC trip curves:
When using 188-J/-K.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For B trip curve = 4.5 to 7.5 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

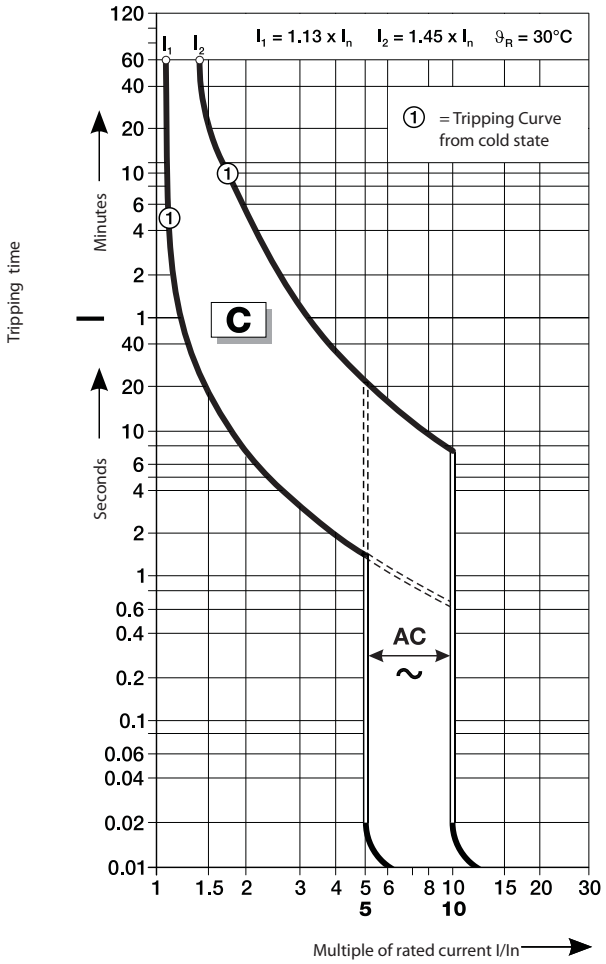
B and C Curve - 230/400V AC Let -through Energy





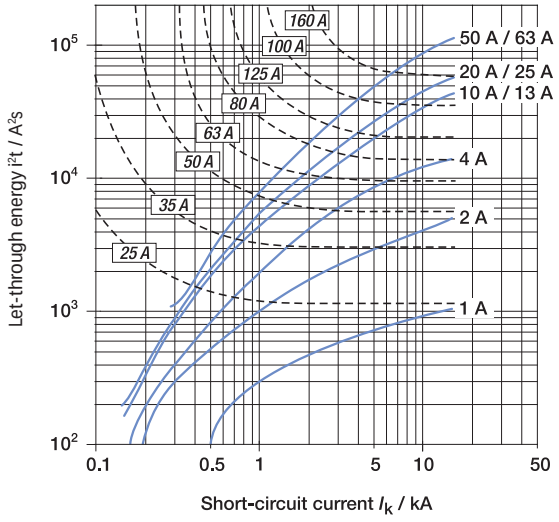
Tripping Characteristics*

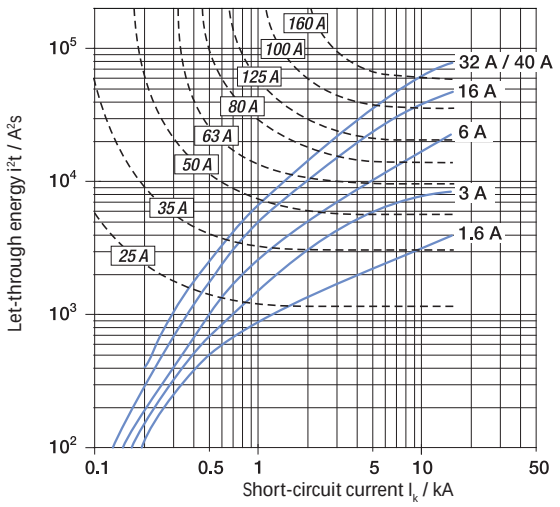
C Curve



* DC trip curves:
When using 188-J/-K.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For C trip curve = 7.5 to 15 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

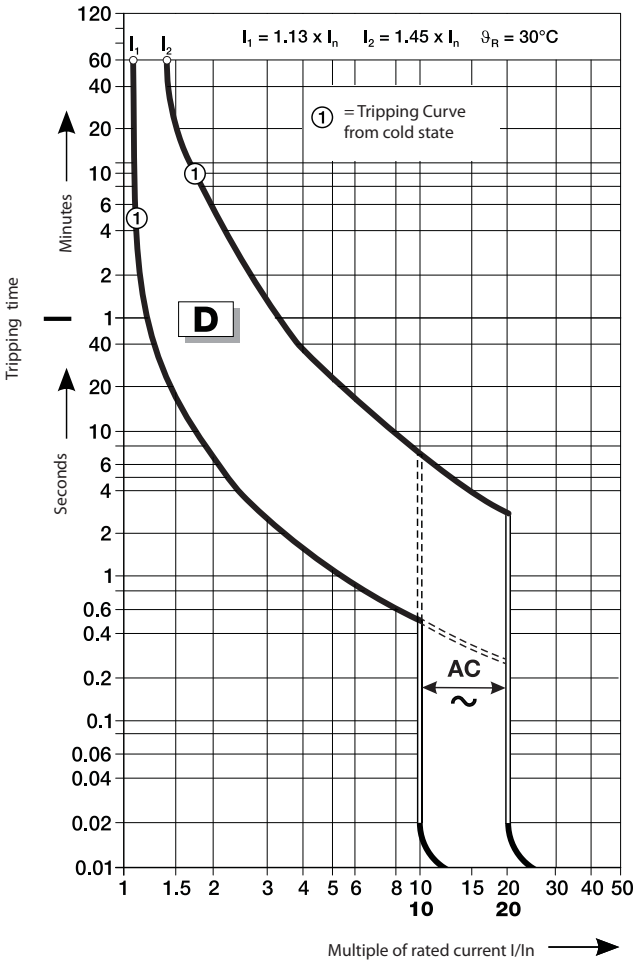
B and C Curve - 230/400V AC Let-through Energy





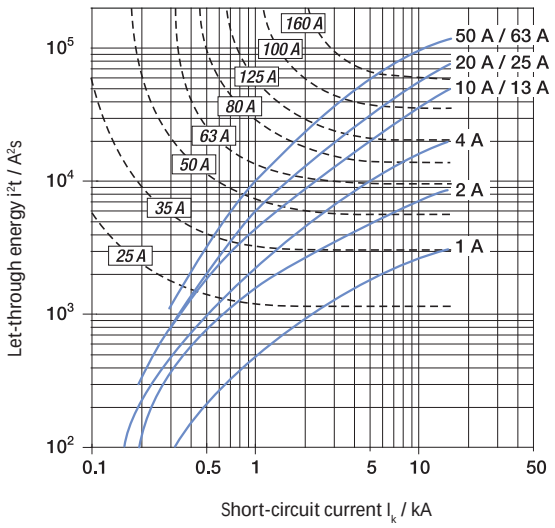
Tripping Characteristics*

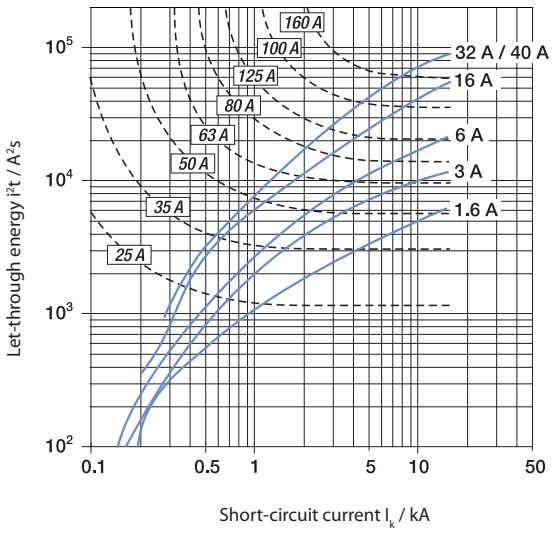
D Curve



* DC trip curves:
When using 188-J/-K.. on DC applications or DC loads, please refer to AC trip curves and times and use a factor of 1.5 for the magnetic instantaneous trip times the continuous current rating (In).
For D trip curve = 15 to 30 multiple of the rated current (I/ In).
The thermal trip times remain the same for both AC and DC applications.

D Curve - 230/400V AC Let-through Energy

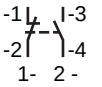
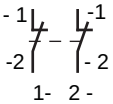




ALLEN BRADLEY 1492-GH

Accessories

Right Mount

Photo	Product Description ‡★Δ	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Shunt Trip		UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	110...415V AC 110-250V DC	110...415V AC 110-250V DC	189-AST1
			UL 1077 CSA 22.2 No. 235	UL Recognized CSA Certified CE Marked	12...60V AC/DC	12...60V AC/DC	189-AST2
	Auxiliary/Signal Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-ASCR3
	Auxiliary Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 480 VAC 2A @ 277 VAC 1.5A @ 125 VDC 2A @ 60 VDC 4A @ 24 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AR3
		1 N.O. + 1 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30V DC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR11
		2 N.C 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR02
		2 N.O. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1A @ 400 VAC 2A @ 230 VAC 1A @ 50 VDC 2A @ 30 VDC	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AR20

‡ A maximum of one C.O. type signal contact, and two C.O. type auxiliary contacts ***OR*** three C.O. type auxiliary contacts may be installed with or without a shunt trip per 188.

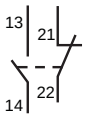
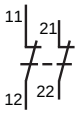
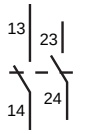
★ A maximum of two 189-AR11, -AR02, or -AR20 auxiliary contacts may be installed per 188. They may not be combined with shunt trips or C.O. type contacts.

Δ A maximum of four right mount accessories of any type may be installed per 188. The shunt trip must be mounted closest to the 188, then the signal contact, then the auxiliary contact(s). For allowed combinations, and installation instructions please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

ALLEN BRADLEY 1492-GH

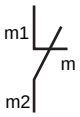
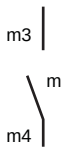
Accessories

Left Mount

Photo	Product Description ★	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.O. + 1 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL11
		2 N.C. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL02
		2 N.O. 	EN 60947-5-1	CE Marked	—	2A @ 230 V (AC-14) 1A @ 400 V (AC-14) 1.5A @ 110 V (DC-12) 1A @ 220 V (DC-12) 4A @ 24 V (DC-13) 2A @ 60 V (DC-13)	189-AL20

★ Only one left mount auxiliary contact may be installed per 188.

Bottom Mount

Photo	Product Description Δ‡	Contacts	Standards	Certifications‡	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary Contact	1 N.C. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 30V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB01
		1 N.O. 	UL1077 CSA C22.2 No.235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked CCC Certified	2 A @ 230V AC 2 A @ 30V DC	2A @ 230 V (AC-14) 2A @ 30V (DC-12) 1A @ 50 V (DC-12) 2A @ 30 V (DC-13) 1A @ 50 V (DC-13)	189-AB10

Δ Only one bottom mount auxiliary contact may be installed per 188.

‡ Bottom mount auxiliaries show a CE Mark on the product instruction sheet and packaging, but not on the product itself.

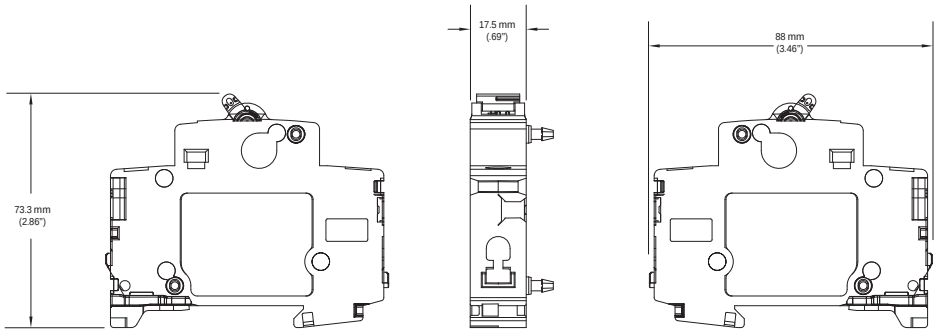
Toggle Mount

Photo	Product Description	Cat. No.
	Lock Out attachment for 1-pole MCB	189-ALOA1
	Lock Out attachment for multi-pole MCB	189-ALOA2

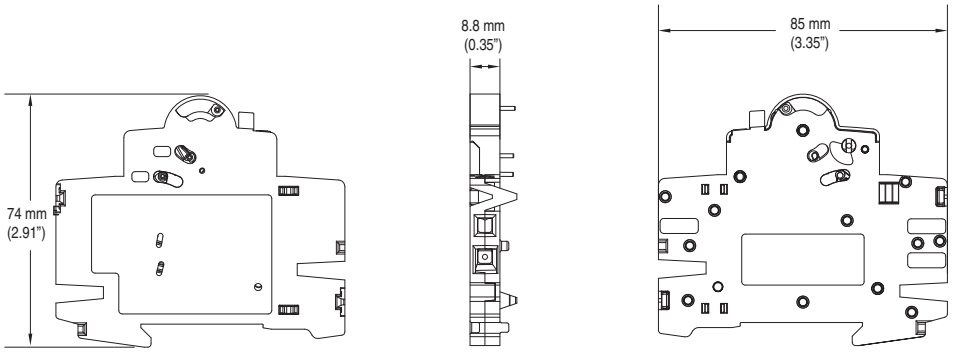
ALLEN BRADLEY 1492-GH

Accessory Approximate Dimensions

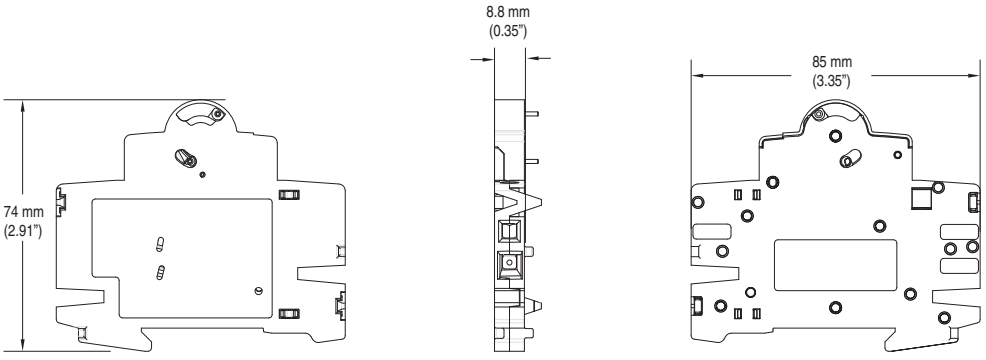
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-AST1 and 189-AST2



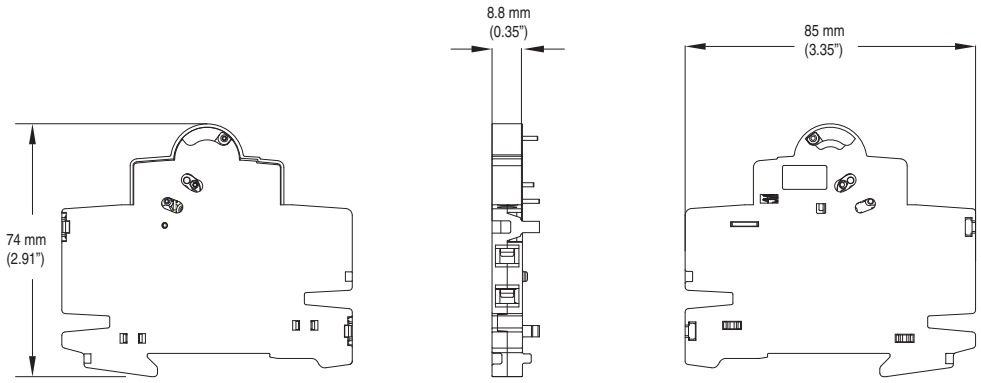
189-ASCR3



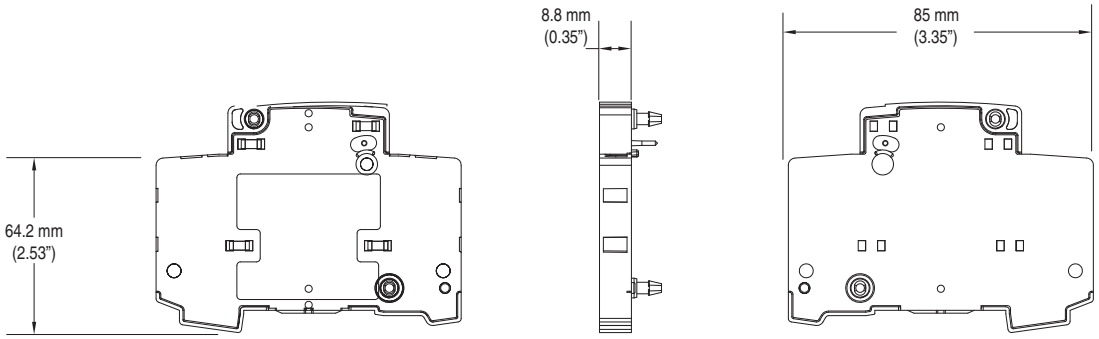
189-AR3

Accessory Approximate Dimensions

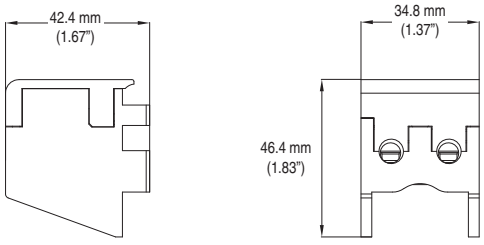
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-AR11, 189-AR02, 189-AR20



189-AL11, 189-AL02, and 189-AL20



189-AB01 and 189-AB10

ALLEN BRADLEY 1492-GH

Bus Bars

188 Bus Bars

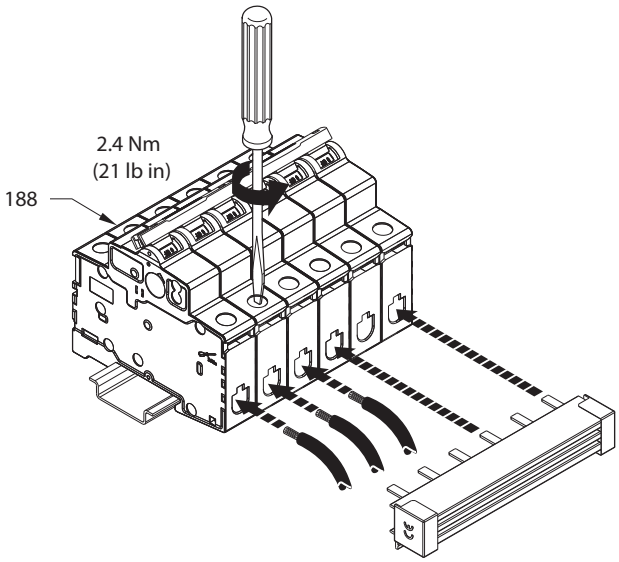
Description	Pins	Pkg. Qty.	Cat. No. ★
1-Phase	60	1	189-CL1
	12	20	189-CL112
	6	20	189-CL106
	2	20	189-CL102
1-Phase with aux contact	38	1	189-CL1H
	9	20	189-CL1H09
	6	20	189-CL1H06
	2	20	189-CL1H02
2-Phase	58	1	189-CL2
	12	10	189-CL212
	6	10	189-CL206
	4	10	189-CL204
2-Phase with aux contact	44	1	189-CL2H
	10	10	189-CL2H10
	6	10	189-CL2H06
	4	10	189-CL2H04
3-Phase	60	1	189-CL3
	12	10	189-CL312
	6	10	189-CL306
3-Phase with aux contact	48	1	189-CL3H
	12	10	189-CL3H12
	6	10	189-CL3H06
4-Phase	56	1	189-CL4
	8	10	189-CL408
4-Phase with aux contact	48	1	189-CL4H
2-Phase MCB to RCD	4	10	189-CL204
4-Phase MCB to RCD	8	10	189-CL408

★ These devices are CE Marked, but not certified to any UL, CSA, or other standard.

188 Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 6...25 mm²	10	189-CLT25
Terminal Power Feed, 6...50 mm²	10	189-CLT50
Dedicated Power Feed, 50 mm²	10	189-CLT50D
For 1-phase bus bar	10	189-CL1EC
For 2- or 3-phase bus bar	10	189-CL3EC
For 4-phase bus bar	10	189-CL4EC
Protective Shroud for unused pins	10	189-CLPS

★ These devices are CE Marked, but not certified to any UL, CSA, or other standard.

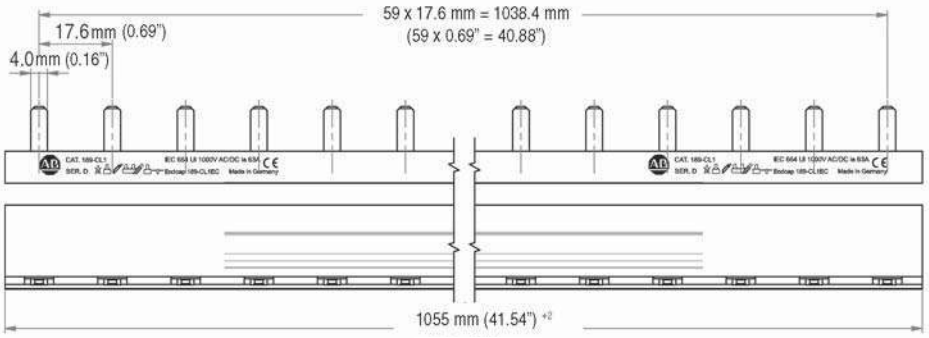


ALLEN BRADLEY 1492-GH

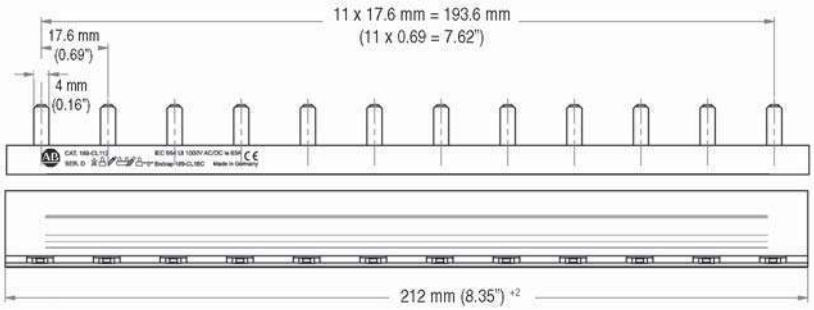
Bus Bar Approximate Dimensions

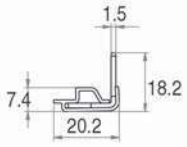
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars

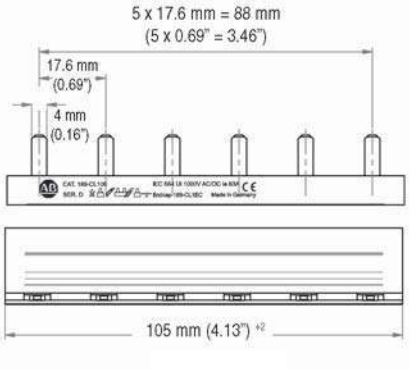


189-CL1

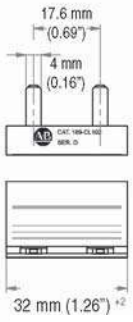




189-CL112



189-CL106

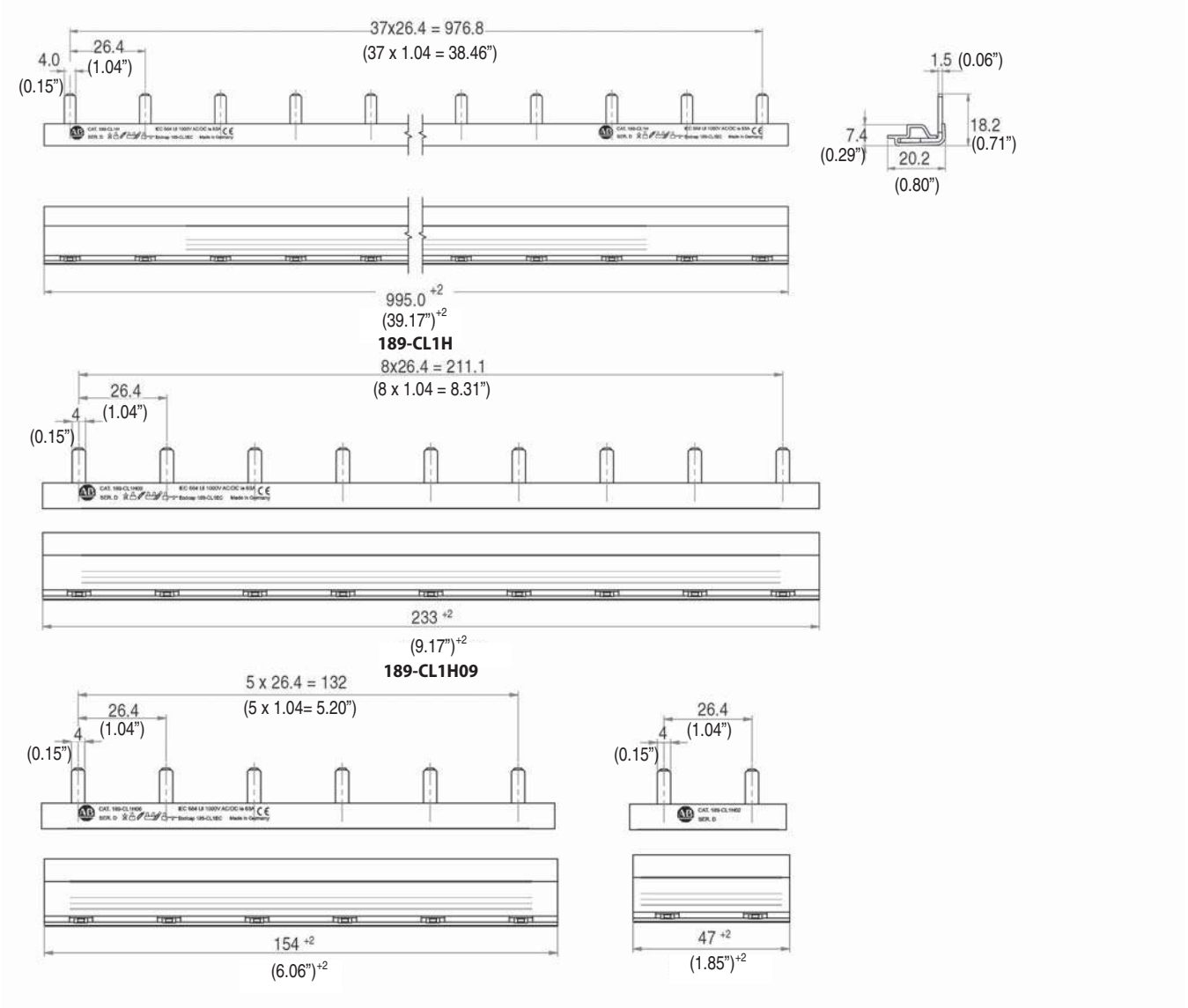


189-CL102

Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars, with Auxiliary Contact

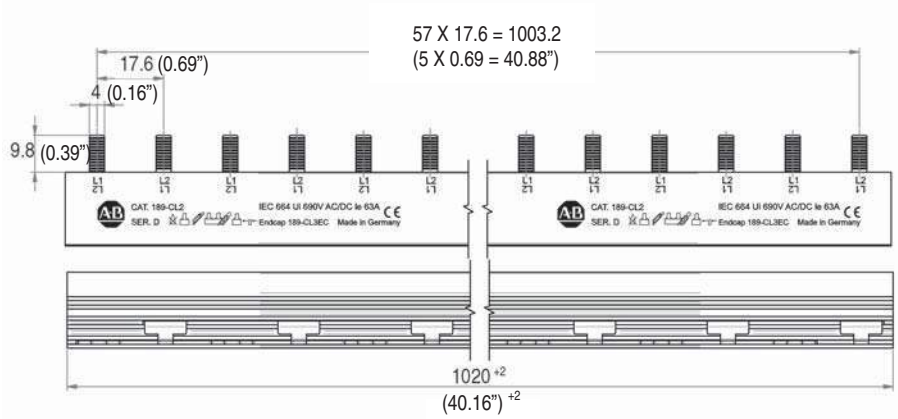


ALLEN BRADLEY 1492-GH

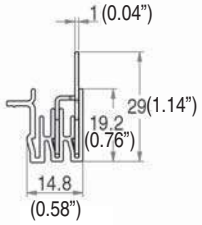
Bus Bar Approximate Dimensions

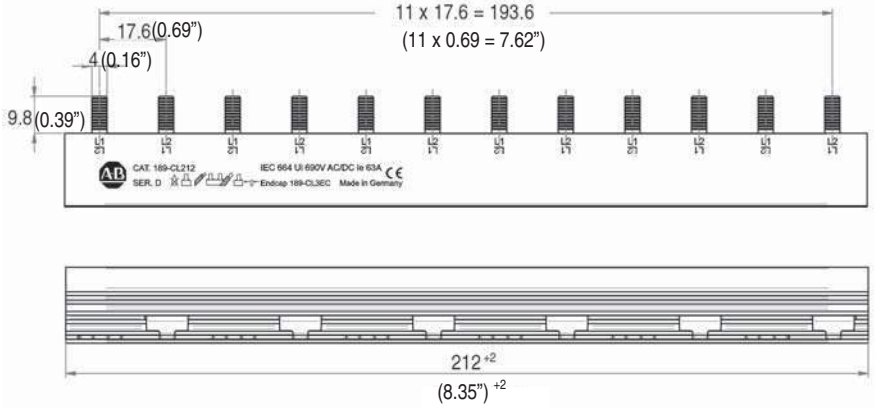
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

2-Phase Bus Bars

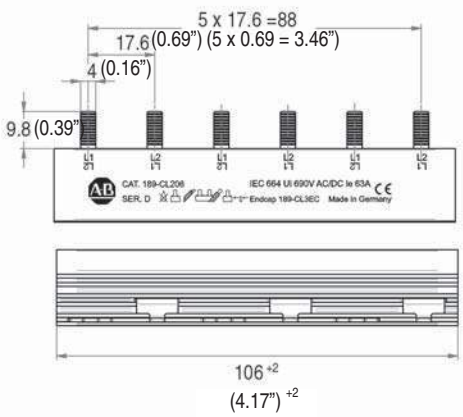


189-CL2

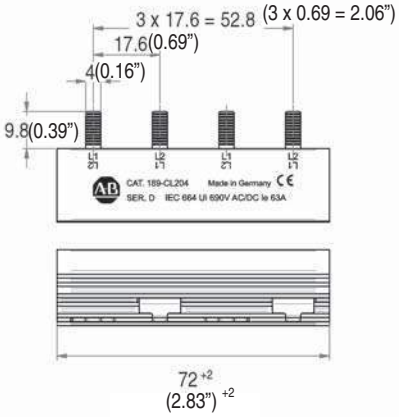




189-CL212



189-CL206

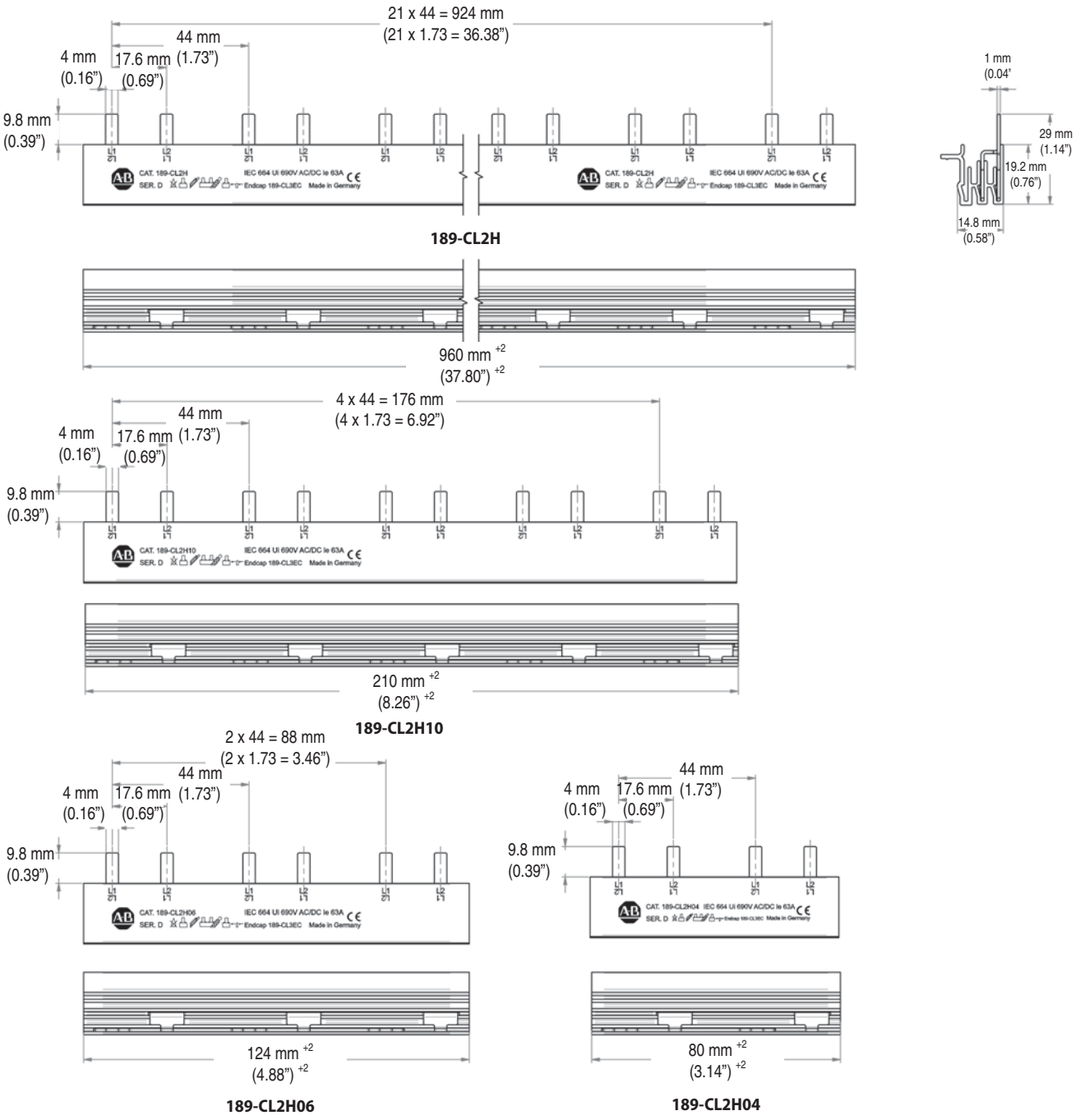


189-CL204

Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

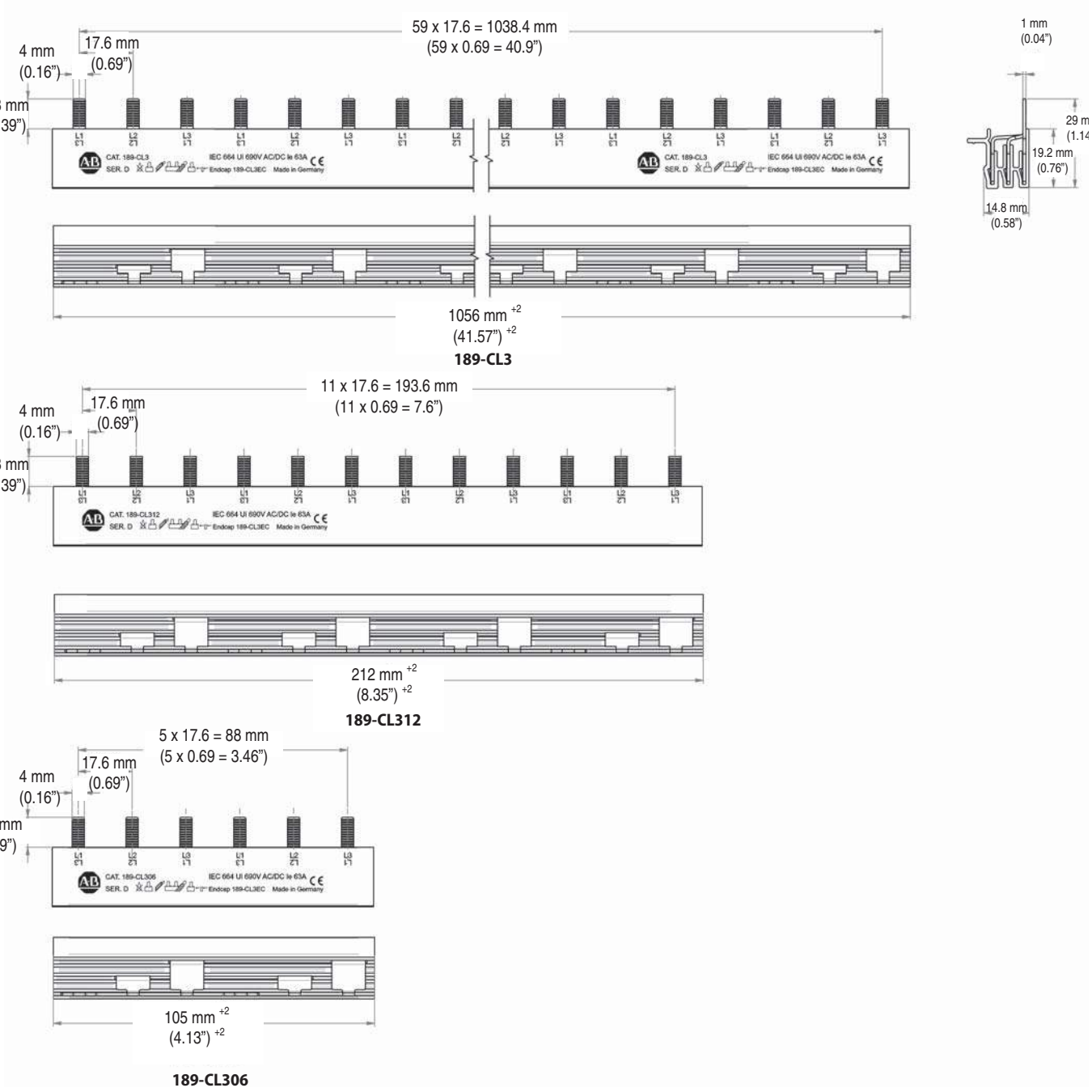
2-Phase Bus Bars, with Auxiliary Contact



Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

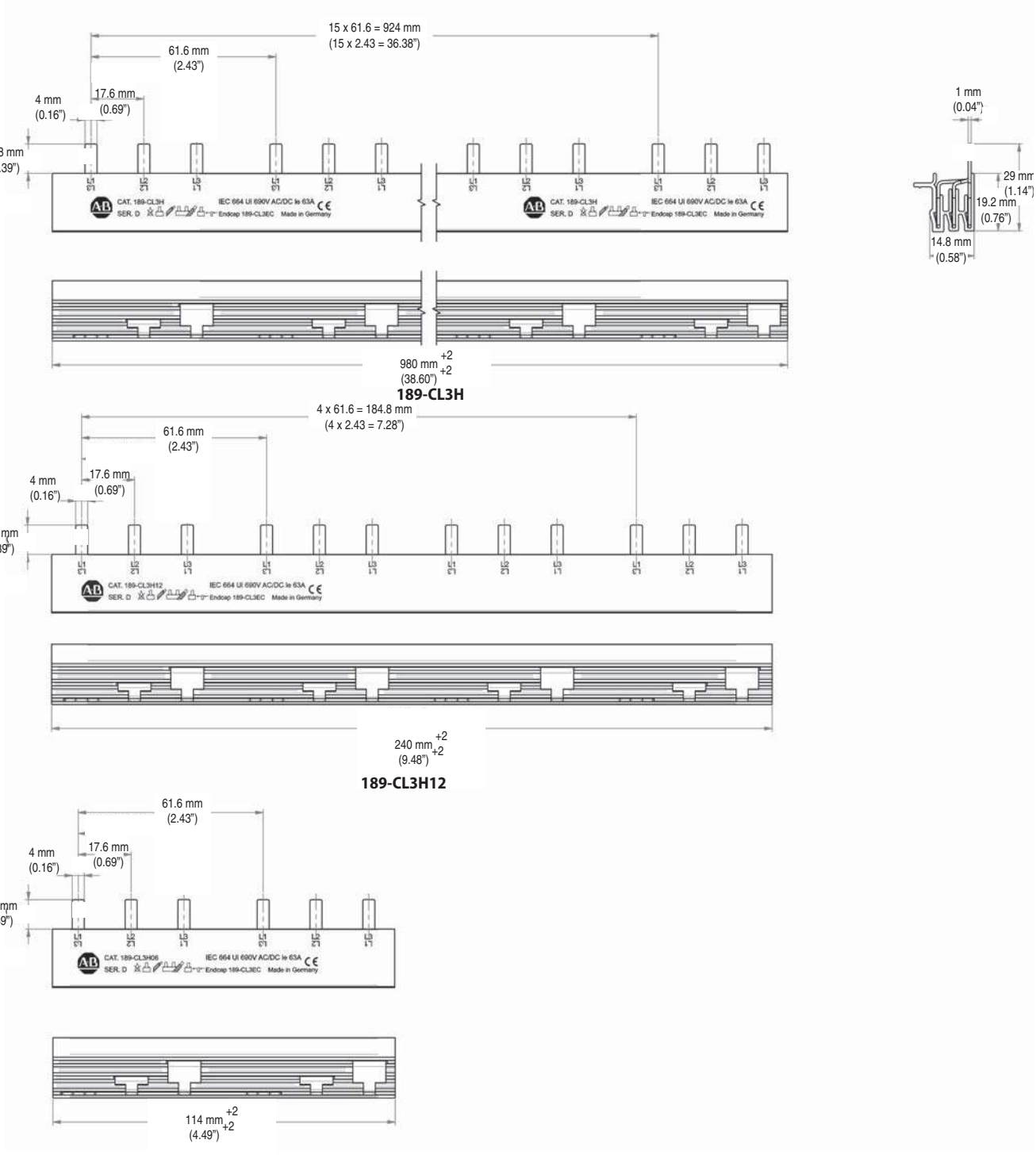
3-Phase Bus Bars



Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

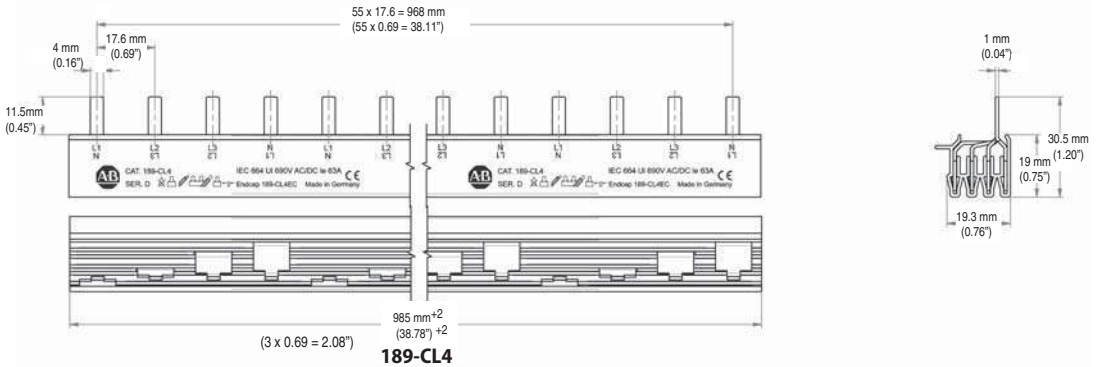
3-Phase Bus Bars, with Auxiliary Contact



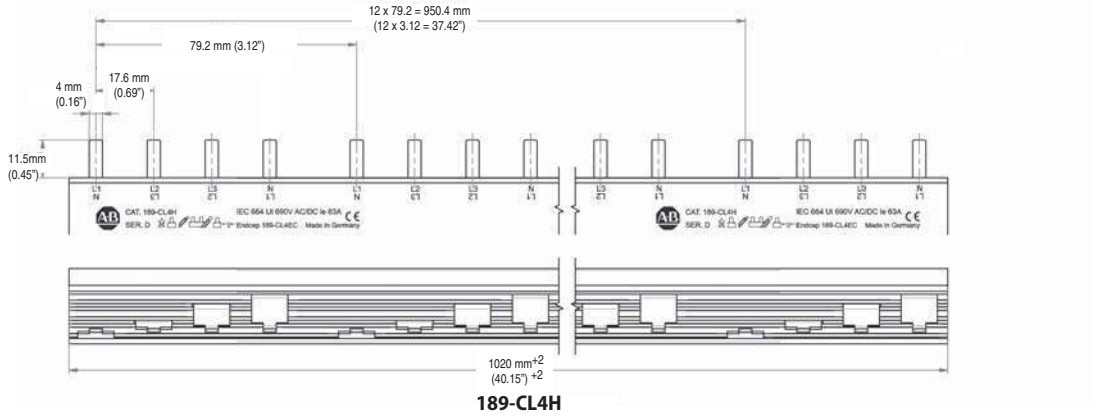
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

4-Phase Bus Bars

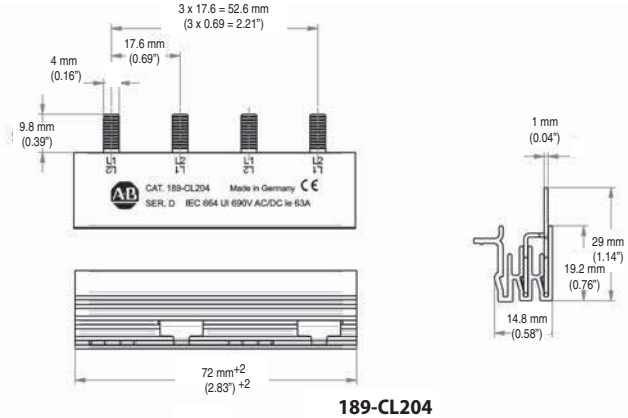


189-CL4

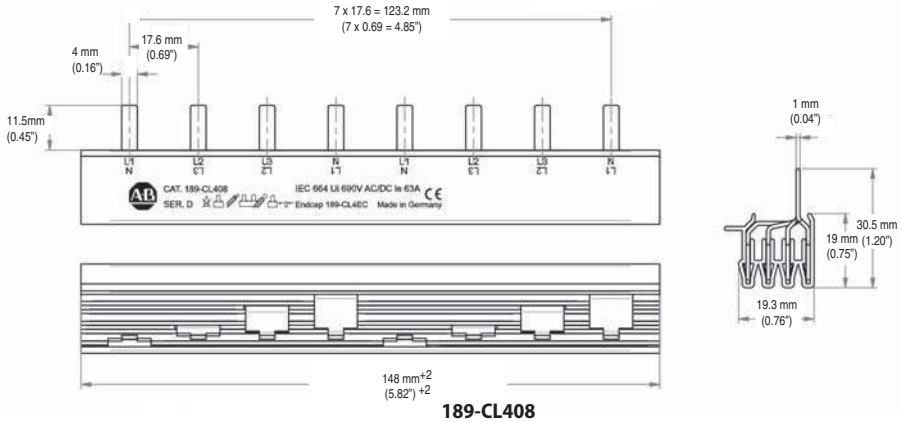


189-CL4H

2- and 4-Phase Bus Bars for connection to 1492-RCD



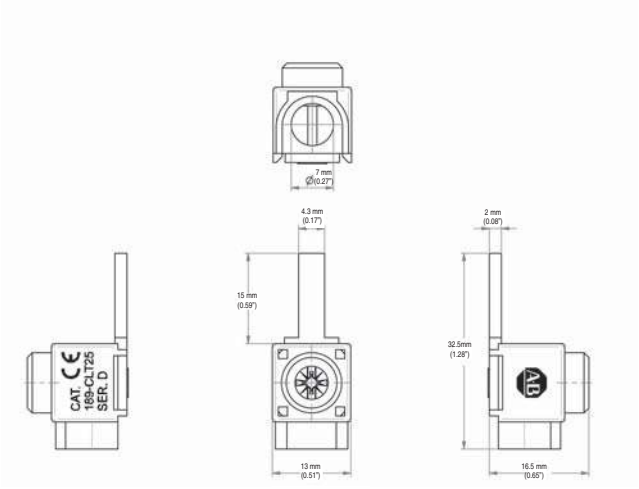
189-CL204



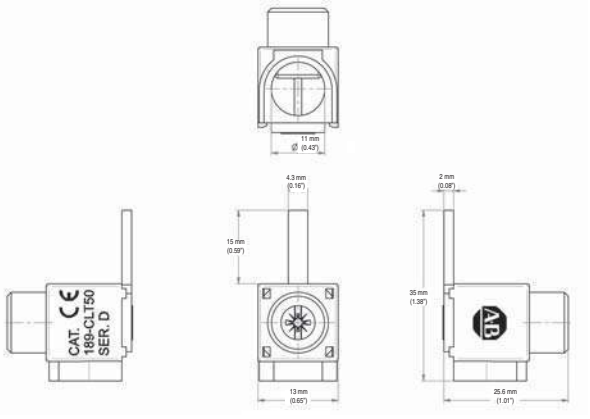
189-CL408

Bus Bar Accessory Approximate Dimensions

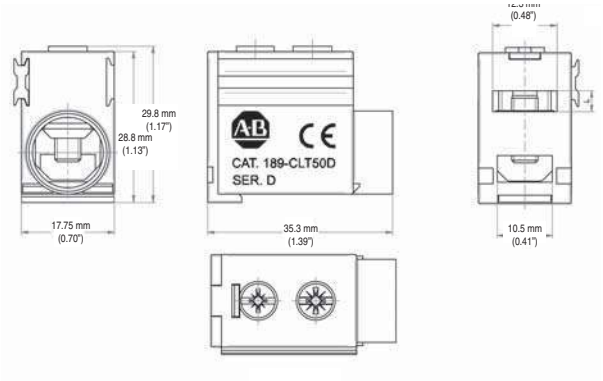
Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



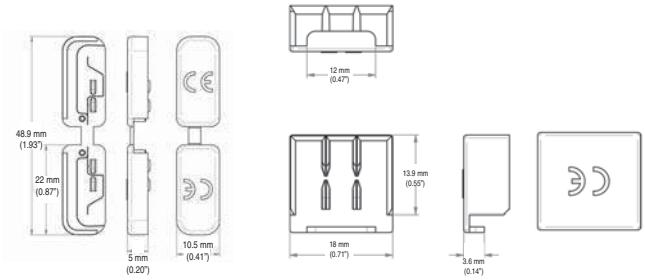
189-CLT25



189-CLT50

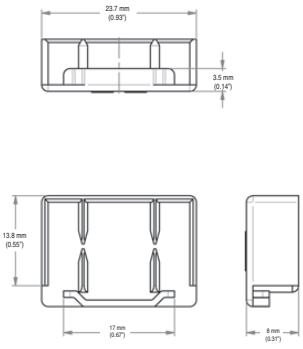


189-CLT50D

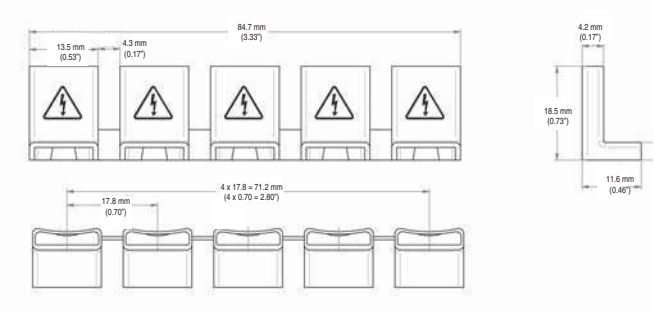


189-CL1EC

189-CL3EC

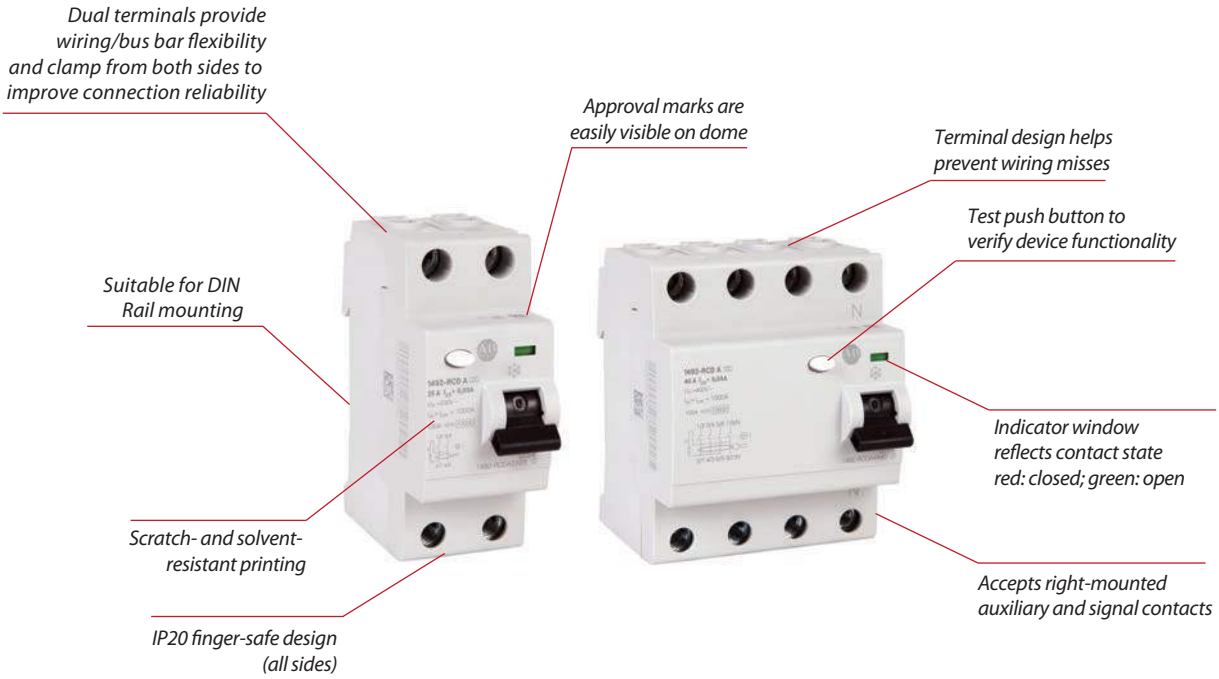


189-CL4EC



189-CLPS

1492-RCD Residual Current Devices



The Bulletin 1492-RCD line includes Residual Current Devices, also known as Residual Current Circuit Breakers, for detecting and interrupting leakage current to ground. By detecting small leakage currents and disconnecting all ungrounded connectors quickly, RCDs can prevent injury to exposed personnel and damage to equipment.

RCDs are used in series with miniature circuit breakers for additional circuit protection from not only overload and short circuit, but also ground fault. Many short circuits begin as undetected ground faults. Using an RCD in an application may detect problems before costly equipment damage and downtime occurs.

These devices are Type A Residual Current Devices to IEC Standards.

1492-RCD Residual Current Devices

Current Ratings	25, 40, 63, 80 A
Rated Sensitivity IΔn	30, 100, 300, 500 mA
Poles	2, 4
Standards Compliance	UL 1053 ANSI/NFPA 70 EN 61008 * CSA C22.2 No.144 GB 16916
Certifications	cURus Recognized, File No. E53935 CE Marked CCC Certified VDE Certified * RoHS Compliant

Features

- Provides protection against current leakage to ground (earth) caused by an insulation loss between a live conductor and an exposed conductive part (such as an abraded wire, or a grounded person touching the live conductor)
- Suitable for protection against AC and pulsating DC (rectified AC) earth leakage current
- 30 mA sensitivity devices for personnel protection (consult local requirements)
- 100, 300 and 500 mA sensitivity devices for equipment protection
- Dual terminals allow a more secure connection of two wires, or both a wire and bus bar
- Reversible line and load connections

* Catalog numbers with -US suffix are not EN or VDE certified.

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492	-	RCDA	2	A	25		-	
		a	*b*	*c*	*d*	*e*		*f*

a

Type	
Code	**Description**
RCDA	Residual Current Device, Type A

b

Poles	
Code	**Description**
2	2-Pole
4	4-Pole

c

Sensitivity IΔn	
Code	**Rated Sensitivity [mA]**
A	30
B	100
C	300
D	500

d

Rated Current (I_n)	
Code	**Current [A]**
25	25
40	40
63	63
80	80

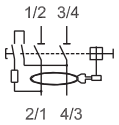
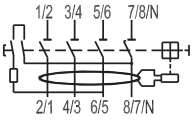
e

Delay Option (available on select 4-pole devices)	
Code	**Description**
	Can be left blank
S	With Delay

f

United States 110V Option (available on select 30 mA sensitivity versions)	
Code	**Description**
	Can be left blank
US	United States 110V

Product Selection

Sensitivity (mA)	**Rated Current (A)**	**2-Pole (1-Pole + Neutral)**		**4-Pole (3-Pole + Neutral)**		
		Ut min = 110V	**Ut min = 170V**	**Ut min = 110V**	**Ut min = 110V (With Delay)**	**Ut min = 170V**
30	25	1492-RCDA2A25-US	1492-RCDA2A25	1492-RCDA4A25-US	—	1492-RCDA4A25
	40	1492-RCDA2A40-US	1492-RCDA2A40	1492-RCDA4A40-US	—	1492-RCDA4A40
	63	—	—	1492-RCDA4A63-US	—	1492-RCDA4A63
	80	—	—	—	—	1492-RCDA4A80
100	25	1492-RCDA2B25	—	1492-RCDA4B25	—	—
	40	1492-RCDA2B40	—	1492-RCDA4B40	1492-RCDA4B40S	—
	63	—	—	1492-RCDA4B63	1492-RCDA4B63S	—
300	25	1492-RCDA2C25	—	1492-RCDA4C25	—	—
	40	1492-RCDA2C40	—	1492-RCDA4C40	1492-RCDA4C40S	—
	63	—	—	1492-RCDA4C63	1492-RCDA4C63S	—
	80	—	—	1492-RCDA4C80	—	—
500	25	—	—	1492-RCDA4D25	—	—
	40	—	—	1492-RCDA4D40	—	—
	63	—	—	1492-RCDA4D63	—	—
	80	—	—	1492-RCDA4D80	—	—
Diagram						

ALLEN BRADLEY 1492-GH

Specifications

General Data		
Poles		2,4
Rated current I_n		25, 40, 63, 80 A
Rated sensitivity IΔn	2-pole	30, 100, 300 mA
	4-pole	30, 100, 300, 500 mA
Electrical Ratings		
Rated short-circuit strength		10 kA with 63 A gG/gL back-up fuse, 10 kA with 80 A gG/gL back-up fuse for 80 A device
Rated operational voltage U_e per IEC/EN		230/400V AC
Rated voltage U_e per UL		480Y/277V AC
Max. operating voltage of circuit test		254V AC
Min. operating voltage of circuit test		110V *
Rated frequency		50/60 Hz
Rated conditional short-circuit		10 kA (SCPD - fuse gG 100 A)
Rated residual breaking capacity		1 kA
Rated impulse withstand voltage U_{imp} (1.2/50µs)		4 kV
Dielectric test voltage at ind. freq. for 1 min.		2.5 kV
Electrical endurance		10,000 operations
Mechanical		
Indicator window		Red ON/green OFF
Protection degree	Housing	IP4X
	Terminals	IP2X
Environmental		
Ambient temperature (with daily average +35 °C)		-25...+55 °C
Storage temperature		-40...+70 °C
Mechanical endurance		20,000 operations
Installation		
Terminal type		Dual terminal
Cross-section of wire - solid, stranded, flexible (front/back terminal slot)	25...63 A	25/25 mm^2
		18...4 AWG
	80 A	35/35 mm^2
		18. . . 2 AWG
Cross-section of bus bars (front/back terminal slot)	25...63 A	10/10 mm^2
	80 A	16/16 mm^2
Tightening torque	25...63 A	2.8 N·m
		25 in·lb
	80 A	4.8 N·m
		43 in·lb
Mounting		DIN Rail EN 60715 (35 mm) with fast clip device
Supply		Optional

Approximate Dimensions and Weight		
Dimensions (H x D x W)	2-pole	88 x 67 x 35 mm
	4-pole	88 x 67 x 70 mm
Weight	2-pole	200 g (7.1 oz.)
	4-pole	350 g (12.3 oz.)
Combination with Auxiliary Elements		
Auxiliary contact		Yes
Signal contact		Yes

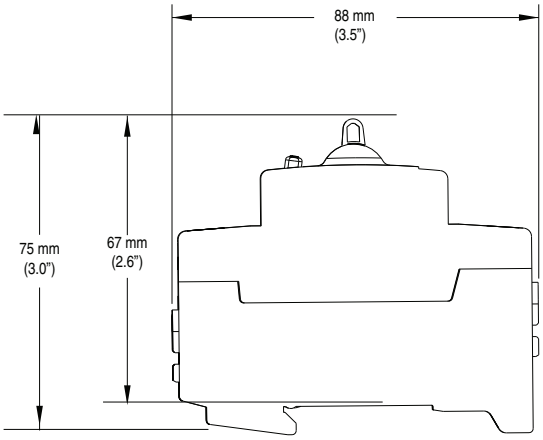
Power Loss Due to Current

Rated Current [A]	Power Loss [W]	
	2-pole	4-pole
25	1	1.3
40	2.4	3.2
63	3.2	4.4
80	8.8	33.3

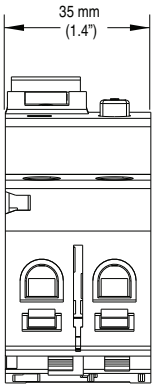
* Ut min = 170V for selected 30 mA sensitivity types as indicated in the product selection chart on page 87.

Approximate Dimensions

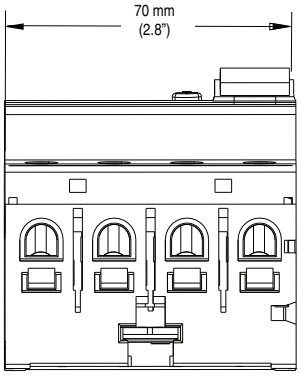
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



2-, 4-Pole



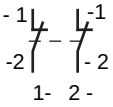
2-Pole



4-Pole

Accessories

Right Mount

Photo	Product Description ‡★Δ	Contacts	Standards	Certifications	UL/CSA Max. Current/Voltage	IEC Ratings Current/Voltage	Cat. No.
	Auxiliary/Signal Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1 A @ 480V AC 2 A @ 277V AC 1.5 A @ 125V DC 2 A @ 60V DC 4 A @ 24V DC	2 A @ 230V (AC-14) 1 A @ 400V (AC-14) 1.5 A @ 110V (DC-12) 1 A @ 220V (DC-12) 4 A @ 24V (DC-13) 2 A @ 60V (DC-13)	189-ASCR3
	Auxiliary Contact	1 N.O./N.C. (1 C.O.) 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1 A @ 480V AC 2 A @ 277V AC 1.5 A @ 125V DC 2 A @ 60V DC 4 A @ 24V DC	2 A @ 230V (AC-14) 1 A @ 400V (AC-14) 1.5 A @ 110V (DC-12) 1 A @ 220V (DC-12) 4 A @ 24V (DC-13) 2 A @ 60V (DC-13)	189-AR3
		1 N.O. + 1 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1 A @ 400V AC 2 A @ 230V AC 1 A @ 50V DC 2 A @ 30V DC	2 A @ 230V (AC-14) 1 A @ 400V (AC-14) 2 A @ 30V (DC-12) 1 A @ 50V (DC-12) 2 A @ 30V (DC-13) 1 A @ 50V (DC-13)	189-AR11
		2 N.C. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1 A @ 400V AC 2 A @ 230V AC 1 A @ 50V DC 2 A @ 30V DC	2 A @ 230V (AC-14) 1 A @ 400V (AC-14) 2 A @ 30V (DC-12) 1 A @ 50V (DC-12) 2 A @ 30V (DC-13) 1 A @ 50V (DC-13)	189-AR02
		2 N.O. 	UL 1077 CSA 22.2 No. 235 EN 60947-5-1 GB 14048.5	UL Recognized CSA Certified CE Marked VDE Certified CCC Certified	1 A @ 400V AC 2 A @ 230V AC 1 A @ 50V DC 2 A @ 30V DC	2 A @ 230V (AC-14) 1 A @ 400V (AC-14) 2 A @ 30V (DC-12) 1 A @ 50V (DC-12) 2 A @ 30V (DC-13) 1 A @ 50V (DC-13)	189-AR20

‡ A maximum of one C.O. type signal contact, and one C.O. type auxiliary contact ***OR*** two C.O. type auxiliary contacts may be installed per 1492-RCD.

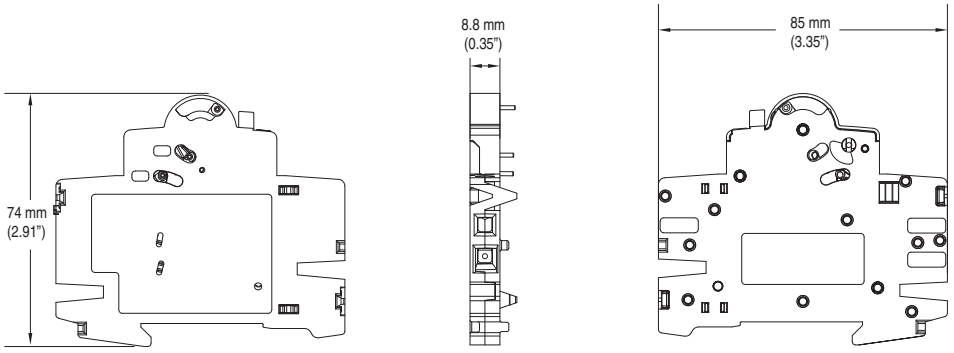
★ A maximum of one 189-AR11, -AR02, or -AR20 auxiliary contact may be installed per 1492-RCD. They may not be combined with C.O. type contacts.

Δ A maximum of three accessories of any type may be installed per 1492-RCD. The signal contact must be mounted closest to the RCD, then the auxiliary contact(s). For allowed combinations, and installation instructions please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

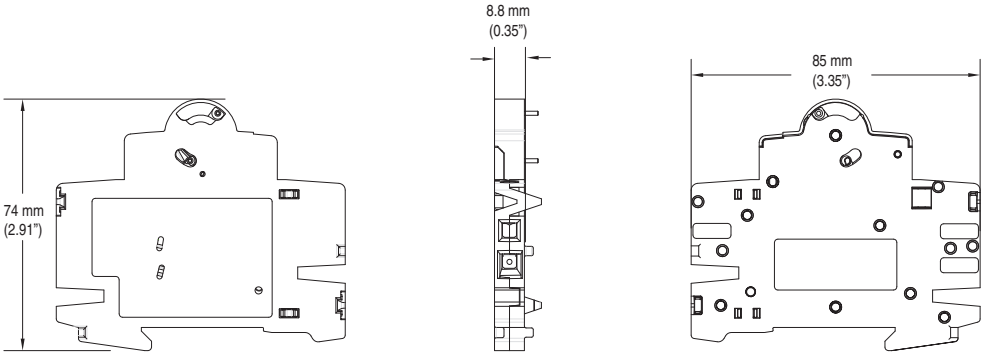
ALLEN BRADLEY 1492-GH

Accessory Approximate Dimensions

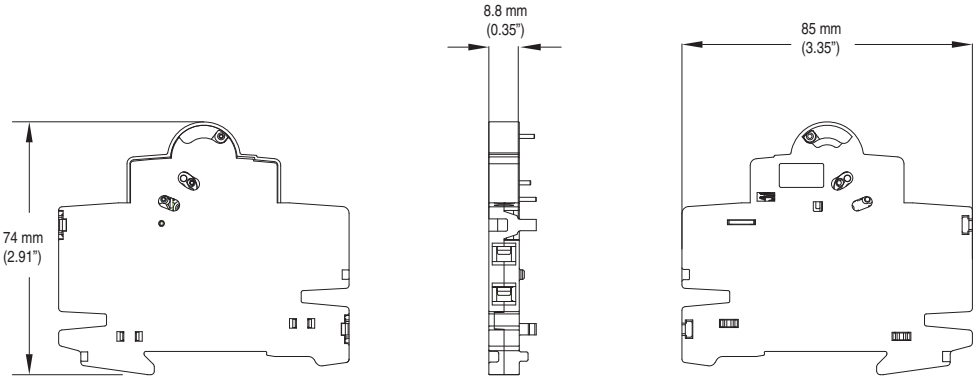
Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.



189-ASCR3



189-AR3



189-AR11, 189-AR02, 189-AR20

ALLEN BRADLEY 1492-GH

Bus Bars

1492-RCD Cuttable Bus Bars

Description	Pins	Pkg. Qty.	Cat. No. ★
2-Phase MCB to RCD	4	10	189-CL204
4-Phase MCB to RCD	8	10	189-CL408

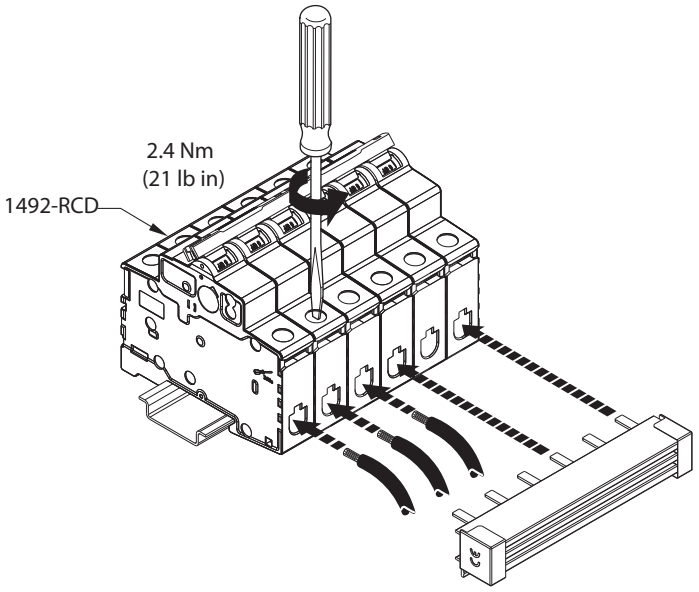
★ These devices are CE Marked, but not certified to any UL, CSA, or other standard.

1492-RCD Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 6...25 mm^2	10	189-CLT25
Terminal Power Feed, 6...50 mm^2	10	189-CLT50
Dedicated Power Feed, 50 mm^2	10	189-CLT50D
For 2-phase bus bar‡	10	189-CL3EC
For 4-phase bus bar	10	189-CL4EC
Protective Shroud for unused pins	10	189-CLPS

★ These devices are CE Marked, but not certified to any UL, CSA, or other standard.

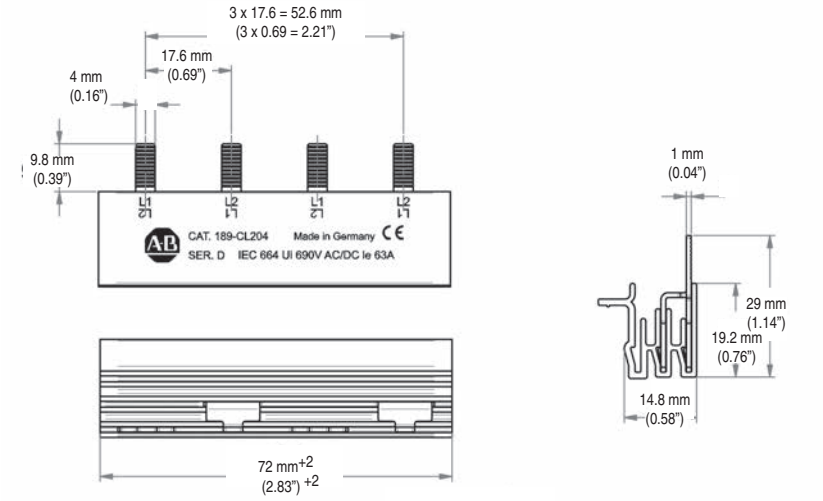
‡ 189-CL3EC also used for 2- and 3-phase MCB bus bars.



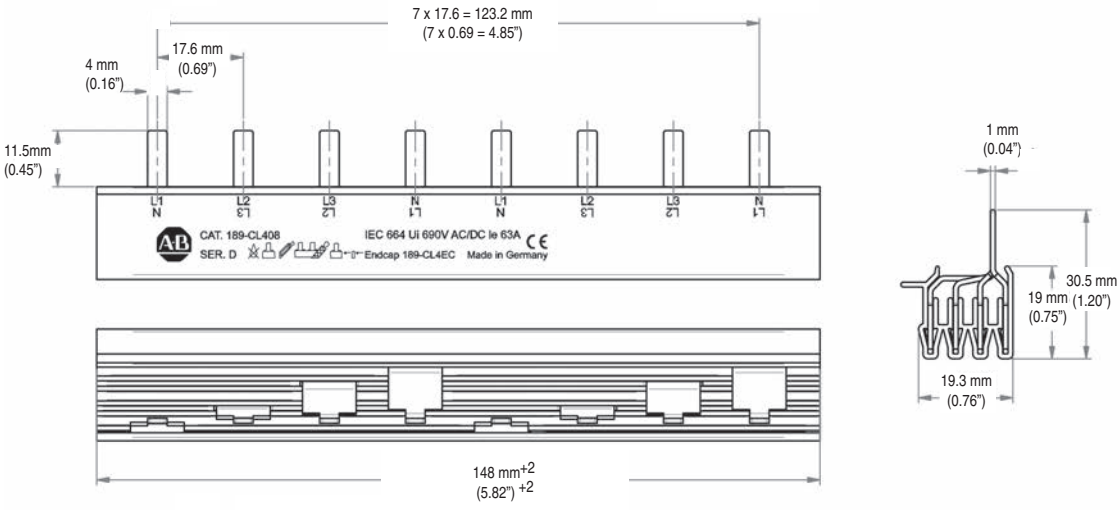
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

2- and 4-Phase Bus Bars



189-CL204

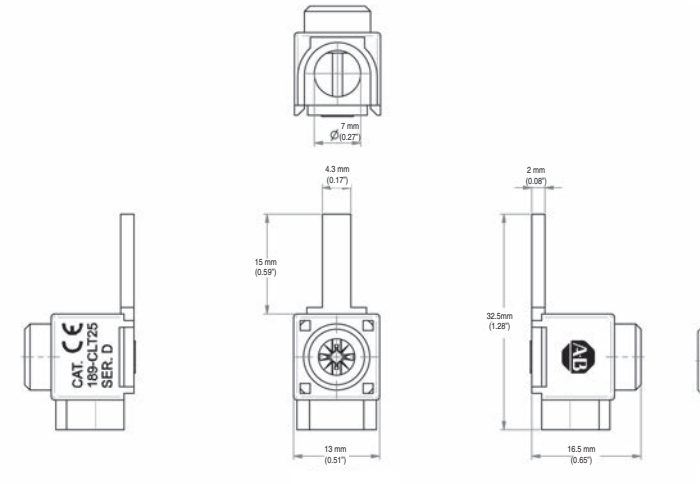


189-CL408

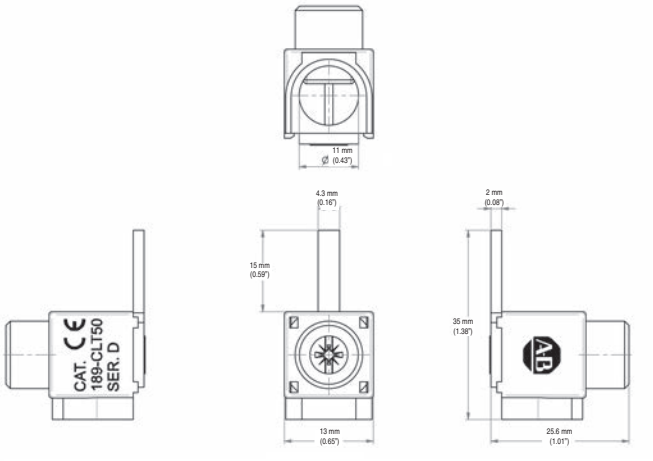
ALLEN BRADLEY 1492-GH

Bus Bar Accessory Approximate Dimensions

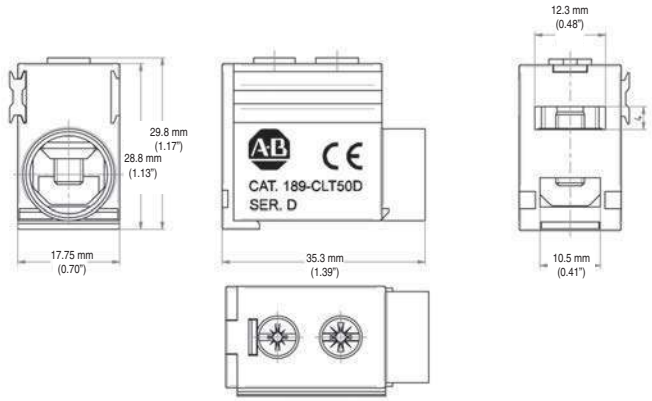
Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



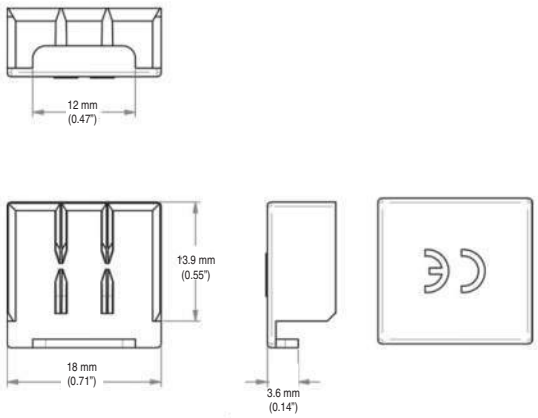
189-CLT25



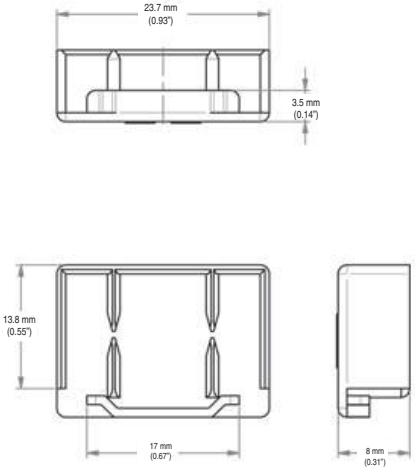
189-CLT50



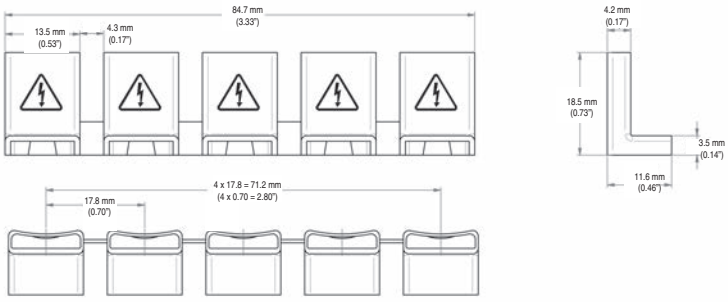
189-CLT50D



189-CL3EC



189-CL4EC



189-CLPS

1692 Electronic Circuit Protectors

Bulletin 1692 Electronic Circuit Protection Modules protect the secondary circuits of 24V DC switched mode power supplies. These modules monitor both supply voltage and load currents, and you can monitor and control the modules both locally and remotely.

Designed for 24VDC circuits, the 1692 provides comprehensive protection against short circuit and overcurrent conditions while allowing for inrush current.

Features

- Input voltage monitoring
- Current monitoring and limitations of the 4 outputs
- Fast tripping
- Select devices offer certified NEC Class 2 circuits

1692 Electronic Circuit Protectors	
Voltage	24V DC (18...30V DC)
Output Current	1 A...12 A, (select devices – NEC Class 2)
Standards Compliance	ATEX 94/9 EC & 2014/34/EU
	CSA Class I, Division 2, Groups A, B, C, and D
	CSA C22.2, No. 142
	EN 60950-1
	ISA 12.12
	NEC Class 2 (select devices)
	UL 508
	UL 2367
Certifications	ATEX
	CE Marked
	CSA
	cULus File No. E56639
	cURus Recognized

ALLEN BRADLEY 1492-GH

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1692	-	Z	G	XXXX
		a	*b*	*c*

a

Module Voltage	
Code	**Description**
Z	24V DC

b

Protection Scheme	
Code	**Description**
G	Module Protection
R	G and Class 2

c

Output Current Rating	
Code	**Description**
1111	1 A, 1 A, 1 A, 1 A
2222	2 A, 2 A, 2 A, 2 A
3333	3 A, 3 A, 3 A, 3 A
4444	4 A, 4 A, 4 A, 4 A
6666	6 A, 6 A, 6 A, 6 A
AAAA	10 A, 10 A, 10 A, 10 A
3366	3 A, 3 A, 6 A, 6 A
66BB	6 A, 6 A, 12 A, 12 A
CLSS	(4) NEC Class 2 circuits (each circuit max 100 VA)

ALLEN BRADLEY 1492-GH

Product Selection

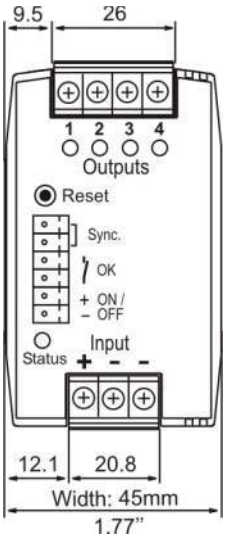
Voltage	Protection Type	NEC Class 2	Output [A]				Cat. No.
			1	2	3	4	
24V DC	Module	Yes	1	1	1	1	1692-ZR1111
		Yes	2	2	2	2	1692-ZR2222
		No	3	3	3	3	1692-ZG3333
		No	4	4	4	4	1692-ZG4444
		No	6	6	6	6	1692-ZG6666
		No	10	10	10	10	1692-ZGAAAA
		No	3	3	6	6	1692-ZG3366
		No	6	6	12	12	1692-ZG66BB
		Yes	(4) NEC Class 2 circuits (100 VA /circuit max)				1692-ZRCLSS

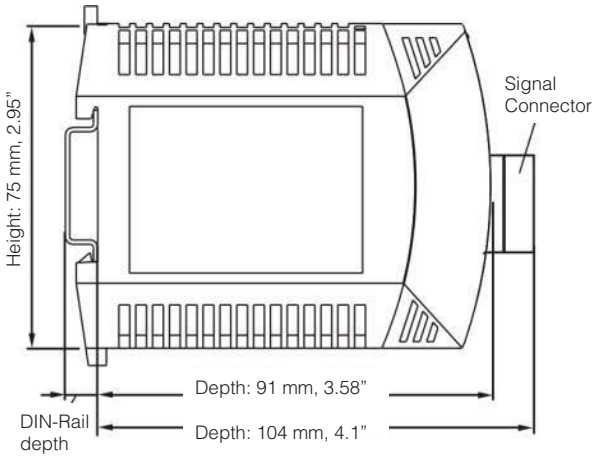
Specifications

Electrical Ratings	
Voltage	24V DC (18...30V DC)
Output current	1 A...12 A, select devices – NEC Class 2
Output ratings	Isolated safety extra-low voltage (SELV)
Environmental	
Operating temperature	-25...+70 °C (-13...158 °F) (non-condensing)
Storage temperature	-40 °C...+85 °C (-40...185 °F)
Humidity	5...95% (non-condensing)
Degree of pollution	2
Construction	
Terminal wire gauge	24...10 AWG (0.2...4mm^2)
Termination type	Screw
Dimensions in. (mm)	1.77 x 2.95 x 3.58 (45 x 75 x 91)
Weight lb. (g)	0.26 (120)

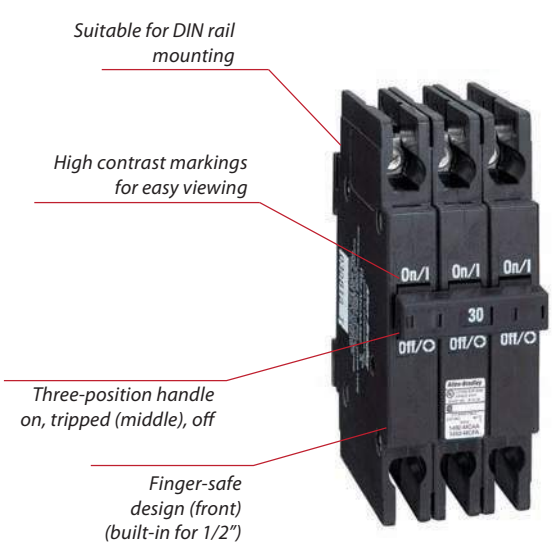
Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

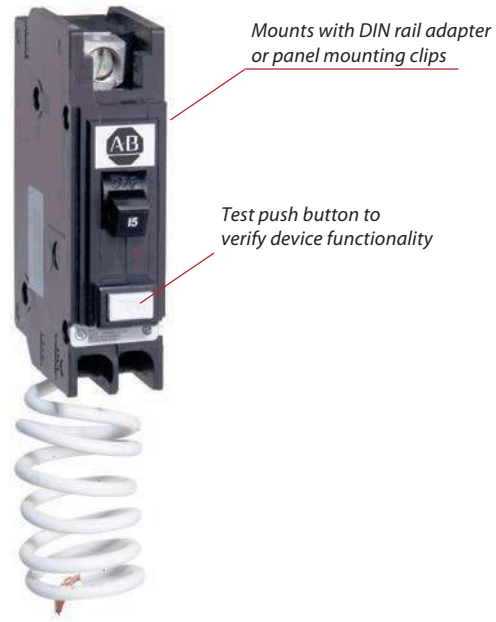




1492-MC Circuit Breakers



1492-MCA/MCB



1492-MCE/MCG

1492-MCA/MCB Circuit Breakers

Bulletin 1492-MC thermal magnetic Circuit Breakers are general-purpose devices suitable for branch circuit protection in industrial applications. They combine thermal and magnetic trip actions and provide accurate overload and short-circuit protection for conductors and connected equipment.

Features

- Thermal-magnetic protection
- Available in ½" and 1" pole widths
- 10 kA interrupting capacity

1492-MCE/MCG Ground Fault Circuit Breakers

This line of ground fault sensing breakers are designed, manufactured and certified to North American and the equivalent CSA standards.

The 1492-MCE devices are Ground Fault Equipment Protectors (GFEPs) that protect from low-level fault currents. With a sensing threshold of 30 mA, these devices are suitable for equipment protection.

The 1492-MCG devices are Ground Fault Circuit Interrupters (GFCIs) that protect from low-level fault currents. With a sensing threshold of 5 mA, these devices are suitable for personnel protection.

The 1492-MCGA devices are Ground Fault Circuit Interrupters (GFCIs) with inherit self test capability as required by the UL 943 standard.

Features

- UL 489 circuit breaker with GFCI (5 mA sensitivity) or GFEP (30 mA sensitivity)
- 10 kA interrupting capacity

1492-MC Circuit Breakers	
Rated Voltage	120/240V AC, 240V AC
Interrupting Capacity	10 kA
Current Ratings	10...100 A
Poles	1, 2, 3
Standards Compliance	UL 489 CSA C22.2 No. 5 HACR (10...100 A) SWD (15 and 20 A) for Switching Duty for fluorescent lighting applications
1492-MCE only	UL 1053 CSA C22.2 No. 144
1492-MCG only	UL 943 CSA C22.2 No. 144
Certifications	UL Listed, File No. E197878 CSA Certified, File No. 216034

ALLEN BRADLEY 1492-GH

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492-MC	A	A	1	15
	a	*b*	*c*	*d*

a

Device Type	
Code	**Description**
A	1/2 in. wide/pole (DIN Rail mounting)
B	1 in. wide/pole (DIN Rail mounting)
E	GFEP (30 mA)
G	GFCI (5 mA)

b

Interrupting Capacity	
Code	**Description**
A	10 kA AIC
AT	10 kA AIC — with self test capability (GFCI only)

c

Poles	
Code	**Description**
1	1-pole
2	2-pole
2H	2-pole (240V AC)
3	3-pole

d

Current Rating	
Code	**Rated Current (*In*)**
10	10
15	15
20	20
25	25
30	30
35	35
40	40
45	45
50	50
55	55
60	60
70	70
80	80
90	90
A0	100

ALLEN BRADLEY 1492-GH

Product Selection

1492-MCA/MCB Branch Circuit Breakers

Photo	Continuous Ampere Rating @ 40 °C (104 °F) [A]	Width per Pole [in.]	Cat. No. 120/240V AC 1-Pole	Cat. No. 120/240V AC 2-Pole	Width per Pole [in.]	Cat. No. 240V AC 2-Pole	Cat. No. 240V AC 3-Pole
	10	1/2	1492-MCAA110	1492-MCAA210	—	—	—
	15	1/2	1492-MCAA115	1492-MCAA215	1/2	1492-MCAA2H15	1492-MCAA315
	20	1/2	1492-MCAA120	1492-MCAA220	1/2	1492-MCAA2H20	1492-MCAA320
	25	1/2	1492-MCAA125	1492-MCAA225	1/2	1492-MCAA2H25	1492-MCAA325
	30	1/2	1492-MCAA130	1492-MCAA230	1/2	1492-MCAA2H30	1492-MCAA330
	35	1/2	1492-MCAA135	1492-MCAA235	1	1492-MCBA2H35	1492-MCBA335
	40	1/2	1492-MCAA140	1492-MCAA240	1	1492-MCBA2H40	1492-MCBA340
	45	1/2	1492-MCAA145	1492-MCAA245	1	1492-MCBA2H45	1492-MCBA345
	50	1/2	1492-MCAA150	1492-MCAA250	1	1492-MCBA2H50	1492-MCBA350
	55	1/2	1492-MCAA155	1492-MCAA255	1	1492-MCBA2H55	1492-MCBA355
	60	1/2	1492-MCAA160	1492-MCAA260	1	1492-MCBA2H60	1492-MCBA360
	70	1	1492-MCBA170	1492-MCBA270	1	1492-MCBA2H70	1492-MCBA370
	80	1	1492-MCBA180	1492-MCBA280	1	1492-MCBA2H80	1492-MCBA380
	90	1	1492-MCBA190	1492-MCBA290	1	1492-MCBA2H90	1492-MCBA390
	100	1	1492-MCBA1A0	1492-MCBA2A0	1	1492-MCBA2HA0	1492-MCBA3A0

1492-MCE/MCG Ground Fault Circuit Breakers

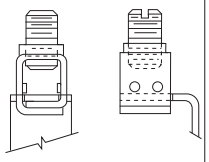
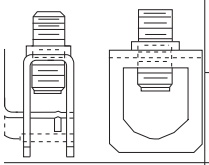
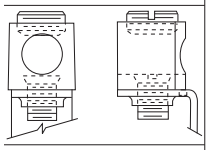
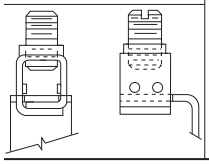
Photo	Continuous Ampere Rating @ 40 °C (104 °F) [A]	Width per Pole [in.]	Cat. No. 120V AC 1-Pole	Cat. No. 120/240V AC‡ 2-Pole
	GFEP (30 mA Sensitivity)			
	15	1	1492-MCEA115	1492-MCEA215
	20	1	1492-MCEA120	1492-MCEA220
	25	1	1492-MCEA125	1492-MCEA225
	30	1	1492-MCEA130	1492-MCEA230
	40	1	1492-MCEA140	1492-MCEA240
	50	1	—	1492-MCEA250
	GFCI (5 mA Sensitivity)			
	15	1	1492-MCGAT115	1492-MCGAT215
	20	1	1492-MCGAT120	1492-MCGAT220
	25	1	1492-MCGAT125	1492-MCGAT225
	30	1	1492-MCGAT130	1492-MCGAT230
	40	1	1492-MCGAT140	1492-MCGAT240
	50	1	—	1492-MCGAT250

‡ These devices are for grounded neutral 240V wye systems only.

Accessories

Device Description		1-Pole	2- and 3-Pole
Locking Attachment for Circuit Breaker	1492-MCAAxxx	1492-AMCAL1	1492-AMCALM
	1492-MCBAxxx	1492-AMCBL1	
Finger protection cover for 1 in. wide Cat. No. 1492-MCBxxx, package of 10 (one required for line and one required for load for each pole) (not for GFCI / GFEP)		1492-AMCBFP	
DIN Rail Adapter for GFCI and GFEP, use two per pole		1492-AMCDIN1	
Panel Mounting Clips for GFCI and GFEP, use two per device		1492-AMCP1	

Terminals

Line and Load Terminals	Continuous Current Rating	Wire Type	Wire Range [AWG]	Terminal Torque	Line Strip Length	Cat. No.
	10…60 A	Copper (Cu)	14…10	20 lb•in (2.3 N•m)	7/16 in.	1492-MCAAxxx
			8	25 lb•in (2.8 N•m)		
			6…4	27 lb•in (3.0 N•m)		
1/8 in. Allen Head 	35…60 A		14…10	20 lb•in (2.3 N•m)		1492-MCBAxxx
			8…4	32 lb•in (3.6 N•m)		
	70…100 A		4…1/0	50 lb•in (5.6 N•m)		
Line 	15…50 A		14…10	20 lb•in (2.3 N•m)	9/16 in.	1492-MCEAxxx
			8	25 lb•in (2.8 N•m)	—	
Load 			6…4	27 lb•in (3.0 N•m)	—	1492-MCGATxxx

ALLEN BRADLEY 1492-GH

Specifications

Electrical Ratings	
Rated voltage	See rated voltage tables
Continuous current rating @ 40°C (104°F)	10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80 90, 100 A
Rated short circuit capability	See interrupting capacity tables
Environmental	
Operating temperature	0...60 °C (32...140 °F) (non-condensing)
Shipment and short term storage limits	-40 °C...+80 °C (-40...176 °F)
Degree of protection	1/2 in. wide circuit breakers are finger safe from front per IEC. Terminal covers available for 1 in. wide circuit breaker.
Mechanical	
Mounting	DIN rail
Wire size	See terminal table
Terminal torque	
Recommended wire strip length	

1492-MCA/MCB Thermal Magnetic Rated Voltage and Interrupting Capacity

	Rated Voltage		Interrupting Capacity (rms Symmetrical Amperes)	
Cat. No.	[V AC]	[V DC] ★	AC Rating [kA]	DC Rating ★ [kA]
1492-MCAA1xx	120/240	24, 48, 62.5	10	3
1492-MCAA2xx				
1492-MCAA2Hxx	240	24, 48, 62.5		3
1492-MCAA3xx				
1492-MCBA1xx	120/240	—		—
1492-MCBA2xx				
1492-MCBA2Hxx	240	—		—
1492-MCBA3xx				

★ Rating as supplementary protector.

1492-MCE/MCG Ground Sensing Rated Voltage and Interrupting Capacity

	Rated Voltage	Interrupting Capacity (rms Symmetrical Amperes)
Cat. No.	[V AC]	AC Rating [kA]
1492-MCEA1xx	120	10
1492-MCEA2xx	120/240 ‡	
1492-MCGAT1xx	120	
1492-MCGAT2xx	120/240 ‡	

‡ These devices are for grounded neutral 240V wye systems only.

Application Information

Selection of a Bul. 1492-MC circuit breaker with appropriate circuit protection includes consideration of:

- Circuit voltage
- Circuit frequency
- Available short circuit current
- Continuous current rating
- Application considerations
- Special operating conditions

The following discussion is based upon National Electric Code and UL requirements. Similar considerations are appropriate for Canadian applications.

Circuit Voltage

Bul. 1492-MC circuit breakers are rated by voltage class. Applications should not exceed the listed voltage range (see Table 1).

Circuit Frequency

Bul. 1492-MC circuit breakers may be applied to frequencies from DC up to 60 Hz without derating. For applications above 60…400 Hz, contact Rockwell Automation with specific application information for the derating of the circuit breakers.

Available Short Circuit Current

Bul. 1492-MC circuit breakers should only be applied in those applications in which the available short-circuit (or fault) current is less than or equal to the interrupting rating shown in the Voltage and Interrupting Ratings table.

Continuous Current Rating

Bul. 1492-MC circuit breakers are rated in RMS amperes at a 40 °C (104 °F) ambient temperature per UL 489 (CSA 22.2 No. 5.1). This temperature is the ambient temperature external to an industrial enclosure. If a circuit breaker is applied in a temperature that exceeds the 40 °C (104 °F) ambient, then the circuit breaker should be derated. Contact your local Rockwell Automation sales office or Allen-Bradley distributor for derating information.

Application Considerations

The selection of a specific ampere rating for a specific application is dependent on the type of load and duty cycle and is governed by the National Electric Code (Canadian Electric Code) and UL/CSA. In general the codes require that overcurrent protection is at the current supply and at points where wire sizes are reduced. In addition the codes state that conductors be protected according to their current carrying capacity. There are specific situations that require application consideration, such as motor circuit, and guidelines for the selection for transformer protection.

Bulletin 1492-MC circuit breakers are "non-100% rated" as defined by UL 489 Part 7.1.4.2. As such the circuit breaker's rating should be loaded to no more than 80%, if used with continuous loads.

Branch Circuits:

Bulletin 1492-MC circuit breakers may be used to protect branch circuits. A branch circuit is the wiring portion of a system extending beyond the final overcurrent device protecting the circuit.

Guidelines established in NEC, CEC, UL, and CSA should be used to determine the specific device. The examples on page , also apply to the 1492-MC devices.

Coordinated Overcurrent Protection

Where an orderly shutdown is required to minimize the hazards to personnel and equipment, a system of coordination based upon the faulted or overloaded circuit is isolated by selective operation of only the overcurrent protective device closest to the overcurrent condition.

The user should select devices that meet this requirement.

References: NEC 240.12. Also see CEC.

Self Test Capability (GFCI only)

Per UL 943 (5.16 / 6.30), GFCI devices have built-in self test capability. The self test is an internal, automated function running in the background. For more information please refer to UL 943 standard.

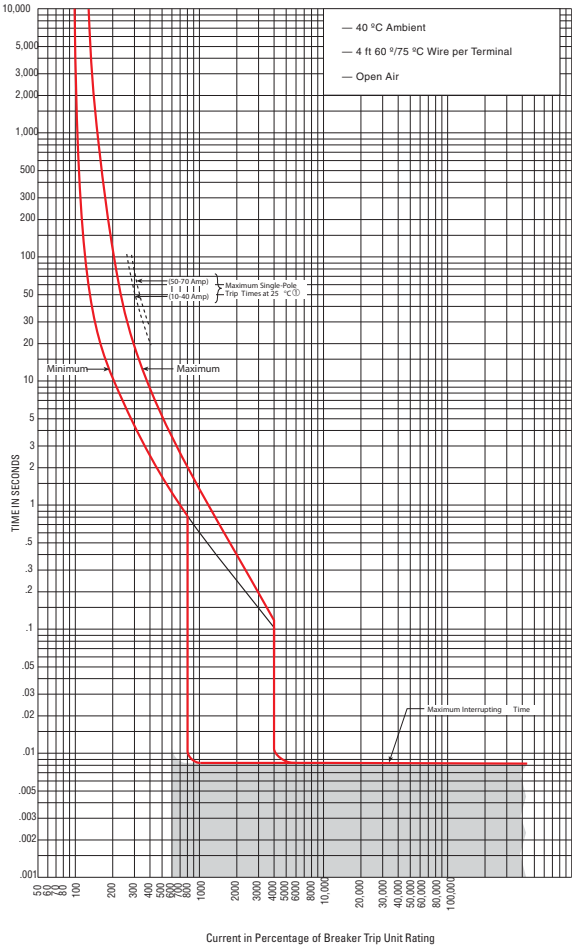
Tripping Characteristics

Time Current Curve – 1-Pole Circuit Breaker

Time Current Curve

1492-MCAA1$_{NN}$ 1492-MCEA1$_{NN}$
1492-MCBA1$_{NN}$ 1492-MCGA1$_{NN}$

1-pole Circuit Breaker

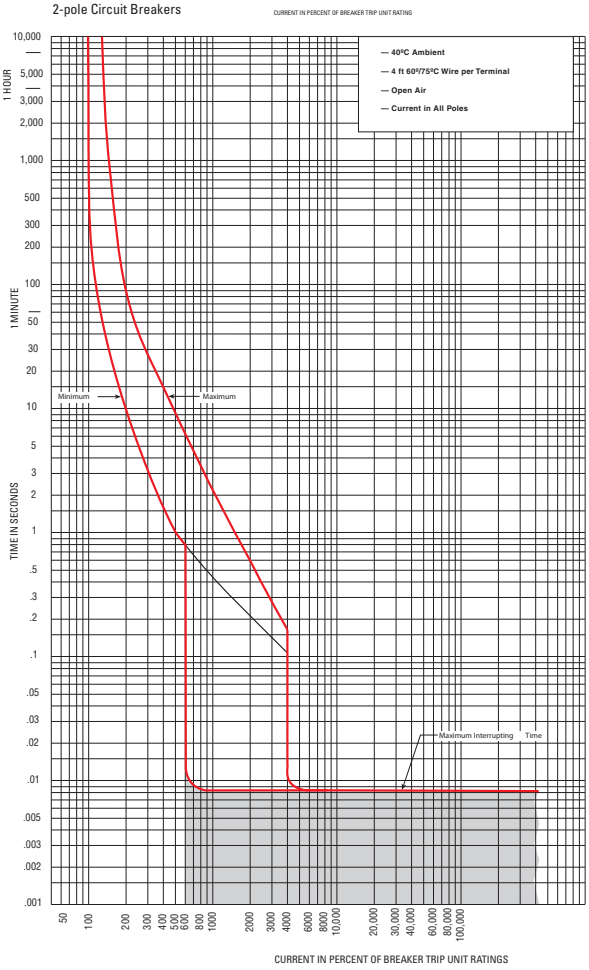


Time Current Curve – 2-Pole Circuit Breakers

Time Current Curve

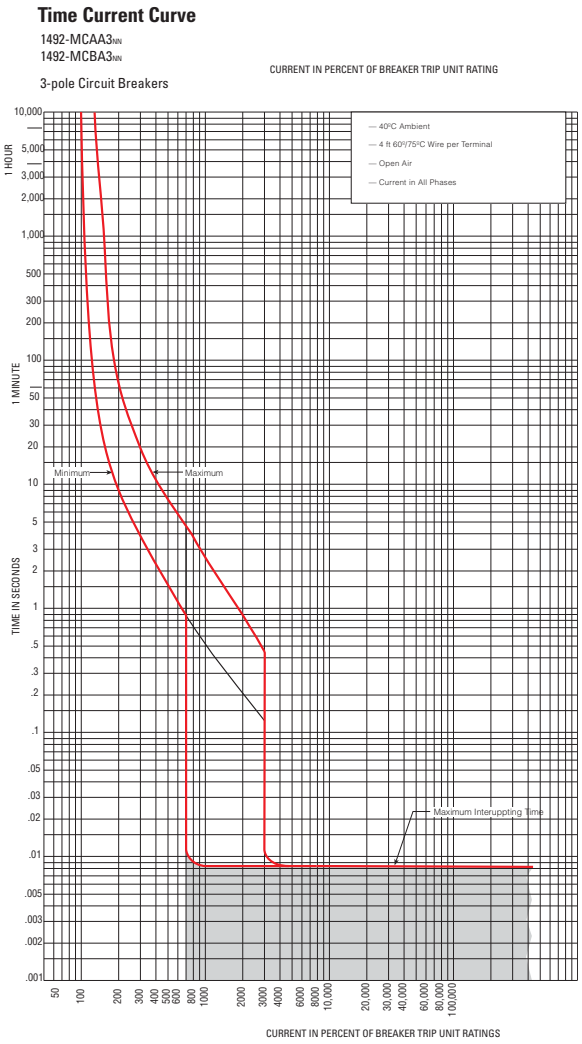
1492-MCAA2$_{NN}$ 1492-MCAA2H$_{NN}$ 1492-MCEA2$_{NN}$
1492-MCBA2$_{NN}$ 1492-MCBA2H$_{NN}$ 1492-MCGA2$_{NN}$

2-pole Circuit Breakers



Tripping Characteristics

Time Current Curve – 3-Pole Circuit Breakers

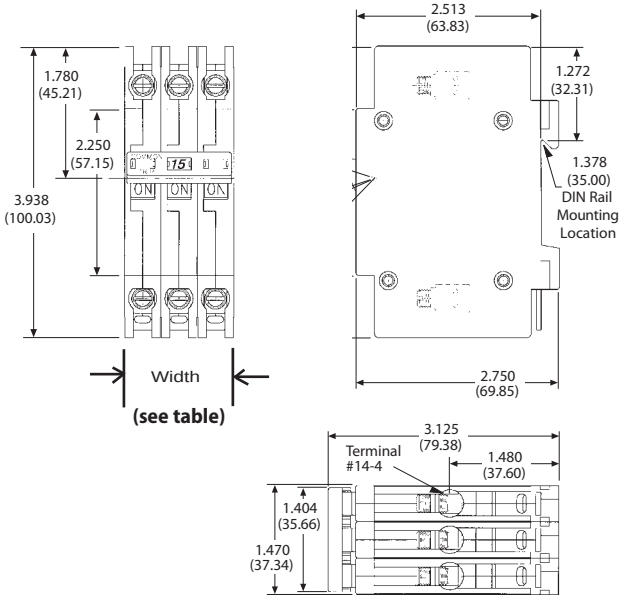


ALLEN BRADLEY 1492-GH

Approximate Dimensions

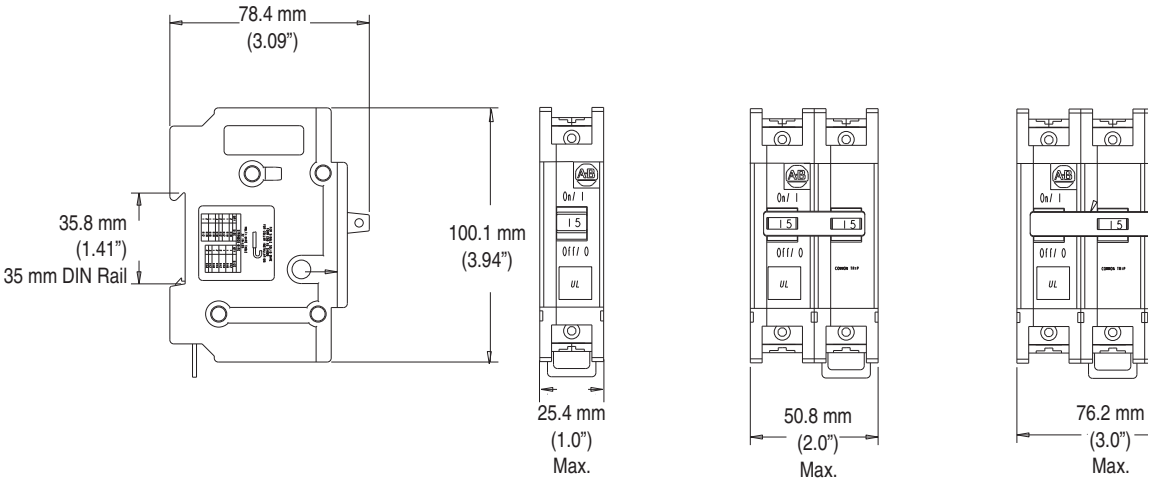
Note: Dimensions are shown in inches (mm). Dimensions are not intended for manufacturing purposes.

1492-MCAA



1-, 2-, 3-Pole (3-Pole shown)

1492-MCBA

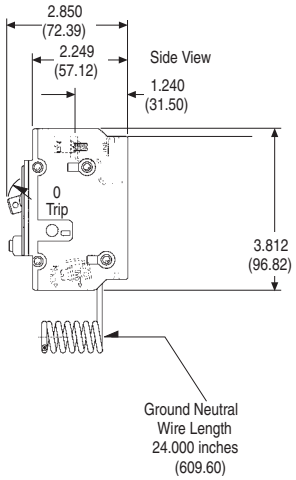


1-, 2-, 3-Pole **1-Pole** **2-Pole** **3-Pole**

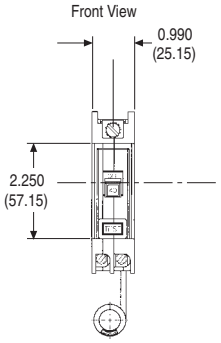
Approximate Dimensions

Note: Dimensions are shown in inches. Dimensions are not intended for manufacturing purposes.

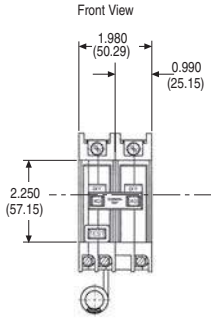
1492-MCE/1492-MCG



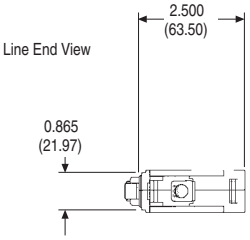
1- , 2-Pole



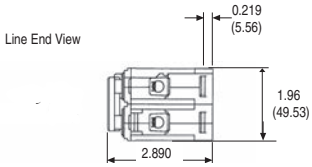
1-Pole



2-Pole

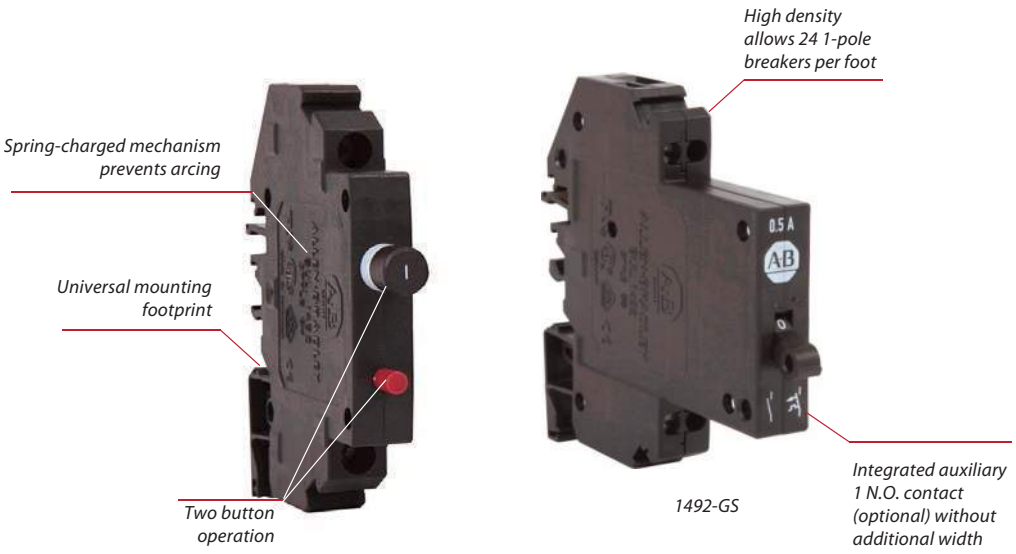


1-Pole



2-Pole

1492-GH/-GS —Supplementary Protectors



Bulletin 1492-GH/GS high density miniature circuit breakers are thermal magnetic type supplementary protectors. These products are a high-density design often used when panel space (width) is a premium. Up to 24 one-pole breakers can be mounted per foot.

1492-GS/GH Supplementary Protectors		
Rated Voltage	-GH	250V AC 50/60 Hz
	-GS	480Y/277V AC 50/60 Hz
Current Ratings	-GH	0.2...15 A
	-GS	0.2...25 A
Poles	-GH	1
	-GS	1, 2, 3
Standards Compliance		UL 1077
		CSA C22.2 No.235
		EN 60934
Certifications		UL Recognized, File No. E65138
		CSA Certified, File No. 72348
		CE Marked
		VDE Certified
		RoHS Compliant

Features

- Low current ratings and numerous rated currents for precise circuit requirements
- Can be ordered with auxiliary contacts that do not add any additional space
- AC and DC voltage ratings in one convenient device
- A positively trip-free mechanism (breaker operation cannot be defeated by holding the handle in the ON position)
- Superior shock and vibration resistance capabilities; to help prevent nuisance tripping

1492-GH Supplementary Protectors

Bulletin 1492-GH breakers are 1-pole devices. They use a push-to-set mechanism for circuit actuation and come with a manual trip button for manually opening the circuit.

1492-GS Supplementary Protectors

Bulletin 1492-GS breakers are available in 1-, 2-, and 3-pole devices. They use a toggle style handle mechanism for circuit actuation. These breakers may also be ordered with an internally mounted N.O. auxiliary contact that requires no additional mounting space.

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492 - GH 002
a *b*

a

Poles	
Code	**Description**
GH	1-Pole

b

Rated Current (*I*n)	
Code	**Current [A]**
002	0.2
005	0.5
008	0.8
010	1
012	1.2
015	1.5
020	2
025	2.5
030	3
040	4
050	5
070	7
100	10
150	15

1492 - GS1G 002 - H1
a *b* *c*

a

Poles	
Code	**Description**
GS1G	1-Pole
GS2G	2-Pole
GS3G	3-Pole

b

Rated Current (*I*n)	
Code	**Current [A]**
002	0.2
005	0.5
008	0.8
010	1
012	1.2
015	1.5
020	2
025	2.5
030	3
040	4
050	5
060	6
070	7
080	8
100	10
120	12
150	15
160	16
200	20
250	25

c

Auxiliary Contact	
Code	**Description**
	Can be left blank
H1	With 1 N.O. integrated auxiliary contact (only 1 may be added per device)

Product Selection

	1492-GH	1492-GS		
	1-Pole	1-Pole	2-Pole	3-Pole
Amperage [A]	Cat. No.	Cat. No.	Cat. No.	Cat. No.
0.2	1492-GH002	1492-GS1G002	1492-GS2G002	1492-GS3G002
0.5	1492-GH005	1492-GS1G005	1492-GS2G005	1492-GS3G005
0.8	1492-GH008	1492-GS1G008	1492-GS2G008	1492-GS3G008
1	1492-GH010	1492-GS1G010	1492-GS2G010	1492-GS3G010
1.2	1492-GH012	—	—	—
1.5	1492-GH015	1492-GS1G015	1492-GS2G015	1492-GS3G015
2	1492-GH020	1492-GS1G020	1492-GS2G020	1492-GS3G020
2.5	1492-GH025	1492-GS1G025	1492-GS2G025	1492-GS3G025
3	1492-GH030	1492-GS1G030	1492-GS2G030	1492-GS3G030
4	1492-GH040	1492-GS1G040	1492-GS2G040	1492-GS3G040
5	1492-GH050	1492-GS1G050	1492-GS2G050	1492-GS3G050
6	—	1492-GS1G060	1492-GS2G060	1492-GS3G060
7	1492-GH070	1492-GS1G070	1492-GS2G070	1492-GS3G070
8	—	1492-GS1G080	1492-GS2G080	1492-GS3G080
10	1492-GH100	1492-GS1G100	1492-GS2G100	1492-GS3G100
12	—	1492-GS1G120	1492-GS2G120	1492-GS3G120
15	1492-GH150	1492-GS1G150	1492-GS2G150	1492-GS3G150
16	—	1492-GS1G160	1492-GS2G160	1492-GS3G160
20	—	1492-GS1G200	1492-GS2G200	1492-GS3G200
25	—	1492-GS1G250	1492-GS2G250	1492-GS3G250
Integrated Auxiliary Contact	—	Add suffix — H1 for integrated N.O. auxiliary (only one may be added per device)		

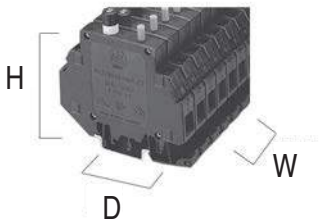
ALLEN BRADLEY 1492-GH

Specifications

	1492-GH	1492-GS		
	1-Pole	1-Pole	2-Pole	3-Pole
UL/CSA	200 A (Not to exceed 100 x rated A)	0.2…16 A	5 kA C1 (2 kA C1 for 65V DC — 1-pole)	
		18…25 A	2 kA C1	
IEC/EN 60934 (CBE)	—	0.2…5 A	400 A	
		6…25 A	800 A	
Maximum voltage ratings	250V AC 50/60 Hz 65V DC	480Y/277V AC 50/60 Hz 65V DC		
Temperature range	-40...+149 °F (-40...+65 °C) non-condensing			
Operating life	6000 operations @ rated current			
Housing material	Glass-filled Polyamide 6.6			
Shock	25 G, 11 ms duration			
Vibration	5 G (10...500 Hz)			
Dielectric strength	1500V AC	1600V AC		
Insulation resistance	100 M Ω @ 500V DC			
Terminal type	Tubular screw with self-lifting box lug			
Wire size	#22...10 AWG			
Recommended wire strip length	0.44 in. (11.2 mm)	Main terminal — 0.51 in. (13 mm) aux terminal — 0.41 in. (10.4 mm)		
Terminal torque	1.3...1.4 N•m (10...12 lb•in)	0.656 N•m (5 lb•in)		
N.O. auxiliary contact rating	—	1.0 A AC or DC (resistive load)		

Approximate Dimensions

Note: Dimensions are shown in inches (mm). Dimensions are not intended for manufacturing purposes.



	1492-GH	1492-GS		
	1-Pole	1-Pole	2-Pole	3-Pole
Height	3.15 in. (80 mm)	3.15 in. (80 mm)		
Depth	2.89 in. (73.4 mm)	3.48 in. (88.5 mm)		
Width	0.49 in. (12.4 mm)	0.49 in. (12.5 mm)	0.98 in. (25 mm)	1.47 in. (37.5 mm)

Application Information

UL 1077, CSA C22.2 #235

In North America, miniature circuit breakers are recognized as supplementary protectors and are intended for use as overcurrent protection within an appliance or other electrical equipment where branch circuit protection is already provided or not required. Internationally, these products are rated to IEC standards as circuit breakers for equipment (CBE).

Selection Information

High-density supplementary protector/miniature circuit breaker applications include, but are not limited to, the protection of test equipment, control instrumentation, solenoids, and power supplies. The wide range of current values and the use of a thermal magnetic trip system allows for a variety of applications where a very accurate and compact breaker is required.

To select a miniature circuit breaker, use the following procedure:

1. Determine the inrush correction factor from the following table.

Inrush Ratio Correction Table

Inrush Ratio	1:1 to 1:4	1:5	1:6	1:7	1:8
Factor	1.3	1.4	1.5	1.6	1.7

Note: For resistive loads use an inrush correction factor of 1.0.

2. Determine the temperature correction factor from the following table.

Ambient Temperature Correction Table

Ambient Temperature	70 °F (21.1 °C)	100 °F (37.8 °C)	120 °F (48.9 °C)	140 °F (60 °C)	160 °F (71.1 °C)	180 °F (82.2 °C)	200 °F (93.3 °C)
Factor	1.0	1.1	1.2	1.3	1.4	1.5	1.6

3. Determine the sealed current of the load being protected.

4. Multiply the sealed current by the two correction factors and select the closest higher ampere rating.

Example — For a solenoid with sealed current of 0.5 A, an inrush ratio of 1:8, and an ambient temperature of +110 °F, (0.5 x 1.7 x 1.15 = 0.9775), select the 1.0 A miniature circuit breaker. Tripping time of the miniature circuit breaker is determined from the table below. Divide the miniature circuit breaker value by the temperature correction factor from the Ambient Temperature Correction Table to determine the actual rated current referenced in the table below.

Tripping Times in Seconds at 70 °F (21.1 °C)

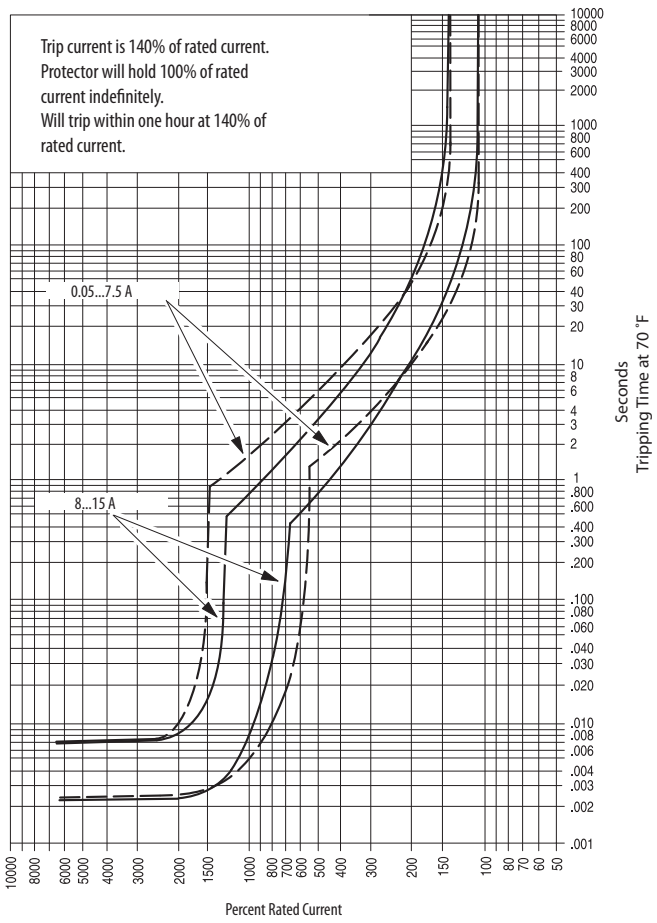
Percent Rated Current	100%	200%	300%	400%	500%	600%	1000%	2000% Greater
Tripping Times (Seconds)	No Trip	10…40	3…18	1.5…9	0.8…6	0.003 …4	0.009 …2	Max. 0.02

Note: When several breakers are rail mounted adjacent to each other, the no-trip current will be 80% of rated current at 70 °F (21.1 °C).

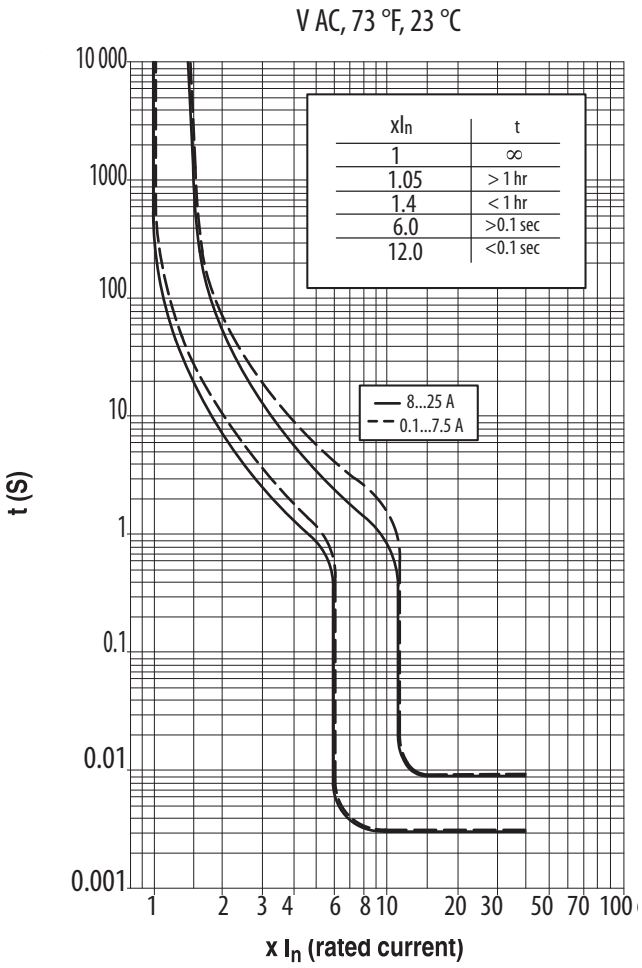
Using selection tables, select Bulletin 1492-GH/GS that allows full load current nearest without exceeding application current. Also, check that inrush current is less than trip range of 6…10 *I*n.

Tripping Characteristics

Time Current Curve –1492-GH

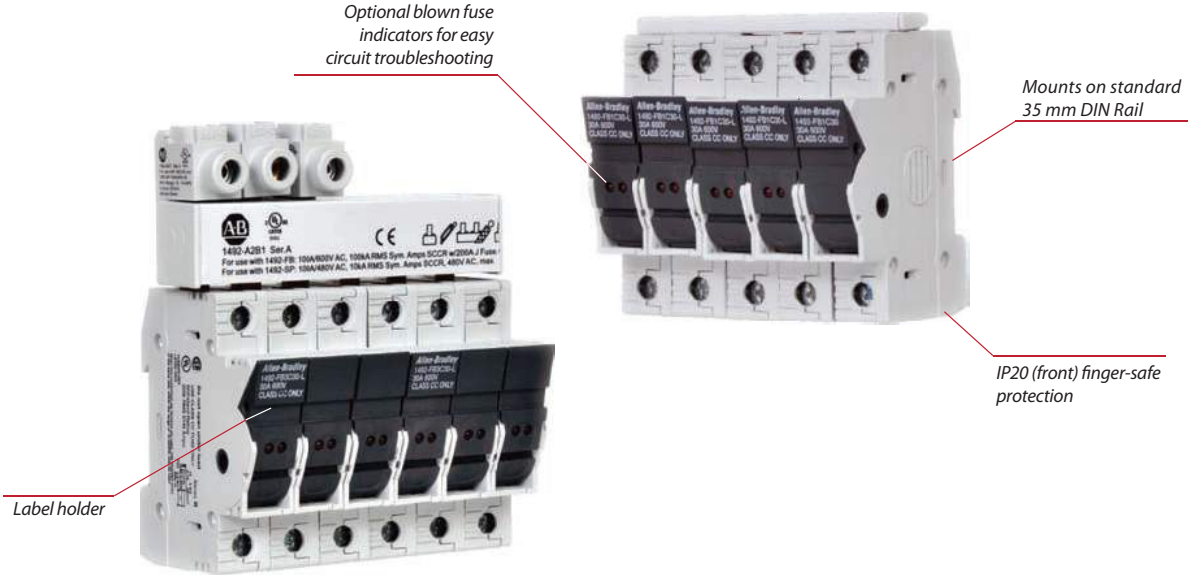


Time Current Curve –1492-GS



Note: When several breakers are rail mounted adjacent to each other, the no-trip current will be 80% of rated current at 70 °F (21.1 °C).

1492-FB Fuse Holders



The 1492-FB fuse holder family is designed for use in many OEM applications, such as power supplies, equipment protection, primary and secondary control transformers, solenoids, lighting and heater loads, and drives.

Bulletin 1492-FB fuse holders provide a safe and convenient means for installation of Class CC, J, and Midget fuses. To support correct fuse type installation, the Class CC fuse holder is designed to reject a Midget fuse or international 10 x 38 mm fuse. The Class J fuse holder will reject all fuses other than a Class J fuse.

All Allen-Bradley Class CC, J, and Midget fuse holders are UL Listed and CSA Certified for branch circuit protection. They are excellent for wire protection, small motor loads, and group protection of small motor loads. The Midget fuse holder is also CE Marked for 10 x 38 mm IEC Midget fuses.

Features

- Compact size requires less panel space than open-style fuse holders
- Handle isolates the fuse from top-wired power when installing or removing fuse
- Terminals are shipped in open position and ready for wiring
- Suitable for use in field wiring applications

1492-FB Fuse Holders		
Poles	1, 2, 3	
Fuse Types	Midget 30 A Class CC 30 A Class J 30 A Class J 60 A	
Standards Compliance	Midget	UL 4248-1 CSA 22.2 No. 39 EN 60947-1 & 3
	Class CC	UL 4248-4 CSA 22.2 No. 39
	Class J	UL 4248-8 CSA 22.2 No. 39
Certifications	UL Listed, File No. E34648 CSA Certified, File No. 71101 CE Marked RoHS Compliant	

ALLEN BRADLEY 1492-GH

Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.

1492	-	FB1	C30	-	L
		a	*b*		*c*

a

Poles	
Code	**Description**
FB1	1-Pole
FB2	2-Pole
FB3	3-Pole

b

Fuse Type	
Code	**Description**
M30	Midget Type 30 Amp
C30	C Class 30 Amp
J30 *	J Class 30 Amp
J60 *	J Class 60 Amp

c

With Indication	
Code	**Description**
	Can be left blank
L	With indication 110...600V AC/DC
D1	With indication 12...72V AC/DC

* Bus bars do not fit on Class J fuse holders.

Product Selection

Description		For Midget Fuse	For Class CC Fuse	For Class J Fuse *	
		30 A	30 A★	30 A	60 A
		Cat. No.	Cat. No.	Cat. No.	Cat. No.
1-Pole	Fuse Block	1492-FB1M30	1492-FB1C30	1492-FB1J30	1492-FB1J60
	Fuse Block with Indication, 110...600V ‡	1492-FB1M30-L	1492-FB1C30-L	1492-FB1J30-L	1492-FB1J60-L
	Fuse Block with Indication, 12...72V	1492-FB1M30-D1	1492-FB1C30-D1	—	—
	Pieces per Carton	12	12	6	6
2-Pole	Fuse Block	1492-FB2M30	1492-FB2C30	1492-FB2J30	1492-FB2J60
	Fuse Block with Indication, 110...600V ‡	1492-FB2M30-L	1492-FB2C30-L	1492-FB2J30-L	1492-FB2J60-L
	Pieces per Carton	6	6	3	3
3-Pole	Fuse Block	1492-FB3M30	1492-FB3C30	1492-FB3J30	1492-FB3J60
	Fuse Block with Indication, 110...600V ‡	1492-FB3M30-L	1492-FB3C30-L	1492-FB3J30-L	1492-FB3J60-L
	Pieces per Carton	4	4	2	2

★ All major fuse brands and current ranges have been evaluated for this fuse holder. Due to the heat they generate, the following fuses must be derated:
Mersen ATQR 1.25 / = 0.42 A max.
Mersen ATQR 1.40 / = 0.47 A max.

‡ 690V when used in IEC applications.

* Bus bars do not fit on Class J fuse holders.

Accessories

Description	Size	Pkg. Quantity	Cat. No.
Fuseholder Identification Slide-in Markers (blank marker squares slip into molded slot.100 markers/card)	5 mm x 5 mm	5 cards	1492-MC5X5
	6 mm x 5 mm		1492-MC6X5

ALLEN BRADLEY 1492-GH

Specifications

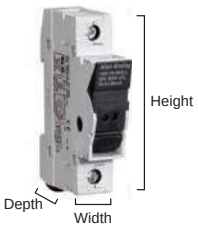
Product Type (*n* = number of poles)		M	CC	J30 *	J60 *
		1492-FB*n*M30 "B" 1492-FB1M30-D1 "B" 1492-FB*n*M30-L "B"	1492-FB*n*C30 "B" 1492-FB1C30-D1 "B" 1492-FB*n*C30-L "B"	1492-FB*n*J30 "B" 1492-FB*n*J30-L "B"	1492-FB*n*J60 "B" 1492-FB*n*J60-L "B"
For Fuse Type:		Midget 13/32" x 1-1/2" (10 x 38 mm)	Class CC	Class J	
Maximum voltage AC/DC		600V, 690V(IEC)	600V	600V	
Maximum current		30 A, 32 A (IEC)	30 A	30 A	60 A
Maximum current withstand (UL/CSA)		Fuse dependent 50 kA max UL	200 kA sym	200 kA sym	
Operating temperature range		-4...+130 °F, -20...+55 °C			
Conductor material		Copper, stranded			
Conductor strip length		0.43 in. (11 mm)		0.79 in. (20 mm)	
Conductor range	1 wire per terminal	#18...4 AWG (0.75...25 mm^2)		#18...1 AWG (0.75...50 mm^2)	#14...1 AWG (2.5...50 mm^2)
	2 wires★ per terminal	#18...8 AWG (0.75...10 mm^2)		#18...6 AWG (0.75...16 mm^2)	#14...6 AWG (2.5...16 mm^2)
Terminal tightening torque		#18...8 AWG: 22 lb•in #6...4 AWG: 26 lb•in 0.75...25 mm^2: 2.5 N•m		35 lb•in (4 N•m)	

★ Both wires must be same size

* Bus bars do not fit on Class J fuse holders.

Approximate Dimensions

Note: Dimensions are shown in inches (mm). Dimensions are not intended for manufacturing purposes.



Dimension		For Midget Fuse	For Class CC Fuse	For Class J Fuse	
		30 A	30 A	30 A	60 A
Height		3.19 in. (81 mm)	3.19 in. (81 mm)	4.65 in. (118 mm)	4.65 in. (118 mm)
Depth		2.51 in. (64 mm)	2.51 in. (64 mm)	2.76 in. (70 mm)	3.23 in. (82 mm)
Width	1-Pole	0.71 in. (18 mm)	0.71 in. (18 mm)	1.41 in. (36 mm)	1.57 in. (40 mm)
	2-Pole	1.41 in. (36 mm)	1.41 in. (36 mm)	2.83 in. (72 mm)	3.15 in. (80 mm)
	3-Pole	2.13 in. (54 mm)	2.13 in. (54 mm)	4.25 in. (108 mm)	4.72 in. (120 mm)

Bus Bars

1492-FB Bus Bars*

Description	Pins	Rated Current [A] ‡	Pkg. Qty.	Cat. No. ★
1-Phase	57	100 A	1	1492-A1B1
	57	80 A	1	1492-A1B8
2-Phase	56	100 A	1	1492-A2B1
	56	80 A	1	1492-A2B8
3-Phase	57	100 A	1	1492-A3B1
	57	80 A	1	1492-A3B8

★ cULus, UL508, EN 60947-1, CE Marked

‡ Refer to the diagrams below for Feeder Terminal & Bus Bar Current Distribution

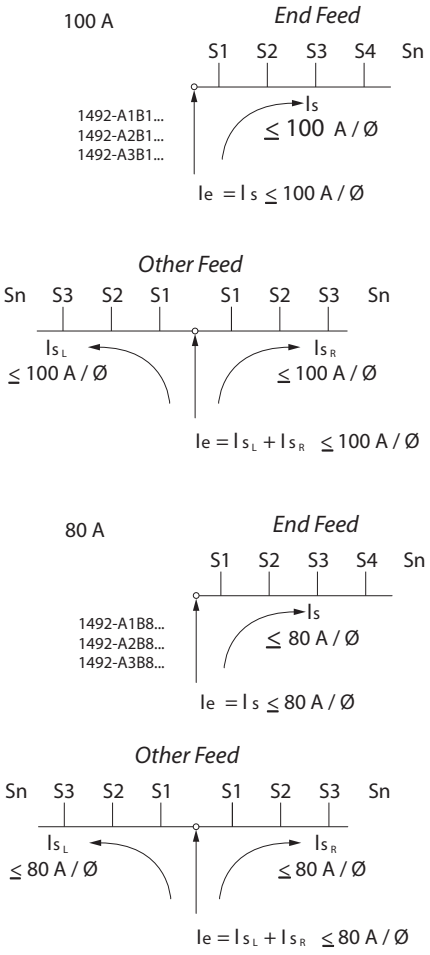
* Bus bars do not fit on Class J fuse holders.

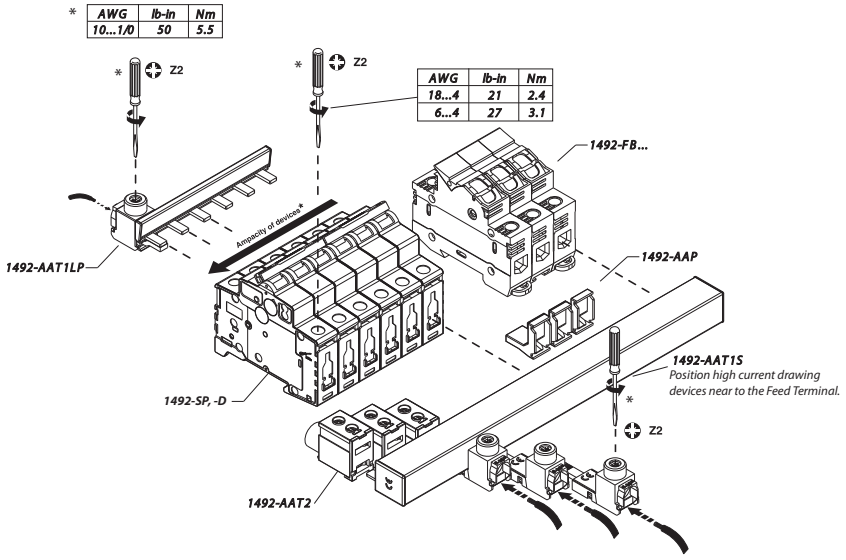
1492-FB Bus Bar Accessories

Description	Pkg. Qty.	Cat. No. ★
Terminal Power Feed, 35 mm², for 1-phase bus bar	10	1492-AAT1LP
Terminal Power Feed, 35 mm², for 2- or 3-phase bus bar	10	1492-AAT1
Dedicated Power Feed, 50 mm²	10	1492-AAT2
End Cover for 1-phase bus bar	10	1492-A1E
End Cover for 2- or 3-phase bus bar	10	1492-AME
Protective Shroud for unused pins	10	1492-AAP

★ cULus, UL508, EN 60947-1, CE Marked

Feeder Terminal & Bus Bar Current Distribution

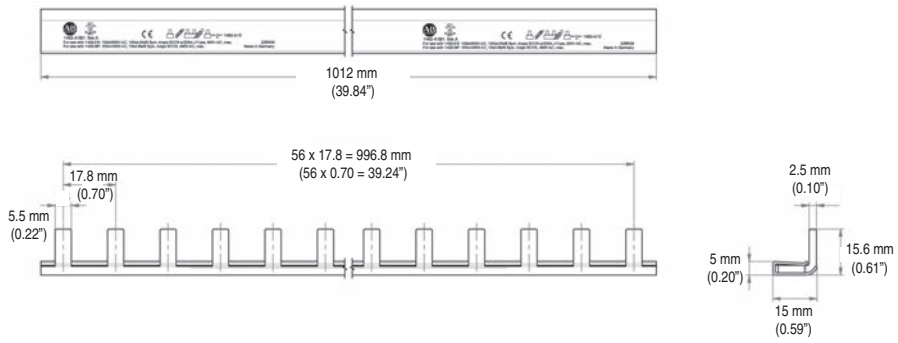




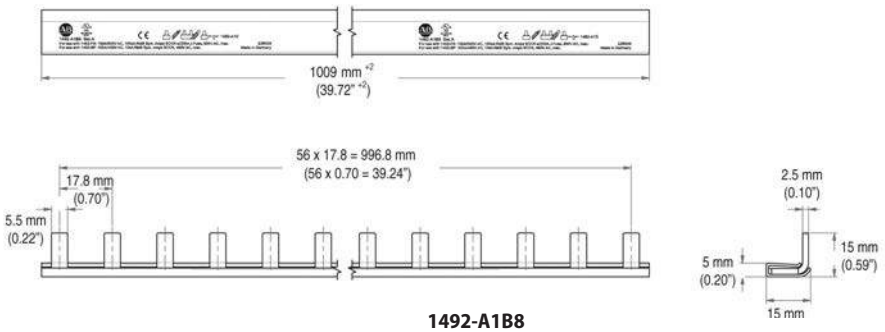
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

1-Phase Bus Bars

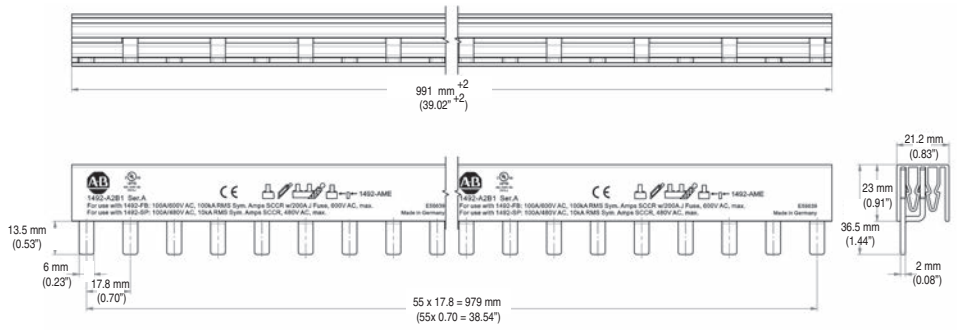


1492-A1B1



1492-A1B8

2-Phase Bus Bars



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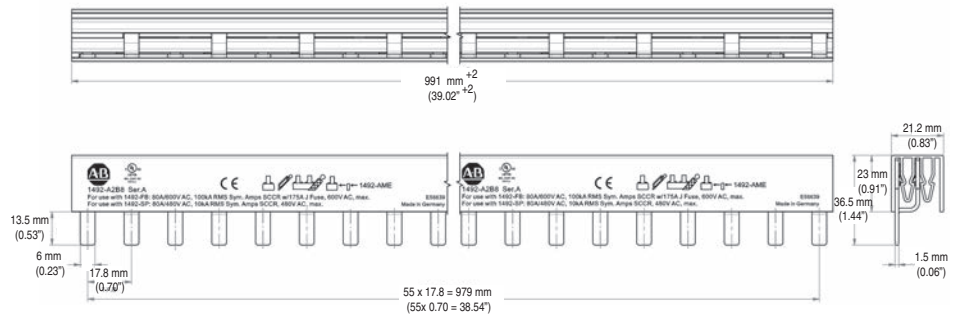
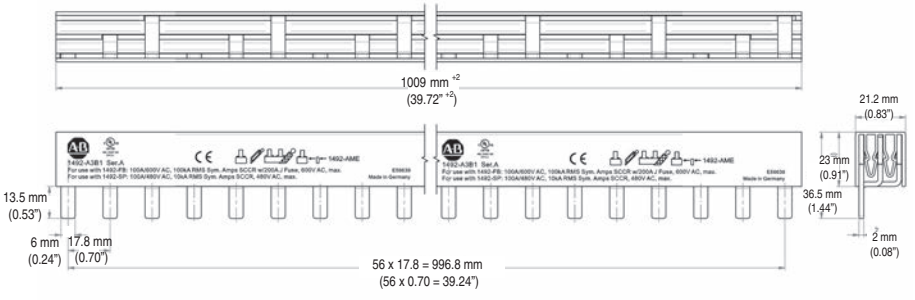


1492-A2B8

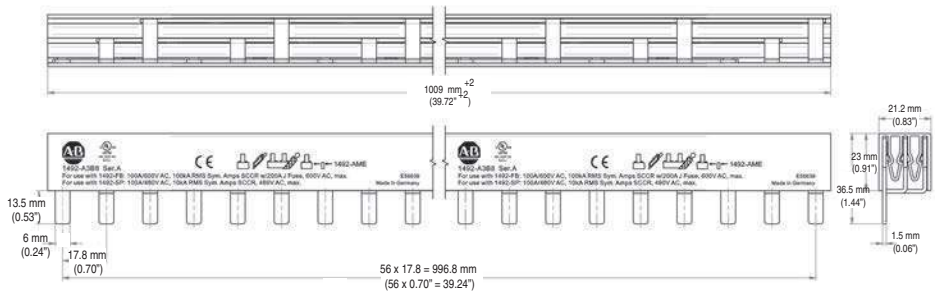
Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.

3-Phase Bus Bars



1492-A3B1

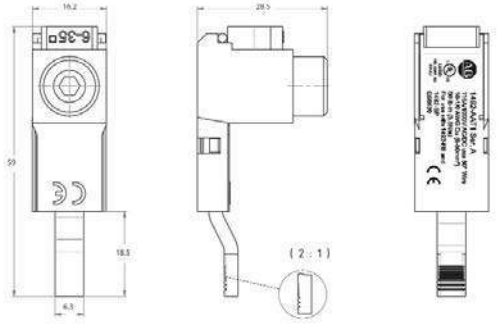


1492-A3B8

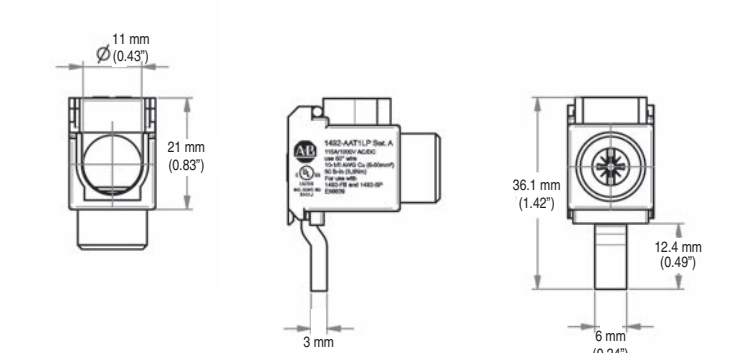
ALLEN BRADLEY 1492-GH

Bus Bar Accessory Approximate Dimensions

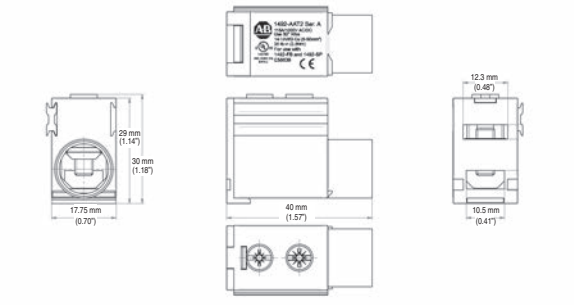
Note: Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



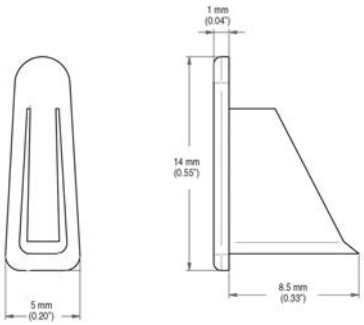
1492-AAT1



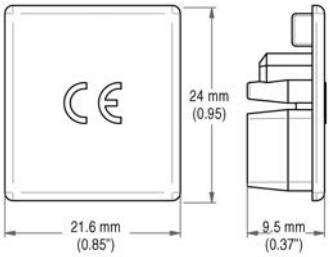
1492-AAT1LP



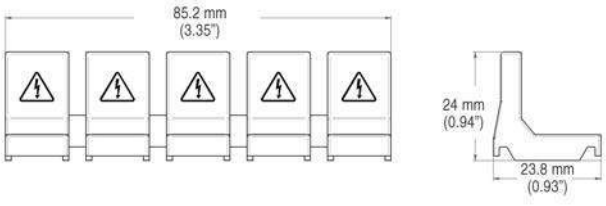
1492-AAT2



1492-A1E



1492-AME



1492-AAP

ALLEN BRADLEY 1492-GH

ALLEN BRADLEY 1492-GH

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Bulletin 1492 DIN Rail Receptacle

ALLEN BRADLEY 1492-REC15G

Advantages

- Quick to snap on 35 mm DIN rail and easy to wire
- Available with ground fault current interrupt (GFCI) or standard duplex outlets
- Feature of visual indication of power included with GFCI receptacle

1492-REC15G
GFCI Receptacle

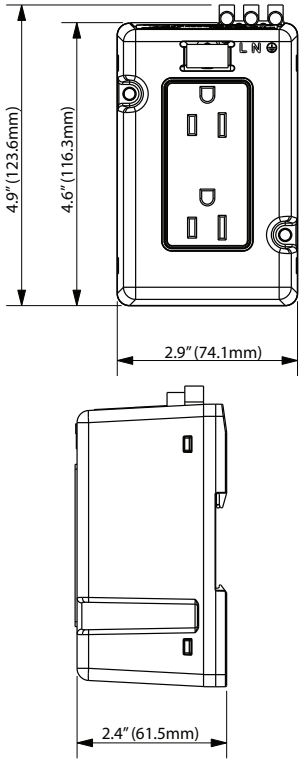
1492-REC15
Standard Duplex Receptacle

Overview

The Bulletin 1492 DIN rail receptacle is an enclosed 15 Amp power outlet. It is a convenient power source for portable computers or test devices for in-the-panel troubleshooting.

Technical Specifications for the DIN Rail Receptacle		
	1492-REC15	1492-REC15G
Mechanical Ratings		
	15 Amp Duplex	15 Amp GFCI
Operating Temperatures	-13°F to 140°F (-25°C to 60°C)	
Storage Temperatures, Short Term	-31°F to 176°F (-35°C to 80°C)	
Terminal Wire Sizes	#20 - #10 AWG solid or stranded	
Terminal Torque	7 lb.-in. (.79 Nm)	
Electrical Ratings		
Device Ratings	15 Amp, 125V	15 Amp, 125V
Operating Frequency	50 - 60 Hz	
Dielectric Voltage	Withstands 2000V per UL498	Withstands 1500V per UL498
Current Interrupting	N/A	10 kA
Trip Level	N/A	5±1 mA
Material Listing		
Enclosure Cover, Flammability	PBT/polycarbonate blend, UL94 rating V0 @ .63mm	
Enclosure Base, Flammability	Polyamide 6/6 30% GF, UL94 rating V0 @ .63mm	
Spring	Stainless Steel	
Standards and Certifications		
	UL 508A (file # E54866)	
	cULus	
	UL498	UL 498, UL 943
	NEMA WD-6	
	NEMA 5-15R	

Dimensions



	Cat. No.	Pkg. Qty.
Marking Systems Marker Card:	1492-MS10x17 (40/card)	5

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Rockwell Automation

Publication 1492-PP023A-EN-E – February 2009

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Bulletin 1606-XLE, -XLP, -XLS Switched Mode Power Supplies

Allen-Bradley

Excellent Performance. Superior Efficiency.

Features and Benefits

Industry-Leading Efficiency

- Intelligent circuit design with long-life electrolytic capacitors
- Generates minimal heat
- Allows up to 50% additional power reserve without reducing output voltage, while minimizing ripple and noise

Wide Power Range and Feature Set

- Multiple single- and three-phase inputs available for global applications
- Redundancy modules provide a means for managing dual power supplies for back-up power
- Multiple output voltages available

Compact Size

- Saves space on plant floor
- Expands plant flexibility

Approvals

- CE marked
- cULus and cURus listed

Overview

Leading the industry in performance and reliability, the Allen-Bradley® Bulletin 1606-XLS, -XLE and -XLP power supplies from Rockwell Automation® meet most worldwide single- and three-phase application requirements. Featuring top of the line efficiency, Bulletin 1606 power supplies help reduce costs and energy consumption. Plus, these compact power supplies are designed and manufactured to accept wide ranges of both AC and DC input voltages and are tested to meet global safety standards.

So, whether you are looking for a standard product covering a broad range of applications or a compact unit to save precious space and costs, there is sure to be an excellent fit for your unique power needs.

ALLEN BRADLEY 1606 POWER SUPPLY

Bulletin 1606-XLE Essential Switched Mode Power Supplies

Designed with simplicity in mind, the XLE line offers high performing, ultra slim power supplies with the most basic feature set. These products contain the essential features for long service life and high reliability. This line is ideal if you are interested in a cost-effective solution to power your operations.

- Rated outputs between 80…960 W (3.3…40 A at 24V DC)
- Cost-effective solution for single-phase applications

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current			Cat. No.
					120V AC	230V AC	400V AC-480V AC	
Bulletin 1606-XLE Essential Single Phase ✶	100…120/200…240V AC	24…28	80	3.3	1.50	0.68		1606-XLE80E
		24…28	120	5	2.34	1.23		606-XLE120E
		24…28	120	5	2.34	1.23		❄ 1606-XLE120EC
	90…132V AC	24…28	120	5	1.23	–		1606-XLE120EN
	180…264V AC	24…28	120	5	–	1.17		1606-XLE120EE
	100…120/200…240V AC	24…28	240	10	4.34	2.23		1606-XLE240E
	90…132V AC	24…28	240	10	3.73	–	–	1606-XLE240EN
	180…264V AC	24…28	240	10	–	2.20		1606-XLE240EE
	100…120/200…240V AC	24…28	240	10	4.34	2.00		1606-XLE240EP
	100…120/200…240V AC	48…52	240	5	4.34	2.23		♦ 1606-XLE240F
	100…240V AC	24…28	480	20	4.36	2.33		1606-XLE480EP
	100…240V AC	48…56	480	10	4.36	2.33		1606-XLE480FP
Three Phase ✶	380…480V AC, 600V DC	12…15	96	8			2x 0.56	1606-XLE96B-2
	380…480V AC, 600V DC	48…56	240	5			3x 0.60	606-XLE240F-3
	380…480V AC, 600V DC	24…28	120	5	–	–	0.68	1606-XLE120E-2
	380…480V AC, 600V DC	24…28	240	10			3x 0.60	1606-XLE240E-3
	480 V AC	24	960	40			3x 1.40	1606-XLE960DX-3N
	480 V AC	48	960	20			3x 1.40	1606-XLE960MX-3N

Bulletin 1606-XLP Compact Switched Mode Power Supplies

When saving critical space is one of your main objectives, the XLP line is an excellent choice. These devices are equipped with many of the same features and certifications as previous generations and support low-power applications. This line is ideal if you require a cost-effective way to save space while delivering safe and reliable power.

- Rated outputs between 15…100 W (0.6…4.2 A at 24V DC)
- Multiple output voltages available
- Smaller, cost-effective solution for low power applications

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current			Cat. No.
					120V AC	230V AC	400V AC-480V AC	
Bulletin 1606-XLP Compact Single Phase ⌘	100…240V AC, 85…375V DC	5…5.5	15	3	0.28	0.17		1606-XLP15A
		12…15	15	1.3	0.28	0.17		1606-XLP15B
		24…28	15	0.6	0.28	0.17		1606-XLP15E
		5…5.5	25	5	0.60	0.30		1606-XLP25A
		10…12	30	3	0.60	0.25		1606-XLP30B
		24…28	30	1.3	0.60	0.35		1606-XLP30E
		24…28	30	1.3	0.54	0.30		1606-XLP30EQ
		± 12/15	36	2.8	0.65	0.40		1606-XLP36C
		12…15	50	4.2	1.00	0.60		1606-XLP50B
		24…28	50	2.1	0.77	0.44		1606-XLP50E
		24…28	50	2.1	1.00	0.60	–	1606-XLP50EZ
		48…56	50	1	1.00	0.60		1606-XLP50F
	100…240V AC, 110…300V DC	12…15	54	4.5	0.91	0.54		1606-XLP60BQ
		12…15	54	4.5	0.97	0.61		1606-XLP60BQT
		24…28	60	2.5	0.98	0.58		1606-XLP60EQ
		24…28	60	2.5	1.05	0.66		1606-XLP60EQT
	100…120/220…240V AC, 220…375V DC	24…28	72	3	1.60	0.80		1606-XLP72E
		12…15	90	7.5	1.90	0.90		✠ ♦ 1606-XLP90B
	100…200/200…240V AC, 220…375V DC	24…28	95	3.9	2.00	0.95		♦ 1606-XLP95E
		24…28	100	4.2	2.10	1.00		✠ ♦ 1606-XLP100E
		48…56	100	2.1	2.10	1.00		✠ ♦ 1606-XLP100F
Two Phase ✠ ⌘ ✦	380…480V AC	24…28	90	3.75	–	–	2x 0.36	1606-XLP90E-2
		24…28	100	4.2	–	–	2x 0.40	1606-XLP100E-2

ALLEN BRADLEY 1606 POWER SUPPLY

Bulletin 1606-XLS Performance Switched Mode Power Supplies

Building on the successful design of its predecessors, the XLS line couples a new technology that significantly reduces unit size yet delivers a 150% power boost. Sleek and compact, these highly efficient devices have enough reserve current available to start even your most stubborn loads.

- Rated outputs between 80…960 W (3.3...40 A at 24V DC)
- 150% power boost feature handles start-up loads
- Buffer modules provide a short boost function, buffering load currents during typical main faults, switching events or load peaks

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current			Cat. No.
					120V AC	230V AC	400V AC-480V AC	
Bulletin 1606-XLS Performance Single Phase ⌘ ✦	100…240V AC, 110…300V DC	24…28	80	3.3	1.42	0.82	–	1606-XLS80E
		24…28	120	5	1.10	0.62		1606-XLS120E
		24…28	120	5	1.10	0.62		1606-XLS120EA
		12…15	180	15	1.65	0.93		1606-XLS180B
		24…28	240	10	2.22	1.22		1606-XLS240E
		24…28	240	10	2.22	1.22		1606-XLS240EA
		24…28	240	10	2.22	1.22		❄ 1606-XLS240EC
		48…56	240	5	2.22	1.22		1606-XLS240F
		28…32	240	8	2.22	1.22		1606-XLS240K
		24…28	480	20	4.56	2.48		1606-XLS480E
		24…28	480	20	4.56	2.48		1606-XLS480EA
		24…28	480	20	4.56	2.48		❄ 1606-XLS480EC
	200…240V AC	24…28	480	20	–	4.45		1606-XLS480EE
	100…240V AC, 110…300V DC	48…56	480	10	4.56	2.48		1606-XLS480F
		36…42	480	13.3	4.56	2.48		1606-XLS480G
	200…240V AC, 220…300V DC	24…28	960	34.3	–	4.6		1606-XLS960EE
		48…56	960	20	–	4.6		1606-XLS960FE
Three Phase ⌘ ✦	380…480V AC, 600V DC	24…28	480	20			3x 0.65	1606-XLS480E-3
	380…480V AC, 600V DC	24…28	480	20			3x 0.65	❄ 1606-XLS480E-3C
	360…900V DC	24…28	480	20			3x 0.85	1606-XLS480E-D
	380…480V AC, 600V DC	48…56	480	10			3x 0.65	1606-XLS480F-3
		36…42	480	13.3			3x 0.65	1606-XLS480G-3
		24…28	960	40			3x 1.35	1606-XLS960E-3
		48…54	960	20			3x 1.35	1606-XLS960F-3

* For additional surge and filter protection, see Bulletin 4983 products
** Requires 2PCS, 1 per phase

⌘ Parallel operation (inclined characteristic)
✦ Meets EN 61000-3-2 PFC harmonics
❄ The C suffix of the cat. no. indicates that the product has conformal coating
✶ Parallel operation is for 1 + 1 redundancy only
✠ Single/parallel operation (inclined characteristic) selectable via jumper

Bulletin 1606 Special Modules

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current		Cat. No.
					120V AC	230V AC	
Bulletin 1606 Special Modules	10…60V DC	Vin 1 - .9V typ	384	16	-	-	1606-XLPRED
	24…60V DC	Vin 1 - .9V typ	480	20	-	-	1606-XLERED
	100…120/200…240V AC	24…28	80	3.3	1.50	0.68	1606-XLEDNET3
	10…60V DC	Vin 1 - .9V typ	480	20	-	-	1606-XLSRED
	24…28	Vin 2.15 typ	960	40	-	-	1606-XLSRED40
	24…28	Vin 2.7 typ	1920	80	-	-	1606-XLSRED80
	100…240V AC, 110…300V DC	24	91	3.8	1.02	0.48	1606-XLSDNET4
	100…240V AC, 110…300V DC	24	192	8	2.13	1.00	1606-XLSDNET8
Bulletin 1606 Special Modules with UPS	22.5…30V DC	22.5	240	10	-	-	1606-XLS240-UPS
	22.5…30V DC	22.5	240	10	-	-	1606-XLS240-UPSC
	22.5…30V DC	12/22.5	240	5/10	-	-	1606-XLS240-UPSD
	22.5…30V DC	22.5	240	10	-	-	1606-XLS240-UPSE
	24…28.8V DC	22.5…27.8	480	20	-	-	1606-XLSBUFFER24
	48…56V DC	45…54	960	10	-	-	1606-XLSBUFFER48

Comparison

	XLE Series	XLP Series	XLS Series
AC input voltage	115/230 auto select	115/230 auto select	100/240 wide range
DC input voltage Single- / three-phase	210-375/450-780	85-375	88-375/450-780
Watt range [W]	80-960	15-100	80-960
Adj. output voltage	Yes	Yes	Yes
Multiple output voltage [V]	12, 24, 48	5 12, 15, 24, 48	12, 24, 30, 36, 48
Power boost	20% power boost	-	50% power boost
DC-OK signal	Yes*	Yes	Yes
Temperature range	-25…+60 ˚C	-40…+70 ˚C	-25…+60 ˚C
Efficiency	90…92%	80…90%	91.6….95%
Terminals	Screw	Screw/Spring Clamp	Spring clamp

* DC–OK contact available on select models only.

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Technical Data

Allen-Bradley

CompactLogix Controllers Specifications

CompactLogix 5370 Controller Catalog Numbers
1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B, 1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B,1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L30ERMS, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERM, 1769-L36ERMS, 1769-L37ERM, 1769-L37ERMK, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERM, 1769-L38ERMK, 1769-L38ERMS, 1769-L38ERMSK

Armor CompactLogix and Armor Compact GuardLogix Controller Catalog Numbers
1769-L33ERM0, 1769-L33ERM0S, 1769-L36ERM0, 1769-L36ERM0S, 1769-L37ERM0, 1769-L37ERM0S,1769-L38ERM0, 1769-L38ERM0S

1769 Packaged Controller Catalog Numbers
1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B

1769 Modular Controller Catalog Numbers
1769-L31, 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L32EK, 1769-L35E

1768 Controller Catalog Numbers
1768-L43, 1768-L43S, 1768-L45, 1768-L45S

Memory Card Catalog Numbers
1784-CF128, 1784-SD1, 1784-SD2

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LISTEN. THINK. SOLVE.®

ALLEN BRADLEY 1769 COMPACTLOGIX

Environmental Specifications - 1769 CompactLogix™ Controllers and Compact GuardLogix® 5370 Controllers

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L38ERMS, 1769-L37ERMSK, 1769-L38ERMSK	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B	1769-L31, 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L32EK, 1769-L35E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	-20…+60 °C (-4…+140 °F)	0…60 °C (32…140 °F)				
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)					
Temperature, surrounding air, max	60 °C (140 °F)					
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing					
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz[1]		5 g @ 10…500 Hz			5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g[1]		20 g - DIN rail 30 g - Panel			20 g - DIN rail 30 g - Panel
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g[1], [2]		30 g - DIN rail 40 g - Panel			30 g - DIN rail 40 g - Panel
Emissions CISPR 11	IEC 61000-6-4					
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges				4 kV contact discharges 8 kV air discharges	6 kV contact discharges 8 kV air discharges

ALLEN BRADLEY 1769 COMPACTLOGIX

Environmental Specifications - 1769 CompactLogix™ Controllers and Compact GuardLogix® 5370 Controllers (continued)

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L38ERMS, 1769-L37ERMSK, 1769-L38ERMSK	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B	1769-L31, 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L32EK, 1769-L35E
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz		10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz		10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz	1769-L31, 1769-L32C, 1769-L35CR 10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 1769-L32E, 1769-L35E 10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±3 kV at 5 kHz on power ports ±3 kV at 5 kHz on signal ports ±3 kV at 5 kHz on communication ports		±3 kV at 5 kHz on communication ports	±3 kV at 5 kHz on communication ports ±4 kV at 5 kHz on Protective Earth (PE)	±2 kV at 5 kHz on power ports ±2 kV at 5 kHz on signal ports ±2 kV at 5 kHz on communication ports	1769-L31, 1769-L32C, 1769-L35CR ±2 kV at 5 kHz on communication ports 1769-L32E, 1769-L35E ±3 kV at 5 kHz on power ports ±3 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on communication ports	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports ±2 kV line-earth (CM) on communication ports	±2 kV line-earth (CM) on communication ports		±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports ±2 kV line-earth (CM) on communication ports	1769-L31 Channel 0: ±2 kV line-earth (CM) on shielded ports Channel 1: ±1 kV line-earth (CM) on shielded ports 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L35E ±2 kV line-earth (CM) on communication ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz					

(1) If you are mounting a CompactLogix™ 5370 L1 controller on an EN 50 022 - 35 x 15 mm (1.38 x 0.59 in.) DIN rail, you must first adhere a bumper on the back of the controller. Failure to install the bumper before mounting the controller causes the system to fail to meet this specification. For more information, see the CompactLogix 5370 Controllers User Manual, publication 1769-UM021.

(2) If you are mounting a CompactLogix 5370 L1 controller on an EN 50 022 - 35 x 15 mm (1.38 x 0.59 in.) DIN rail, the Shock, nonoperating specification = 30 g.

ALLEN BRADLEY 1769 COMPACTLOGIX

Environmental Specifications - Armor™ CompactLogix and Armor Compact GuardLogix Controllers

Feature	1769-L33ERM0, 1769-L36ERM0, 1769-L37ERM0, 1769-L38ERM0	1769-L33ERM0S, 1769-L36ERM0S, 1769-L37ERM0S, 1769-L38ERM0S
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0 °C < Ta < 60 °C (32 °F < Ta < 140 °F)	
Temperature, ambient, max	60 °C (140 °F)	
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)	
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing	
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz	
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g	
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g	
Emissions	IEC 61000-6-4	
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges	
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz 3V/m with 1 kHz sine-wave 80% AM from 2700…6000 MHz	
EFT/B immunity IEC 61000-4-4	±3 kV at 5/100 kHz on power ports ±3 kV at 5/100 kHz on Ethernet ports	
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ± 2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on Ethernet ports	
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz	

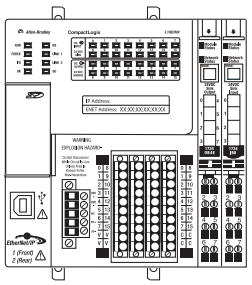
ALLEN BRADLEY 1769 COMPACTLOGIX

Environmental Specifications - 1768-CompactLogix Controllers

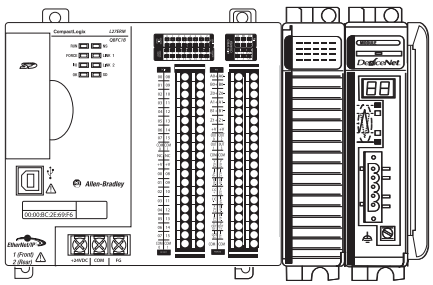
Attribute	1768-L43, 1768-L43S, 1768-L45, 1768-L45S
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions CISPR 11	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on communication ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz

CompactLogix 5370 Controllers

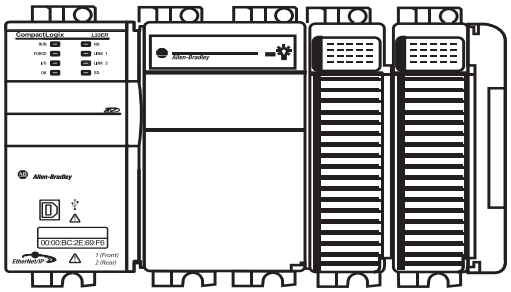
CompactLogix 5370 L1 Control System



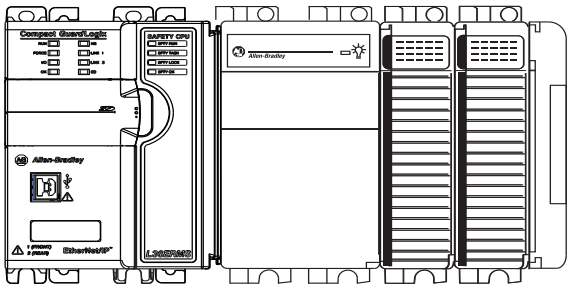
CompactLogix 5370 L2 Control System



CompactLogix 5370 L3 Control System



Compact GuardLogix® 5370 Control System



CompactLogix 5370 controllers provide scalable controller solutions to address a wide variety of applications. All CompactLogix 5370 controllers provide the following functionality:

- Two Ethernet ports
- One USB port
- Support for local expansion modules
- Control of local and distributed I/O modules
- Use of 1784-SD1 or 1784-SD2 Secure Digital (SD) card for nonvolatile memory
- A battery is no longer necessary because of the internal energy-storage solution

Some CompactLogix 5370 controllers provide the following functionality:

- Built-in power supply
- Some combination of embedded digital, analog, and high-speed counter modules
- Support for Integrated Motion over an EtherNet/IP network
- Access to DeviceNet™ networks

The Compact GuardLogix controller is a 1769-L3 CompactLogix controller that provides safety control to achieve SIL CL3 according to EN62061 / EN 61511-1 / IEC 61508 and PLe according to EN ISO 13849-1. A major benefit of this system is that it is still one project, safety and standard together.

Application	Description
SIL 1, 2, 3	The Compact GuardLogix controller system is type-approved and certified for use in safety applications up to and including SIL 3 according to IEC 61508, and applications up to and including PLe/Cat.4 according to ISO 13849-1. For more information, see the following: • GuardLogix 5570 and Compact GuardLogix 5370 Controllers Systems Safety Reference Manual, publication 1756-RM099 • Compact GuardLogix 5370 Controllers User Manual, publication 1769-UM002 • GuardLogix Safety Application Instruction Set Reference Manual, publication 1756-RM095

ALLEN BRADLEY 1769 COMPACTLOGIX

During development, safety and standard have the same rules. The following are allowed:

- Multiple programmers
- Online editing
- Forcing

Once the project is tested and ready for final validation, you apply the safety application signature and safety-lock the application. This process sets the safety task to a SIL 3 integrity level. The Compact GuardLogix enforces the SIL 3 integrity level. When safety memory is locked and protected, the safety logic cannot be modified and all safety functions operate with SIL 3 integrity. On the standard side of the Compact GuardLogix controller, all functions operate like a regular Logix controller. Thus online editing, forcing, and other activities are all allowed.

Standard logic and external devices, like HMIs or other controllers, can read safety memory with this level of integration. This level of integration removes the need to condition safety memory for use elsewhere. The result is easy systemwide integration and the ability to display safety status on displays or marquees. Use Guard I/O™ modules for field device connectivity. For safety interlocking between Compact GuardLogix controllers, use Ethernet or ControlNet™ networks. Multiple Compact GuardLogix controllers can share safety data for zone to zone interlocking, or one Compact GuardLogix controller can use remote distributed safety I/O between different cells/areas.

Features - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

Feature	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMOS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
Controller tasks: • Continuous • Periodic	• 32 tasks • 100 programs/task			
Built-in communication ports	• Two Ethernet ports - CompactLogix 5370 controllers have two Ethernet ports to connect to an EtherNet/IP network. The ports carry the same network traffic as part of the embedded switch of the controller. However, the controller uses only one IP address. • One USB port (only for temporary connection)			
Communication options	EtherNet/IP	• EtherNet/IP • DeviceNet via 1769-SDN scanner		
EtherNet/IP node, max	• 1769-L16ER-BB1B: Up to 4nodes • 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B: Up to 8 nodes	• 1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK: Up to 8 nodes • 1769-L27ERM-QBFC1B: Up to 16 nodes	• 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 769-L30ERMK, 1769-L30ERMS: Up to 16 nodes • 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L33ERMS, 1769-L33ERMSK: Up to 32 nodes • 1769-L36ERM, 1769-L36ERMS: Up to 48 nodes • 1769-L37ERM, 1769-L37ERMK, 1769-L37ERMS, 1769-L37ERMSK: Up to 64 nodes • 1769-L38ERM, 1769-L38ERMK, 1769-L38ERMS, 1769-L38ERMSK: Up to 80 nodes	
Controller connections	256			
Embedded I/O modules	• 16 DC digital inputs • 16 DC digital outputs	All controllers: • 16 DC digital inputs • 16 DC digital outputs Only 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: • 4 high-speed counter modules • 4 high-speed counter module outputs • 4 universal analog inputs • 2 analog output points	–	
Sockets, max	32			
Integrated Motion over an EtherNet/IP network	1769-L18ERM-BB1B - 1 or 2 axes	1769-L27ERM-QBFC1B - As many as 4 axes	• 1769-L30ERM, 1769-L30ERMS - As many as 4 axes • 1769-L33ERM, 1769-L33ERMS - As many as 8 axes • 1769-L36ERM, 1769-L36ERMS - As many as 16 axes • 1769-L37ERM, 1769-L37ERMS - As many as 16 axes • 1769-L38ERM and 1769-L38ERMS - As many as 16 axes	

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Features - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

Feature	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMOS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
Programming languages	• Relay ladder[1] • Structured Text • Function block • SFC			
Integrated safety	–			Yes

(1) The Compact GuardLogix 5370 controllers support only the relay ladder programming language in the safety task. The Compact GuardLogix 5370 controllers support all listed programming languages in the standard task.

Technical Specifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
User memory	• 1769-L16ER: 384 KB • 1769-L18ER, 1769-L18ERM: 512 KB • 1769-L19ER-BB1B: 1 MB	• 1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK: 750 KB • 1769-L27ERM-QBFC1B: 1 MB	• 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERM: 1 MB • 1769-L33ER, 1769-L33ERM, 1769-L33ERM: 2 MB • 1769-L36ERM: 3 MB • 1769-L37ERM, 1769-L37ERMK: 4 MB • 1769-L38ERM, 1769-L38ERMK: 5 MB	• 1769-L30ERMS: 1 MB standard + 0.5 MB safety • 1769-L33ERMS, 1769-L33ERMSK: 2 MB standard + 1 MB safety • 1769-L36ERMS: 3 MB standard + 1.5 MB safety • 1769-L37ERMS, 1769-L37ERMSK: 4 MB standard + 1.5 MB safety • 1769-L38ERMS, 1769-L38ERMSK: 5 MB standard + 1.5 MB safety
Optional nonvolatile memory	1784-SD1 card with 1 Gb of available memory (shipped with controller) 1784-SD2 card with 2 Gb of available memory (available for separate ordering)			
Number of local expansion modules, max[1]	• 1769-L16ER-BB1B: 6 - 1734 POINT I/O™ modules • 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B: 8 - 1734 POINT I/O™ modules	4 - 1769 Compact I/O™ modules	• 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L30ERMS, 1769-L30ERMSK: 8 -1769 Compact I/O™ modules • 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L33ERMS, 1769-L33ERMSK: 16 -1769 Compact I/O modules • 1769-L36ERM, 1769-L36ERMS: 30 -1769 Compact I/O modules • 1769-L37ERM, 1769-L37ERMK, 1769-L37ERMS, 1769-L37ERMSK: 31 -1769 Compact I/O modules • 1769-L38ERM, 1769-L38ERMK, 1769-L38ERMS, 1769-L38ERMSK: 31 -1769 Compact I/O modules	
Number of I/O module banks, max	–	1	3	
Current draw @ 5V DC, controller power	1 A	• 1769-L24ER-QB1B: 1.54 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F). • 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: 1 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).	500 mA	850 mA
Current draw @ 24V DC, controller power	–	• 1769-L24ER-QB1B: 0.95 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F). • 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: 0.8 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).	225 mA	700 mA

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Technical Specifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers (continued)

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
Current draw @ 24V DC, field power, max	3 A - Combined total for all devices that draw current from field power connections Input: 5 mA Output: 500 mA	–		
Power dissipation, max	11.5 W	• 1769-L24ER-QB1B: 12 W • 1769-L24ER-QBFC1B, L27ERM-QBFC1B: 21 W	4.5 W	6.5 W
Isolation voltage	50V (continuous), Basic Insulation Type Tested at 500V AC for 60 s, System to Field	30V (continuous), Basic Insulation Type, USB to system, Ethernet to system and Ethernet to Ethernet Type tested at 500V AC for 60 s		50V, Basic Insulation Type Tested at 500V AC for 60 s, System to Communication ports.
Short circuit protection, field power	Internal fuse, Non-replaceable	–		
Recommended external short circuit protection, field power	User-provided 4…5 A @ 3.15…5.5 A^2t fuse	–		
Weight, approx	0.66 kg (1.5 lb)	• 1769-L24ER-QB1B = 0.63 kg (1.39 lb) • 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B = 0.9 kg (1.9 lb)	0.31 kg (0.68 lb)	0.54 kg (1.18 lb)
Module width	100.00 mm (3.94 in.)	1769-L24ER-QB1B = 115.00 mm (4.53 in.) 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B = 140 mm (5.51 in.)	55.00 mm (2.17 in.)	89.00 mm (3.50 in.)
Module location	DIN rail mount	DIN rail or panel mount		
Panel-mounting screw torque	—	1.1…1.8 N•m (10…16 lb•in) - use M4 or #8 screws		
Embedded power supply	24V DC input, isolated	24V DC Input, isolated	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4	
Power supply distance rating	–		• Controller and 1769-SDN: 4 • 1769 Compact I/O modules: 4…8, depending on module	4 (3 I/O modules between controller and power supply)
Wire category[2]	1 - signal ports 1 - power ports 2 - communication ports		2 - communication ports	
Wire type, Ethernet	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568 B.1 or Category 5 cable according to ISO/IEC 24702			
Wire type, power terminals, and embedded I/O connections	Copper		–	
Wire size, power terminals[3]	0.051…3.31 mm^2 (30…12 AWG) solid or stranded copper wire rated at 75 °C (167 °F), or greater, 1.2 mm (3/64 in.) insulation, max Each terminal accepts 1 or 2 wires	0.25…2.50 mm^2 (22…14 AWG) solid copper wire rated at 75 °C (167 °F), or greater 1.2 mm (3/64 in.) insulation, max Each terminal accepts only 1 wire	–	
Wire stripping length, power terminals[3]	10 mm (0.39 in)	8 mm (0.31 in)	–	
Screw torque, power terminals[3]	0.5…0.6 N•m (4.4…5.3 lb•in)	1.0…1.2 N•m (8.9…10.6 lb•in)	–	
Wire size, embedded I/O connections	0.205…1.31 mm^2 (24…16 AWG) solid or stranded copper wire rated at 75 °C (167 °F), or greater 1.2 mm (3/64 in.) insulation, max or 90 °C (194 °F) Each terminal accepts only 1 wire		–	
Wire stripping length, embedded I/O connections	10 mm (0.39 in)		–	

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Technical Specifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers (continued)

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
North American temperature code	T4A	T3C	T5	
IEC temperature code	T4		T5	
Enclosure type rating	None (open-style)			

(1) You can use up to the maximum number of local expansion modules with the CompactLogix 5370 L1 controllers that are listed. This condition applies if only the total current drawn by the embedded I/O and local expansion modules does not exceed both the available POINTBus™ backplane current of 1 A and the field power current of 3 A. For more information on POINTBus™ backplane current and field-power current considerations when installing local expansion modules, see page 12.
(2) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1 and the appropriate system-level installation manual.
(3) In regard to the CompactLogix 5370 L1 controllers, this specification applies to connecting wires to the power connector that is inserted in the controller. In regard to the CompactLogix 5370 L2 controllers, this specification applies to connecting wires to power terminals built into the controller.

Real-time Clock Accuracy

This table lists the real-time clock accuracy specifications for the CompactLogix 5370 controllers.

Ambient Temperature	Accuracy
0 °C (32 °F)	-143…+42 s/mo
25 °C (77 °F)	-78…+91 s/mo
40 °C (104 °F)	-101…+73 s/mo
60 °C (140 °F)	-204…-4.50 s/mo

Real-time Clock Hold-up Times

This table lists the typical real-time clock hold-up specifications for the CompactLogix 5370 controllers.

IMPORTANT The values in this table are typical and can vary with some CompactLogix 5370 control systems.

Ambient Temperature	Holdup Time, Typical
0 °C (32 °F)	40 days
25 °C (77 °F)	35 days
40 °C (104 °F)	28 days
60 °C (140 °F)	16 days

The I/O module support for CompactLogix 5370 controller systems varies by controller.

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I/O Module Support - CompactLogix 5370 L1 Controllers

The CompactLogix 5370 L1 controllers offer an embedded I/O module and the option to use 1734 POINT I/O modules as local expansion modules.

The embedded I/O module provides the following:

- 16 sinking 24V DC digital input points
- 16 sourcing 24V DC digital output points

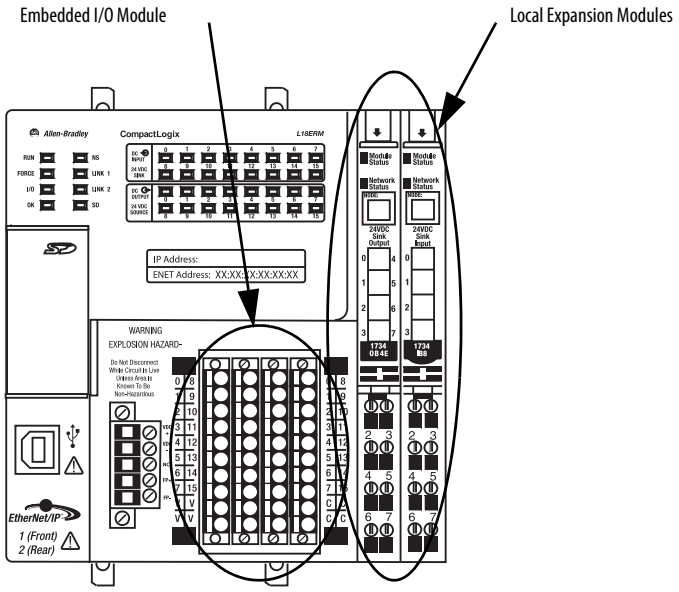
To use 1734 POINT I/O modules as local expansion modules, keep in mind the following:

- Local expansion modules must be installed in the same system as the CompactLogix 5370 L1 controller.
- The modules are installed to the right of the controller.
- The maximum number of local expansion modules available depends on the controller catalog of that system.

This table lists the number of 1734 POINT I/O modules the CompactLogix 5370 L1 controllers support. The minimum RPI of each I/O module is 1.0 ms and can be changed by 0.5 ms increments.

1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B Controllers - Local I/O Module Support

Cat. No.	Local 1734 POINT I/O Modules Supported, max
1769-L16ER-BB1B	6
1769-L18ER-BB1B	8
1769-L18ERM-BB1B	
1769-L19ER-BB1B	



You can use the maximum number of 1734 POINT I/O modules with the CompactLogix 5370 L1 controllers that are listed in the previous table. The total current that the embedded I/O and local expansion modules draw cannot exceed both the available POINTBus backplane current of 1 A and the field power current of 3 A.

Depending on the configuration of your application, you can use one of the following devices to make additional POINTBus backplane current or field power current available:

- **1734-EP24DC POINT I/O Expansion Power Supply** - An expansion power supply is installed between embedded I/O modules and local expansion modules or between local expansion modules.

  The expansion power supply breaks the available POINTBus backplane current between the modules to its left and right. With the expansion power supply installed, the modules to its left can draw up to 1 A of POINTBus backplane current. The modules to the right of the expansion power supply can draw as much current as the current provided by the expansion power supply.

  Additionally, the expansion power supply breaks the available field power current between the modules to its left and right. With the expansion power supply installed, the modules to its left can draw up to 3 A of field power current. The modules to the right of the expansion power supply can draw as much field power current as allowed by the expansion power supply.

  For more information on the 1734-EP24DC expansion power supply, see the POINT I/O 24V DC Expansion Power Supply Installation Instructions, publication 1734-IN058.

- **1734-FPD POINT I/O Field Power Distributor Module** - A field power distributor module can also be installed between embedded I/O modules and local expansion modules or between local expansion modules.

  The field power distributor module breaks the available field power current between the modules to its left and right. With the field power distributor module installed, the modules to its left can draw up 3 A of field power current. The modules to the right of the field power distributor can draw as much field power current as allowed by the field power distributor.

  For more information on the 1734-FPD POINT I/O Field Power Distributor module, see the POINT I/O Field Power Distributor Module Installation Instructions, publication 1734-IN059.

IMPORTANT Remember, the field power distributor module changes only the level of field power current available in the system. The module does not affect the level of POINTBus backplane current available.

Local I/O Performance of the CompactLogix 5371 L1 Controllers

The requested packet interval (RPI) defines the frequency at which the controller sends data to and receives data from I/O modules. You set an RPI rate for each I/O module in your system.

CompactLogix 5370 L1 controllers always attempt to scan an I/O module at the configured RPI rate. For individual I/O modules, a Module RPI Overlap minor fault occurs if there are enough I/O modules with RPI rates set too fast that they cannot all be serviced in the allotted interval.

The specific configuration parameters for a system determine the impact on actual RPI rates. These configuration factors can impact the effective scan frequency for any individual module:

- Rates at which the RPI rates of other 1734 POINT I/O module are set
- Number of other 1734 POINT I/O modules in the system
- Types of other 1734 POINT I/O modules in the system
- Application user task priorities

In general, follow these guidelines when setting the RPI rates in a CompactLogix 5370 L1 control system:

- For **digital** modules:
  - 1...2 modules can be scanned in 2 ms.
  - 3...4 modules can be scanned in 4 ms.
  - 5...8 modules can be scanned in 8 ms.

IMPORTANT When considering digital I/O modules, remember that they can be the embedded I/O module on the controller or 1734 POINT I/O modules that are used as local expansion modules. Therefore, the consideration for using two modules can be the embedded I/O module and a 1734 POINT I/O module or two 1734 POINT I/O modules.

- For **specialty and analog** modules (except 1734-485ASC modules):
  - 1 module can be scanned at 20 ms.
  - For each additional module, add 20 ms.

  For example, if a CompactLogix 5370 L1 control system uses two analog modules, the module can be scanned in 40 ms.

- For **1734-485ASC** modules, the total data size for all ASC modules determines the RPI rates:
  - For total data size less than 20 bytes, each module can be scanned in 20 ms.
  - For data size greater than 20 bytes, use the size value as the RPI.

  For example, if the total data size is 40 bytes, each ASC module can be scanned in 40 ms.

You are not required to set the RPI values of individual 1734 POINT I/O module to the values listed previously. For example, if your application scans one or two modules, you do not have to use RPI rates of 2 ms. Remember, though, that higher RPI rates result in scanning the data less frequently.

The RPI shows how quickly modules can be scanned, not how quickly an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

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Embedded DC Input Specifications

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B
Inputs	16
Voltage category	24V DC sink
Operating voltage range	10…28.8V DC 24V DC nom
Digital filter, off to on	0.5 ms hardware plus 0…65 ms (selectable)
Input delay, off to on	
Digital filter, on to off	0.5 ms hardware plus 0…65 ms (selectable)
Input delay, on to off	
Off-state voltage, max	5V DC
Off-state current, max	1 mA
On-state current, min	2 mA @ 24V DC
Input impedance, max	5.4 kΩ
Cyclic update time	1…750 ms
Isolation voltage	50V DC (continuous), Basic Insulation Type Tested at 500V AC for 60 s, system to field No isolation between individual channels
IEC input compatibility	Type 3
Isolated groups	None

Embedded DC Output Specifications

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B
Outputs	16
Voltage category	24V DC source
Operating voltage range	10…28.8V DC 24V DC nom
Output delay, off to on	0.1 ms
Output delay, on to off	0.1 ms
Off-state leakage current, max	0.5 mA @ 24V DC
On-state current, min	1 mA per channel
On-state voltage drop, max	0.6V DC
Current per point, max	0.5 A
Current per module, max	3 A
Surge current per point, max	1 A for 100 ms per point, repeatable every 2 s
Isolation voltage	50V DC (continuous), Basic Insulation Type Tested at 500V AC for 60 s, system to field No isolation between individual channels
Isolated groups	None
Pilot duty rating	0.5 A

Embedded Power Supply

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B
Input voltage range	10…28.8V DC
Input voltage, nom	24V DC
Line requirement (VDC), min	30VA

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Embedded Power Supply (continued)

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B
Available 5V DC POINTBus backplane current	1 A @ 5V DC
Current draw @ 24V DC, field power, max	3 A(1)
Inrush, max	10 A
Line loss ride through	10 ms…10 s
Output bus current capacity, max	0.1…3 A @ 5V DC
Load current, min	300 mA
Power dissipation, max	12 W
Short circuit protection	Internal fuse Not replaceable
Overvoltage protection	Yes

(1) Combined total for all devices that draw current from field power connections.

I/O Module Support - CompactLogix 5370 L2 Controllers

The CompactLogix 5370 L2 controllers offer embedded I/O modules and the option to use 1769 Compact I/O modules as local expansion modules. This table describes the embedded I/O modules and local expansion modules that the CompactLogix 5370 L2 controllers support.

Cat. No.	Embedded I/O Module Support						Local Expansion Modules Support
	Sinking/Sourcing 24V DC Digital Input Points	Sourcing 24V DC Digital Output Points	High-speed Counter Modules	High-speed Counter Module Output Points	Universal Analog Input Points	Analog Output Points	1769 Compact I/O Modules
1769-L24ER-QB1B	16	16	–	–	–	–	As many as 4 modules
1769-L24ER-QBFC1B			4	4	4	2	
1769-L27ERM-QBFC1B							

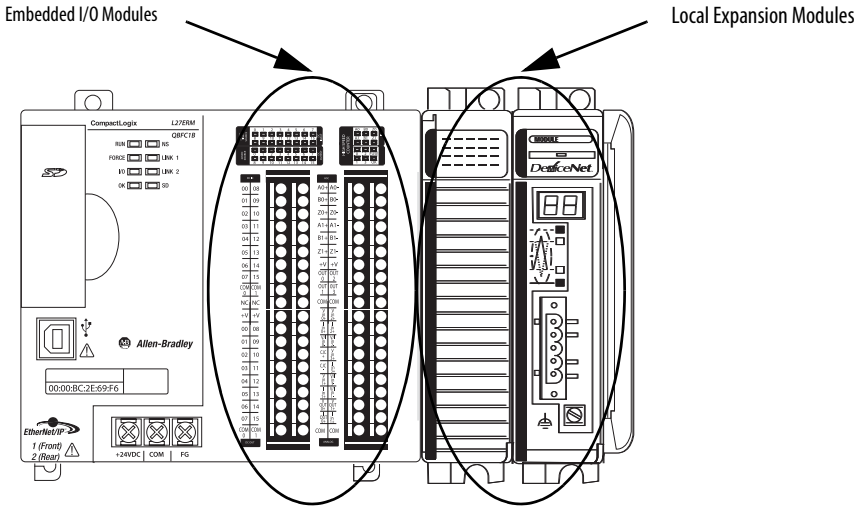
IMPORTANT Remember the following when using the embedded I/O modules on CompactLogix 5370 L2 controllers:

- 1769-L24ER-QB1B controller - The digital input points and digital output points are on one embedded I/O module. Therefore, the 1769-L24ER-QB1B controller is considered to have one embedded I/O module.
- 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B controllers - The digital input points and digital output points are on one embedded I/O module. The high-speed counter module input/output points, universal analog input points, and analog output points are on another single embedded I/O module. Therefore, the 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B controllers are considered to have two embedded I/O modules.

You configure an RPI rate for the embedded I/O modules to establish specific time intervals at which data is transmitted between the controller and the embedded I/O modules. The available RPI range of the embedded I/O modules is 0.5…750.0 ms and can be changed by 0.5 ms increments. The default setting is 20 ms.

To use 1769 Compact I/O modules as local expansion modules, keep in mind the following:

- Local expansion modules must be installed in the same system as the CompactLogix 5370 L2 controller.
- Local expansion modules are installed to the right of the embedded I/O modules.
- You must install a 1769-ECR Compact I/O end cap on the right side of control system. The end cap can be installed on the right side of the embedded I/O module. If local expansion modules are used, the end cap can be installed on the right side of 1769 Compact I/O module.



CompactLogix 5370 L2 Controller Local I/O Performance

The requested packet interval (RPI) defines the frequency at which the controller sends data to and receives data from I/O modules. You set an RPI rate for each I/O module in your system in the programming software. You also set RPI rates through the programming software for embedded I/O modules, local expansion modules, and distributed I/O modules over an EtherNet/IP network.

The CompactLogix 5370 L2 controllers always attempt to scan an I/O module at the configured RPI rate. The controller scans distributed I/O modules at the configured RPI rates.

With embedded I/O modules and local expansion modules, however, some specific system-configuration parameters determine the actual rate at which the controller scans the modules. That is, the controller can be configured to scan an I/O module at one rate, but actually scan the module at another rate.

For individual I/O modules, a Module RPI Overlap minor fault occurs if there is at least one I/O module that cannot be serviced within its RPI time.

The specific configuration parameters for a system determine the impact on actual RPI rates. These configuration factors can impact the effective scan frequency for any individual embedded or local expansion module:

- Rates at which the RPI values of the embedded I/O modules are set
- Number of embedded I/O modules that are used in the system
- Types of embedded I/O modules that are used in the system
- Rates at which RPI values for the 1769 Compact I/O module are set
- Number of 1769 Compact I/O modules in the system
- Types of 1769 Compact I/O modules in the system
- Application user task priorities

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The RPI Rate Guidelines table describes RPI rate guidelines.

RPI Rate Guidelines

Type of Module	Guidelines
Digital and analog (any mix)	The following guidelines apply: • 1…2 modules can be scanned in 0.5 ms. • 3…4 modules can be scanned in 1 ms. • 5…6 modules can be scanned in 2 ms. • Some input modules have a fixed 8 ms filter, so selecting a faster RPI has no effect.
Specialty	The following conditions apply: • For every full-sized 1769-SDN module in the system, increase the RPI of every other module by 2 ms. • For every 1769-HSC module in the system, increase the RPI of every other module by 1 ms. • For every full-sized 1769-ASCII module system, increase the RPI of every other module by 1 ms. • For every 1769-SM2 module in the system, increase the RPI of every other module by 2 ms. For example, the system includes four I/O modules that are configured with an RPI = 1 ms and you add a 1769-SDN module to the system. You must increase the RPI value for all four I/O modules by 2 ms. Therefore, when the 1769-SDN module is added to the system, the four I/O modules use an RPI = 3 ms. If, in the same system, you add a second 1769-SDN module, the RPI value of the four I/O modules is increased to 5 ms.

IMPORTANT The number of I/O modules can be the embedded I/O modules on the controller or 1769 Compact I/O modules that are used as local expansion modules.

Therefore, the consideration for using modules can be any of the following system configurations:

- Only embedded I/O modules
- Only 1769 Compact I/O modules
- Some combination of embedded I/O modules and 1769 Compact I/O modules

You can set individual RPI rates for 1769 Compact I/O modules higher than those values listed in the Embedded DC Input Specifications table. The RPI shows how quickly modules can be scanned, not how quickly an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

Embedded DC Input Specifications

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B
Inputs	16	
Voltage category	24V DC sink/source	
Operating voltage range	10…28.8V DC @ 40 °C (104 °F) 10…26.4V DC @ 60 °C (140 °F) 24V DC nom	10…28.8V DC @ 40 °C (104 °F) 10…27.0V DC @ 55 °C (131 °F) 10…26.4V DC @ 60 °C (140 °F) 24V DC nom
Digital filter, off to on	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms	
Input delay, off to on	100 µs, min 8 ms, max	
Digital filter, on to off	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms	
Input delay, on to off	100 µs, min 8 ms, max	
Off-state voltage, max	5V DC	
Off-state current, max	1.5 mA	
On-state current, min	2 mA @ 24V DC per channel	
On-state current, max	5 mA @ 24V DC per channel	
Input impedance, max	5.2 kΩ @ 24V DC 6.1 kΩ @ 30V DC	
Cyclic update time	0.5…750 ms	

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Embedded DC Input Specifications (continued)

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B
Isolation voltage	75V (continuous), Reinforced Insulation Type Type tested at 1200V AC for 1 s and at 1700V DC for 1 s; group to system, group to group	
IEC input compatibility	Type 3	
Isolated groups	Group 1: inputs 0…7 Group 2: inputs 8…15 Isolated groups operate in either sink or source configurations	

Embedded DC Output Specifications

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B
Outputs	16	
Voltage category	24V DC source	
Operating voltage range	20.4…26.4V DC 24V DC nom	
Output delay, off to on	0.05 ms	
Output delay, on to off	0.5 ms	
Off-state leakage current, max	0.1 mA @ 26.4V DC	
On-state current, max	0.5 mA @ 24V DC per channel	
On-state voltage drop, max	1.0V DC @ 1.0 A	
Current per point, max	0.83 A @ 40 °C (104 °F) 0.5 A @ 60 °C (140 °F)	0.83 A @ 40 °C (104 °F) 0.58 A @ 55 °C (131 °F) 0.5 A @ 60 °C (140 °F)
Current per module, max	6.64 A @ 40 °C (104 °F) 4.0 A @ 60 °C (140 °F)	6.64 A @ 40 °C (104 °F) 4.64 A @ 55 °C (131 °F) 4.0 A @ 60 °C (140 °F)
Surge current per point, max	2.0 A for 10 ms per point, repeatable every 2 s	
Isolation voltage	75V (continuous), Reinforced Insulation Type Type tested at 1200V AC for 1 s and at 1700V DC for 1 s; group to system, group to group	
Isolated groups	Group 1: inputs 0…7 Group 2: inputs 8…15	

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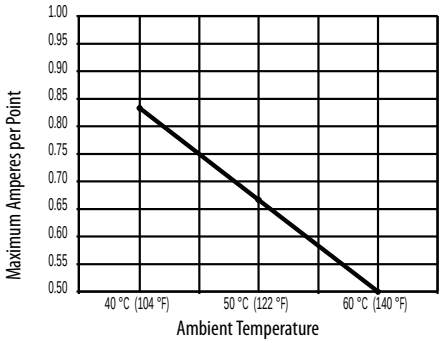
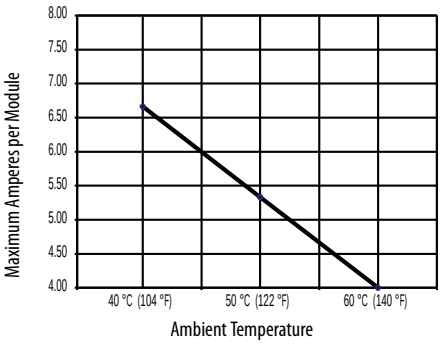
Embedded DC Output Temperature Derating

The area within the curves represents the safe operating range for the embedded DC outputs under various conditions of user-supplied voltages and ambient temperatures.

Embedded DC Outputs Maximum Amperes Per Point Versus Temperature



Embedded DC Outputs Maximum Amperes Per Module Versus Temperature



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Embedded Analog Input Specifications

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Inputs	4 channels of thermocouple/voltage/current 2 channels of RTD/Resistance inputs
Operating voltage range	2.6…30.0V DC @ 40 °C (104 °F) 2.6…26.4V DC @ 55 °C (131 °F) 2.6…5V DC @ 60 °C (140 °F)
Input types	• Thermocouple: J, K, T, E, R, S, B, N, and C • Voltage • Current • RTD: Platinum 385, Platinum 3916, Copper 426, Nickel 672, Nickel 618, Nickel-Iron 518 • Resistance
Input ranges[1]	Thermocouple: • K at 1370…1372 °C (2498…2501.6 °F) • K at -170…+1370 °C (-274…+2498 °F) • K at -200…+1370 °C (-328…+2498 °F) • S and R at 0…1768 °C (32…3214.4 °F) • S and R at -50…0 °C (-58…+32 °F) • B at 300…1820 °C (572…3308 °F) • B at 250…300 °C (482…572 °F) • J at -210…+1200 °C (-328…+2192 °F) • T at -170…+400 °C (-274…+752 °F) • T at -200…-170 °C (-328…-274 °F) • E at -200…+1000 °C (-328…+1832 °F) • N at -110…+1300 °C (-166…+2372 °F) • N at -200…-110 °C (-328…-166 °F) • C at 0…2315 °C (32…4199 °F) Voltage: • -50…+50 mV • -100…+100 mV • 0…5V • 1…5V • 0…10V • -10V…+10V Current: • 0…20 mA • 4…20 mA RTD: • 0…100 Ω Platinum 385 • 0…200 Ω Platinum 385 • 0…500 Ω Platinum 385 • 0…1000 Ω Platinum 385 • 0…100 Ω Platinum 3916 • 0…200 Ω Platinum 3916 • 0…500 Ω Platinum 3916 • 0…1000 Ω Platinum 3916 • 0…10 Ω Copper 426 • 0…120 Ω Nickel 618 • 0…120 Ω Nickel 672 • 0…604 Ω Nickel-Iron 518 Resistance: • 0…150 Ω • 0…500 Ω • 0…1000 Ω • 0…3000 Ω
Resolution, max	15 bits plus sign (Bipolar) 16 bits (Unipolar)
Input impedance	Voltage: 10 MΩ Current: 250 Ω
Converter type	Sigma-Delta
Cyclic update time	11…5000 ms dependent on user configuration
Rated working voltage	30V AC/30V DC
Common mode voltage	±10V DC per channel
Common mode rejection ratio, min	115 dB at 50 Hz at 10V 115 dB at 60 Hz at 10V
Normal mode rejection ratio, min	85 dB at 50 Hz at 1.5V 85 dB at 60 Hz at 1.5V

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Embedded Analog Input Specifications (continued)

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Accuracy, overall at 25 °C (77 °F)[2]	Thermocouple types: • J at -210…+1200 °C (-328…+2192 °F): ±0.6 °C (1.1 °F) • N at -110…+1300 °C (-166…+2372 °F): ±1.0 °C (1.8 °F) • N at -200…-110 °C (-328…-166 °F): ±1.0 °C (1.8 °F) • T at -170…+400 °C (-274…+752 °F): ±1.0 °C (1.8 °F) • T at -200…-170 °C (-328…-274 °F): ±1.0 °C (1.8 °F) • K at 1370…1372 °C (2498…2501.6 °F): ±1.2 °C (2.2 °F) • K at -200…+1370 °C (-328…+2498 °F): ±1.0 °C (1.8 °F) • E at -200…+1000 °C (-328…+1832 °F): ±0.5 °C (0.9 °F) • S and R at 0…1768 °C (32…3214.4 °F): ±1.7 °C (3.1 °F) • S and R at -50…0 °C (-58…+32 °F): ±4.0 °C (7.2 °F) • B at 300…1820 °C (572…3308 °F): ±3.0 °C (5.4 °F) • B at 250…300 °C (482…572 °F): ±6.0 °C (10.8 °F) • C at 0…2315 °C (32…4199 °F): ±1.8 °C (3.2 °F) Voltage inputs: • ±50 mV: +15 µV • ±100 mV: ±20 µV • 0…5V: ±2.5 mV • 1…5V: ±2 mV • 0…10V: ±5 mV • ±10V: ±10 mV Current inputs: • 0…20 mA: ±20 µA • 4…20 mA: ±16 µA RTD types: • Platinum 385: ±0.5 °C (0.9 °F) • Platinum 3916: ±0.4 °C (0.7 °F) • Nickel: ±0.2 °C (0.4 °F) • Nickel-Iron: ±0.3 °C (0.5 °F) • Copper: ±0.6 °C (1.1 °F) Resistance types: • 0…150 Ω: ±0.15 Ω • 0…500 Ω: ±0.5 Ω • 0…1000 Ω: ±1.0 Ω • 0…3000 Ω: ±1.5 Ω
Accuracy, overall at 0…60 °C (32…140 °F)[2]	Thermocouple types: • J at -210…+1200 °C (-328…+2192 °F): ±0.9 °C (1.6 °F) • N at -110…+1300 °C (-166…+2372 °F): ±1.5 °C (2.7 °F) • N at -200…-110 °C (-328…-166 °F): ±1.5 °C (2.7 °F) • T at -170…+400 °C (-274…+752 °F): ±1.5 °C (2.7 °F) • T at -200…-170 °C (-328…-274 °F): ±1.5 °C (2.7 °F) • K at 1370…1372 °C (2498…2501.6 °F): ±1.8 °C (3.2 °F) • K at -200…+1370 °C (-328…+2498 °F): ±1.5 °C (2.7 °F) • E at -200…+1000 °C (-328…+1832 °F): ±0.8 °C (1.4 °F) • S and R at 0…1768 °C (32…3214.4 °F): ±3.5 °C (6.3 °F) • S and R at -50…0 °C (-58…+32 °F): ±4.0 °C (7.2 °F) • B at 300…1820 °C (572…3308 °F): ±4.5 °C (8.1 °F) • B at 250…300 °C (482…572 °F): ±9.0 °C (16.2 °F) • C at 0…2315 °C (32…4199 °F): ±3.5 °C (6.3 °F) Voltage inputs: • ±50 mV: ±25 µV • ±100 mV: ±30 µV • 0…5V: ±5 mV • 1…5V: ±4 mV • 0…10V: ±10 mV • ±10V: ±20 mV Current inputs: • 0…20 mA: ±50 µA • 4…20 mA: ±40 µA RTD types: • Platinum 385: ±0.9 °C (1.6 °F) • Platinum 3916: ±0.8 °C (1.4 °F) • Nickel: ±0.4 °C (0.7 °F) • Nickel-Iron: ±0.5 °C (0.9 °F) • Copper: ±1.1 °C (2.0 °F) Resistance types:[2] • 0…150 Ω: ±0.25 Ω • 0…500 Ω: ±0.8 Ω • 0…1000 Ω: ±1.5 Ω • 0…3000 Ω: ±2.5 Ω

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Embedded Analog Input Specifications (continued)

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Cold junction compensation accuracy at 0…60 °C (32…140 °F)[2]	±1.3 °C (34.34 °F)
Calibration	Cyclic calibration by user configuration
Non-linearity (in percent full scale)	±0.05%
Repeatability at 25 °C (77 °F) with 10 Hz filter	Thermocouple types: • J at -210…+1200 °C (-328…+2192 °F): ±0.1 °C (0.2 °F) • N at -110…+1300 °C (-166…+2372 °F): ±0.1 °C (0.2 °F) • N at -200…-110 °C (-328…-166 °F): ±0.25 °C (0.5 °F) • T at -170…+400 °C (-274…+752 °F): ±0.1 °C (0.2 °F) • T at -200…-170 °C (-328…-274 °F): ±1.5 °C (2.7 °F) • K at 1370…1372 °C (2498…2501.6 °F): ±0.15 °C (0.3 °F) • K at -170…+1370 °C (-274…+2498 °F): ±0.1° (0.2 °F) • K at -200…-170 °C (-328…-274 °F): ±2.0 °C (3.6 °F) • E at -200…+1000 °C (-328…+1832 °F): ±0.1° (0.2 °F) • S and R at 0…1768 °C (32…3214.4 °F): ±0.4 °C (0.7 °F) • S and R at -50…0 °C (-58…+32 °F): ±1.0 °C (1.8 °F) • B at 300…1820 °C (572…3308 °F): ±0.7 °C (1.3 °F) • B at 250…300 °C (482…572 °F): ±1.5 °C (2.7 °F) • C at 0…2315 °C (32…4199 °F): ±0.2 °C (0.4 °F) Voltage inputs: • ±50 mV: ±6 µA • ±100 mV: ±6 µV • 0…5V: ±150 mV • 1…5V: ±150 mV • 0…10V: ±150 mV • ±10V: ±150 mV Current inputs: • 0…20 mA: ±0.3 µA • 4…20 mA: ±0.3 µA RTD types: • Platinum 385: ±0.2 °C (0.4 °F) • Platinum 3916: ±0.2 °C (0.4 °F) • Nickel: ±0.01 °C (0.02 °F) • Nickel-Iron: ±0.01 °C (0.02 °F) • Copper: ±0.2 °C (0.4 °F) Resistance types: • 0…150 Ω: ±0.04 Ω • 0…500 Ω: ±0.2 Ω • 0…1000 Ω: ±0.2 Ω • 0…3000 Ω: ±0.2 Ω
Overload at input terminals, max	Voltage: ±35V DC continuous Current: 32 mA continuous, ±7.6V DC
Channel diagnostics	Invalid configuration, Over-, or underrange by bit reporting, open circuit
Isolation voltage	30V AC/30V DC (continuous), reinforced insulation type Type tested at 720V DC for 60 s; inputs to system backplane

(1) Values for these input types rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).
(2) These specification values are based on cyclic calibration and connecting a 4-wire device to the module.

Embedded Analog Output Specifications

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Outputs	2 single-ended
Output types	• Voltage • Current
Output ranges[1]	Voltage: • 0…5V • 1…5V • 0…10V • -10V…+10V Current: • 0…20 mA • 4…20 mA
Converter type	R-2R Ladder Voltage Switching
Resolution, max	15 bits plus sign (Bipolar) 16 bits (Unipolar)

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Embedded Analog Output Specifications (continued)

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Cyclic update time, nom	2.5 ms
Cyclic update time, max	9.5 ms
Current load on voltage output	10 mA max
Resistive load on current output	0…300 Ω
Load range on voltage output	> 1 kΩ at 10V DC
Inductive load, max (current outputs)	0.1 mH
Capacitive load, max (Voltage Outputs)	1 µF
Accuracy, overall at 25 °C (77 °F)	Voltage: ±0.5% full scale Current: ±0.5% full scale
Accuracy, overall at 0…60 °C (32…140 °F)	Voltage: ±0.8% full scale Current: ±0.8% full scale
Accuracy drift with temperature	Voltage: ±0.0086% full scale per °C Current: ±0.0086% full scale per °C
Output ripple range 0…50 kHz (referred to output range)	±0.05%
Non-linearity	±0.05% (in percent full scale)
Repeatability	± 0.05%
Output impedance	Voltage: <1 Ω Current: >1 MΩ
Short circuit protection	Yes
Short circuit, nom	Current: 16 mA
Open circuit, max	16V
Output response at system powerup and powerdown	Current: ± 1.0V spike for < 5 ms Voltage: ± 1.0V DC spike < 5 ms
Isolation voltage	30V AC/30V DC (continuous), reinforced insulation type Type tested at 500V AC or 710V DC for 60 s; outputs to system backplane

(1) Values for these input types rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).

Analog Input Ranges

Input Type Normal Op. Range	Full Range[1]	Raw/Prop. Data Units for Full Range	Eng. Unit Values for Full Range x 1		Eng. Unit Values for Full Range x 10		Scaled-for-PID Values for Normal Operating Range	Scaled-for-PID Values for Full Range	Percent of Normal Op. Range Values	Percent of Full Range Values
			°C	°F	°C	°F				
-10… +10V DC	-10.5V… +10.5V	-32767… +32767	-10500…+10500		-1050…+1050		0…16,383	-410…+16793	-10000… +10000	-10500… +10500
0…5V DC	-0.5V… +5.25V		-500…+5250		-50…+525			-1638… +17202	0…10000	-1000… +10500
0…10V DC	-0.5V… +10.5V		-500…+10500		-50…+1050			-819… +17202		-500… +10500
4…20 mA	3.2…21 mA		3200…21000		320…2100			-819… +17407		-500… +10625

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Analog Input Ranges (continued)

Input Type Normal Op. Range	Full Range[1]	Raw/Prop. Data Units for Full Range	Eng. Unit Values for Full Range x 1		Eng. Unit Values for Full Range x 10		Scaled-for-PID Values for Normal Operating Range	Scaled-for-PID Values for Full Range	Percent of Normal Op. Range Values	Percent of Full Range Values
			°C	°F	°C	°F				
1…5V DC	0.5V…5.25V	-32767… +32767	500…5250		50…525		0…16,383	-2048… +17407	0…10000	-1250… +10625
0…20 mA	0…21 mA		0…21000		0…2100			0…17202		0…10500
J (-210…+1200)			-2100… +12000	-3460… +21920	-210…+1200	-346…+2192		0…16,383		0…10000
K (-200…+1372)			-2000… +13720	-3280… +25020	-200…+1372	-328…+2502				
T (-200…+400)			-2000… +4000	-3280…+7520	-200…+400	-328…+752				
E (-200…+1000)			-2000… +10000	-3280… +18320	-200…+1000	-328…+1832				
R (-50…+1768)			-500… +17680	-580…+32140	-50…+1768	-58…+3214				
S (-50…+1768)			-500… +17680	-580…+32140	-50…+1768	-58 …+3214				
B (250…1820)			2500…18200	4820… +32767	250…1820	482…3308				
N (-200…+1300)			-2000… +13000	-3280… +23720	-200…+1300	-328…+2372				
C (0…2315)			0…23150	320…32767	0…2315	32…4199				
-50…+50 mV			-5000…+5000		-500…+500					
-100…+100 mV			-10000…+10000		-1000…+1000					
0…150 Ω			0…15000		0…1500					
0…500 Ω			0…5000		0…500					
0…1000 Ω			0…10000		0…1000					
0…3000 Ω			0…30000		0…3000					
Platinum 385 (-200…+850)			-2000…+8500	-3280… +15620	-200…+850	-328…+1562				
Platinum 3916 (-200…+510)			-2000…+5100	-3280…+9500	-200…+510	-328…+950				
Copper 426 (-70…+150)			-700…+1500	-940…+3020	-70…+1500	-94…+302				
Nickel 618 (-60…+250)			-600…+2500	-760…+4820	-60…+250	-76…+482				
Nickel 672 (-80…+260)			-800…+2600	-1120…+5000	-80…+260	-112…+500				
Nickel-Iron 518 (-100…+200)			-1000…+2000	-1480…+3920	-100…+200	-148…+392				

(1) Includes amount over and under normal operating.

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Embedded Analog Output Module Data(1)

Analog Output Module Range	Input Value	Example Data		Output Range State	Raw/Proportional Data		Engineering Unit		Scaled-for-PID		Percent Full Range	
		Controller Ordered	Embedded Analog Module Output		Decimal Range		Decimal Range		Decimal Range		Decimal Range	
					Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output
±10V	Over 10.5V	+11.0V	+10.5V	Over	–	–	11000	–	17202	–	11000	–
	+10.5V	+10.5V	+10.5V	Over	32767	32767	10500	10500	16793	16793	10500	10500
	±10V	+10.0V	+10.0V	Normal	31207	31207	10000	10000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	8192	8192	0	0
		-10.0V	-10.0V	Normal	-31207	-31207	-10000	-10000	0	0	-10000	-10000
	-10.5V	-10.5V	-10.5V	Under	-32767	-32767	-10500	-10500	-410	-410	-10500	-10500
	Under 10.5V	-11.0V	-10.5V	Under	–	–	-11000	-10500	-819	-410	-11000	-10500
0…5V	Over 5.25V	5.5V	+5.25V	Over	–	–	5500	5250	18021	17202	11000	10500
	5.25V	5.25V	+5.25V	Over	32767	32767	5250	5250	17202	17202	10500	10500
	0…5.0V	5.0V	+5.0V	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	0	0	0	0
	-0.5V	-0.5V	-0.5V	Under	-3121	-3121	-500	-500	-1638	-1638	-1000	-1000
	Under -0.5V	-1.0V	-0.5V	Under	-6241	-3121	-500	-500	-3277	-1638	-2000	-1000
0…10V	Over 10.5V	11.0V	+10.5V	Over	–	–	11000	10500	18021	17202	11000	10500
	+10.5V	+10.5V	+10.5V	Over	32767	32767	10500	10500	17202	17202	10500	10500
	0…10.0V	+10.0V	+10.0V	Normal	31207	31207	10000	10000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	0	0	0	0
	-0.5V	-0.5V	-0.5V	Under	-1560	-1560	-500	-500	-819	-819	-500	-500
	Under -5.0V	-1.0V	-0.5V	Under	-3121	-1560	-1000	-500	-1638	-819	-1000	-500
4…20 mA	Over 21.0 mA	+22.0 mA	21 mA	Over	–	–	22000	21000	18431	17407	11250	10625
	21.0 mA	+21.0 mA	21 mA	Over	32767	32767	21000	21000	17407	17407	10625	10625
	4…20.0 mA	+20.0 mA	20 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		+4.0 mA	+4.0 mA	Normal	6241	6241	4000	4000	0	0	0	0
	3.2 mA	+3.2 mA	+3.2 mA	Under	4993	4993	3200	3200	-819	-819	-500	-500
	Under 3.2	0.0 mA	+3.2 mA	Under	0	4993	0	3200	-4096	-819	-2500	-500
1…5V	Over 5.25V	+5.5V	+5.25V	Over	–	–	5500	5250	18431	17407	11250	10625
	+5.25V	+5.25V	+5.25V	Over	32767	32767	5250	5250	17407	17407	10625	10625
	1…5.0V	+5.0V	+5.0V	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		+1.0V	+1.0V	Normal	6241	6241	1000	1000	0	0	0	0
	0.5V	+0.5V	+0.5V	Under	3121	3121	500	500	-2048	-2048	-1250	-1250
	Under 0.5V	0.0V	0.0V	Under	0	3121	0	500	-4096	-2048	-2500	-1250
0…20 mA	Over 21.0 mA	+22.0 mA	21 mA	Over	–	–	22000	21000	18201	17202	11000	10500
	21.0 mA	21.0 mA	21 mA	Over	32767	32767	21000	21000	17202	17202	10500	10500
	0…20.0 mA	20.0 mA	20 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		0.0 mA	0.0 mA	Normal	0	0	0	0	0	0	0	0
	Under 0.0 mA	-1.0 mA	0.0 mA	Under	-1560	0	0	-1000	-819	0	-500	0

(1) If Clamping is enabled, the output value is the clamped value that is defined in the configuration.

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded HSC Module Input Specifications

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Input frequency, max	250 kHz
Input current, max	15 mA per channel
Input current, min	6.8 mA
Input voltage range	2.6…30V DC(1)
On-state voltage, max	30V DC
On-state current, min	6.8 mA
Off-state voltage, max	1.0V DC
Off-state current, max	1.5 mA
Off-state leakage current, max	1.5 mA
Input impedance, nom	1950 Ω
Pulse width, min	2.5 µs
Phase separation, min	1.3 µs
Isolation voltage	75V (continuous), reinforced insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input

(1) See Maximum Input Voltage - 24V DC Operation temperature derating.

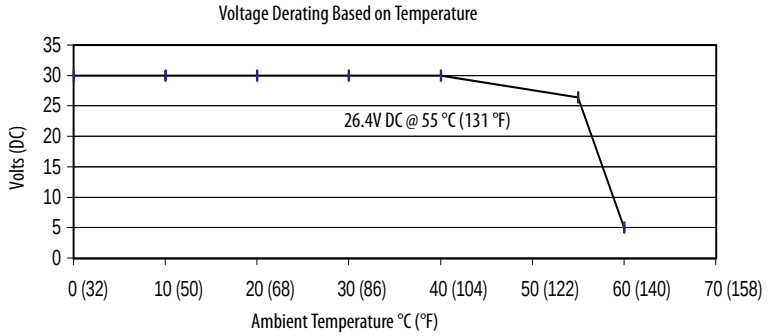
Embedded HSC Module Output Specifications

Attribute	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Output voltage range	5…30V DC
On-state voltage, max	User power - 0.1V DC
On-state output current, max	0.25 A per channel
On-state output current, min	1 mA
On-state voltage drop, max	0.5V DC
Off-state leakage current, max	5 µA
Turn-on time, max	400 µs
Turn-off time, max	200 µs
Reverse polarity protection	30V DC
Isolation voltage	75V (continuous), reinforced insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input
Current per channel, max	1.0 A @ 40 °C (104 °F) 0.5 A @ 55 °C (131 °F) 0.25 A @ 60 °C (140 °F)
Current per module, max	4.0 A @ 40 °C (104 °F) 2.0 A @ 55 °C (131 °F) 1.0 A @ 60 °C (140 °F)

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded HSC Module Temperature Derating

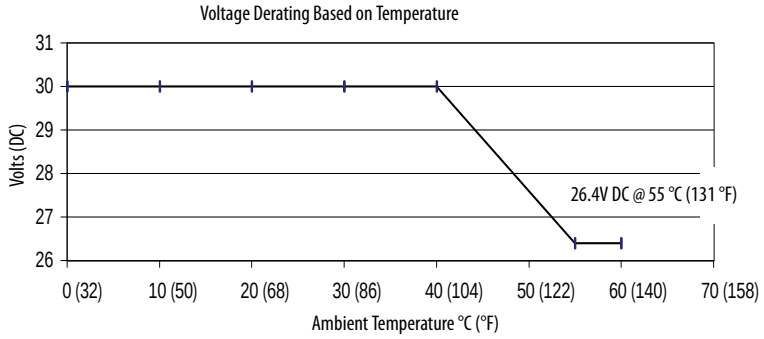
Maximum Input Voltage - 24V DC Operation



Temperature	Derated Voltage(1)
40 °C (104 °F)	30V DC
55 °C (131 °F)	26.4V DC
60 °C (140 °F)	5V DC

(1) You achieve input voltage derating 55...60 °C (131…140 °F) by using a dropping resistor.
For 24V DC input voltage, use a 2.4 kΩ, 1/2 W resistor.
For input voltages other than 24V DC, use a 1/2 W resistor with value: 125 x (V_{in} - 5V).

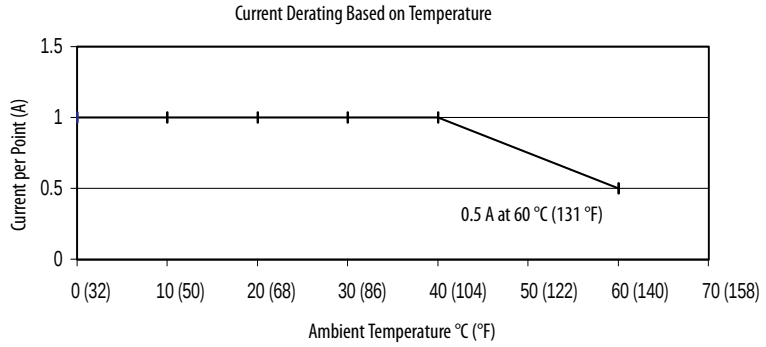
Maximum Output Voltage - 24V DC Operation



Temperature	Derated Voltage
40 °C (104 °F)	30V DC
55…60 °C (131…140 °F)	26.4V DC

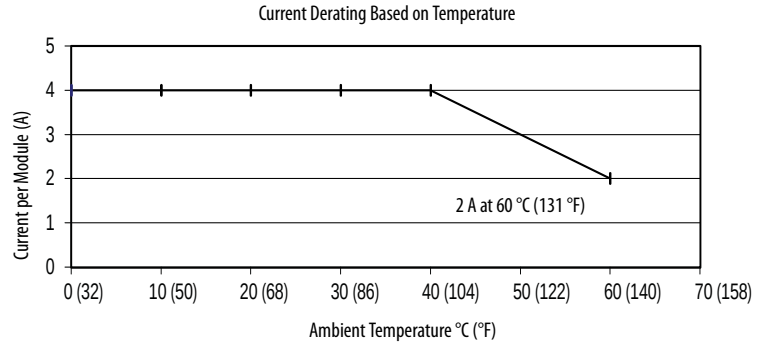
ALLEN BRADLEY 1769 COMPACTLOGIX

Maximum Output Current Per Point - 5V DC Operation



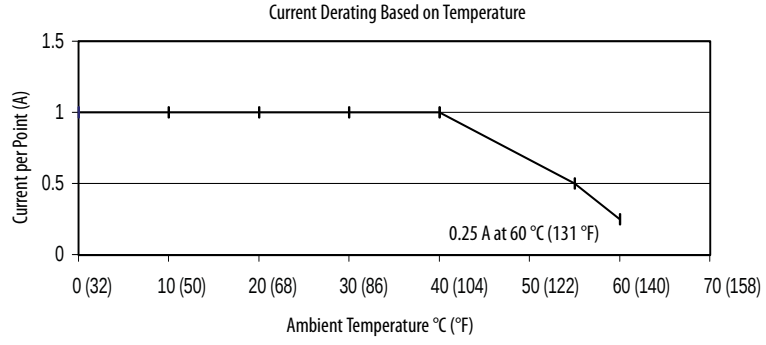
Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
60 °C (140 °F)	0.5 A

Maximum Output Current Per Module - 5V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	4 A
60 °C (140 °F)	2 A

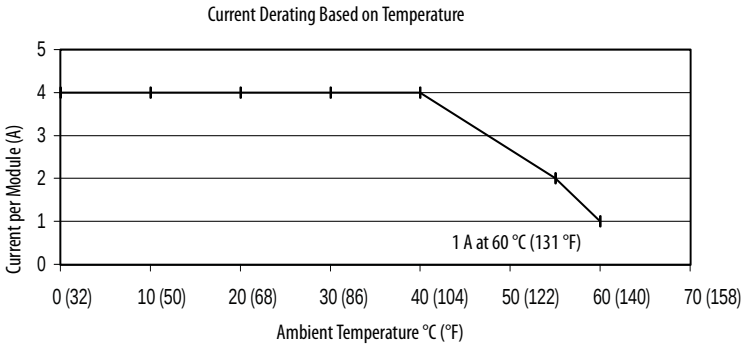
Maximum Output Current Per Point - 24V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
55 °C (131 °F)	0.5 A
60 °C (140 °F)	0.25 A

ALLEN BRADLEY 1769 COMPACTLOGIX

Maximum Output Current Per Module - 24V DC Operation



Temperature	Derated Current
40 °C (104 °F)	4 A
55 °C (131 °F)	2 A
60 °C (140 °F)	1 A

Embedded Power Supply

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK,1769-L27ERM-QBFC1B
Input voltage range	19.2…31.2V DC	
Input voltage, nom	24V DC	
Line requirement, max(1)	2.1 A @ 24V DC, Class 2/SELV	
Available 5V DC bus current	1.54 A	1.0 A
Available 24V DC bus current	0.95 A	0.8 A
Inrush, max	< 30 A @ 19.2…31.2V DC	
Line loss ride through	10 ms…10 s	
Short circuit protection	Internal fuse Not replaceable	
Overvoltage protection	Yes	
Isolation voltage	30V AC/30V DC (continuous), reinforced insulation type Type tested at 500V AC or 710V DC for 60 s; outputs to system backplane	

(1) Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).

ALLEN BRADLEY 1769 COMPACTLOGIX

I/O Module Support - CompactLogix 5370 L3 and Compact GuardLogix 5370 Controllers

The CompactLogix 5370 L3 controllers offer local expansion modules that are installed across up to three banks of modules. You must use 1769 Compact I/O modules with these controllers.

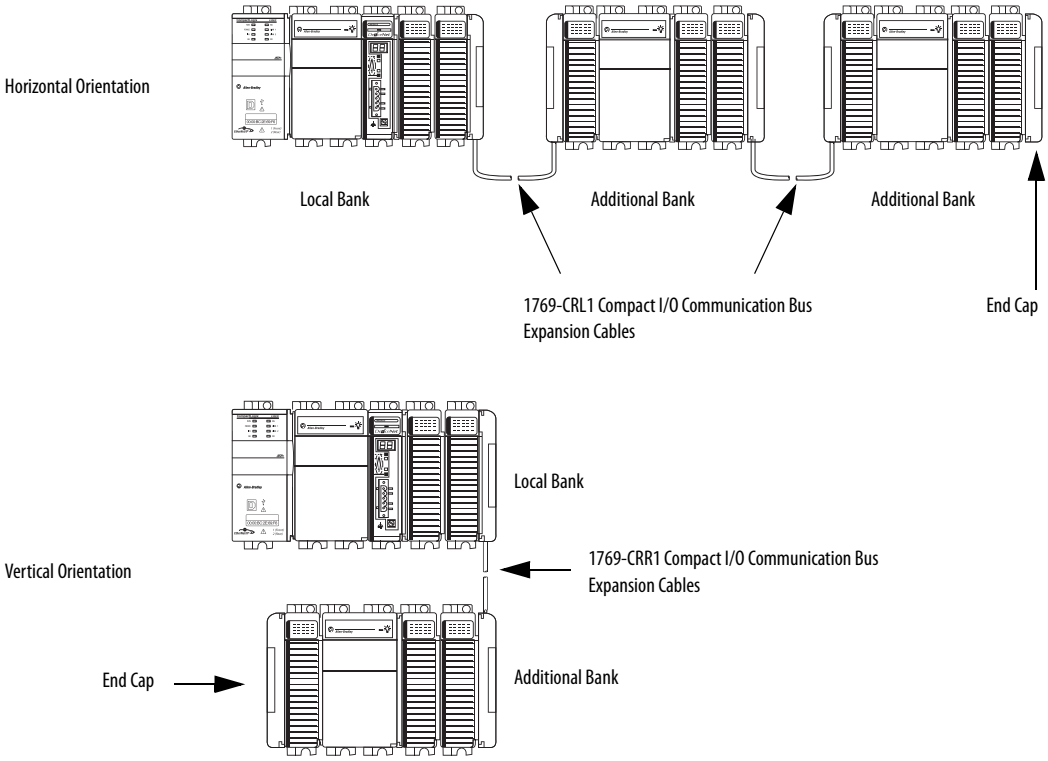
Remember the following when using I/O modules with the CompactLogix 5370 L3 and Compact GuardLogix 5370 controllers:

- The controller must be the leftmost module in the local bank of the system.
- The number of I/O modules that are supported in a controller system varies by controller catalog number.

Cat. No.	Local 1769 Compact I/O Modules Supported, max
1769- L30ER 1769-L30ERM 1769-L30ERMS 1769-L30ER-NSE	8
1769-L33ER 1769-L33ERM 1769-L33ERMS	16
1769-L36ERM 1769-L36ERMS 1769-L37ERM 1768-L37ERMS 1769-L37ERMK 1768-L37ERMSK 1769-L38ERM 1769-L38ERMS 1769-L38ERMK 1769-L38ERMSK	30

- You can install I/O modules in as many as three banks, that is, the local bank and two additional banks.
- You can install as many as three I/O modules between the controller and power supply.
- You can install as many as eight I/O modules to the right of the power supply in the local bank.
- You can install as many as eight I/O modules on both the left and right sides of the power supply in additional banks.
- You must consider the distance rating and current draw of the controller and all I/O modules when designing your system.
- Systems with multiple banks can be installed vertically or horizontally.
- You must use expansion cables to connect banks in multi-bank systems.

- You must terminate the end of the last bank in a system.



Local I/O Performance of CompactLogix 5370 L3 Controllers

The requested packet interval (RPI) defines the frequency at which the controller sends data to and receives data from I/O modules. In the programming software, you set an RPI rate for each I/O module in your system.

The CompactLogix 5370 L3 controllers always attempt to scan an I/O module at the configured RPI rate. An I/O Task Overlap minor fault occurs if there is not enough system bandwidth. This fault occurs if other, higher priority tasks prevent the 1769 Compact I/O subsystem from completing before the next scheduled time for it to run again, which consumes system bandwidth. Higher priority tasks that prevent the 1769 Compact I/O subsystem task from completing before the next scheduled time for it to run again use up system bandwidth.

For individual I/O modules, a Module RPI Overlap minor fault occurs if there is at least one I/O module that cannot be serviced within its RPI time.

The specific configuration parameters for a system determine the impact on actual RPI rates. These configuration factors can impact the effective scan frequency for any individual module:

- Rates at which the RPI rates of other 1769 Compact I/O are set
- Number of other 1769 Compact I/O modules in the system
- Types of other 1769 Compact I/O modules in the system
- Application user task priorities

ALLEN BRADLEY 1769 COMPACTLOGIX

RPI Rate Guidelines

Type of Module	Guidelines
1769 Compact I/O digital and analog (any mix) modules	The following guidelines apply: • 1…2 modules can be scanned in 0.5 ms. • 3…4 modules can be scanned in 1 ms. • 5…30 modules can be scanned in 2 ms. • Some input modules have a fixed 8 ms filter, so selecting a faster RPI has no effect.
1769 Compact I/O specialty modules	The following conditions apply: • For every full-sized 1769-SDN module in the system, increase the RPI of every other module by 2 ms. • For every 1769-HSC module in the system, increase the RPI of every other module by 1 ms. • For every full-sized 1769-ASCII module system, increase the RPI of every other module by 1 ms. For every 1769-SM2 module in the system, increase the RPI of other module by 2 ms. For example, the system includes four I/O modules that are configured with an RPI = 1 ms and you add a 1769-SDN module to the system. You must increase the RPI value for all four I/O modules by 2 ms. Therefore, when the 1769-SDN module is added to the system, the four I/O modules use an RPI = 3 ms. If, in the same system, you add a second 1769-SDN module, the RPI value of the four digital I/O modules is increased to 5 ms.

You can set individual RPI values of 1769 Compact I/O module higher than those values listed in the RPI Rate Guidelines table. For example, if your application scans one or two modules, you do not have to use RPI values = 0.5 ms. You can set the RPI to a higher value, such as 1.0 ms, if necessary. Remember, higher RPI values result in scanning the data less frequently.

The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

Certifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

Certification[1]	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.			
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)			European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) • EN 60204-1; Electrical equipment of machines • EN ISO 13849-1; Safety-related parts of control systems • EN 62061; Functional safety of safety-related control systems European Union 2011/65/EU RoHS, compliant with: EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions			
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements • II 3 G Ex nA IIC T4 Gc • ITS12ATEX47611X	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements • II 3 G Ex nA IIC T4 Gc • DEMKO12ATEX 1116807X	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements • II 3 G Ex nA IIC T5 Gc X • ITS09ATEX46118X	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements • II 3 G Ex nA IIC T5 Gc • DEMKO 15ATEX1388X
TÜV	—			TÜV Certified for Functional Safety Capable of SIL 3

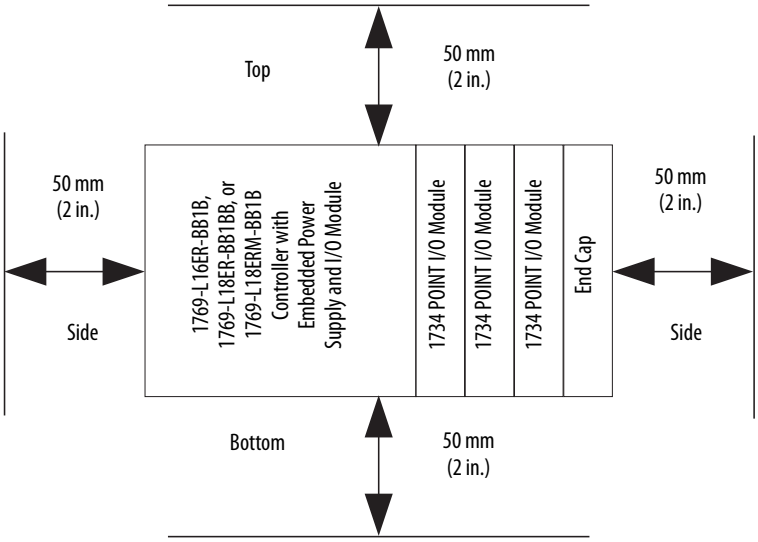
ALLEN BRADLEY 1769 COMPACTLOGIX

Certifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

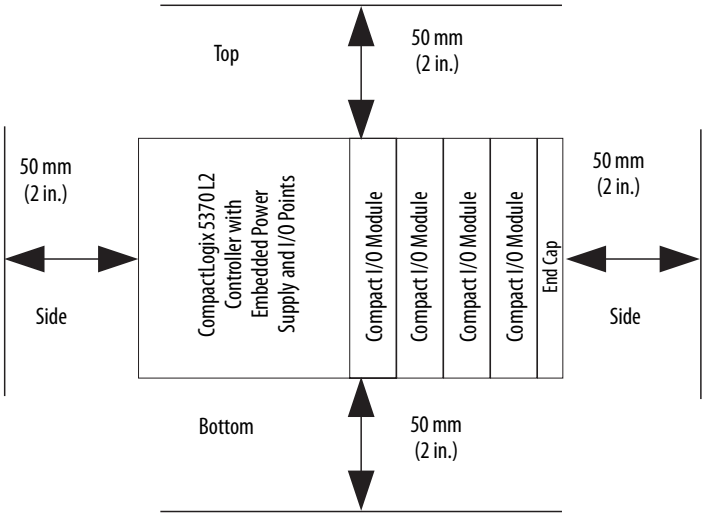
Certification[1]	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L24ER-QBFC1BK, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMK, 1769-L33ER, 1769-L33ERM, 1769-L33ERMK, 1769-L36ERM, 1769-L37ERM, 1769-L37ERMK, 1769-L38ERM, 1769-L38ERMK	1769-L30ERMS, 1769-L33ERMS, 1769-L33ERMSK, 1769-L36ERMS, 1769-L37ERMS, 1769-L37ERMSK, 1769-L38ERMS, 1769-L38ERMSK
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3			
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation			
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications.			

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

CompactLogix 5370 L1 Controllers Minimum Spacing Requirements

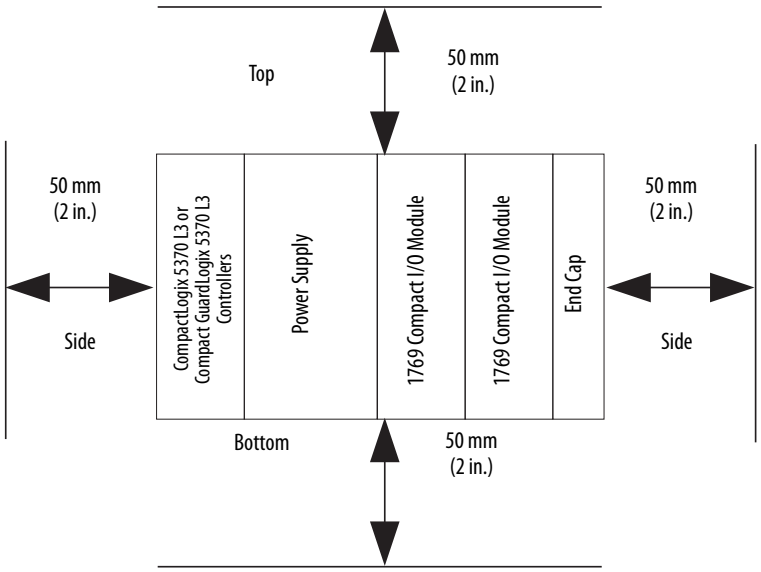


CompactLogix 5370 L2 Controllers Minimum Spacing Requirements

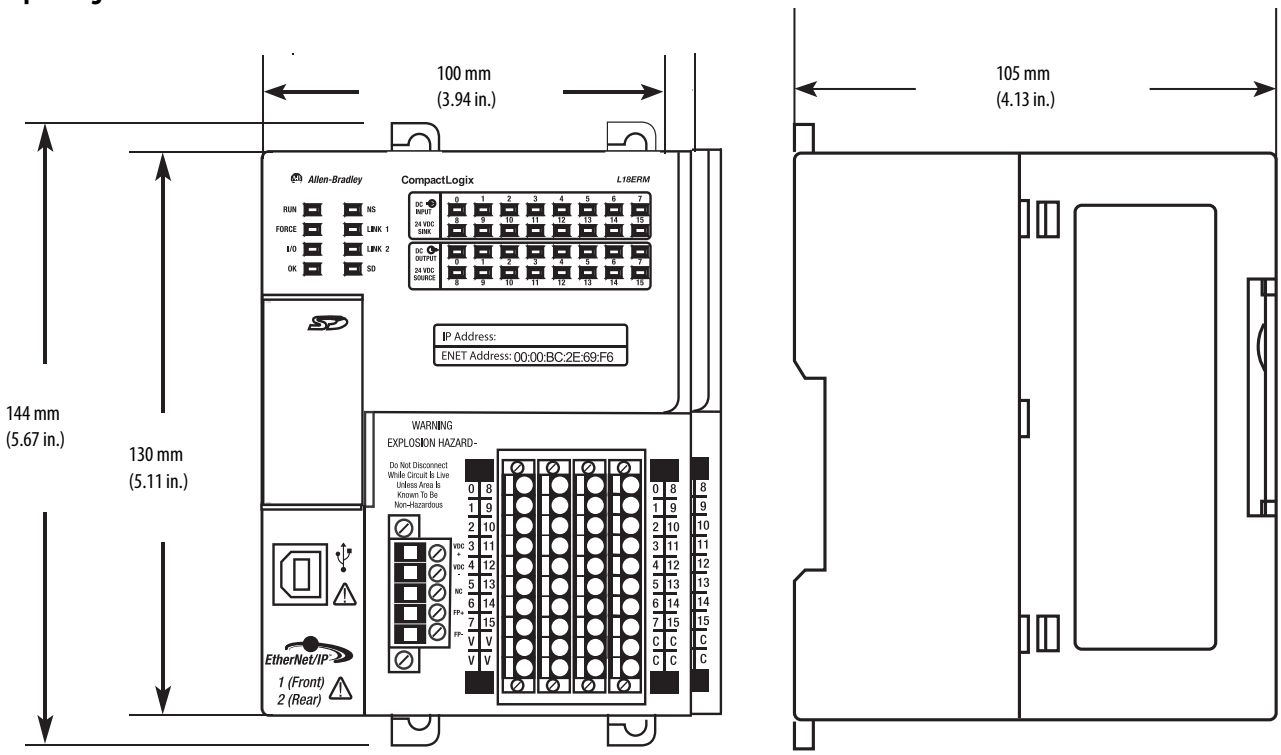


ALLEN BRADLEY 1769 COMPACTLOGIX

CompactLogix 5370 L3 and Compact GuardLogix 5370 Controllers Minimum Spacing Requirements



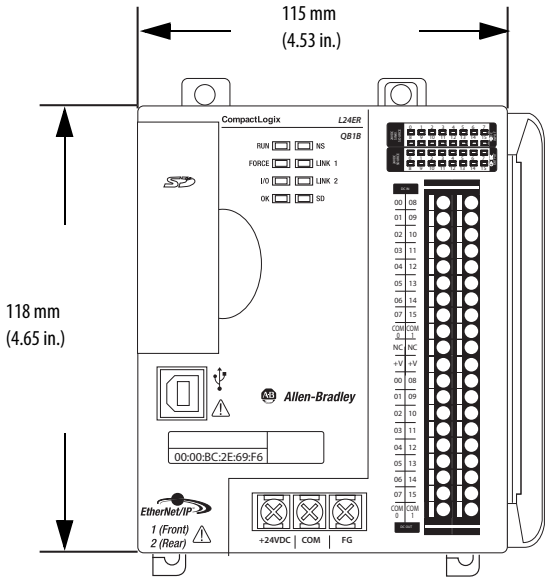
CompactLogix 5370 L1 Controllers Dimensions

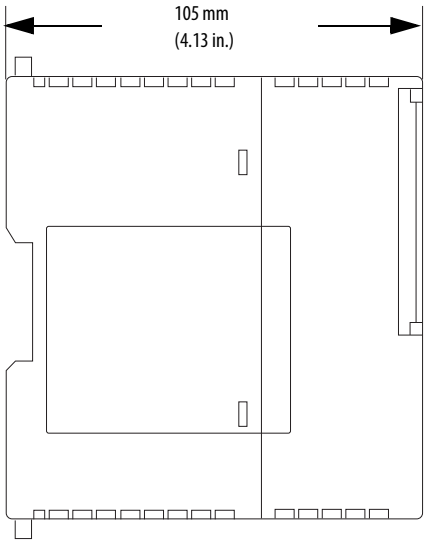


ALLEN BRADLEY 1769 COMPACTLOGIX

CompactLogix 5370 L2 Controllers Dimensions

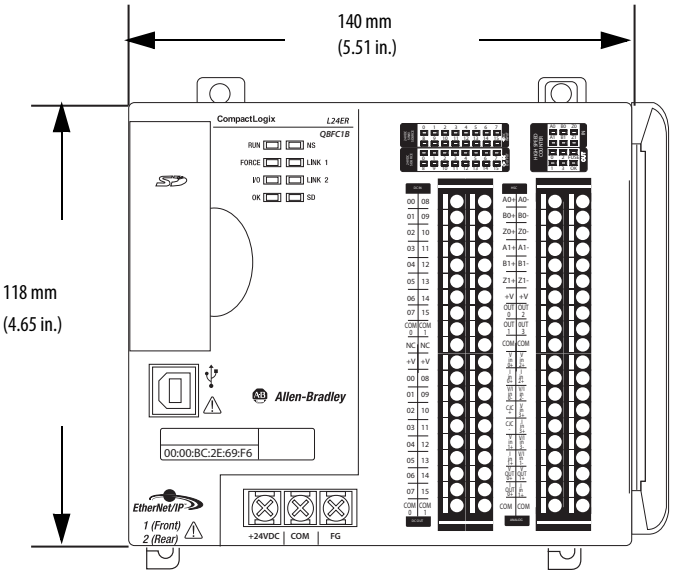
1769-L24ER-QB1B





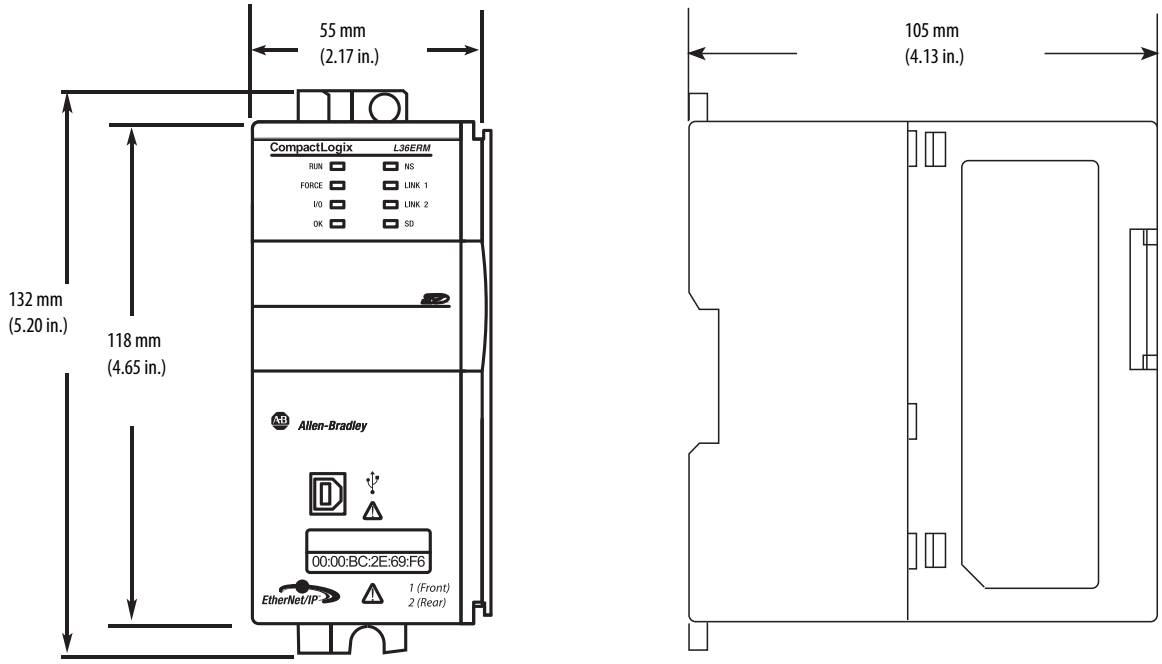
1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B

(Dimensions are the same on both controller catalog numbers.)

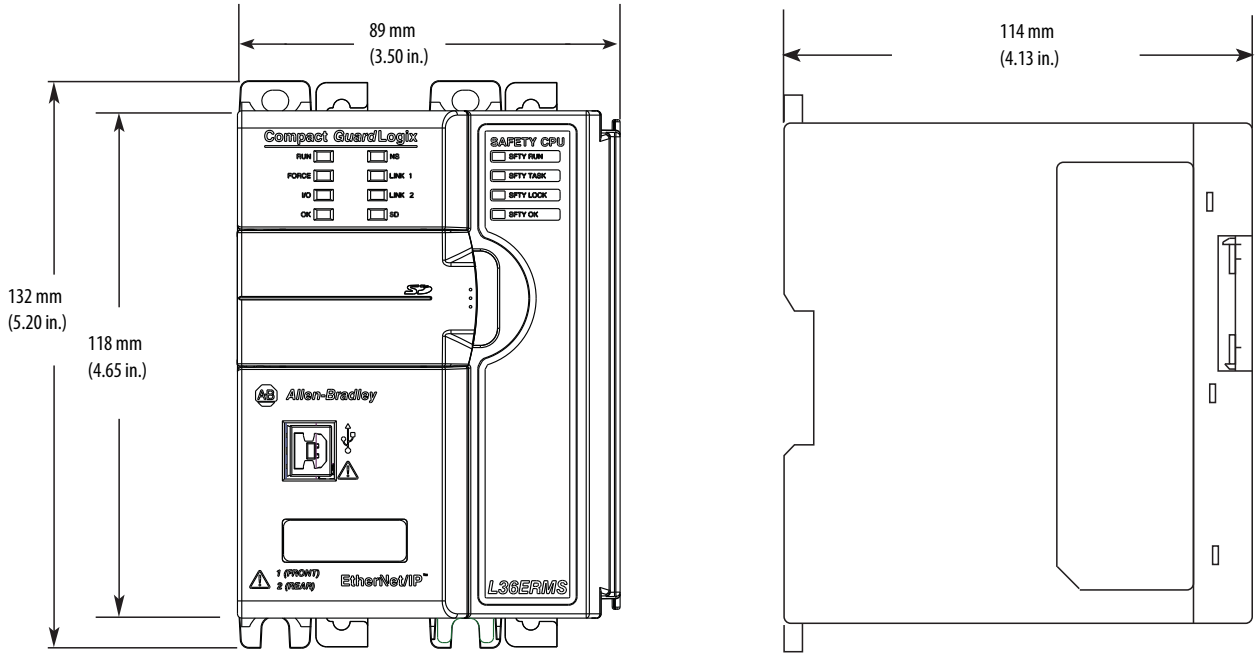


ALLEN BRADLEY 1769 COMPACTLOGIX

CompactLogix 5370 L3 Controllers Dimensions

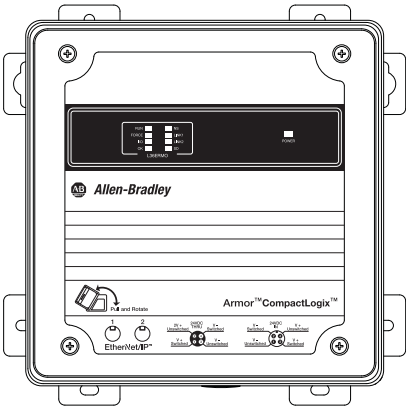


Compact GuardLogix 5370 Controllers Dimensions

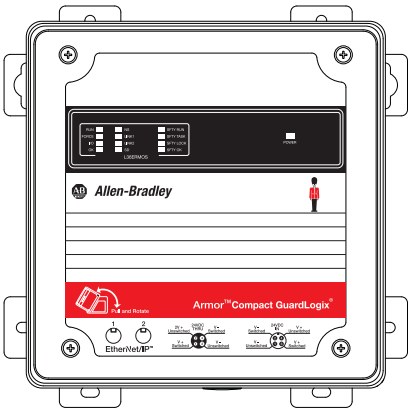


Armor CompactLogix and Armor Compact GuardLogix Controllers

Armor™ CompactLogix



Armor Compact GuardLogix



The Armor CompactLogix and Armor Compact GuardLogix controllers extend the CompactLogix platform to the On-Machine™ space, putting industrial control closer to the application and sometimes onto the machine itself. The safety controllers provide standard and safety memory. The memory supported by catalog number is listed in the Technical Specifications table on page 38. The controllers also support two independent Ethernet ports to connect to an EtherNet/IP network.

This safety controller supports the full temperature range as CompactLogix controllers, while offering global certifications and ratings for IP67 dust and water protection. It is certified for use in safety applications up to and including safety integrity level (SIL) 3 and Performance Level (e) in which the de-energized state is the safe state. With so many hardware functions in one device, the Armor CompactLogix and Armor Compact GuardLogix controllers provide the following benefits:

- Minimized cabinet hardware
- Simplified wiring layouts
- No required tools or specialty personnel for component replacement
- Improve Mean Time to Repair (MTTR)
- Simplified troubleshooting
- Readily available system status without the need to open a cabinet or visit a control room

The Armor CompactLogix and Armor Compact GuardLogix controllers provide memory capacity for the most demanding applications. In some applications, for example, when used on a Device Level Ring (DLR) network, these controllers also provide resiliency from loss of one network connection and allow replacement of devices without stopping production.

Similar to the Compact GuardLogix controllers, the Armor Compact GuardLogix controllers offer the standard features of a CompactLogix controller and safety features. One difference is that the Armor Compact GuardLogix controllers can use I/O modules that are on-machine I/O modules accessible over an EtherNet/IP network.

ALLEN BRADLEY 1769 COMPACTLOGIX

Armor CompactLogix and Armor CompactGuardLogix 5370 Controller Specifications

Features - Armor CompactLogix and Armor Compact GuardLogix Controllers

Feature	1769-L33ERM0, 1769-L36ERM0, 1769-L37ERM0, 1769-L38ERM0	1769-L33ERM0S, 1769-L36ERM0S, 1769-L37ERM0S, 1769-L38ERM0S
Controller tasks: • Continuous • Periodic	• 32 tasks • 100 programs/task	
Built-in communication ports	• Two Ethernet ports - CompactLogix 5370 controllers have two Ethernet ports to connect to an EtherNet/IP network. The ports carry the same network traffic as part of the embedded switch of the controller. However, the controller uses only one IP address. • One USB port (only for temporary connection)	
Communication options	EtherNet/IP	
EtherNet/IP node, max	• 1769-L33ERM0, 1769-L33ERM0S: Up to 32 nodes • 1769-L36ERM0, 1769-L36ERM0S: Up to 48 nodes • 1769-L37ERM0, 1769-L37ERM0S: Up to 64 nodes • 1769-L38ERM0, 1769-L38ERM0S: Up to 80 nodes	
Controller connections	256	
Sockets, max	32	
Integrated Motion over an EtherNet/IP network	• 1769-L33ERM0, 1769-L33ERM0S - As many as 8 axes • 1769-L36ERM0, 1769-L36ERM0S - As many as 16 axes • 1769-L37ERM0, 1769-L37ERM0S - As many as 16 axes • 1769-L38ERM0, 1769-L38ERM0S - As many as 16 axes	
Programming languages	• Relay ladder(1) • Structured Text • Function block • SFC	
Integrated safety	—	Yes

(1) The Armor Compact GuardLogix controllers support only the relay ladder programming language in the safety task. The Armor Compact GuardLogix controllers support all listed programming languages in the standard task.

Technical Specifications - Armor CompactLogix and Armor Compact GuardLogix Controllers

Attribute	1769-L33ERM0, 1769-L36ERM0, 1769-L37ERM0, 1769-L38ERM0	1769-L33ERM0S, 1769-L36ERM0S, 1769-L37ERM0S, 1769-L38ERM0S
User memory	• 1769-L33ERM0: 2 MB • 1769-L36ERM0: 3 MB • 1769-L37ERM0: 4 MB • 1769-L38ERM0: 5 MB	• 1769-L33ERM0S: 2 MB standard + 1 MB safety • 1769-L36ERM0S: 3 MB standard + 1.5 MB safety • 1769-L37ERM0S: 4 MB standard + 1.5 MB safety • 1769-L38ERM0: 5 MB + 1.5 MB safety
Optional nonvolatile memory	• 1784-SD1 card with 1 Gb of available memory (shipped with controller) • 1784-SD2 card with 2 Gb of available memory (available for separate ordering)	
Voltage and current ratings	IN (Pins 2,3) 18…32V DC, 8 A SELV IN (Pins 1,4) 18…32V DC, 8 A SELV Out (Pins 1,4) 18…32V DC, 8 A Out (Pins 2,3) 18…32V DC, 6 A	
Power dissipation, max	7.5 W	
Power consumption, max	50VA @ 24V DC	
Isolation voltage	30V (continuous), Basic Insulation Type, Power to enclosure, Ethernet channels to Power, and non-redundant Ethernet channels to non-redundant Ethernet channels. No isolation between redundant Ethernet channels. Type tested at 2257V rms for 60 seconds between Input and pass through power to Ethernet ports. Type tested at 2257V rms for 60 seconds between Input power and pass through power.	
Weight, approx (with mounting feet)	5.40 kg (11.90 lb)	5.62 kg (12.40 lb)
Module location	Panel mount	
Panel-mounting screw torque	6.6 N•m (58 lb•in) - use M6 screw	
Wire category(1)	3 - on USB ports 2 - on power ports 2 - on Ethernet ports	

ALLEN BRADLEY 1769 COMPACTLOGIX

Technical Specifications - Armor CompactLogix and Armor Compact GuardLogix Controllers (continued)

Attribute	1769-L33ERM0, 1769-L36ERM0, 1769-L37ERM0, 1769-L38ERM0	1769-L33ERM0S, 1769-L36ERM0S, 1769-L37ERM0S, 1769-L38ERM0S
Wire type, Ethernet	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702	M12, D-code, IP67 rated, quick disconnect cables Input and pass-through power connections are made via MINI sized, D-code, IP67 rated, quick disconnect cables
Wire size	PE Ground: 1.3…5.2 mm^2 (16…10 AWG) Torque grounding screw to 2.0 N•m (17.7 lb•in)	
Enclosure type rating	UL Type 4x Meets IP67 (when marked) with receptacle dust caps or cable termination	

(1) Use this Conductor Category information for planning conductor routing. See Industrial Wiring and Grounding Guidelines, publication 1770-4.1.

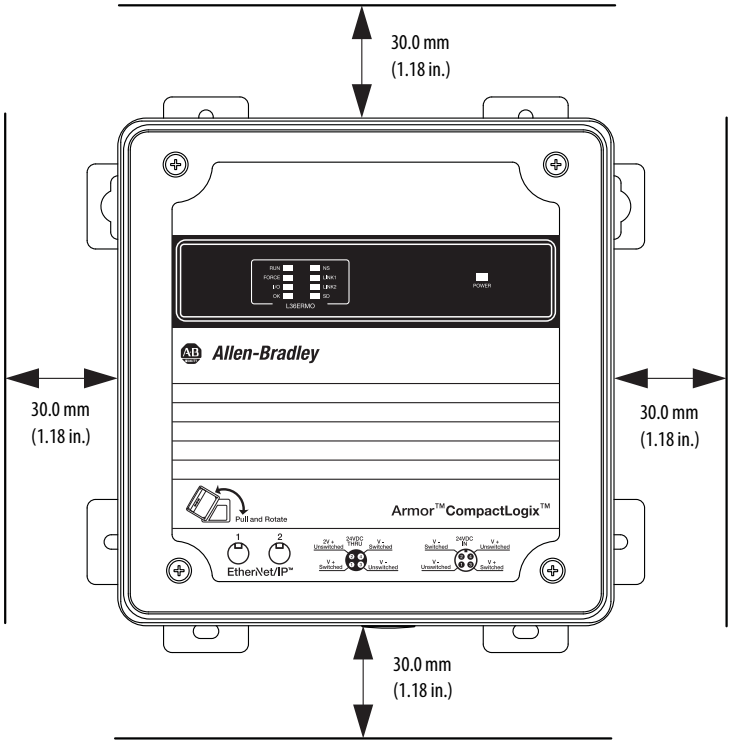
Certifications - Armor CompactLogix and Armor Compact GuardLogix Controllers

Certification(1)	1769-L33ERM0, 1769-L36ERM0, 1769-L37ERM0, 1769-L38ERM0	1769-L33ERM0S, 1769-L36ERM0S, 1769-L37ERM0S, 1769-L38ERM0S
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.	
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/42/EC MD, compliant with: • EN 60204-1; Electrical equipment of machines • EN ISO 13849-1; Safety-related parts of control systems • EN 62061; Functional safety of safety-related control systems
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions	
TÜV certified for Functional Safety(2)	–	Capable of Cat. 4/PL e according to EN ISO 13849-1 and SIL 3 according to EN 62061/IEC 61508
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3	
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation	

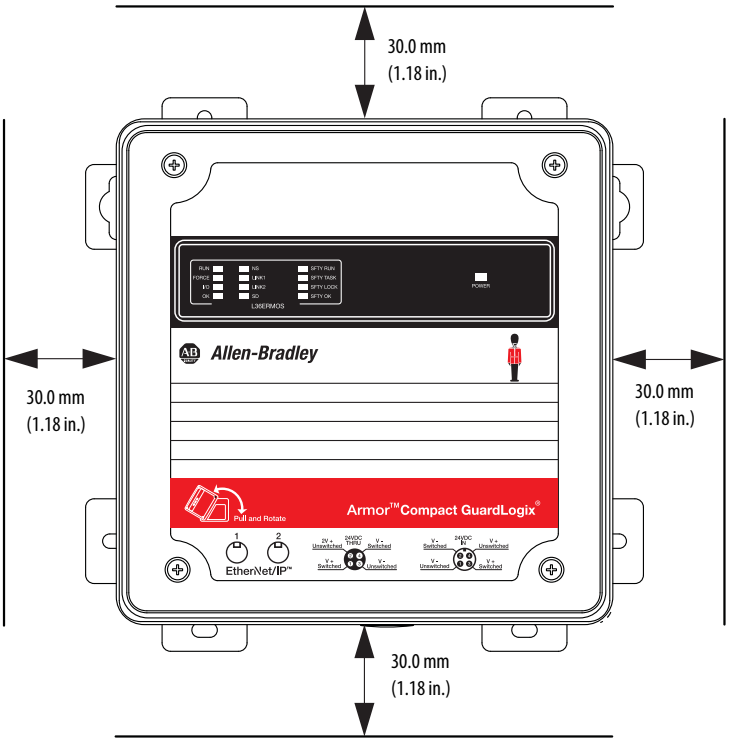
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.
(2) When used with specified firmware revisions.

ALLEN BRADLEY 1769 COMPACTLOGIX

Armor CompactLogix Controllers Minimum Spacing Requirements

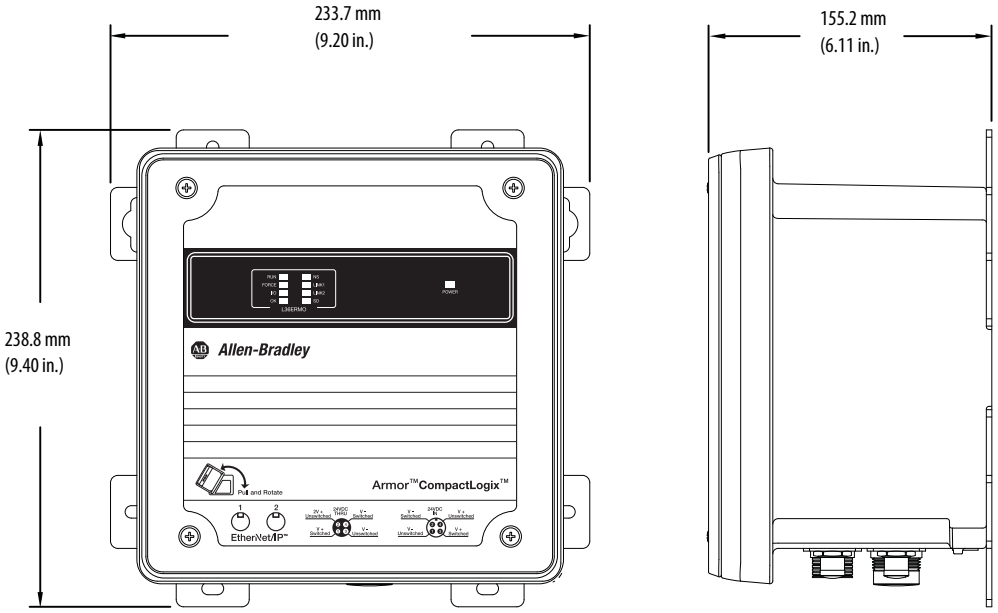


Armor Compact GuardLogix Controllers Minimum Spacing Requirements

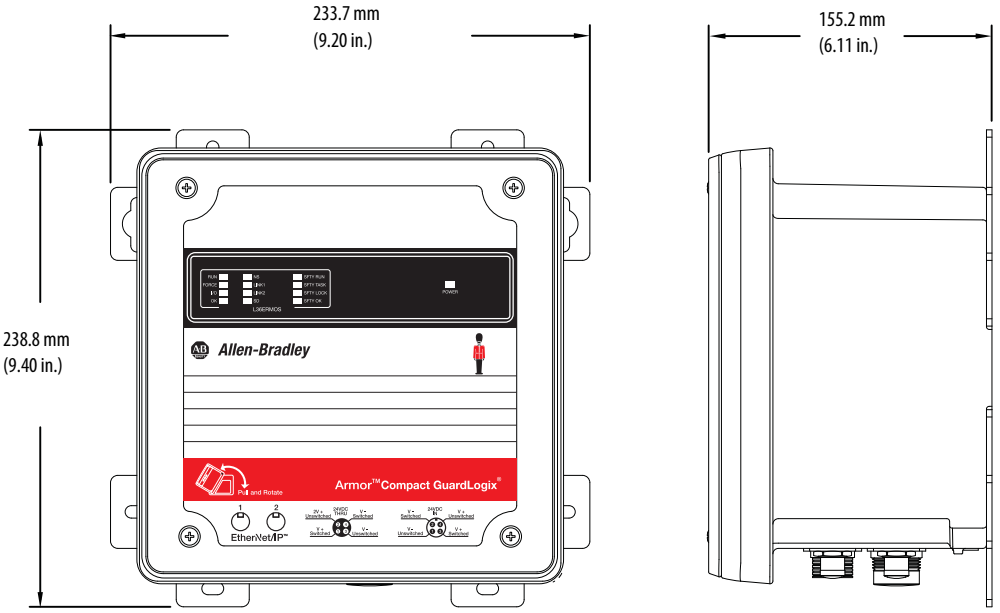


ALLEN BRADLEY 1769 COMPACTLOGIX

Armor CompactLogix Controllers Dimensions

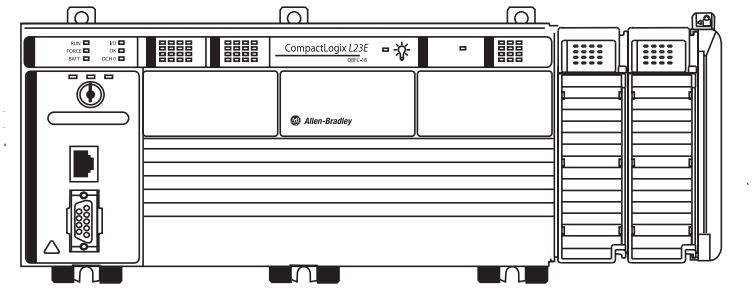


Armor Compact GuardLogix Controllers Dimensions



ALLEN BRADLEY 1769 COMPACTLOGIX

1769 Packaged CompactLogix Controllers with Embedded I/O



The 1769-L23*x* controllers provide the following functionality:

- Built-in power supply
- Either two serial ports or one serial and one Ethernet port, depending on controller catalog number
- Combination of embedded digital, analog, and high-speed counter module I/O modules
- 1769-ECR right-end cap

Features - 1769 Packaged CompactLogix Controllers

Characteristic	1769-L23E-QB1B	1769-L23E-QBFC1B	1769-L23-QBFC1B
Available user memory	512 KB	512 KB	512 KB
CompactFlash card	–	–	–
Communication ports	1 Ethernet port 1 RS-232 serial port (DF1 or ASCII)	1 Ethernet port 1 RS-232 serial port (DF1 or ASCII)	2 RS-232 ports (isolated DF1 or ASCII; only nonisolated DF1)
Embedded I/O	• 16 DC inputs • 16 DC outputs	• 16 DC inputs • 16 DC outputs • 4 analog inputs • 2 analog outputs • 4 high-speed counter modules	• 16 DC inputs • 16 DC outputs • 4 analog inputs • 2 analog outputs • 4 high-speed counter modules
Module expansion capacity	Up to three additional 1769 modules	Up to two additional 1769 modules	Up to two additional 1769 modules
Embedded power supply	24V DC	24V DC	24V DC

You can add one or two additional 1769 modules to the right of the controller package. The modules that you can add depend on their current draw. Each packaged controller has the following amount of 5V DC bus current.

1769-L23*x* Available DC Current

Controller	Available 5V DC Bus Current
1769-L23E-QB1B	1000 mA
1769-L23E-QBFC1B	450 mA
1769-L23-QBFC1B	800 mA

ALLEN BRADLEY 1769 COMPACTLOGIX

1769-L23*x* Local I/O Performance

The requested packet interval (RPI) defines the frequency at which the controller sends and receives all I/O data on the backplane. The default RPI is 5 ms. The combination of embedded I/O in the packaged controllers determines the fastest RPI you can configure.

Controller	Guideline
1769-L23E-QB1B	1…4 modules can be scanned in 1.0 ms
1769-L23E-QBFC1B 1769-L23-QBFC1B	• 1…4 modules can be scanned in 1.5 ms • 5…6 modules can be scanned in 2.0 ms

You can always select an RPI that is slower than listed previously. These considerations show how fast modules can be scanned—not how fast an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

Technical Specifications - 1769 Packaged CompactLogix Controllers

Attribute	1769-L23E-QB1B	1769-L23E-QBFC1B	1769-L23-QBFC1B
User memory	512 KB	512 KB	512 KB
Optional nonvolatile memory	None		
Number of expansion I/O modules, max	3 (limited by current draw of module)	2 (limited by current draw of module)	2 (limited by current draw of module)
Replacement battery	1769-BA		
Current draw @ 5V DC	1000 mA	450 mA	800 mA
Current draw @ 24V DC	700 mA	500 mA	600 mA
Power dissipation	7.01 W	13.58 W	10.73 W
Isolation voltage	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 to system backplane, Ethernet to system backplane, and RS-232 to Ethernet		30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 channel 0 to system backplane, no isolation between RS-232 channel 1 and system
Serial communication ports	CH0 - RS-232 DF1, DH-485, ASCII Fully isolated 38.4 Kbps max		CH0 - RS-232 DF1, DH-485, ASCII Fully isolated 38.4 Kbps max CH1 - RS-232 DF1, DH-485 Nonisolated 38.4 Kbps max
Serial cables	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m (9.84 ft)		
Weight, approx	0.91 kg (2 lb)	1.22 kg (2.7 lb)	1.22 kg (2.7 lb)
Slot width	1		
Module location	DIN rail or panel mount		
Mounting screw torque	1.1…1.8 N•m (10…16 lb•in) - use M4 or #8 screws		
Wire category(1)	2 - on signal ports 2 - on power ports 2 - on communication ports		
Wire type, Ethernet	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702		–
Wire size, DC power	0.25…2.5 mm^2 (22…14 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation max		
Wire size, discrete I/O connections	0.5…0.8 mm^2 (20…18 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation max		
Wire size, embedded analog and high-speed counter module connections	0.5…0.8 mm^2 (20…18 AWG) solid or stranded shielded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation max		
North American temperature code	T3C		
Enclosure type rating	None (open-style)		

(1) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded DC Input Specifications

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Inputs	16 (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26.4V DC @ 60 °C (140 °F)
Digital filter, off to on	0 s, 100 µs, 500 µs, 1 ms, 2 ms
Input delay, off to on	100 µs (typical), 300 µs (max)
Digital filter, on to off	0 s, 100 µs, 500 µs, 1 ms, 2 ms
Input delay, on to off	250 µs (typical), 1 ms (max)
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10V DC
Inrush current, max	250 mA
Input impedance, max	3 kΩ
Cyclic update time	100 µs…750 ms
Isolation voltage	75V (continuous), basic insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input group to input group
IEC input compatibility	Type 3
Isolated groups	Group 1: inputs 0…7 Group 2: inputs 8…15 Isolated groups operate in either sink or source configurations

Embedded DC Output Specifications

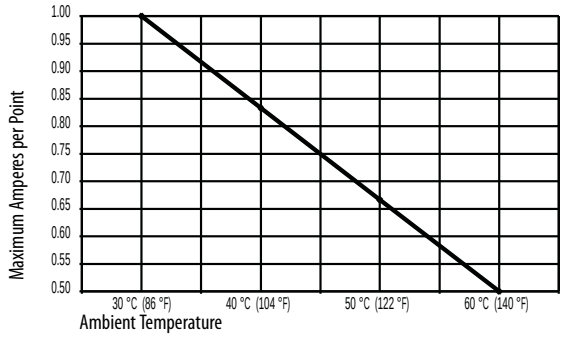
Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Outputs	16
Voltage category	24V DC source
Operating voltage range	20.4…26.4V DC
Output delay, off to on	0.1 ms
Output delay, on to off	1.0 ms
Off-state leakage current, max	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 1.0 A
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F) Also see the derating graphs
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F) Also see the derating graphs on page 45
Surge current per point	2 A for 10 ms per point, repeatable every 2 s
Load current, min	3 mA per point
Isolation voltage	75V (continuous), basic insulation type Type tested at 1200V AC for 60 s; outputs to system backplane
Isolated groups	Group 1: outputs 0…15 (internally connected to common)
Pilot duty rating	0.5 A, 24V DC @ 60 °C (140 °F) 1.0 A, 24V DC @ 30 °C (86 °F)

ALLEN BRADLEY 1769 COMPACTLOGIX

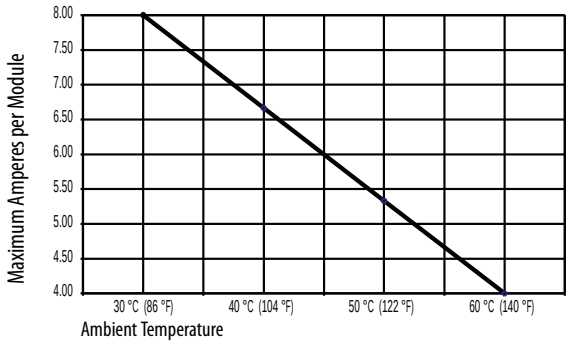
Embedded DC Output Temperature Derating

The area within the curves depicts the safe operating range for the embedded DC outputs under various conditions of user-supplied voltages and ambient temperatures.

Embedded DC Outputs Maximum Amperes Per Point Versus Temperature



Embedded DC Outputs Maximum Amperes Per Module Versus Temperature



Embedded Analog Input Specifications

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Inputs	4 differential or single-ended
Input range	0…10.5V 0…21 mA
Resolution	8 bits plus sign (sign is always positive).
Input impedance	Voltage: 150 kΩ nom Current: 150 Ω nom
Converter type	Successive approximation
Response speed per channel	5 ms
Rated working voltage	30V AC/30V DC
Common mode voltage	10V DC max per channel
Common mode rejection	Greater than 60 dB at 60 Hz at 10V between inputs and analog common
Normal mode rejection ratio	None
Accuracy, overall at 25 °C (77 °F)(1)	Voltage: ±0.7% full scale Current: ±0.6% full scale
Accuracy, overall at 0…60 °C (32…140 °F)	Voltage: ±0.9% full scale Current: ±0.8% full scale
Accuracy drift with temperature	Voltage: ±0.006% per °C Current: ±0.006% per °C

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded Analog Input Specifications (continued)

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Calibration	Not required; components guarantee accuracy
Non-linearity (in percent full scale)	±0.4%
Repeatability	±0.4%
Overload at input terminals, max	Voltage: 20V continuous, 0.1 mA Current: 32 mA continuous, +5V DC
Channel diagnostics	Overrange by bit reporting
Isolation voltage	30V (continuous), basic insulation type Type tested at 500V AC for 60 s; inputs to system backplane and outputs to system backplane

(1) Includes offset, gain, non-linearity, and repeatability error terms.

Embedded Analog Output Specifications

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Outputs	2 single-ended
Output range	0…10.5V 0…21 mA
Converter type	Resistor string
Resolution, max	8 bits plus sign (sign is always positive, Bit 15 = 0)
Response speed per channel	0.3 ms for rated resistance and rated inductance 3.0 ms for rated capacitance
Current load on voltage output	10 mA max
Resistive load on current output	0…300 Ω (includes wire resistance)
Load range on voltage output	> 1 kΩ at 10V DC
Inductive load, max (current outputs)	0.1 mH
Capacitive load, max (Voltage Outputs)	1 µF
Accuracy, overall at 25 °C (77 °F)(1)	Voltage: ±0.5% full scale Current: ±0.5% full scale
Accuracy, overall at 0…60 °C (32…140 °F)	Voltage: ±0.6% full scale Current: ±1.0% full scale
Accuracy drift with temperature	Voltage: ±0.01% full scale per °C Current: ±0.01% full scale per °C
Output ripple range 0…50 kHz (referred to output range)	±0.05%
Non-linearity	±0.4% (in percent full scale)
Repeatability	±0.05% (in percent full scale)
Output impedance	10 Ω nom
Open and short circuit protection	Yes
Short circuit, max	Current: 40 mA
Open circuit, max	Voltage: 15V
Output response at system powerup and powerdown	+2.0…-1.0V DC spike for less than 6 ms
Isolation voltage	30V (continuous), basic insulation type Type tested at 500V AC for 60 s; inputs to system backplane and outputs to system backplane

(1) Includes offset, gain, drift, non-linearity, and repeatability error terms.

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded HSC Module Input Specifications

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Input frequency, max	250 kHz
Input current, max	15 mA
Input current, min	6.8 mA
Input voltage range	-30…+30V DC(1)
On-state voltage range	2.6…30V DC
On-state current, min	6.8 mA
Off-state voltage, max	1.0V DC
Off-state current, max	1.5 mA
Off-state leakage current, max	1.5 mA
Input impedance, nom	1950 Ω
Pulse width, min	2.5 µs
Phase separation, min	1.084 µs
Isolation voltage	75V (continuous), basic insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input

(1) See Maximum Input Voltage - 24V DC Operation temperature derating.

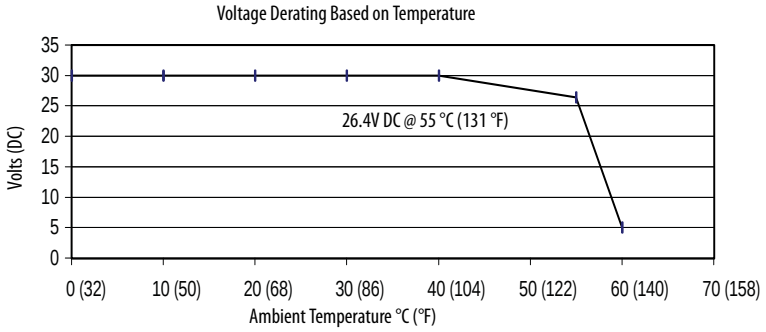
Embedded HSC Module Output Specifications

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Output voltage range	5…30V DC
On-state voltage, max	User power - 0.1V DC
On-state output current, max	1 A per point
	4 A per module
On-state output current, min	1 mA
On-state voltage drop, max	0.5V DC
Off-state leakage current, max	5 µA
Turn-on time, max	400 µs
Turn-off time, max	200 µs
Reverse polarity protection	30V DC
Isolation voltage	75V (continuous), basic insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded HSC Module Temperature Derating

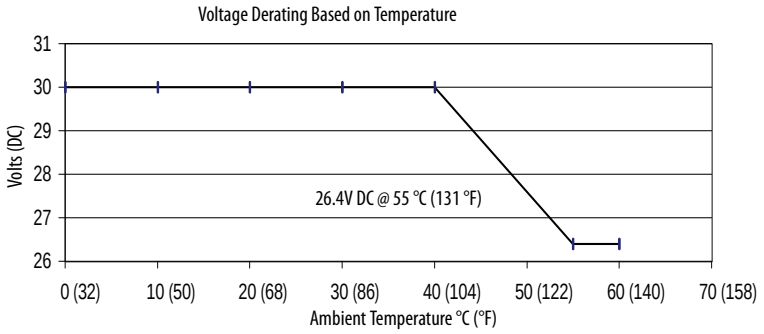
Maximum Input Voltage - 24V DC Operation



Temperature	Derated Voltage(1)
0…40 °C (32…104 °F)	30V DC
55 °C (131 °F)	26.4V DC
60 °C (140 °F)	5V DC

(1) You achieve input voltage derating 55...60 °C (131…140 °F) by using a dropping resistor.
For 24V DC input voltage, use a 2.4 kΩ, 1/2 Watt resistor.
For input voltages other than 24V DC, use a 1/2 W resistor with value: 125 x (V_{in} - 5V).

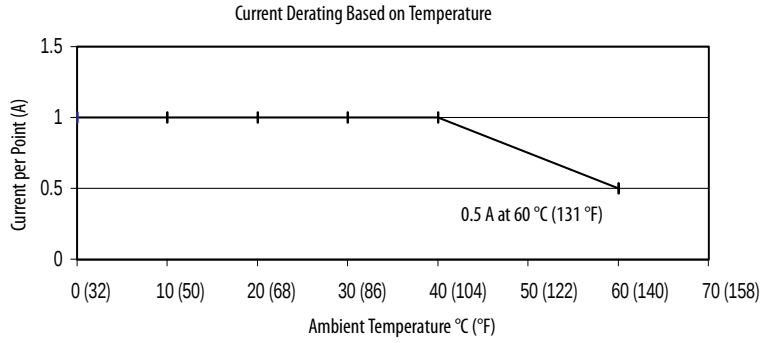
Maximum Output Voltage - 24V DC Operation



Temperature	Derated Voltage
0…40 °C (32…104 °F)	30V DC
55…60 °C (131…140 °F)	26.4V DC

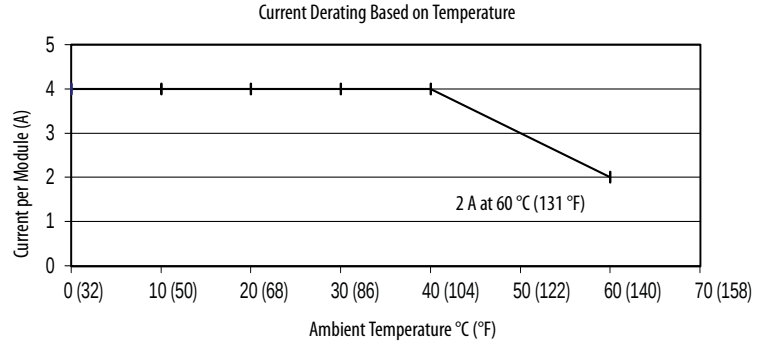
ALLEN BRADLEY 1769 COMPACTLOGIX

Maximum Output Current Per Point - 5V DC Operation



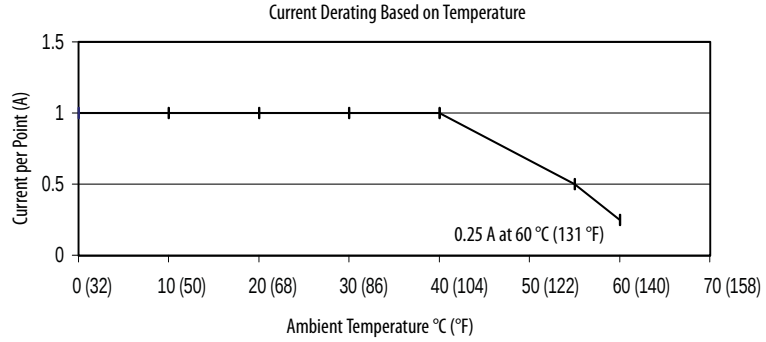
Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
60 °C (140 °F)	0.5 A

Maximum Output Current Per Module - 5V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	4 A
60 °C (140 °F)	2 A

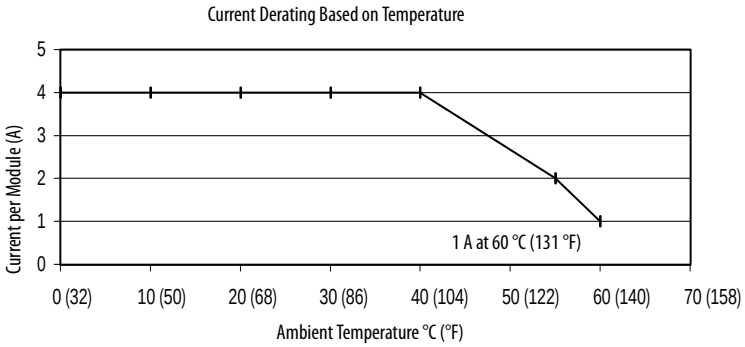
Maximum Output Current Per Point - 24V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
55 °C (131 °F)	0.5 A
60 °C (140 °F)	0.25 A

ALLEN BRADLEY 1769 COMPACTLOGIX

Maximum Output Current Per Module - 24V DC Operation



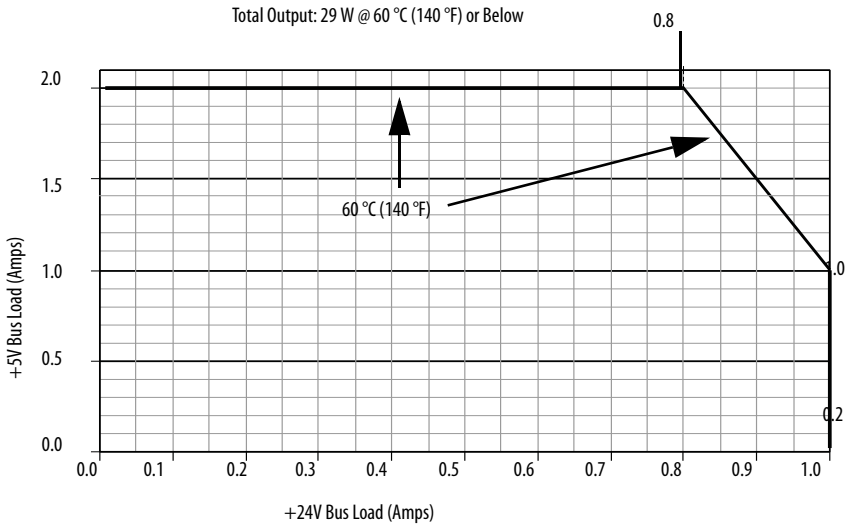
Temperature	Derated Current
0…40 °C (32…104 °F)	4 A
55 °C (131 °F)	2 A
60 °C (140 °F)	1 A

Embedded Power Supply

Attribute	1769-L23E-QB1B, 1769-L23E-QBFC1B, 1769-L23-QBFC1B
Input voltage range	19.2…31.2V DC
Input voltage, nom	24V AC
Line requirement, max	50VA at 24V DC
Available 5V DC bus current	1769-L23E-QB1B: 1 A (1000 mA) 1769-L23E-QBFC1B: 450 mA 1769-L23-QBFC1B: 800 mA
Inrush, max	30 A @ 31.2V DC
Line loss ride through	10 ms…10 s
Output bus current capacity 0…55 °C (32…131 °F) 55…60 °C (131…140 °F)	2 A @ 5V DC 0.8 A @ 24V DC See temperature derating graphs
Load current, min	0 mA @ 5V DC 0 mA @ 24V DC
Short circuit protection	Front access fuse Replacement part number: Wickmann 19193-6.3A
Overvoltage protection	Yes
Isolation voltage	75V (continuous), basic insulation type Type tested at 1200V AC for 60 s; power to system backplane

ALLEN BRADLEY 1769 COMPACTLOGIX

Embedded Power Supply Temperature Derating

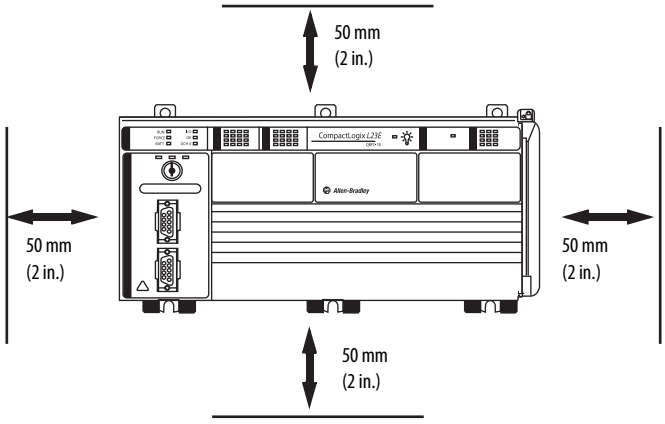


Certifications - 1769 Packaged CompactLogix Controllers

Certification[1]	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3

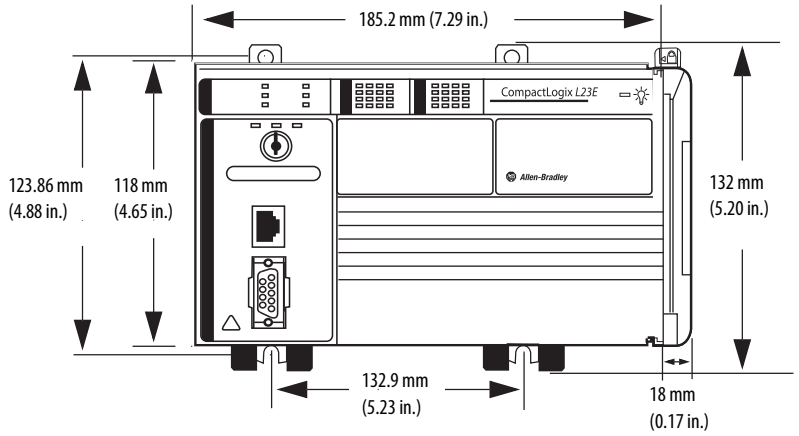
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1769-L23*x* Minimum Spacing Requirements

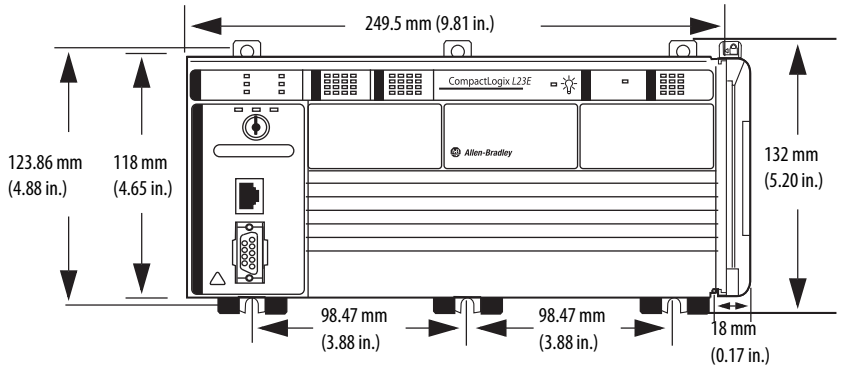


ALLEN BRADLEY 1769 COMPACTLOGIX

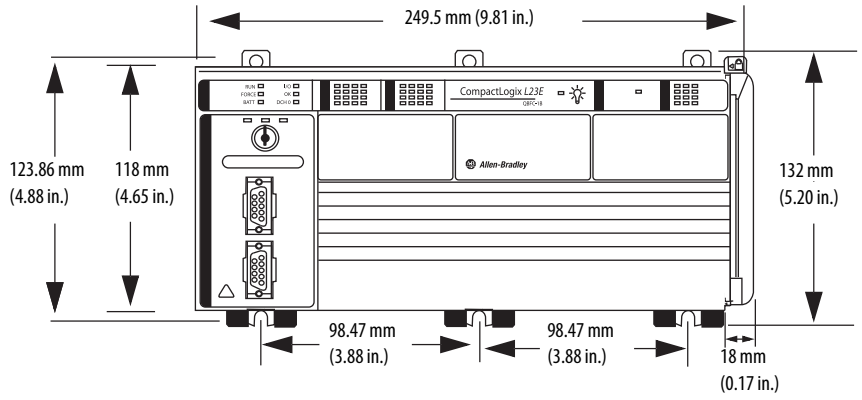
1769-L23E-QB1B CompactLogix Dimensions



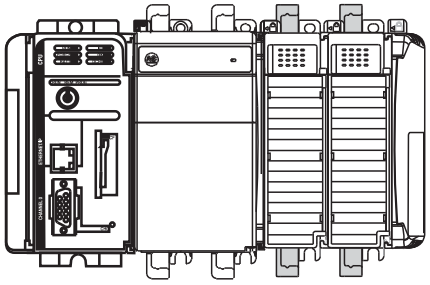
1769-L23E-QBFC1B CompactLogix Dimensions



1769-L23-QBFC1B CompactLogix Dimensions



1769 Modular CompactLogix Controllers



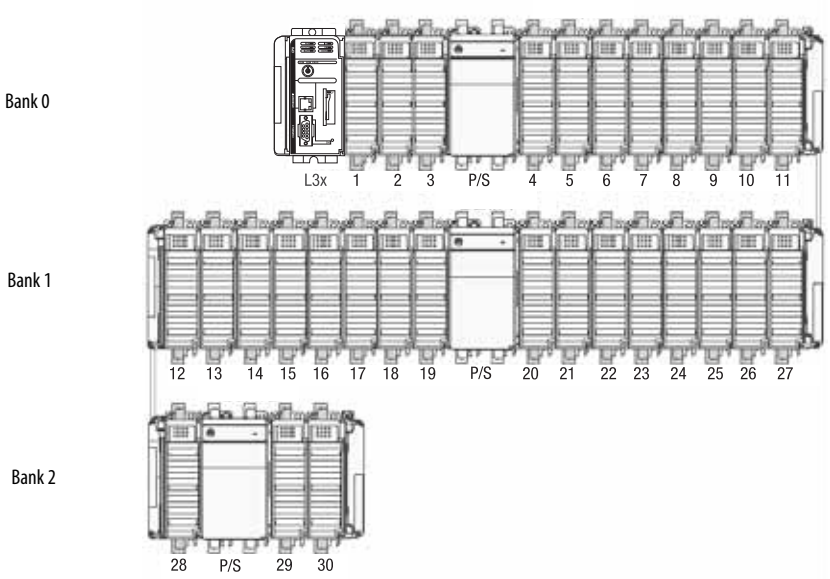
In a 1769-L3*x* controller system, the 1769 I/O modules can be placed to the left and the right of the power supply. As many as eight modules can be placed on each side of the power supply.

Features - 1769 Modular CompactLogix Controllers

Characteristic	1769-L31	1769-L32C	1769-L32E, 1769-L32EK	1769-L35CR	1769-L35E
Available user memory	512 KB	750 KB	750 KB	1.5 MB	1.5 MB
CompactFlash card	1784-CF128	1784-CF128	1784-CF128	1784-CF128	1784-CF128
Communication ports	2 RS-232 ports (isolated DF1 or ASCII; only nonisolated DF1)	1 ControlNet port 1 RS-232 serial port (DF1 or ASCII)	1 Ethernet port 1 RS-232 serial port (DF1 or ASCII)	1 ControlNet port 1 RS-232 serial port (DF1 or ASCII)	1 Ethernet port 1 RS-232 serial port (DF1 or ASCII)
Module expansion capacity	16 1769 modules	16 1769 modules	16 1769 modules	30 1769 modules	30 1769 modules
Power supply distance rating	4 modules	4 modules	4 modules	4 modules	4 modules

The CompactLogix controller has a power supply distance-rating of four modules. The controller must be the leftmost module in the first bank of the system. The maximum configuration for the first bank of a CompactLogix controller includes the following:

- The controller
- Three I/O modules to the left of the power supply
- Eight I/O modules to the right of the power supply



ALLEN BRADLEY 1769 COMPACTLOGIX

1769-L3*x* Local I/O Performance

You can configure an individual RPI for each local 1769 Compact I/O module. The RPI defines the frequency at which the controller sends and receives all I/O data on the backplane.

Type of Module	Guideline
Digital and analog (any mix)	• 1…4 modules can be scanned in 1 ms • 5…30 modules can be scanned in 2 ms • Some input modules have a fixed 8 ms filter, so selecting a faster RPI has no effect
Specialty	• Full-sized 1769-SDN modules add 2 ms per module • 1769-HSC modules add 1 ms per module • Full-sized 1769-ASCII modules add 1 ms per module

You can always select an RPI that is slower than listed previously. These considerations show how fast modules can be scanned—not how fast an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

Technical Specifications - 1769 Modular CompactLogix Controllers

Attribute	1769-L31	1769-L32C	1769-L32E, 1769-L32EK	1769-L35CR	1769-L35E
User memory	512 KB	750 KB	750 KB	1.5 MB	1.5 MB
Optional nonvolatile memory	1784-CF128				
Number of I/O modules, max	16	16	16	30	30
Number of I/O banks, max	3				
Number of expansion I/O modules, max	16 1769 modules			30 1769 modules	
Replacement battery	1769-BA				
Current draw @ 5V DC	330 mA	650 mA	660 mA	680 mA	660 mA
Current draw @ 24V DC	40 mA	40 mA	90 mA	40 mA	90 mA
Power dissipation	2.61 W	4.21 W	5.5 W	4.36 W	5.5 W
Isolation voltage	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 channel 0 to system No isolation between RS-232 channel 1 and system	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 to system, ControlNet to system, RS-232 to ControlNet, ControlNet channel A to ControlNet channel B	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 to system, Ethernet to system, RS-232 to Ethernet	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 to system, ControlNet to system, RS-232 to ControlNet, ControlNet channel A to ControlNet channel B	30V (continuous), basic insulation type Type tested at 710V DC for 60 s; RS-232 to system, Ethernet to system, RS-232 to Ethernet
Communication ports	CH0 - RS-232 DF1, DH-485, ASCII Fully isolated 38.4 Kbps max CH1 - RS-232 DF1, DH-485 Nonisolated 38.4 Kbps max	RS-232 Fully isolated 38.4 Kbps max ControlNet port	RS-232 Fully isolated 38.4 Kbps max Ethernet port 10/100 BASE-T	RS-232 Fully isolated 38.4 Kbps max ControlNet port	RS-232 Fully isolated 38.4 Kbps max Ethernet port 10/100 BASE-T
Serial cables	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m				
Weight, approx	0.30 kg (0.66 lb)	0.32 kg (0.70 lb)	0.30 kg (0.66 lb)	0.32 kg (0.70 lb)	0.30 kg (0.66 lb)
Slot width	1				
Module location	DIN rail or panel mount				

ALLEN BRADLEY 1769 COMPACTLOGIX

Technical Specifications - 1769 Modular CompactLogix Controllers (continued)

Attribute	1769-L31	1769-L32C	1769-L32E, 1769-L32EK	1769-L35CR	1769-L35E
Panel-mounting screw torque	1.1…1.8 N•m (10…16 lb•in) - use M4 or #8 screws				
Power supply distance rating	4 modules				
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4				
Wire category(1)	2 - on communication ports				
North American temperature code	T5	T4A			
IEC temperature code	—		T4	–	T4
Enclosure type rating	None (open-style)				

(1) Use this conductor category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Certifications - 1769 Modular CompactLogix Controllers

Certification(1)	1769-L31	1769-L32C, 1769-L35CR	1769-L32E, 1769-L35E
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.		
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)		European Union 2004/108/EC EMC Directive, compliant with: • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions		
EX	–		European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection 'n' • EN 60079-0; General Requirements (Zone 2) • II 3 G Ex nA IIC T4 Gc
CI	–	ControlNet International conformance tested to ControlNet specifications	–
EtherNet/IP	–	–	ODVA conformance tested to EtherNet/IP specifications.
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3		

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

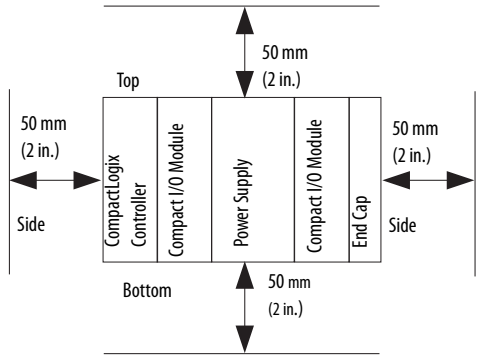
Real-time Clock Accuracy

This table lists the real-time clock accuracy specifications for the 1769 Modular CompactLogix controllers.

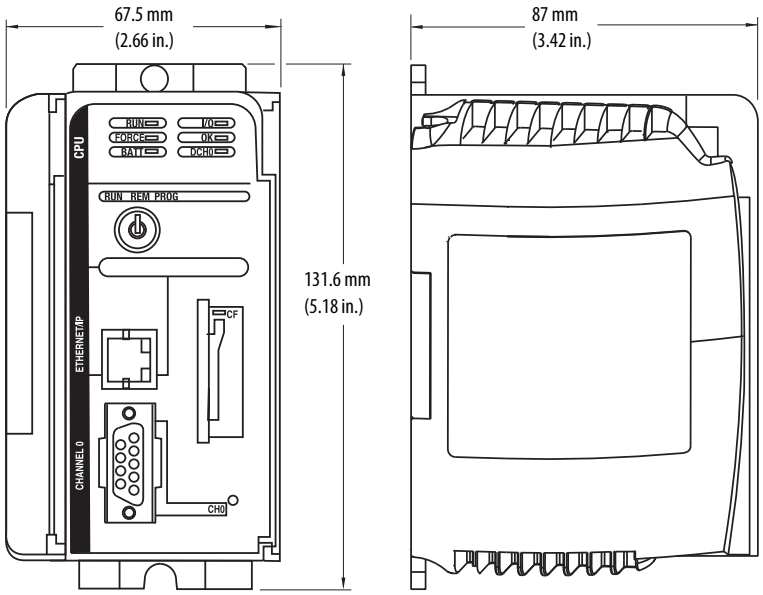
Ambient Temperature	Accuracy
0 °C (32 °F)	+54…-56 s/mo
25 °C (77 °F)	+9…-124 s/mo
40 °C (104 °F)	-84…-234 s/mo
55 °C (131 °F)	-228…-394 s/mo
60 °C (140 °F)	-287…-459 s/mo

ALLEN BRADLEY 1769 COMPACTLOGIX

1769-L3*x* Minimum Spacing Requirements

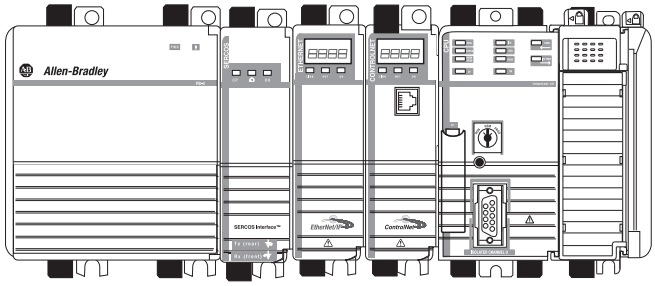


1769-L3*x* CompactLogix Dimensions



ALLEN BRADLEY 1769 COMPACTLOGIX

1768 CompactLogix Controllers



The 1768-L4*x* controller combines both a 1768 backplane and a 1769 backplane. The 1768 backplane supports the 1768 controller, the 1768 power supply, and a maximum of four 1768 modules. The 1769 backplane supports 1769 modules.

Features - 1768 CompactLogix Controllers

Characteristic	1768-L43	1768-L43S	1768-L45	1768-L45S
Available user memory	2 MB	2 MB standard 0.5 MB safety	3 MB	3 MB standard 1 MB safety
CompactFlash card	1784-CF128			
Communication options	• EtherNet/IP (standard and safety) • ControlNet (standard and safety) • DeviceNet (standard)			
Serial communication port	1 RS-232 port			
Module expansion capacity	• Two 1768 modules • Sixteen 1769 modules			
Power supply distance rating	–			
Programming languages	• Relay ladder • Structured Text • Function block • Sequential Function Chart	• Standard task: all languages • Safety task: relay ladder, safety application instructions	• Relay ladder • Structured Text • Function block • Sequential Function Chart	• Standard task: all languages • Safety task: relay ladder, safety application instructions

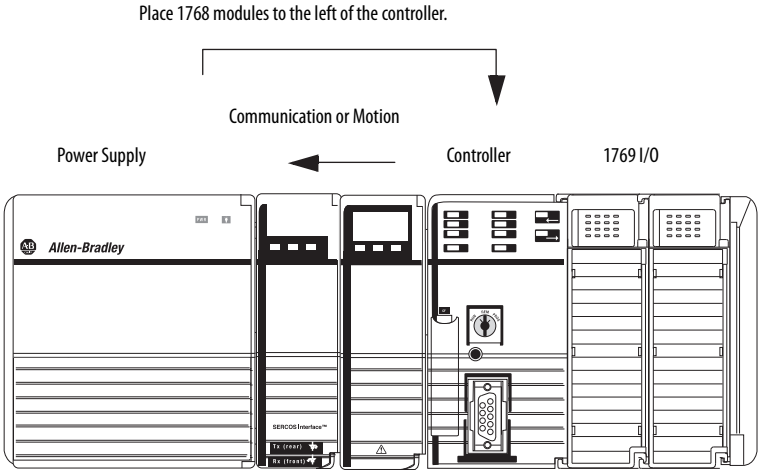
Compact GuardLogix Safety System

The Compact GuardLogix controller is a 1768-L4*x*S CompactLogix controller that provides safety control to achieve SIL 3/PLe according to ISO 13849. A major benefit of this system is that it is still one project, safety and standard together. See page 6 for more information on how to develop projects with Compact GuardLogix controllers.

ALLEN BRADLEY 1769 COMPACTLOGIX

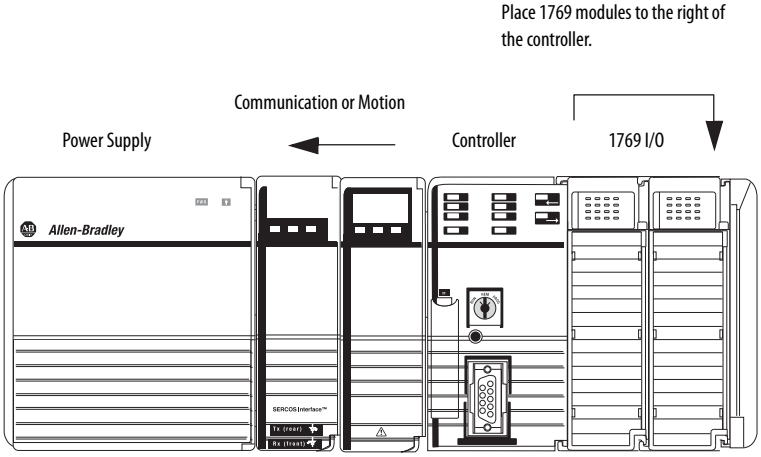
1768-L4*x* Placement

In a 1768-L4*x* controller system, place 1768 modules between the power supply and the controller.



Place 1769 modules to the right of the 1768 backplane:

- As many as eight 1769 modules can be attached to the right of the 1768 system.
- The 1769 I/O connected directly to the 1768 backplane does not need a 1769 power supply.
- Additional 1769 modules must be in additional I/O banks.
- Each additional I/O bank must have its own 1769 power supply.



ALLEN BRADLEY 1769 COMPACTLOGIX

1768-L4*x* Local I/O Performance

Configure an individual RPI for each local 1769 Compact I/O module. Use the default RPI numbers that the programming software automatically assigns or select faster RPI values as fast as 1 ms. I/O module update times do not affect overall 1768 bus performance in the following situations:

- Use faster RPI values for time critical I/O without impacting overall 1769 Compact I/O performance.
- Use Immediate Output (IoT) instructions for further reduction in I/O module update times.

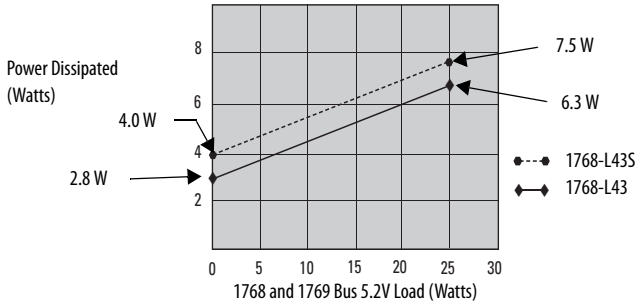
Technical Specifications - 1768 CompactLogix Controllers

Attribute	1768-L43	1768-L43S	1768-L45	1768-L45S
User memory	2 MB	2 MB standard 0.5 MB safety	3 MB	3 MB standard 1 MB safety
Optional nonvolatile memory	1784-CF128			
Number of 1768 modules, max	2		4	
Number of 1768 communication modules, max	2			
Number of 1768 motion modules, max	2		4	
Number of 1769 I/O modules, max	16		30	
Number of I/O banks, max	2		3	
Replacement battery	–			
Backplane current draw @ 24V DC	1.3 A	1.4 A	2.0 A	2.1 A
1768 current draw @ 5V DC	2.8 A		5.6 A	
1769 current draw @ 5V DC	2.0 A		2.0 A	
Total 1768 and 1769 current draw @ 5V DC	4.8 A		7.6 A	
Power dissipation	6.3 W	7.5 W	8.3 W	9.5 W
Power consumption	31.3 W	33.6 W	48.0 W	50.4 W
Isolation voltage	30V (continuous), functional insulation type Type tested at 500V AC for 60 s; RS-232 to system			
Communication ports	RS-232 Fully isolated, 38.4 Kbps max			
Serial cables	1756-CP3 or 1747-CP3, right angle connector to controller, straight to serial port, 3 m			
Weight, approx	0.34 kg (11.99 oz)	0.45 kg (15.9 oz)	0.34 kg (11.99 oz)	0.45 kg (15.9 oz)
Dimensions (HxWxD)	131.1 x 56.4 x 121.1 mm (5.18 x 2.22 x 4.81 in.)	131.6 x 89.6 x 122.1 mm (5.18 x 3.53 x 4.81 in.)	131.1 x 56.4 x 121.1 mm (5.18 x 2.22 x 4.81 in.)	131.6 x 89.6 x 122.1 mm (5.18 x 3.53 x 4.81 in.)
Slot width	1	1.5	1	1.5
Module location	DIN rail or panel mount			
Panel-mounting screw torque	1.16 N•m (10 lb•in) - use M4 or #8 screws			
Power supply distance rating	4 modules			
Power supply	1768-PA3, 1768-PB3			
Wire category[1]	2 - on communication ports			
IEC temperature code	–	T4	—	T4
North American temperature code	T4			
Enclosure type rating	None (open-style)			

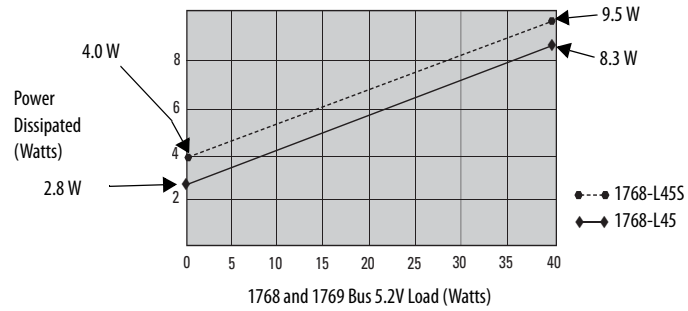
(1) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ALLEN BRADLEY 1769 COMPACTLOGIX

1768-L43 and 1768-L43S Power Dissipation



1768-L45 and 1768-L45S Power Dissipation



Certifications - 1768 CompactLogix Controllers

Certification[1]	1768-L43, 1768-L45
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

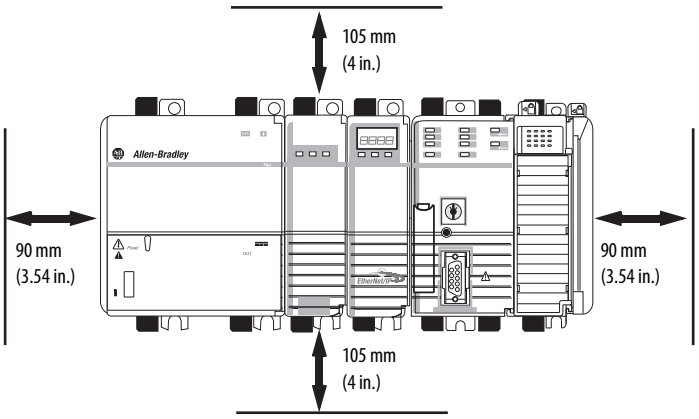
ALLEN BRADLEY 1769 COMPACTLOGIX

Certifications - 1768 Compact GuardLogix Controllers

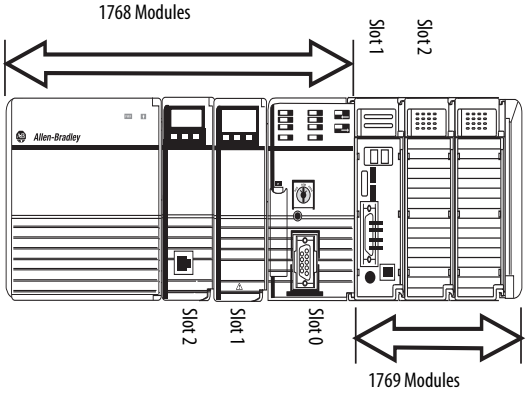
Certification[1]	1768-L43S, 1768-L45S
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/42/EC MD, compliant with: • EN 60204-1; Electrical equipment of machines • EN ISO 13849-1; Safety-related parts of control systems • EN 62061; Functional safety of safety-related control systems
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection 'n' • EN60079-0; General Requirements • II 3 G Ex nA nL IIC T4 Gc
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3
Functional Safety[2]	Certified by TÜV: capable of SIL 1 to 3, according to IEC 61508; and PLe/Cat. 4 according to ISO 13849-1

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.
(2) When used with specified programming software versions.

1768-L4*x* Minimum Spacing Requirements

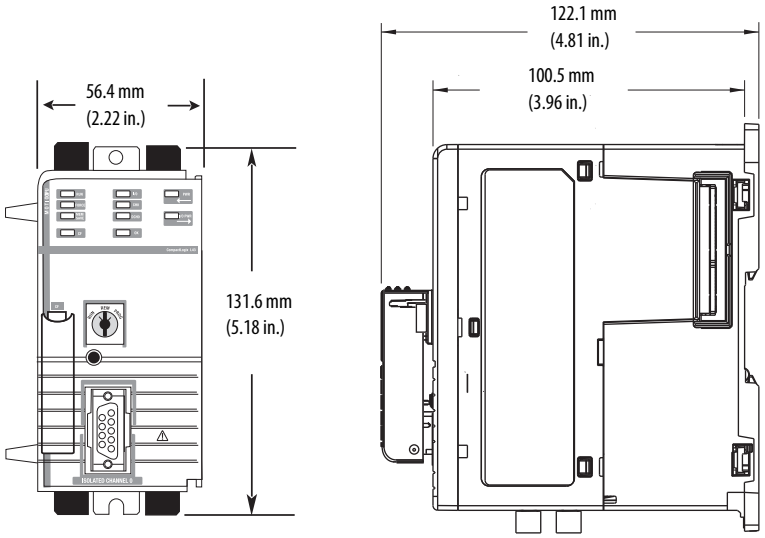


1768 Slot Numbering

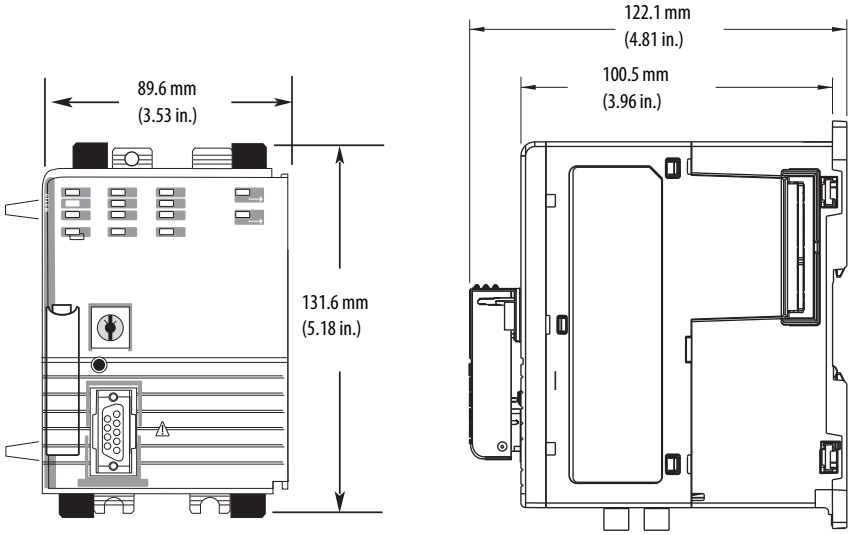


ALLEN BRADLEY 1769 COMPACTLOGIX

1768-L43, 1768-L45 CompactLogix Dimensions



1768-L43S, 1768-L45S CompactLogix Dimensions



ALLEN BRADLEY 1769 COMPACTLOGIX

Controller Memory Use

These equations provide an estimate of the memory that is needed for a controller. These numbers are rough estimates.

Controller tasks	_____ * 4000	=	_____ bytes (minimum 1 task)
Digital I/O points	_____ * 400	=	_____ bytes
Analog I/O points	_____ * 2600	=	_____ bytes
DeviceNet modules[1]	_____ * 7400	=	_____ bytes
Other communication modules[2]	_____ * 2000	=	_____ bytes
Motion axes	_____ * 8000	=	_____ bytes
FactoryTalk® alarm instruction	_____ * 1000	=	_____ bytes (per alarm)
FactoryTalk® subscriber	_____ * 10000	=	_____ bytes

(1) The first DeviceNet module is 7400 bytes. Additional DeviceNet modules are 5800 bytes each.
(2) Count all communication modules in the system, not just the modules in the local chassis. This total includes device connection modules, adapters, and ports on PanelView™ terminals.

Reserve 20…30% of the controller memory for future expansion.

ALLEN BRADLEY 1769 COMPACTLOGIX

Controller Compatibility

Your controller can control and communicate with other devices, including the following:

- Control Distributed I/O Modules
- Control Safety I/O Modules
- Communicate with Display Devices
- Communicate with Other Controllers
- Communicate with Other Communication Devices

Control Distributed I/O Modules

The controller can control these distributed I/O modules.

I/O Modules	CompactLogix 5370 1768-ENBT 1769-L23Ex 1769-L32E, 1769-L32EK, 1769-L35E EtherNet/IP Network(1)	1768-CNB, 1768-CNBR 1769-L32C, 1769-L35CR ControlNet Network	CompactLogix 5370 L2 and L3 1769-SDN DeviceNet Network(2) (3)
Chassis-based I/O			
1746 SLC™ I/O	Yes	No	No
1756 ControlLogix® I/O	Yes	Yes	Yes
1769 Compact I/O	No	No	Yes
1771 Universal I/O	No	No	No
In-cabinet I/O			
1734 POINT I/O	Yes	Yes	Yes
1734D POINTBlock I/O	Yes	Yes	Yes
1790, 1790D, 1790P CompactBlock™ LDX I/O	No	No	Yes
1791D, 1791P, 1791R CompactBlock™ I/O	No	No	Yes
1794 FLEX™ I/O	Yes	Yes	Yes
1797 FLEX Ex™ I/O	Yes	Yes	No
On-machine I/O			
1732 ArmorBlock® I/O	Yes	No	Yes
1738 ArmorPOINT® I/O	Yes	Yes	No
1792D ArmorBlock® MaXum™ I/O	No	No	Yes
1799 Embedded I/O	No	No	Yes

(1) A non-EtherNet/IP CompactLogix controller requires a 1761-NET-ENI interface to connect to an EtherNet/IP network. This interface is only a messaging bridge.
(2) To control I/O, use a 1769-SDN scanner to connect the controller to the DeviceNet network.
(3) The 1769-SDN does not support safety communication to Guard I/O modules on a DeviceNet network.

Control Safety I/O Modules

The Compact GuardLogix controller can control these safety I/O modules in a safety system.

I/O Modules	EtherNet/IP	ControlNet
1791ES CompactBlock Guard I/O	Yes	No
1734 POINT Guard I/O™	Yes	No

Communicate with Display Devices

The controller can communicate with these display devices.

Display Devices	EtherNet/IP Network(1)	ControlNet Network	DeviceNet Network(2)	RS-232 (DF1) Network	DH-485 Network
Industrial Computers					
Allen-Bradley® industrial computers (all)(3)	Yes	Yes	Yes	Yes	Yes
Graphic Terminals					
PanelView™ Plus and PanelView CE terminals	Yes	Yes	Yes	Yes	Yes
PanelView™ standard terminals	Yes	Yes	Yes	Yes	Yes
PanelView e terminals	No	No	No	No	No
Message Displays					
InView™ message displays	Yes	Yes	Yes	Yes	Yes

(1) A non-EtherNet/IP CompactLogix controller requires a 1761-NET-ENI interface to connect to an EtherNet/IP network. This interface is only a messaging bridge.
(2) For DeviceNet access, use either a 1769-SDN scanner (control I/O and send/receive messages) or a 1761-NET-DNI interface (messaging bridge).
(3) Includes: Allen-Bradley-integrated display rotating media (HDD) and solid-state (SSD) computers, Allen-Bradley non-display computers, and Allen-Bradley-integrated display computers with keypad.

Communicate with Other Controllers

The controller can communicate with these programmable controllers.

Compatible Programmable Controllers

Controller	EtherNet/IP Network(1)	ControlNet Network	DeviceNet Network(2)	RS-232 (DF1) Network	DH-485 Network
1756 ControlLogix® 1756 GuardLogix	Yes	Yes	Yes	Yes	Yes
CompactLogix 5370	Yes	No	Yes(3)	Yes(4)	Yes(5)
1768-L4*x* CompactLogix	Yes	Yes	Yes	Yes	Yes
1769-L3*x* CompactLogix	Yes	Yes	Yes	Yes	Yes
1769-L23*x* CompactLogix	Yes	No	Yes	Yes	Yes
1789 SoftLogix™ 5800	Yes	Yes	Yes	Yes	No
1794 FlexLogix™	Yes	Yes	Yes	Yes	Yes
PowerFlex® with DriveLogix™	Yes	Yes	Yes	Yes	Yes
1785 PLC-5®	Yes(6) (7)	Yes	Yes(8)	Yes	—
1747 SLC™	Yes(9)	Yes	Yes(4)	Yes	Yes
1761 MicroLogix™	Yes	No	Yes(4)	Yes	Yes
1762 MicroLogix	Yes	No	Yes(4)	Yes	Yes
1763 MicroLogix	Yes	No	Yes(4)	Yes	Yes
1764 MicroLogix	Yes	No	Yes(4)	Yes	Yes

ALLEN BRADLEY 1769 COMPACTLOGIX

Compatible Programmable Controllers (continued)

Controller	EtherNet/IP Network(1)	ControlNet Network	DeviceNet Network(2)	RS-232 (DF1) Network	DH-485 Network
1772 PLC-2®	–	–	–	Yes	–
1775 PLC-3®	–	–	–	Yes	–
5250 PLC-5/250	–	–	No	Yes	–

(1) A non-EtherNet/IP controller requires a 1761-NET-ENI interface to connect to an EtherNet/IP network. This interface is only a messaging bridge.
(2) In the CompactLogix system, use either a 1769-SDN scanner (control I/O and send/receive messages) or a 1761-NET-DNI interface (messaging bridge).
(3) The CompactLogix 5370 L1 controllers cannot access a DeviceNet network and, therefore, cannot communicate with other controllers on a DeviceNet network.
(4) The CompactLogix 5370 controllers do not have an embedded serial port. You must add external modules to communicate over an RS-232 (DF1) network.
(5) The CompactLogix 5370 controllers do not have an embedded serial port. You must add external modules to communicate over a DH-485 network.
(6) The Ethernet PLC-5® controller must be series C, firmware revision N.1 or later; series D, firmware revision E.1 or later; or series E, firmware revision D.1 or later.
(7) The 1785-ENET Ethernet communication interface module must be series A, firmware revision D or later.
(8) The PLC-5, SLC, and MicroLogix processors appear as I/O points to the Logix controller. Use the appropriate DeviceNet interface for the controller.
(9) Use a 1747-L55*x* controller with OS501 or later.

Communicate with Other Communication Devices

The controller can communicate with these communication devices.

Compatible Communication Devices

Communication Device	EtherNet/IP Network(1)	ControlNet Network	DeviceNet Network(2)
Linking device (only ControlLogix controllers)	1788-EN2DN	1788-CN2DN 1788-CN2FF	1788-EN2DN(3) 1788-CN2DN
PCMCIA card	–	1784-PCC	1784-PCD
PCI card	–	1784-PCIC 1784-PCICS	1784-PCID 1784-PCIDS 1784-CPCIDS
Drives SCANport™ module	–	1203-FM1 1203-FB1(4)	–
Communication module	–	1203-CN(5) 1770-KFC15 1770-KFCD15 1747-KFC15	1770-KFD 1770-KFG
Communication card	–	1784-PKTCS 1784-KTCS 1784-KTCX15	1784-PKTX 1784-PKTXD
USB communication device	–	1784-U2CN	1784-U2DN

(1) A non-EtherNet/IP controller requires a 1761-NET-ENI interface to connect to an EtherNet/IP network. This interface is only a messaging bridge.
(2) In the CompactLogix system, use either a 1769-SDN scanner (control I/O and send/receive messages) or a 1761-NET-DNI interface (messaging bridge).
(3) The 1788-EN2DN does not support safety communication (CIP Safety).
(4) Use a CIP generic MSG instruction to communicate with the 1203-FM1 SCANport™ module on a DIN rail that is remote to the controller. The remote DIN rail also requires a 1794-ACN15 or 1794-ACNR15 ControlNet adapter.
(5) Use the generic module configuration to configure the 1203-CN1 module and a CIP generic MSG instruction to communicate with the module.

ALLEN BRADLEY 1769 COMPACTLOGIX

Controller Connections

A CompactLogix system uses the connection types to establish communication links between devices:

- Controller-to-local I/O modules or local communication modules
- Controller-to-remote I/O or remote communication modules
- Controller-to-remote I/O (rack-optimized) modules
- Produced and consumed tags
- Messages
- Controller access by the programming software
- Controller access by RSLinx® Classic software for HMI or other applications

You indirectly determine the number of connections the controller uses by configuring the controller to communicate with other devices in the system. The limit of connections can ultimately reside in the communication module you use for the connection. If a message path routes through a communication module, the connection that is related to the message also counts toward the connection limit of that communication module.

CompactLogix 5370 Controller Ethernet Node Limits and Connections

When designing a CompactLogix 5370 control system, you must consider the following:

- Maximum number of Ethernet nodes available for the project of your controller
- Connections

The controller that you select determines the number of Ethernet nodes available.

Cat. No.	Ethernet Nodes Supported
1769-L16ER-BB1B	4
1769-L18ER-BB1B	8
1769-L18ERM-BB1B	
1769-L19ER-BB1B	
1769-L24ER-QB1B	8
1769-L24ER-QBFC1B	
1769-L27ERM-QBFC1B	16
1769-L30ER	16
1769-L30ERM	
1769-L30ER-NSE	
1769-L33ER	32
1769-L33ERM	
1769-L36ERM	48
1769-L37ERM	65
	80

All CompactLogix 5370 controllers support 256 CIP™ connections and 120 TCP/IP connections.

ALLEN BRADLEY 1769 COMPACTLOGIX

1769-L23*x* CompactLogix Connections

The controller that you select determines the connections for I/O and messages.

Controller	Supports
1769-L23EQB1B	32 CIP connections 8 TCP/IP connections
1769-L23EQBFC1B	

The total connection requirements for a 1769 CompactLogix system include both local and remote (distributed) connections. The controller supports 100 connections. The available remote connections depend on the network interface.

1769-L3*x* CompactLogix Connections

The controller that you select determines the connections for I/O and messages.

Controller	Supports
1769-L32C 1769-L35CR	32 CIP connections
1769-L32E 1769-L32EK 1769-L35E	32 CIP connections 32 TCP/IP connections

The total connection requirements for a 1769 CompactLogix system include both local and remote (distributed) connections. The controller supports 100 connections. The available remote connections depend on the network interface.

1768-L4*x* CompactLogix Connections

The communication module that you select determines the connections for I/O and messages.

Communication Module	Supports
1768-ENBT 1768-EWEB	128 CIP connections 64 TCP/IP connections
1768-CNB 1768-CNBR	48 CIP connections

The total connection requirements for a 1768 CompactLogix system include both local and remote (distributed) connections. The controller supports 250 connections. The available remote connections depend on the network interface.

ALLEN BRADLEY 1769 COMPACTLOGIX

Determine Total Connection Use

The total connection requirements for a CompactLogix system include both local and remote (distributed) connections. The controllers support these numbers of connections:

- 1769-L23*x* and 1769-L3*x* controllers support 100 connections.
- 1768-L4*x* controllers support 250 connections.
- CompactLogix 5370 controllers support 256 connections.

The available remote connections depend on the network interface.

Connection Type	Device Quantity	Connections Per Device	Total Connections
Remote ControlNet communication module Configured as a direct (none) connection Configured as a rack-optimized connection		0 **or** 1	
Remote I/O module over a ControlNet network (direct connection)		1	
Remote Ethernet communication module Configured as a direct (none) connection Configured as a rack-optimized connection		0 **or** 1	
Remote I/O module over an EtherNet/IP network (direct connection)		1	
Remote device over a DeviceNet network (accounted for in rack-optimized connection for local 1756-DNB module)		0	
Produced tag and first consumer		2	
Each additional consumer		1	
Consumed tag		1	
Cached message		1	
Message		1	
FactoryTalk® Linx subscriber (16 maximum)		1	
Total			

ALLEN BRADLEY 1769 COMPACTLOGIX

CompactLogix Controller Accessories

Memory Cards

Memory cards offer nonvolatile memory to store a user program and tag data on a controller. Through the programming software, you can manually trigger the controller to save to or load from nonvolatile memory or configure the controller to load from nonvolatile memory on powerup.

IMPORTANT The 1769-L23x packaged CompactLogix controllers do not offer a nonvolatile memory option.

The CompactLogix 5370 controllers come with a 1784-SD1 Secure Digital (SD) card installed. You can order a 1784-SD2 SD card separately for additional nonvolatile memory with the CompactLogix 5370 controllers.

The 1768-L4*x* and 1769-L3*x* modular CompactLogix controllers offer a CompactFlash card as a nonvolatile memory option. You install the CompactFlash card in a socket on the controller. Through the programming software, you can manually trigger the controller to save to or load from nonvolatile memory or configure the controller to load from nonvolatile memory on powerup.

Technical Specifications - 1784-CF128, 1784-SD1, 1784-SD2

Attribute	1784-CF128	1784-SD1	1784-SD2
Memory	128 MB	1 GB	2 GB
Supported controllers	1769 modular controllers 1768 controllers	CompactLogix 5370 controllers	
Weight, approx	14.2 g (0.5 oz)	1.76 g (0.062 oz)	

Environmental Specifications - 1784-CF128, 1784-SD1, 1784-SD2

Attribute	1784-CF128, 1784-SD1, 1784-SD2
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-25…+70 °C (-13…+158 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz

ALLEN BRADLEY 1769 COMPACTLOGIX

Certifications - 1784 Memory Cards

Certification[1]	1784-CF128, 1784-SD1, 1784-SD2
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61000-6-4; Industrial Emissions • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1769 CompactLogix Batteries

The 1769-L23*x* and 1769-L3*x* controllers come with one 1769-BA lithium battery.

The 1768 controllers and the CompactLogix 5370 controllers do not require a battery. The controller uses internal nonvolatile memory to store its program during shutdown. Energy that is stored in the system maintains controller power long enough to store the program to internal nonvolatile memory, but not the external CompactFlash card nor SD card respectively.

Technical Specifications - 1769-BA

Attribute	1769-BA
Description	Lithium battery (0.59 g)
CompactLogix controllers	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B 1769-L31 1769-L32C, 1769-L35CR 1769-L32E, 1769-L35E

Removable Terminal Kits

You can order removable terminal kits with the CompactLogix 5370 L1 and L2 controllers separately. The kits are used to connect wiring to the controllers. The CompactLogix 5370 Controllers Removable Terminal Kits table describes the kits.

CompactLogix 5370 Controllers Removable Terminal Kits

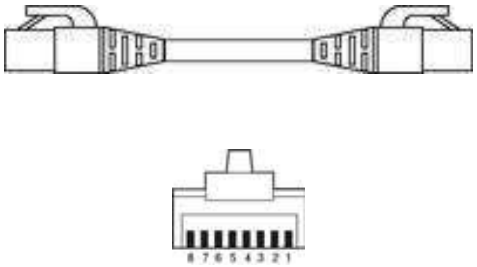
Cat. No.	Controllers Supported	Description
1769-RTB45	CompactLogix 5370 L1	• Four 10-pin connectors are used to connect wiring to the embedded digital I/O module of the controller. • One 5-pin connector is used to connect an external 24V DC power source to the controller.
1769-RTB40DIO	CompactLogix 5370 L2	Four 10-pin connectors are used to connect wiring to the embedded digital I/O module of the controller.
1769-RTB40AIO	1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B	Four 10-pin connectors are used to connect wiring to the embedded analog I/O module of the controller.

ALLEN BRADLEY 1769 COMPACTLOGIX

Cold Junction Compensation

The CompactLogix 5370 L2 controllers require the use of the 1769-CJC CompactLogix CJC Sensor when the embedded analog input of the controller is configured for Thermocouple mode.

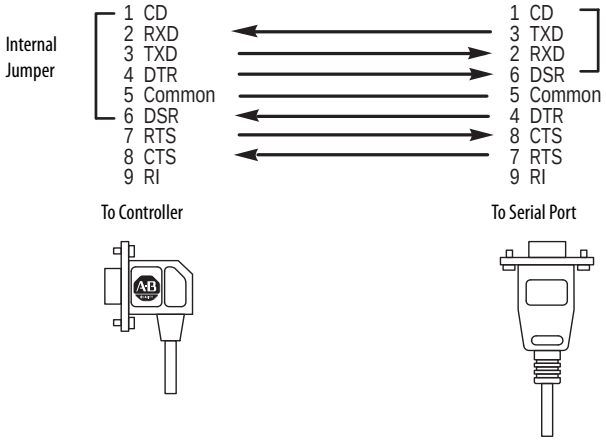
Ethernet Communication Cables



Connector Number	Color	1585J-M8xBJM-2	1585J-M4TBJM-2
1	White/Orange	TxData +	
2	Orange	TxData -	
3	White/Green	Recv Data +	
4	Blue	Unused	–
5	White/Blue	Unused	–
6	Green	Recv Data -	
7	White/Brown	Unused	–
8	Brown	Unused	–

Attribute	Value
Connector type	RJ45 Male to RJ45 Male
Connector angle	Straight-through
Length	Varies by catalog number

Serial Communication Cables



Attribute	1756-CP3	1747-CP3
Connector type	Female 9-pin D-shell	
Connector angle	Right angle connector to controller, straight to serial port	
Length	3 m (118 in.)	

ALLEN BRADLEY 1769 COMPACTLOGIX

Additional Resources

These documents contain more information about related products from Rockwell Automation.

Resource	Description
Replacement Guidelines: Logix 5000™ Controllers Reference Manual, publication 1756-RM100	Provides guidelines on how to replace the following: • ControlLogix® 5560/5570 controller with a ControlLogix 5580 controller • CompactLogix 5370 L3 controllers with a CompactLogix 5380 controller
CompactLogix 5370 Controllers System User Manual, publication 1769-UM021	Provides information on how to configure, operate, and monitor Armor CompactLogix and CompactLogix 5370 controllers.
Compact GuardLogix 5370 Controllers User Manual, publication 1769-UM022	Provides information on how to configure, operate, and monitor Armor Compact GuardLogix and Compact GuardLogix 5370 controllers
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/rockwellautomation/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

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Technical Data

Allen-Bradley

1769 Compact I/O Modules Specifications

Catalog Numbers 1769 Series

Topic	Page
Summary of Changes	2
I/O Module Overview	2
Place Compact I/O Modules	4
Digital I/O Modules	4
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The 1769 Compact I/O™ modules can be used in the following applications:

- With a CompactLogix™ controller
- For expansion I/O in a MicroLogix™ 1500 controller assembly
- In an assembly with a 1769-ADN DeviceNet adapter
- In an assembly with a 1769-AENTR Ethernet adapter.

Unless connected to a MicroLogix 1500 base, each bank of I/O modules must include its own power supply.

Install the I/O modules on a panel with two mounting screws or on a DIN rail. The modules mechanically lock together with a tongue-and-groove design and have an integrated communication bus that is connected from module to module by a moveable bus connector.

ALLEN BRADLEY 1769 I_O MODULES

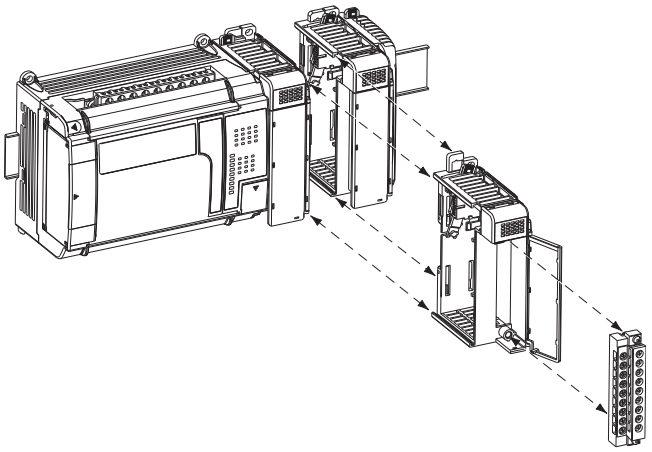
Summary of Changes

This manual contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the right of this paragraph.

Topic	Page
Updated information for Compact I/O modules applications	1
Updated specifications in Table 51	51
Updated description of 1769-ARM module	102

I/O Module Overview

Each I/O module includes a built-in removable terminal block with fingersafe cover for connections to I/O sensors and actuators. The terminal block is behind a door at the front of the module. I/O wiring can be routed from beneath the module to the I/O terminals.



- Once the modules are locked together, the system becomes a rugged assembly.
- Upper and lower tongue-and-groove slots guide the module during installation and secure the module within the system.
- Removable terminal blocks help ease the wiring task.
- Self-lifting, field-wire pressure plates cut installation time.
- The patented bus connector with the lock function enables consistent and system communication.
- A color bar is provided on the front of the module.
- Digital and field circuits are optically isolated.

ALLEN BRADLEY 1769 I_O MODULES

Available 1769 I/O Modules

I/O Type	Cat. No.	Page	Cat. No.	Page
AC digital	1769-IA8I 1769-IA16 1769-IM12	6 8 35	1769-OA8 1769-OA16	57 60
DC digital	1769-IG16 1769-IQ16 1769-IQ16F 1769-IQ32 1769-IQ32T 1769-IQ6XOW4	33 37 39 41 43 45	1769-OB8 1769-OB16 1769-OB16P 1769-OB32 1769-OB32T 1769-OG16 1769-OV16 1769-OV32T	63 64 67 69 72 90 92 94
Contact	1769-OW8 1769-OW8I	96 98	1769-OW16	100
Analog	1769-IF4 1769-IF4I 1769-IF4XOF2 1769-IF4FXOF2F 1769-IF8 1769-IF16C 1769-IF16V 1769-IR6 1769-IT6	10 13 16 19 24 28 30 48 53	1769-OF2 1769-OF4 1769-OF4CI 1769-OF4VI 1769-OF8C 1769-OF8V	74 76 79 82 85 87
Specialty	1769-ARM 1769-ASCII	102 103	1769-BOOLEAN 1769-HSC	105 109

Table 1 - Environmental Specifications - 1769 I/O Modules

Attribute	1769-IA8I, 1769-IA16, 1769-IM12, 1769-OA8, 1769-OA16, 1769-IQ16, 1769-IQ16F, 1769-IQ32, 1769-IQ6XOW4, 1769-OB8, 1769-OB16, 1769-OB16P, 1769-OB32, 1769-OV16, 1769-OW8, 1769-OW8I, 1769-OW16 1769-IF4, 1769-IF4XOF2, 1769-IR6, 1769-IT6 1769-ARM, 1756-HSC	1769-IG16, 1769-IQ32T, 1769-OB32T, 1769-OG16, 1769-OV32T 1769-IF4I, 1769-IF8, 1769-IF16C, 1769-IF16V, 1769-OF2, 1769-OF4CI, 1769-OF4VI, 1769-OF8C, 1769-OF8V, 1769-IF4FXOF2F 1769-ASCII, 1769-BOOLEAN
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)	0…60 °C (32…140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	Operating: 5 g @ 10…500 Hz Relay operating: 2 g	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	Panel mount 30 g DIN rail mount 20 g	Panel mount 30 g DIN rail mount 20 g
Shock, relay operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	Panel mount 7.5 g DIN rail mount 5 g	—
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	Panel mount 40 g DIN rail mount 30 g	Panel mount 40 g DIN rail mount 30 g

ALLEN BRADLEY 1769 I_O MODULES

Place Compact I/O Modules

You can DIN-rail or panel mount the controller and I/O modules. The number of local I/O modules that are supported depends on the controller.

Controller	Supports	Location	Considerations
1769-L24ER-QB1B 1769-L24ER-QBFC1B 1769-L27ERM-QBFC1B	4 local modules	Right side of the controller	The additional modules are connected directly to the controller. There are no additional banks of local I/O.
1769-L30ER 1769-L30ERM 1769-L30ER-NSE	8 local modules	1 separate bank	Standard 1769 power supplies power the additional banks and connect to the main rack by using standard 1769 expansion cables.
1769-L33ER 1769-L33ERM	16 local modules	2 separate banks	
1769-L36ERM	30 local modules	3 separate banks	
1769-L23E-QB1B 1769-L23E-QBFC1B 1769-L23-QBFC1B	2 local modules, V17 and earlier.	Right side of the packaged controller	The additional modules are connected directly to the packaged controller. There are no additional banks of local I/O.
1769-L23E-QB1B	3 local modules, v18 and later.		
1769-L35CR 1769-L35E	30 local modules	3 separate banks	Standard 1769 power supplies power the additional banks and connect to the main rack by using standard 1769 expansion cables.
1769-L32C 1769-L32E 1769-L31	16 local modules	3 separate banks	
1768-L43	16 local modules	3 separate banks	As many as eight 1769 local modules can be attached to the 1768 backplane. The remaining modules can be in one or two additional I/O banks. Standard 1769 power supplies power the additional banks and connect to the main rack by using standard 1769 expansion cables.
1768-L45	30 local modules	3 separate banks	

Each 1769 I/O module has a distance rating. In 1769 systems, the distance rating is the number of modules between the specific module and the 1769 power supply. In a 1768 system, the distance rating is the number of modules between the specific I/O module and the 1768 controller.

Digital I/O Modules

Choose digital I/O modules when you need these features.

Type	Description
Input	An input module responds to an input signal in the following manner: • Input filtering limits the effect of voltage transients that contact bounce and/or electrical noise cause. If not filtered, voltage transients could produce false data. All input modules use input filtering. • Optical isolation shields logic circuits from possible damage due to electrical transients. • Logic circuits process the signal. • An input indicator turns on or off, which indicates the status of the corresponding input device.
Output	An output module controls the output signal in the following manner: • Logic circuits determine the output status. • An output indicator displays the status of the output signal. • Optical isolation separates module logic and bus circuits from field power. • The output driver turns the corresponding output on or off.

Most output modules have built-in surge suppression to reduce the effects of high-voltage transients. Use an additional suppression device if an output is being used to control inductive devices, such as relays, motor starters, solenoids, or motors.

ALLEN BRADLEY 1769 I_O MODULES

Additional suppression is especially important if your inductive device is in series with or parallel to hard contacts, such as push buttons or selector switches. Add a suppression device directly across the coil of an inductive device. The suppression device reduces the effects of voltage transients that are caused by interrupting the current to that device and to prolong the life of the switch contacts.

Analog I/O Modules

Choose analog, thermocouple, or RTD modules for these features:

- Individually configurable channels
- Ability to enable and disable channels individually
- Onboard scaling
- Auto calibration of inputs
- Online configuration
- Selectable input filters
- Over-range and under-range detection and indication
- Selectable response to a broken input sensor
- Selectable power source
- Input modules offer both single-ended or differential inputs
- Ability to direct output device operation during an abnormal condition
- High accuracy ratings

The data can be configured on board each module as:

- Engineering Units in volts or milliamps.
- Scaled-for-PID.
- Percent of range.
- Raw/Proportional Data for maximum resolution.

Specialty I/O Modules

These specialty modules are available.

Cat. No.	Description
1769-ARM	Use a 1769-ARM address reserve module to reserve module slots. To use the 1769-ARM module, first you create an I/O configuration and user program. Then you can remove and replace any module in the system with a 1769-ARM module after you inhibit the removed module in the programming software.
1769-ASCII	The 1769-ASCII module, a general-purpose two-channel ASCII interface, provides a flexible network interface to a wide variety of RS-232, RS-485, and RS-422 ASCII devices. The module provides the communication connections to the ASCII device.
1769-BOOLEAN	Use the 1769-BOOLEAN module in applications that require repeatability, such as material handling and packaging, when there is a requirement to activate an output that is based on the transition of an input. If the Boolean expression is true, the output is directed to the ON state. If the Boolean expression is false, the output channel is directed to the OFF state. There are four operators that you can configure as OR, AND, XOR, or none.

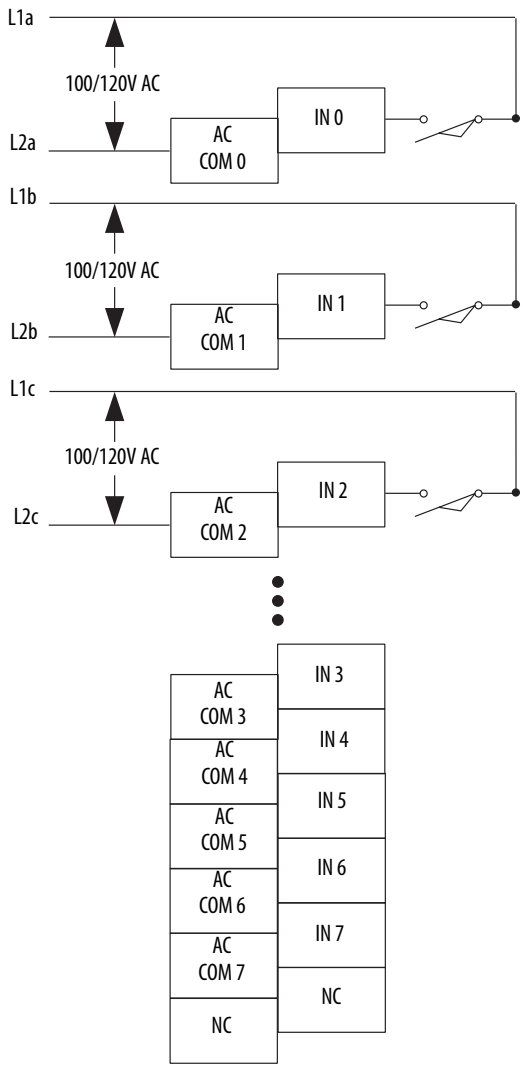
ALLEN BRADLEY 1769 I_O MODULES

Cat. No.	Description
1769-HSC	Use the 1769-HSC module when you need: • A counter module that can react to high-speed input signals. • To generate rate and time-between-pulses (pulse interval) data. • One or two channels of quadrature or four channels of pulse/count inputs.
1769-SM1	The Compact I/O to DPI/SCANport module connects to PowerFlex® 7-class drives, other DPI-based host devices, and SCANport-based host devices such as 1305 and 1336 PLUS™ II drives.
1769-SM2	The Compact I/O to DSI/Modbus module connects to PowerFlex 4-class drives and to other Modbus RTU slave devices, such as PowerFlex 7-class drives with 20-COMM-H RS-485 HVAC adapters.

1769-IA8I

Compact individually isolated 120V AC input module

1769-IA8I



ALLEN BRADLEY 1769 I_O MODULES

Table 2 - Technical Specifications - 1769-IA8I

Attribute	1769-IA8I
Inputs	8 individually isolated
Voltage category	100/120V AC
Operating voltage range	79…132V AC, 47…63 Hz
Input delay, on	20 ms
Input delay, off	20 ms
Current draw @ 5.1V	90 mA
Heat dissipation, max	1.81 W
Off-state voltage, max	20V AC
Off-state current, max	2.5 mA
On-state voltage, min	79V AC
On-state current, min	5 mA @ 74V AC
On-state current, max	12 mA @ 120V AC
Inrush current, max(1)	250 mA
Input impedance, max	12 kΩ @ 50 Hz 10 kΩ @ 60 Hz
Isolation voltage	Verified by one of the following dielectric tests: 1517V AC for 1 s or 2145V DC for 1 s, input point to bus and group to group 132V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	270 g (0.60 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	81
Enclosure type rating	None (open-style)

(1) A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the AC input circuit are affected. If a 6.8 kΩ (2.5 W minimum) resistor is placed in series with the input, the inrush current is reduced to 35 mA. In this configuration, the minimum on-state voltage increases to 92V AC. Before adding the resistor in a hazardous environment, be sure to consider the operating temperature of the resistor and the temperature limits of the environment. The operating temperature of the resistor must remain below the temperature limit of the environment.

ALLEN BRADLEY 1769 I_O MODULES

Table 3 - Certifications - 1769-IA8I

Certification[1]	1769-IA8I
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-IA16

Compact 120V AC input module

1769-IA16

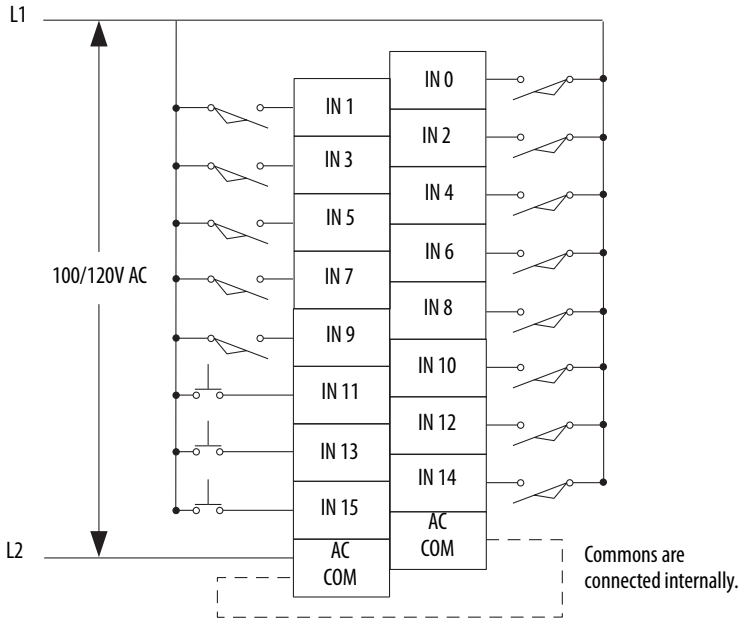


Table 4 - Technical Specifications - 1769-IA16

Attribute	1769-IA16
Inputs	16 (16 points/group, internally connected commons)
Voltage category	100/120V AC
Operating voltage range	79…132V AC, 47…63 Hz
Input delay, on	20 ms
Input delay, off	20 ms
Current draw @ 5.1V	115 mA
Heat dissipation, max	3.30 W
Off-state voltage, max	20V AC
Off-state current, max	2.5 mA

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Table 4 - Technical Specifications - 1769-IA16

Attribute	1769-IA16
On-state voltage, min	79V AC
On-state current, min	5 mA @ 74V AC
On-state current, max	12 mA @ 120V AC
Inrush current, max(1)	250 mA
Input impedance, max	12 kΩ @ 50 Hz 10 kΩ @ 60 Hz
Isolation voltage	Verified by one of the following dielectric tests: 1517V AC for 1 s or 2145V DC for 1 s, input point to bus 132V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	82
Enclosure type rating	None (open-style)

(1) A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the AC input circuit are affected. If a 6.8 kΩ (2.5 W minimum) resistor is placed in series with the input, the inrush current is reduced to 35 mA. In this configuration, the minimum on-state voltage increases to 92V AC. Before adding the resistor in a hazardous environment, be sure to consider the operating temperature of the resistor and the temperature limits of the environment. The operating temperature of the resistor must remain below the temperature limit of the environment.

Table 5 - Certifications - 1769-IA16

Certification(1)	1769-IA16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

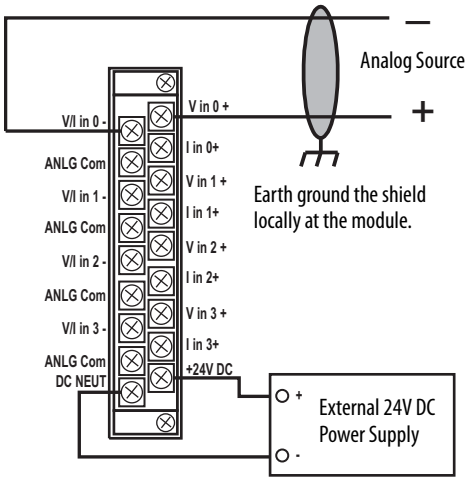
ALLEN BRADLEY 1769 I_O MODULES

1769-IF4

Compact voltage/current analog input module

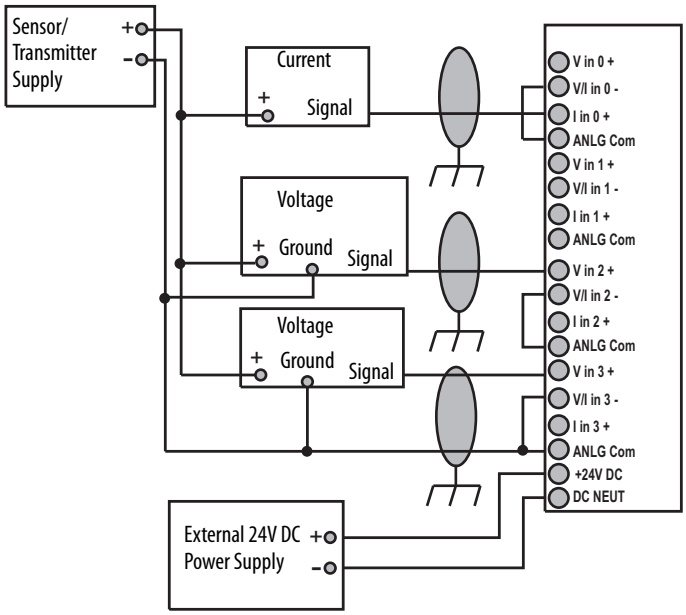
1769-IF4 Differential Inputs

Belden 8761 Cable (or equivalent)

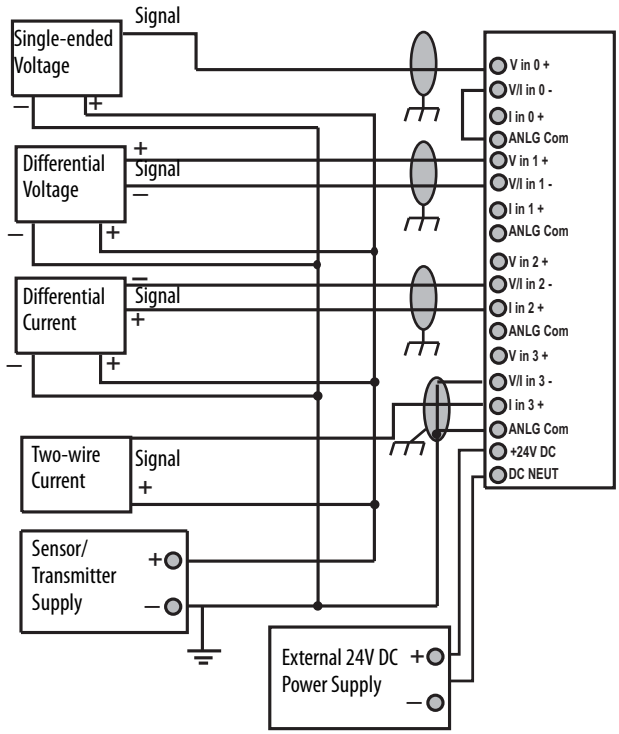


The external power supply must be rated Class 2, with a 24V DC range of 20.4…26.4V DC and 60 mA minimum. Series B and later modules support this option.

1769-IF4 Single-ended Sensor/Transmitter Inputs



1769-IF4 Mixed Transmitter Inputs



ALLEN BRADLEY 1769 I_O MODULES

Table 6 - Technical Specifications - 1769-IF4

Attribute	1769-IF4
Inputs	4 differential or single-ended
Input range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Current draw @ 5.1V	120 mA
Current draw @ 24V	60 mA
Heat dissipation, max	2.52 W
Converter type	Delta Sigma
Resolution [2]	14 bits (unipolar) 14 bits plus sign (bipolar)
Rated working voltage[3]	30V AC/30V DC
Common mode voltage range[4]	±10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 50 or 60 Hz filter selected, respectively
Normal mode rejection ratio	-50 dB @ 50 and 60 Hz with the 50 or 60 Hz filter selected, respectively
Input impedance	Voltage: 220 kΩ Current: 250 Ω
Accuracy[5]	Voltage: ±0.2% full scale @ 25 °C (77 °F) Current: ±0.35% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	Voltage: ±0.003% per °C Current: ±0.0045% per °C
Nonlinearity	±0.03%
Repeatability[6]	±0.03%
Module error	Voltage: ±0.3% Current: ±0.5%
Overload at input terminals, max[7]	Voltage: ±30V DC continuous, 0.1 mA Current: ±32 mA continuous, ±7.6V DC
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	300 g (0.65 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Optional 24V DC Class 2 power supply voltage range[8]	20.4…26.4V DC
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)

ALLEN BRADLEY 1769 I_O MODULES

Table 6 - Technical Specifications - 1769-IF4

Attribute	1769-IF4
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	35
Enclosure type rating	None (open-style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminals.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.
(8) If the optional 24V DC Class 2 power supply is used, the 24V DC current draw from the bus is 0 mA.

Table 7 - Response Speed - 1769-IF4

Filter Frequency	Cutoff Frequency	Step Response	Channel Update
50 Hz	13.1 Hz	60 ms	22 ms
60 Hz	15.7 Hz	50 ms	19 ms
250 Hz	65.5 Hz	12 ms	6 ms
500 Hz	131 Hz	6 ms	4 ms

Table 8 - Certifications - 1769-IF4

Certification(1)	1769-IF4
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

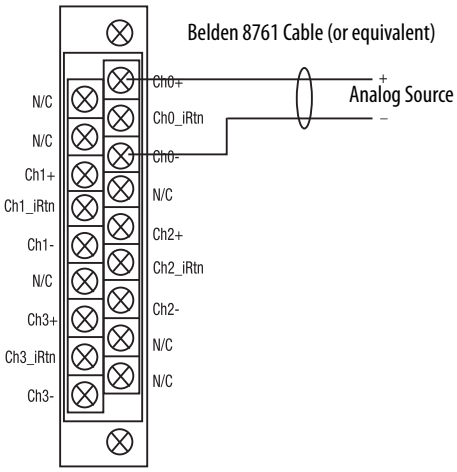
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

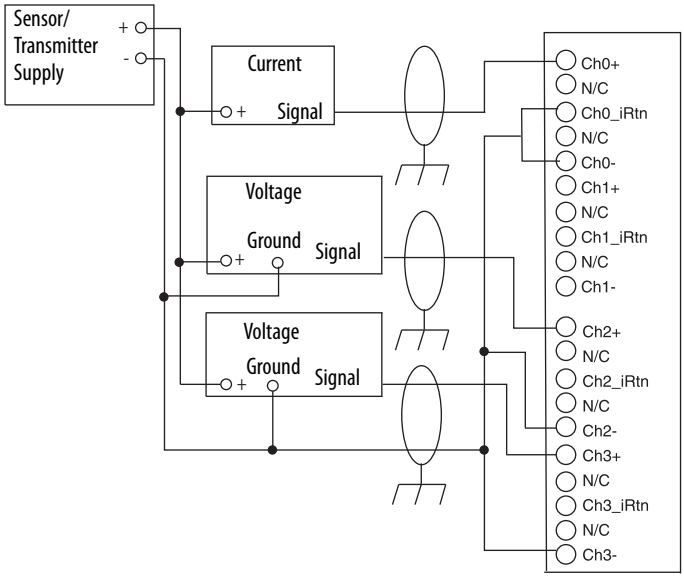
1769-IF4I

Compact voltage/current analog, individually isolated input module

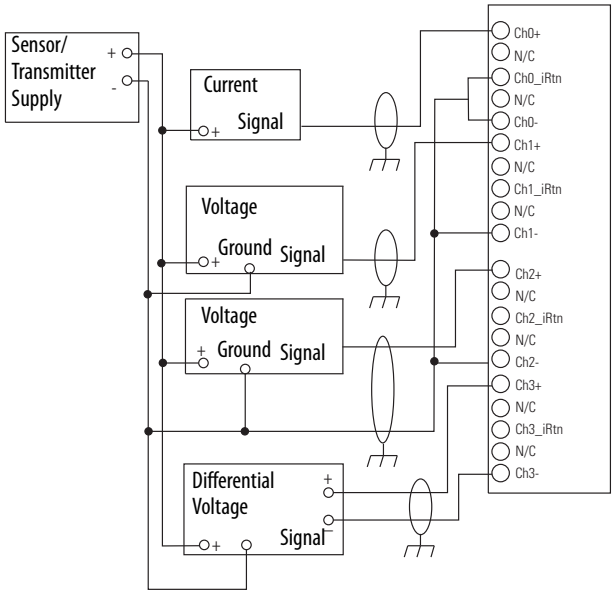
1769-IF4I Differential Inputs



1769-IF4I Single-ended Sensor/Transmitter Inputs



1769-IF4I Mixed Transmitter Inputs



ALLEN BRADLEY 1769 I_O MODULES

Table 9 - Technical Specifications - 1769-IF4I

Attribute	1769-IF4I
Inputs	4 isolated differential
Input range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Bus current draw	5V DC, 140 mA 24V DC, 110 mA
Heat dissipation, max	3.0 W
Converter type	Delta Sigma
Resolution [2]	16 bits (unipolar) 15 bits plus sign (bipolar)
Rated working voltage[3]	30V AC/30V DC
Common mode voltage range[4]	±10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 10 Hz filter selected
Normal mode rejection ratio	-50 dB @ 50 and 60 Hz with the 10 Hz filter selected
Input impedance	Voltage: 1 MΩ Current: 249 Ω
Accuracy[5]	Voltage: ±0.2% full scale @ 25 °C (77 °F) Current: ±0.35% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	Voltage: ±0.003% per °C Current: ±0.0045% per °C
Nonlinearity	±0.03%
Repeatability[6]	±0.03%
Module error	Voltage: ±0.3% Current: ±0.5%
Overload at input terminals, max[7]	Voltage: ±24V DC continuous, 0.1 mA Current: ±28 mA continuous, ±7.6V DC
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation) 500V AC or 710V DC for 1 minute or 250V continuous (optical and magnetic), channel to rack and channel to channel
Weight, approx	300 g (0.65 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)

ALLEN BRADLEY 1769 I_O MODULES

Table 9 - Technical Specifications - 1769-IF4I

Attribute	1769-IF4I
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	44
Enclosure type rating	None (open-style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 10 - Response Speed - 1769-IF4I

Filter Frequency	Channel Update
28.5 Hz	108 ms
50 Hz	62 ms
60 Hz	52 ms
300 Hz	12 ms
360 Hz	10 ms

Table 11 - Certifications - 1769-IF4I

Certification(1)	1769-IF4I
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

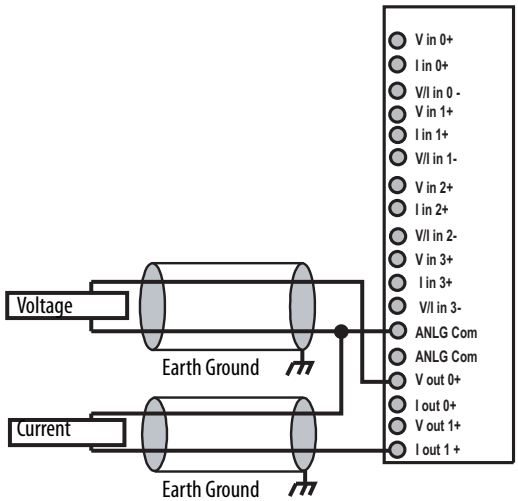
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IF4X0F2

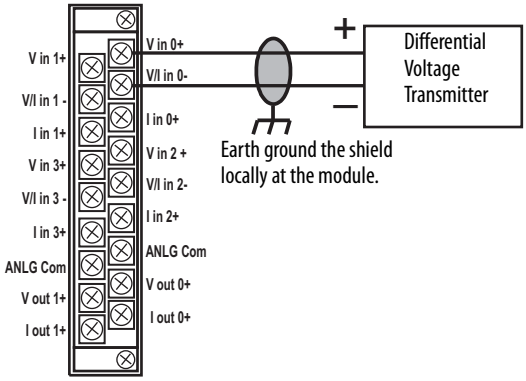
Compact combination input/output analog module

1769-IF4X0F2 Outputs

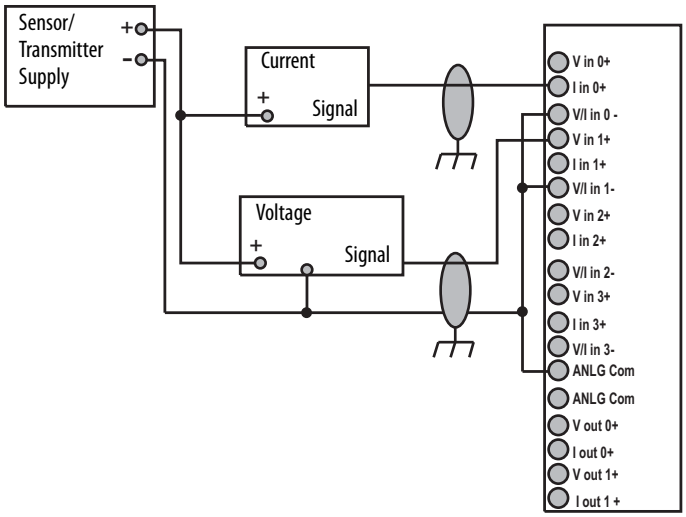


1769-IF4X0F2 Differential Inputs

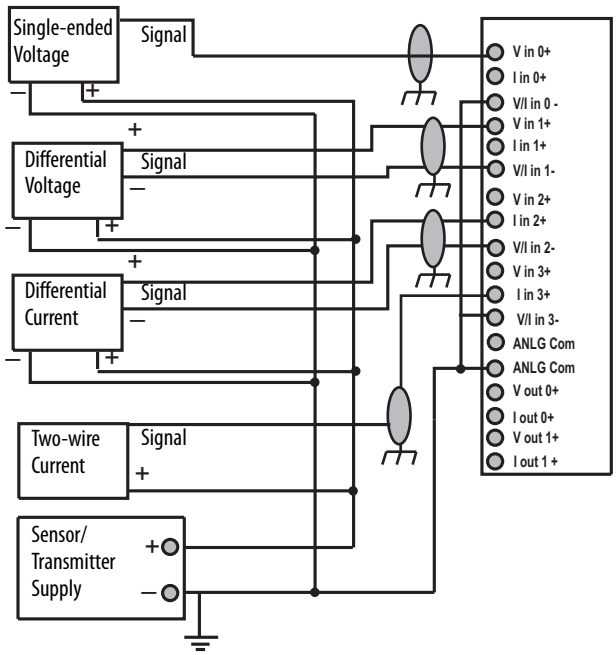
Belden 8761 Cable (or equivalent)



1769-IF4X0F2 Single-ended Sensor/Transmitter Inputs



1769-IF4X0F2 Mixed Transmitter Inputs



The sensor power supply must be rated Class 2.

ALLEN BRADLEY 1769 I_O MODULES

Table 12 - Technical Specifications - 1769-IF4X0F2

Attribute	1769-IF4X0F2
Current draw @ 5.1V	120 mA
Current draw @ 24V	160 mA
Heat dissipation, max	3.03 W
Weight, approx	290 g (0.64 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	33
Enclosure type rating	None (open-style)

Table 13 - 1769-IF4X0F2 Input Specifications

Attribute	1769-IF4X0F2
Inputs	4 differential or single-ended
Input range	0…10V 0…20 mA
Full scale range(1)	0…10.5V 0…21 mA
Converter type	Successive approximation
Resolution (2)	8 bits plus sign
Response speed per channel	5 ms
Rated working voltage(3)	30V AC/30V DC
Common mode voltage range(4)	10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 10 Hz filter selected
Input impedance	Current: 150 Ω Voltage: 150 kΩ
Accuracy(5)	Current: ±0.6% full scale @ 25 °C (77 °F) Voltage: ±0.7% full scale @ 25 °C (77 °F)
Overall accuracy	Current: ±0.8% full scale @ 0…60 °C (32…140 °F) Voltage: ±0.9% full scale @ 0…60 °C (32…140 °F)
Accuracy drift with temperature	Current: ±0.006% per °C Voltage: ±0.006% per °C
Nonlinearity	±0.4%

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Table 13 - 1769-IF4X0F2 Input Specifications

Attribute	1769-IF4X0F2
Repeatability(6)	±0.4%
Overload at input terminals, max(7)	Current: ±32 mA continuous, ±5V DC Voltage: ±20V DC continuous, 0.1 mA
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 14 - 1769-IF4X0F2 Output Specifications

Attribute	1769-IF4X0F2
Outputs	2 single-ended
Output range	0…10V 0…20 mA
Full scale range(1)	0…10.5V 0…21 mA
Converter type	Resistor string
Resolution	8 bits plus sign
Response speed per channel	0.3 ms for rated resistance and rated inductance 3.0 ms for rated capacitance
Current load on voltage output, max	10 mA
Resistive load on current output	0…300 Ω (includes wire resistance)
Load range on voltage output	> 1 kΩ
Inductive load, max	Current: 0.1 mH Voltage: 1 µF
Accuracy(2)	Current: ±0.5% full scale @ 25 °C (77 °F) Voltage: ±0.5% full scale @ 25 °C (77 °F)
Overall accuracy	Current: ±1.0% full scale @ 0…60 °C (32…140 °F) Voltage: ±0.6% full scale @ 0…60 °C (32…140 °F)
Accuracy drift with temperature	Current: ±0.01% per °C Voltage: ±0.01% per °C
Output ripple(3)	±0.05% @ 0…50 kHz
Nonlinearity	±0.4%
Repeatability(4)	±0.05%
Output impedance	10 kΩ
Open and short-circuit protection	Yes
Short-circuit, max	40 mA
Open circuit, max	15V
Output response at system powerup and power down	+2.0…-1.0V DC spike for < 6 ms
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Includes offset, gain, nonlinearity, and repeatability error terms.

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(3) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(4) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.

Table 15 - Response Speed - 1769-IF4X0F2

Fixed Filter Frequency	Filter Cutoff Frequency	Step Response % Complete	Step Response Time
2.7 kHz	2.7 kHz	63%	59 µs
2.7 kHz	2.7 kHz	90%	136 µs (nom)

Table 16 - Certifications - 1769-IF4X0F2

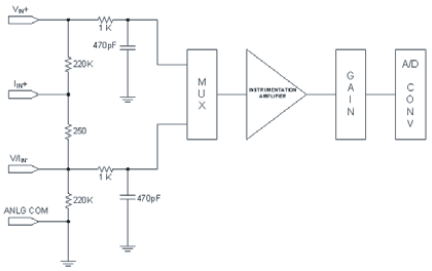
Certification[1]	1769-IF4X0F2
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

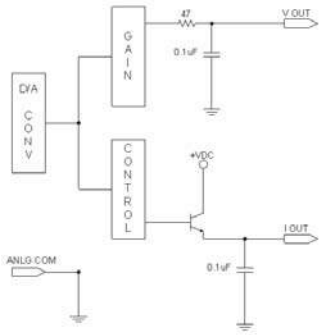
1769-IF4FX0F2F

Compact combination fast input/output analog module

Simplified Input Circuit Diagram

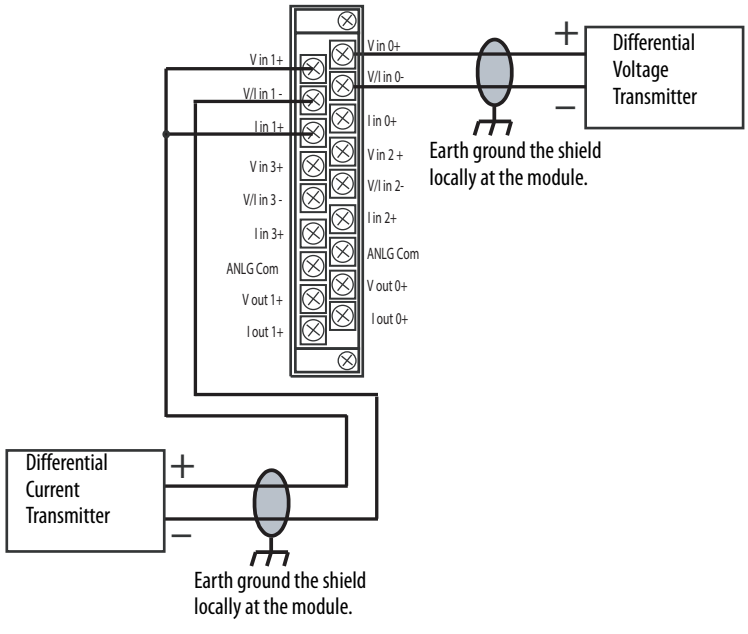


Simplified Output Circuit Diagram



1769-IF4FX0F2F Differential Inputs

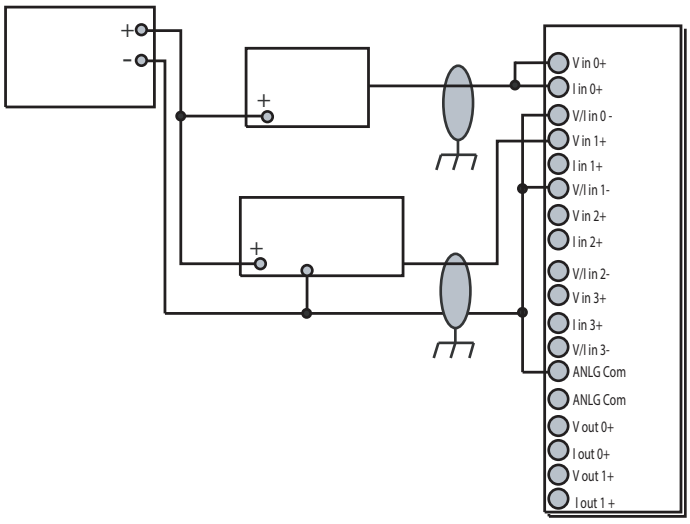
Belden 8761 Cable (or equivalent)



The sensor power supply must be rated Class 2.

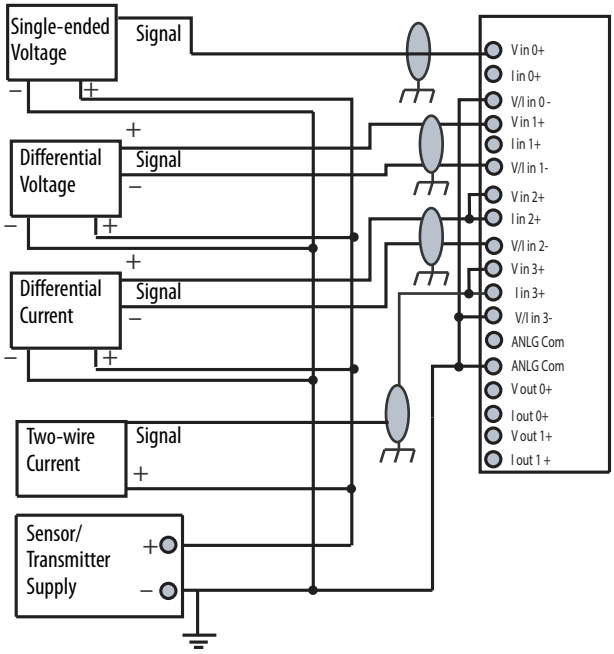
ALLEN BRADLEY 1769 I_O MODULES

1769-IF4FX0F2F Single-ended Sensor/Transmitter Inputs



The sensor power supply must be rated Class 2.

1769-IF4FX0F2F Mixed Transmitter Inputs



1769-IF4FX0F2F Outputs

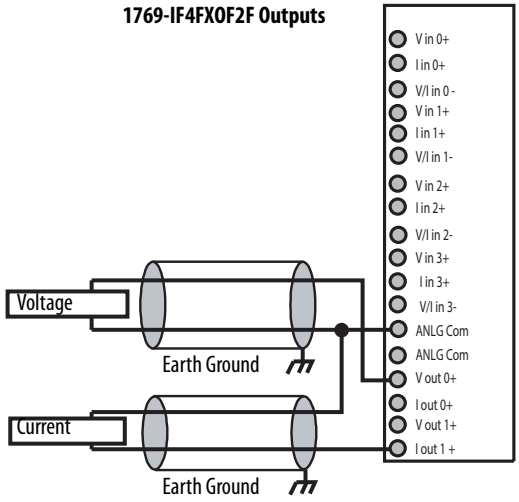


Table 17 - Technical Specifications - 1769-IF4FX0F2F

Attribute	1769-IF4FX0F2F
Current draw @ 5.1V	220 mA
Current draw @ 24V	120 mA
Heat dissipation, max	3.39 W
Weight, approx	290 g (0.64 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules

ALLEN BRADLEY 1769 I_O MODULES

Table 17 - Technical Specifications - 1769-IF4FXOF2F

Attribute	1769-IF4FXOF2F
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	43
Input words	10
Output words	4
Configuration words	42
Enclosure type rating	None (open-style)

Table 18 - 1769-IF4FXOF2F Input Specifications

Attribute	1769-IF4FXOF2F
Inputs	4 differential or single-ended
Input range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range(1)	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Converter type	Successive approximation
Resolution (2)	14 bits (unipolar) 14 bits plus sign (bipolar)
Rated working voltage(3)	30V AC/30V DC
Common mode voltage range(4)	±10V DC max per channel
Common mode rejection	> 70 dB @ 50 and 60 Hz with the 10 Hz filter selected
Input impedance	Current: 250 Ω Voltage: 220 kΩ
Accuracy(5)	Current: ±0.2% full scale @ 25 °C (77 °F) Voltage: ±0.15% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	Current: ±0.0045% per °C Voltage: ±0.003% per °C
Nonlinearity	±0.03%
Repeatability(6)	±0.03%

ALLEN BRADLEY 1769 I_O MODULES

Table 18 - 1769-IF4FXOF2F Input Specifications

Attribute	1769-IF4FXOF2F
Module error	Current: ±0.3% Voltage: ±0.2%
Overload at input terminals, max(7)	Current: ±32 mA continuous, ±7.6V DC Voltage: ±30V DC continuous, 0.1 mA
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 19 - 1769-IF4FXOF2F Output Specifications

Attribute	1769-IF4FXOF2F
Outputs	2 single-ended
Output range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range(1)	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Resolution	13 bits (unipolar) 13 bits plus sign (bipolar)
Conversion rate (all channels), max	1 ms
Step response to 63%(2)	2.0 ms
Current load on voltage output, max	10 mA
Resistive load	Current: 0…500 Ω (includes wire resistance) Voltage: 1 kΩ or greater
Inductive load, max	Current: 0.1 mH Voltage: 1 µF
Field calibration	None required
Accuracy(3)	±0.2% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	Current: ±0.0058% per °C Voltage: ±0.0086% per °C
Output ripple(4)	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%
Repeatability(5)	±0.05%
Module error	Current: ±0.4% Voltage: ±0.3%
Open and short-circuit protection	Yes
Short-circuit protection, max	50 mA

ALLEN BRADLEY 1769 I_O MODULES

Table 19 - 1769-IF4FX0F2F Output Specifications

Attribute	1769-IF4FX0F2F
Output overvoltage protection	Yes
Rated working voltage[6]	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.

Table 20 - Response Speed - 1769-IF4FX0F2F

Filter Frequency	Channel Step Response
5 Hz	802 ms
10 Hz	401 ms
50 Hz	81 ms
60 Hz	65 ms
100 Hz	42 ms
250 Hz	17 ms
500 Hz	10 ms
1000 Hz	5 ms

Table 21 - Certifications - 1769-IF4FX0F2F

Certification[1]	1769-IF4FX0F2F
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives

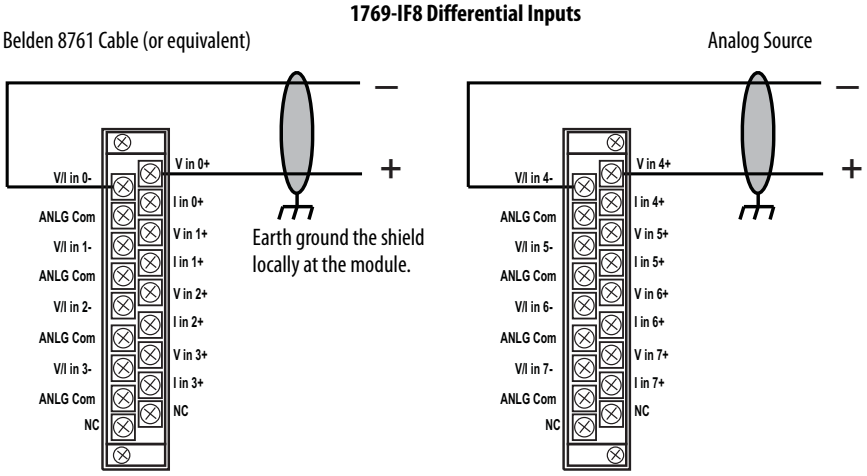
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IF8

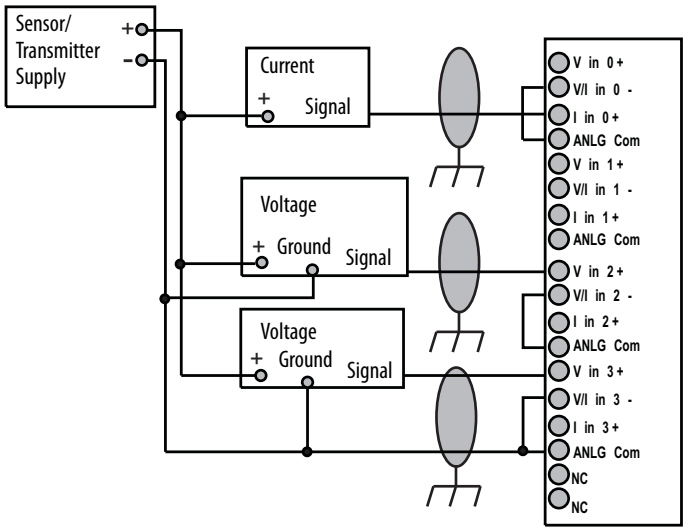
Compact voltage/current analog input module

1769-IF8 Differential Inputs



1769-IF8 Single-ended Sensor/Transmitter Inputs

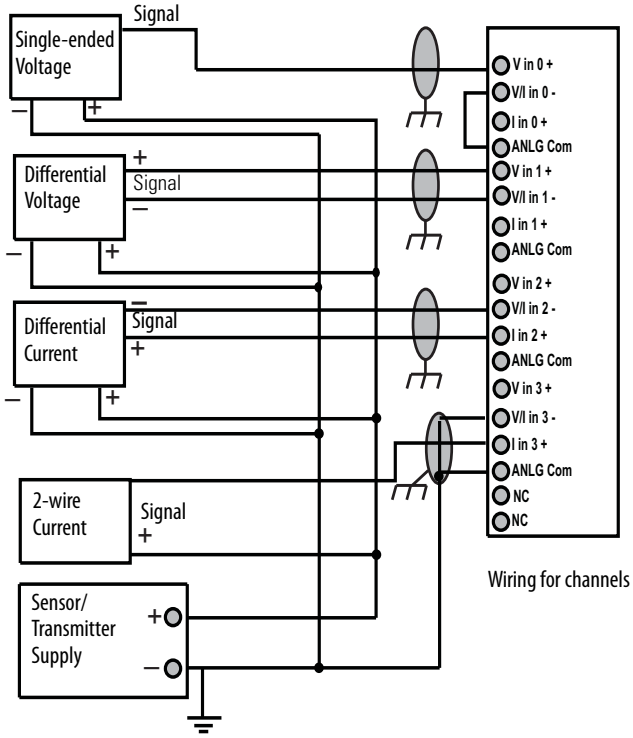
The sensor power supply must be rated Class 2.



Wiring for channels 4…7 are identical.

ALLEN BRADLEY 1769 I_O MODULES

1769-IF8 Mixed Transmitter Inputs



The sensor power supply must be rated Class 2.

Wiring for channels 4…7 are identical.

Table 22 - Technical Specifications - 1769-IF8

Attribute	1769-IF8
Inputs	8 differential or single-ended
Input range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Current draw @ 5.1V	120 mA
Current draw @ 24V	70 mA
Converter type	Delta Sigma
Heat dissipation, max	3.24 W
Resolution [2]	16 bits (unipolar) 15 bits plus sign (bipolar)
Rated working voltage[3]	30V AC/30V DC
Common mode voltage range[4]	±10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 10 Hz filter selected
Normal mode rejection ratio	-50 dB @ 50 and 60 Hz with the 10 Hz filter selected
Input impedance	Voltage: 220 kΩ Current: 250 Ω
Accuracy[5]	Voltage: ±0.2% full scale @ 25 °C (77 °F) Current: ±0.35% full scale @ 25 °C (77 °F)

ALLEN BRADLEY 1769 I_O MODULES

Table 22 - Technical Specifications - 1769-IF8

Attribute	1769-IF8
Accuracy drift with temperature	Voltage: ±0.003% per °C Current: ±0.0045% per °C
Nonlinearity	±0.03%
Repeatability(6)	±0.03%
Module error	Voltage: ±0.3% Current: ±0.5%
Overload at input terminals, max(7)	Voltage: ±30V DC continuous, 0.1 mA Current: ±32 mA continuous, ±7.6V DC
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	450 g (0.99 lb)
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	38
Enclosure type rating	None (open-style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 23 - Response Speed - 1769-IF8

Filter Frequency	Update Time Per Channel	Update Time Per Module
10 Hz	100 ms	400 ms
50 Hz	30 ms	120 ms
60 Hz	30 ms	120 ms
250 Hz	9 ms	36 ms
500 Hz	6 ms	24 ms

ALLEN BRADLEY 1769 I_O MODULES

Table 24 - Certifications - 1769-IF8

Certification[1]	1769-IF8
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

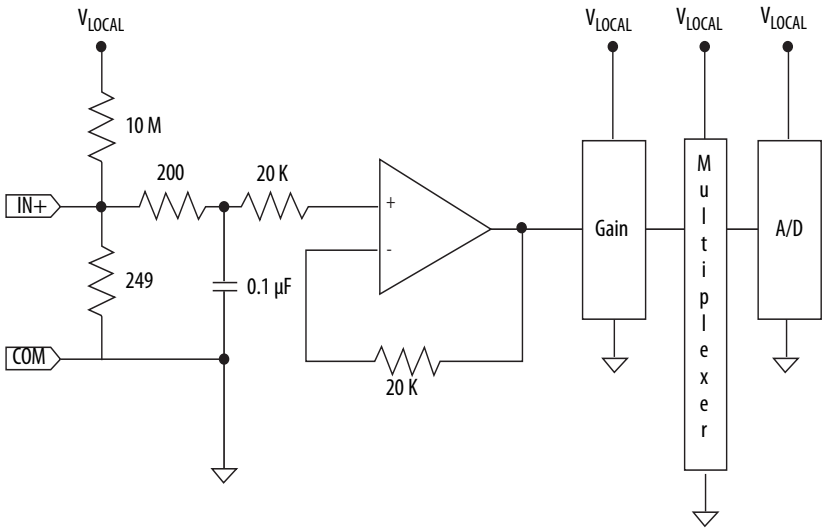
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

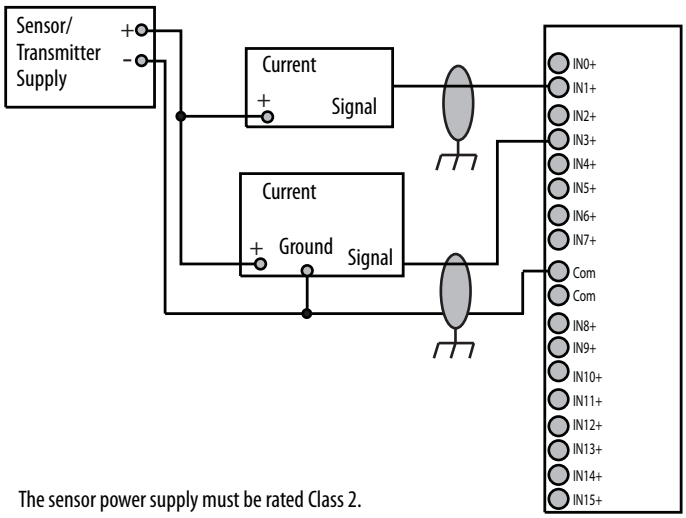
1769-IF16C

Compact current analog input module

Simplified Input Circuit Diagram



1769-IF16C Sensor/Transmitter Inputs



The sensor power supply must be rated Class 2.

Table 25 - Technical Specifications - 1769-IF16C

Attribute	1769-IF16C
Inputs	16 single-ended
Input range	0…20 mA 4…20 mA
Full scale range[1]	0…21 mA 3.2…21 mA
Current draw @ 5.1V	190 mA
Current draw @ 24V	70 mA
Heat dissipation, max	4.0 W
Converter type	Sigma Delta
Resolution [2]	16 bits (unipolar) 15 bits plus sign (bipolar)
Rated working voltage[3]	30V AC/30V DC

ALLEN BRADLEY 1769 I_O MODULES

Table 25 - Technical Specifications - 1769-IF16C

Attribute	1769-IF16C
Common mode voltage range[4]	±10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 16 Hz filter selected
Input impedance	249 Ω
Accuracy[5]	±0.5% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.0045% per °C
Nonlinearity	±0.03%
Repeatability[6]	±0.03%
Module error	1.25%
Overload at input terminals, max[7]	±28 mA continuous, ±7.6V DC
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	281 g (0.62 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	47
Input words	22
Output words	2
Configuration words	98
Enclosure type rating	None (open-style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 26 - Response Speed - 1769-IF16C

Filter Frequency	Step Response	Update per Input Pari	Update per Module
16 Hz	1550 ms	200 ms	1600 ms
50 Hz	500 ms	70 ms	560 ms
60 Hz	420 ms	60 ms	480 ms
315 Hz	90 ms	15 ms	120 ms
1365 Hz	35 ms	5 ms	40 ms

ALLEN BRADLEY 1769 I_O MODULES

Table 27 - Certifications - 1769-IF16C

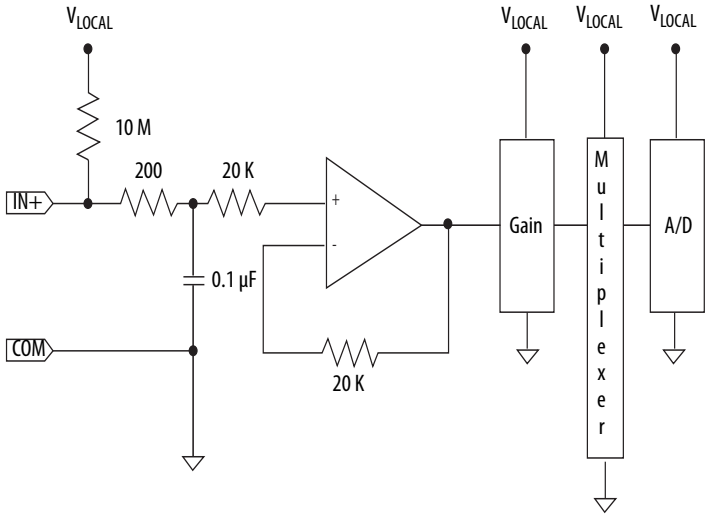
Certification[1]	1769-IF16C
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

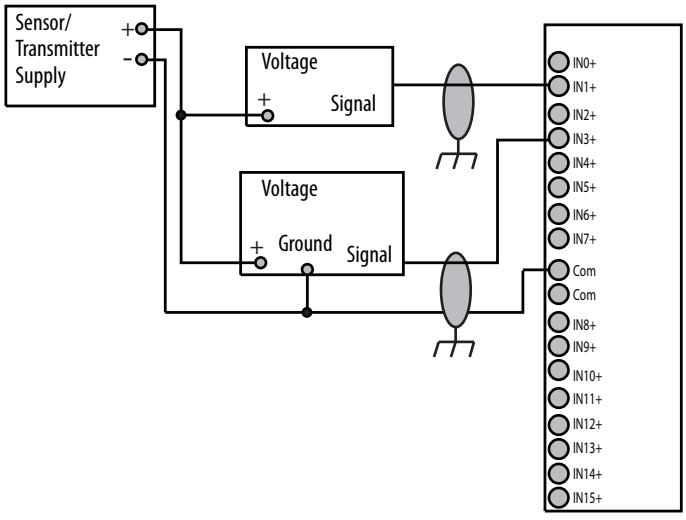
1769-IF16V

Compact voltage analog input module

Simplified Input Circuit Diagram



1769-IF16V Sensor/Transmitter Inputs



The sensor power supply must be rated Class 2.

ALLEN BRADLEY 1769 I_O MODULES

Table 28 - Technical Specifications - 1769-IF16V

Attribute	1769-IF16V
Inputs	16 single-ended
Input range	±10V 0…10V 0…5V 1…5V
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V
Current draw @ 5.1V	190 mA
Current draw @ 24V	70 mA
Heat dissipation, max	2.4 W
Converter type	Sigma Delta
Resolution [2]	16 bits (unipolar) 15 bits plus sign (bipolar)
Rated working voltage[3]	30V AC/30V DC
Common mode voltage range[4]	±10V DC max per channel
Common mode rejection	> 60 dB @ 50 and 60 Hz with the 16 Hz filter selected
Input impedance	> 1 MΩ
Accuracy[5]	±0.35% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.03% per °C
Nonlinearity	±0.03%
Repeatability[6]	±0.06%
Module error	1.0%
Overload at input terminals, max[7]	±30 mA continuous, ±7.6V DC
Isolation voltage	500V AC or 710V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	281 g (0.62 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	46
Input words	22

ALLEN BRADLEY 1769 I_O MODULES

Table 28 - Technical Specifications - 1769-IF16V

Attribute	1769-IF16V
Output words	2
Configuration words	98
Enclosure type rating	None (open-style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

Table 29 - Response Speed - 1769-IF16V

Filter Frequency	Step Response	Update per Input Pari	Update per Module
16 Hz	1550 ms	200 ms	1600 ms
50 Hz	500 ms	70 ms	560 ms
60 Hz	420 ms	60 ms	480 ms
315 Hz	90 ms	15 ms	120 ms
1365 Hz	35 ms	5 ms	40 ms

Table 30 - Certifications - 1769-IF16V

Certification(1)	1769-IF16V
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives

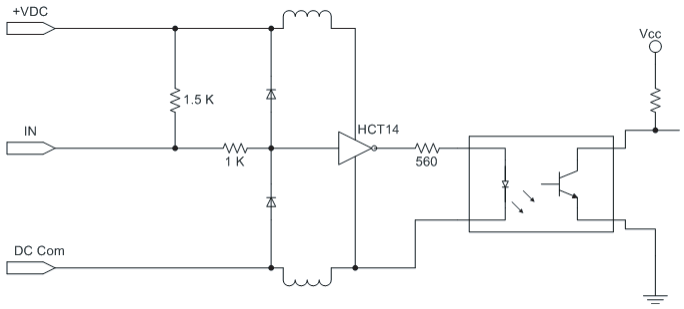
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

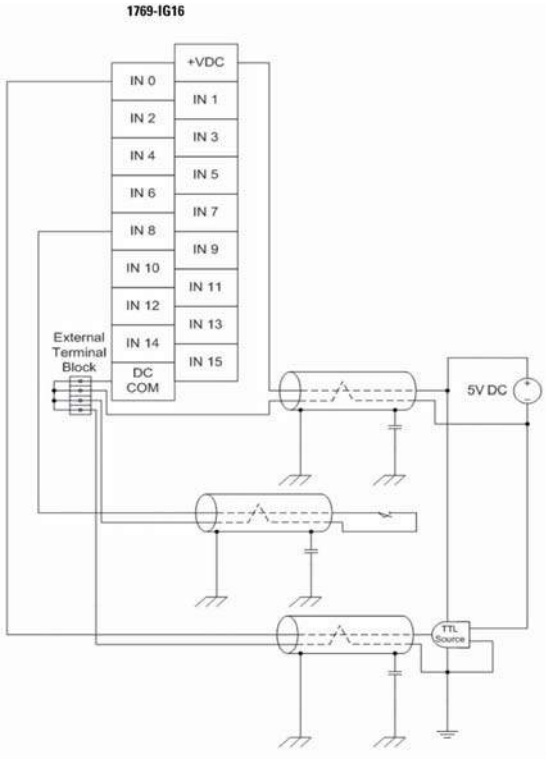
ALLEN BRADLEY 1769 I_O MODULES

1769-IG16

Compact TTL input module

Simplified Input Circuit Diagram





- Use Belden 8761, or equivalent, shielded wire.
- Do not connect more than two wires to any single terminal.
- Do not exceed 10 m (30 ft) for the DC power cable and I/O cables.
- The capacitors that are shown ind the diagram must be 0.01µF and rated for 2000V min.
- User power supply must be rated Class 2 with a 5V DC range of 4.5…5.5V DC.

Low to True Format - 1769-IG16

- -0.2...0.8V = Input on-state is guaranteed
- 0.8...2.0V = Input state is not guaranteed
- 2.0...5.5V = Input off-state is guaranteed

Table 31 - Technical Specifications - 1769-IG16

Attribute	1769-IG16
Inputs	16
Voltage category	5V DC TTL source (Low=True)(1)
Operating voltage range	4.5…5.5V DC 50 mV peak-to-peak ripple max
Input delay, on	20 ms
Digital filter, off to on	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Digital filter, on to off	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Current draw @ 5.1V	120 mA
Heat dissipation, max	1.6 W
Off-state voltage, typical	2.0…5.5V DC
Off-state current, max	4.1 mA
On-state voltage, typical	-0.2…0.8V DC
On-state current, nom	3.7 mA @ 5V DC

ALLEN BRADLEY 1769 I_O MODULES

Table 31 - Technical Specifications - 1769-IG16

Attribute	1769-IG16
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 2 s or 1697V DC for 2 s, input point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	250 g (0.55 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	No
Vendor ID code	1
Product type code	7
Product code	77
Input words	1
Output words	0
Configuration words	4
Enclosure type rating	None (open-style)

(1) TTL inputs are inverted (-0.2…0.8 = low voltage = True = On.) Use a NOT instruction in your program to convert to traditional True = High logic.

Table 32 - Certifications - 1769-IG16

Certification[1]	1769-IG16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IM12

Compact 240V AC input module

1769-IM12

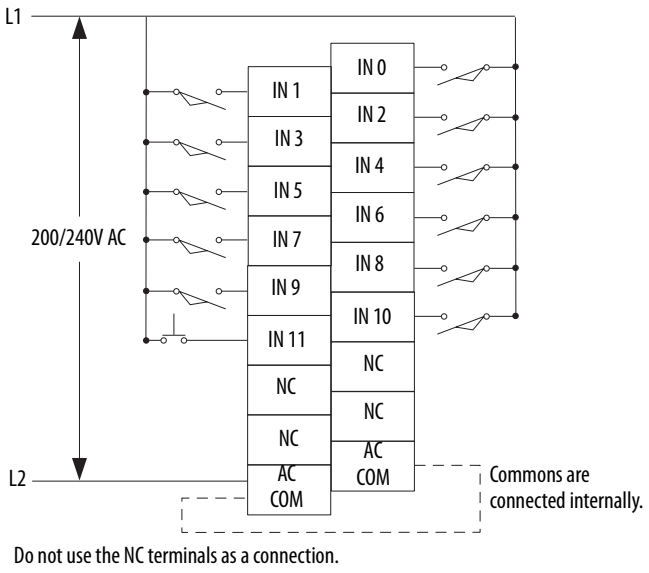


Table 33 - Technical Specifications - 1769-IM12

Attribute	1769-IM12
Inputs	12 (12 points/group, internally connected commons)
Voltage category	200/240V AC
Operating voltage range	159…265V AC, 47…63 Hz
Input delay, on	20 ms
Input delay, off	20 ms
Current draw @ 5.1V	100 mA
Heat dissipation, max	3.65 W
Off-state voltage, max	40V AC
Off-state current, max	2.5 mA
On-state voltage, min	159V AC
On-state current, min	5 mA @ 74V AC
On-state current, max	12 mA @ 120V AC
Inrush current, max[1]	250 mA
Input impedance, max	27 kΩ @ 50 Hz 23 kΩ @ 60 Hz
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, input point to bus 132V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	300 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4

ALLEN BRADLEY 1769 I_O MODULES

Table 33 - Technical Specifications - 1769-IM12

Attribute	1769-IM12
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	83
Enclosure type rating	None (open-style)

(1) A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the AC input circuit are affected. If a 6.8 kΩ (2.5 W minimum) resistor is placed in series with the input, the inrush current is reduced to 35 mA. In this configuration, the minimum on-state voltage increases to 92V AC. Before adding the resistor in a hazardous environment, be sure to consider the operating temperature of the resistor and the temperature limits of the environment. The operating temperature of the resistor must remain below the temperature limit of the environment.

Table 34 - Certifications - 1769-IM12

Certification[1]	1769-IM12
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IQ16

Compact 24V DC sink/source input module

1769-IQ16

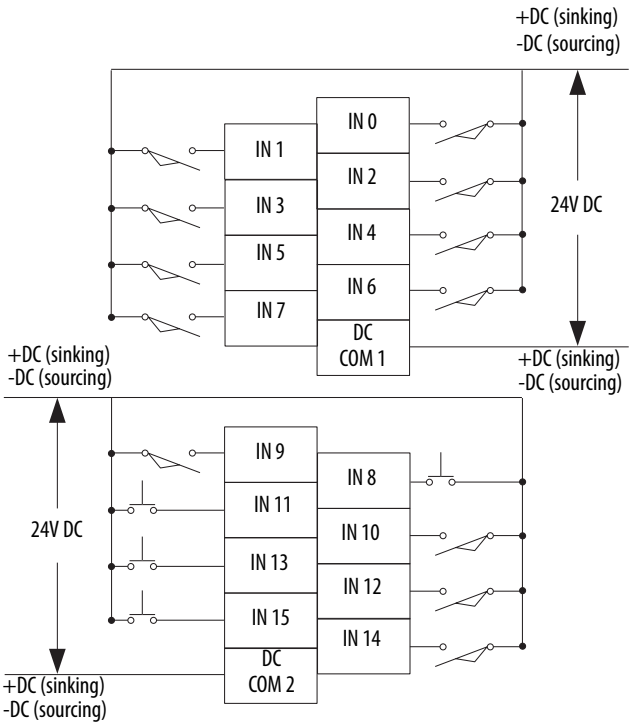


Table 35 - Technical Specifications - 1769-IQ16

Attribute	1769-IQ16
Inputs	16 (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26.4V DC @ 60 °C (140 °F)
Input delay, on	8 ms
Input delay, off	8 ms
Current draw @ 5.1V	115 mA
Heat dissipation, max	3.55 W
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2 mA
Inrush current, max	250 mA
Input impedance, nom	3 kΩ
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	270 g (0.60 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1

ALLEN BRADLEY 1769 I_O MODULES

Table 35 - Technical Specifications - 1769-IQ16

Attribute	1769-IQ16
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	67
Enclosure type rating	None (open-style)

Table 36 - Certifications - 1769-IQ16

Certification(1)	1769-IQ16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IQ16F

Compact 24V DC sink/source, high-speed input module

1769-IQ16

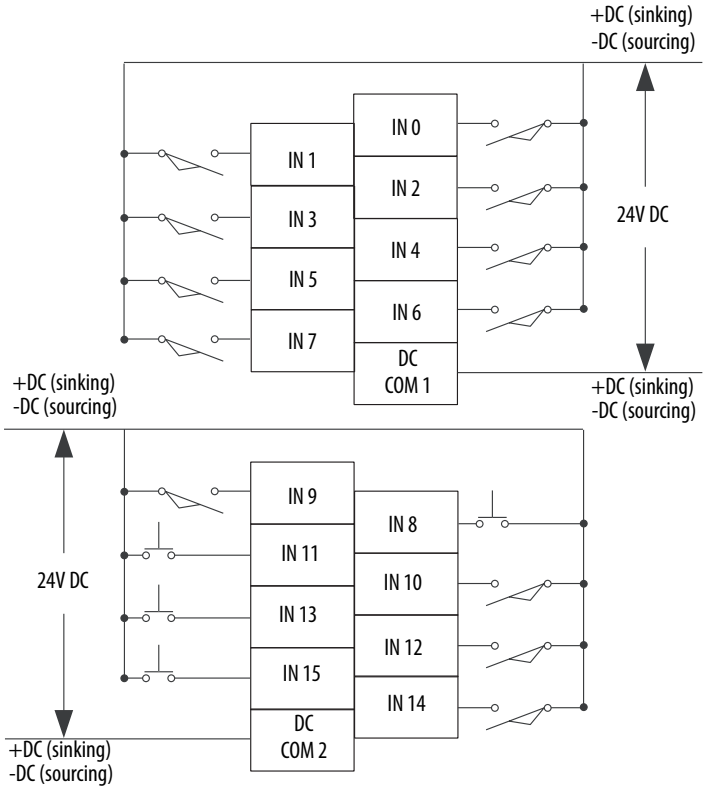


Table 37 - Technical Specifications - 1769-IQ16F

Attribute	1769-IQ16F
Inputs	16 (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26.4V DC @ 60 °C (140 °F)
Digital filter, off to on	0 s, 100 µs, 500 µs, 1 ms, 2 ms
Digital filter, on to off	0 s, 100 µs, 500 µs, 1 ms, 2 ms
Input delay, off to on	100 µs, typical 300 µs, max
Input delay, on to off	250 µs, typical 1 ms, max
Current draw @ 5.1V	110 mA
Heat dissipation, max	3.55 W
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2 mA
Inrush current, max	250 mA
Input impedance, nom	3 kΩ

ALLEN BRADLEY 1769 I_O MODULES

Table 37 - Technical Specifications - 1769-IQ16F

Attribute	1769-IQ16F
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	270 g (0.60 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	69
Enclosure type rating	None (open-style)

Table 38 - Certifications - 1769-IQ16F

Certification[1]	1769-IQ16F
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IQ32

Compact 24V DC sink/source input module

1769-IQ32

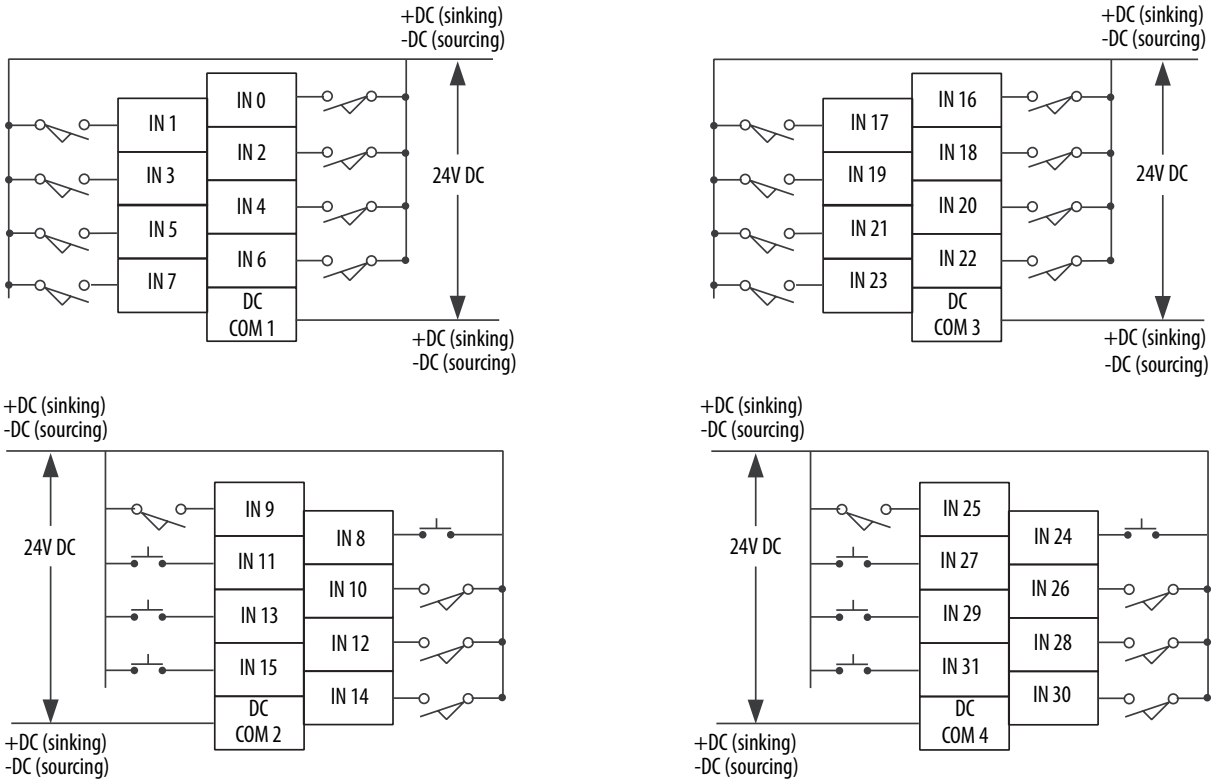


Table 39 - Technical Specifications - 1769-IQ32

Attribute	1769-IQ32
Inputs	32 (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26.4V DC @ 60 °C (140 °F)
Input delay, on	8 ms
Input delay, off	8 ms
Current draw @ 5.1V	170 mA
Heat dissipation, max	4.6 W
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2 mA
Inrush current, max	250 mA
Input impedance, nominal	5.2 kΩ @ 24V DC 6.1 kΩ @ 30V DC
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	440 g (0.97 lb)

ALLEN BRADLEY 1769 I_O MODULES

Table 39 - Technical Specifications - 1769-IQ32

Attribute	1769-IQ32
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N●m (6 lb●in)
Retaining screw torque	0.46 N●m (4.1 lb●in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	68
Enclosure type rating	None (open-style)

Table 40 - Certifications - 1769-IQ32

Certification[1]	1769-IQ32
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-IQ32T

Compact 24V DC sink/source, terminated input module

1769-IQ32T

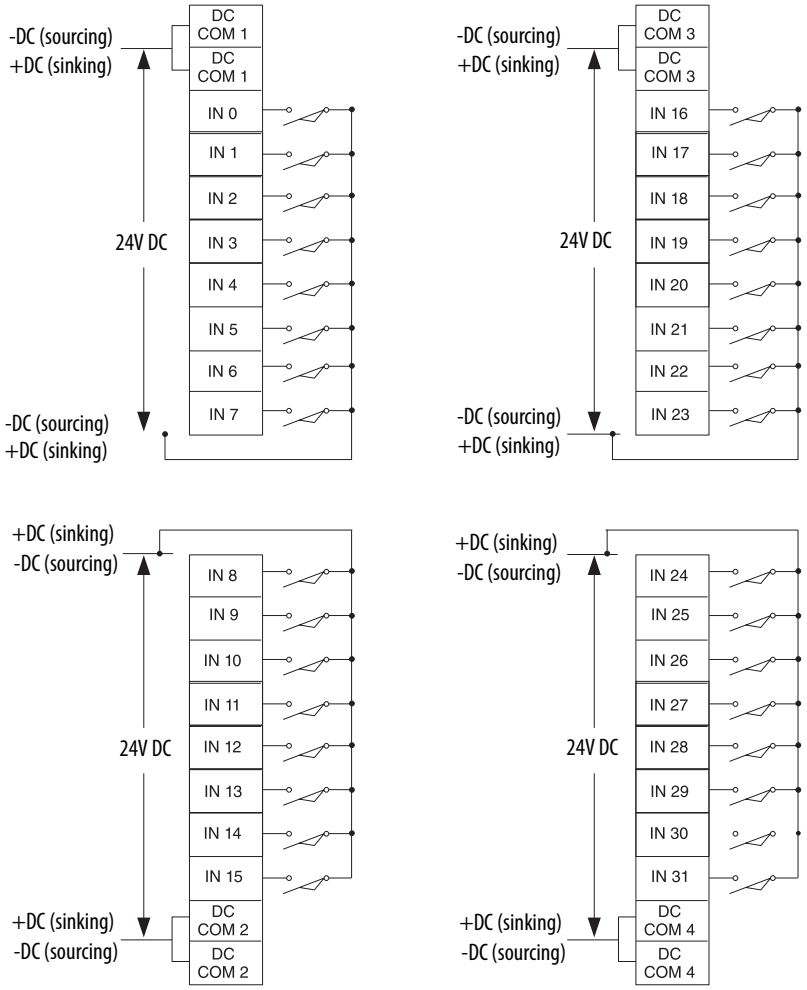


Table 41 - Technical Specifications - 1769-IQ32T

Attribute	1769-IQ32T
Inputs	32 terminated (8 points/group)
Voltage category	24V DC sink/source
Operating voltage range	20.4…26.4V DC @ 60 °C (140 °F)
Digital filter, off to on	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Digital filter, on to off	0 s, 100 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Input delay, off to on	0.1 ms, typical 0.42 ms, max
Input delay, on to off	0.25 ms, typical 1.0 ms, max
Current draw @ 5.1V	170 mA
Heat dissipation, max	4.77 W
Off-state voltage, max	11V DC
Off-state current, max	1.7 mA

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Table 41 - Technical Specifications - 1769-IQ32T

Attribute	1769-IQ32T
On-state voltage, min	19V DC
On-state current, min	2 mA
Inrush current, max	5 mA
Input impedance, nom	5.6 kΩ
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement connector	1746-N3 (1 connector, 40 terminals)
Vendor ID code	1
Product type code	7
Product code	76
Enclosure type rating	None (open-style)

Table 42 - Certifications - 1769-IQ32T

Certification[1]	1769-IQ32T
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives

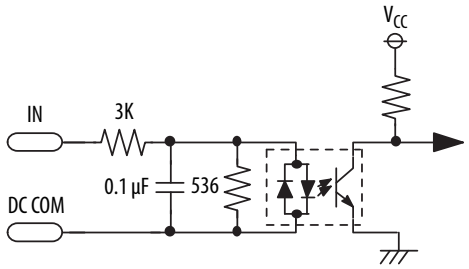
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

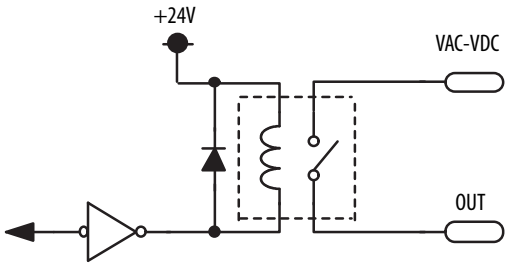
1769-IQ6XOW4

Compact combination 24V DC sink/source input and AC/DC relay output module

Simplified Input Circuit Diagram



Simplified Output Circuit Diagram



1769-IQ6XOW4

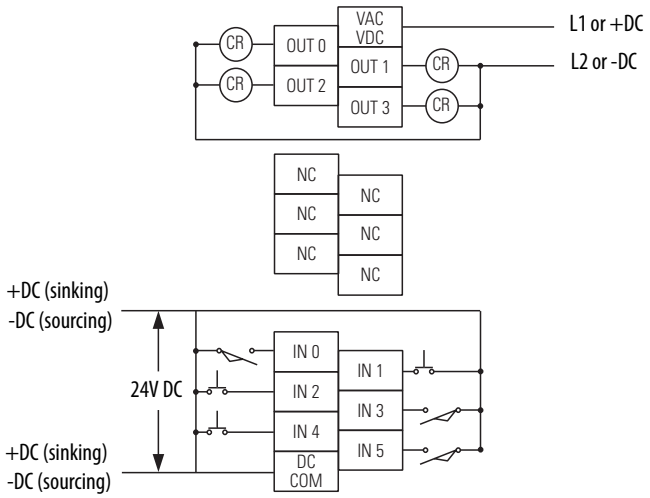


Table 43 - Technical Specifications - 1769-IQ6XOW4

Attribute	1769-IQ6XOW4
Current draw @ 5.1V	105 mA
Current draw @ 24V	50 mA
Heat dissipation, max	2.75 W
Off-state voltage, max	11V DC
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input group to bus, output group to bus, and input group to output group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)

ALLEN BRADLEY 1769 I_O MODULES

Table 43 - Technical Specifications - 1769-IQ6X0W4

Attribute	1769-IQ6X0W4
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	66
Enclosure type rating	None (open-style)

Table 44 - 1769-IQ6X0W4 Input Specifications

Attribute	1769-IQ6X0W4
Inputs	6
Voltage category	24V DC sink/source
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26.4V DC @ 60 °C (140 °F)
Delay, on	8 ms
Delay, off	8 ms
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2.0 mA
Inrush current, max	250 mA
Input impedance, nom	3 kΩ
IEC input compatibility	Type 3

Table 45 - 1769-IQ6X0W4 Output Specifications

Attribute	1769-IQ6X0W4
Outputs	4
Voltage category	AC/DC normally open relay contacts
Operating voltage range	5…265V AC 5…125V DC
Delay, on	10 ms
Delay, off	10 ms
Off-state leakage, max	0 mA
On-state current, min	10 mA @ 5V DC
Current per point, max	2.5 A
Current per module, max	8 A

Table 46 - Relay Contact Ratings - 1769-IQ6X0W4

Volts, max	Continuous Amps per Point, max	Amperes[1]		Voltamperes		NEMA ICS 2-125
		Make	Break	Make	Break	
240V AC	2.5 A	7.5 A	0.75 A	1800VA	180VA	C300
120V AC		15 A	1.5 A			
125V DC	1.0 A	0.22 A[2]		28VA		R150
24V DC	2.0 A	1.2 A[2]		28VA		—

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(1) If you connect surge suppressors across your external inductive load, you extend the life of the relay contacts.
(2) For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28VA by the applied DC voltage. For example, 28 VA/48V DC = 0.58 A. For DC voltage applications less than 48V, the make/break ratings for relay contacts cannot exceed 2 A.

Table 47 - Certifications - 1769-IQ6X0W4

Certification[1]	1769-IQ6X0W4
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives

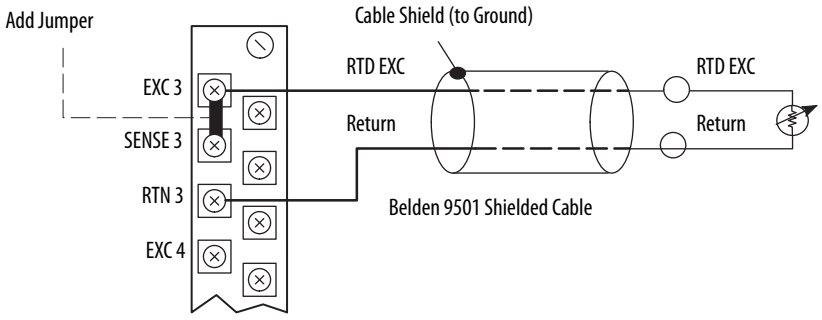
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

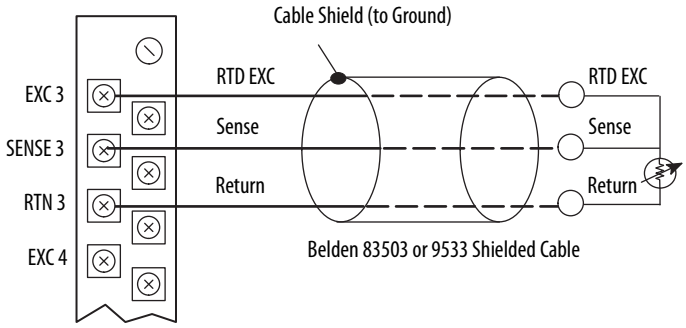
1769-IR6

Compact RTD/resistance input module

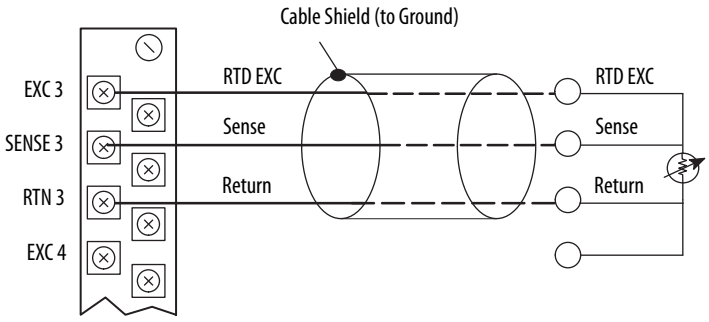
Two Wire RTD Configuration



Three Wire RTD Configuration

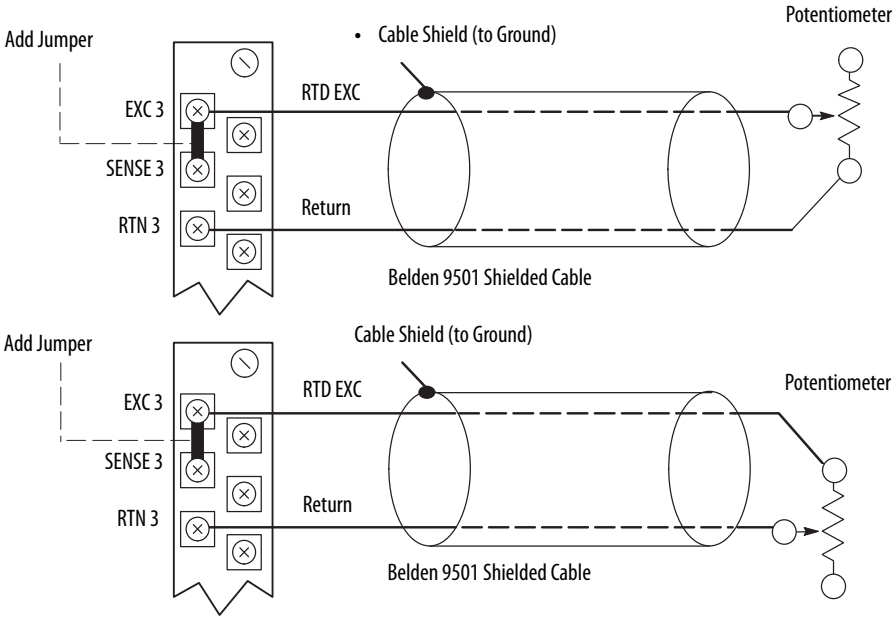


Four Wire RTD Configuration



ALLEN BRADLEY 1769 I_O MODULES

Two Wire Potentiometer Configuration



Three Wire Potentiometer Configuration

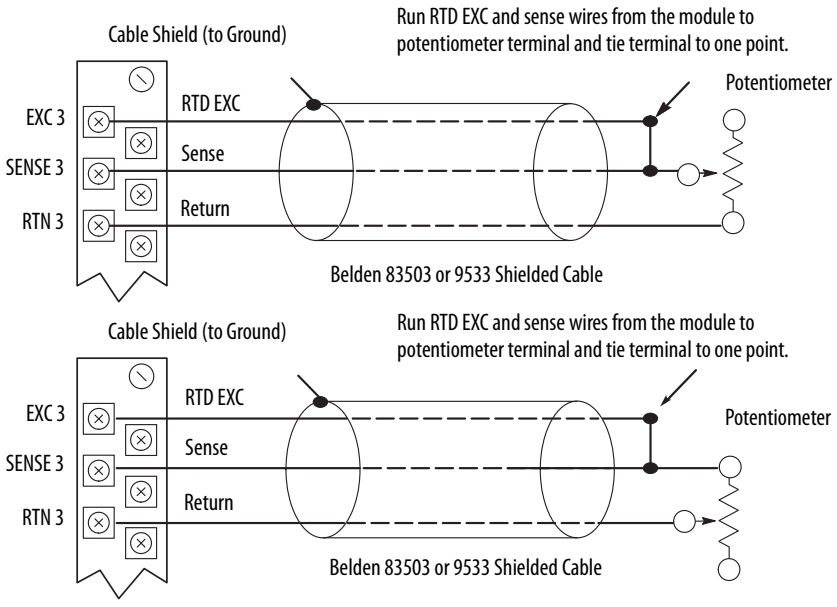


Table 48 - Data Formats for RTD Temperature Ranges for 0.5 mA and 1.0 mA Excitation Current

RTD Input Type	Engineering Units x1		Engineering Units x10		Scaled-for-PID	Proportional Counts
	0.1 °C	0.1 °F	1.0 °C	1.0 °F		
100 Ω Platinum 385	-2000…+8500	-3280…+15620	-200…+850	-328…+1562	0…16383	-32768…+32767
200 Ω Platinum 385	-2000…+8500	-3280…+15620	-200…+850	-328…+1562	0…16383	-32768…+32767
500 Ω Platinum 385	-2000…+8500	-3280…+15620	-200…+850	-328…+1562	0…16383	-32768…+32767

ALLEN BRADLEY 1769 I_O MODULES

Table 48 - Data Formats for RTD Temperature Ranges for 0.5 mA and 1.0 mA Excitation Current

RTD Input Type	Engineering Units x1		Engineering Units x10		Scaled-for-PID	Proportional Counts
	0.1 °C	0.1 °F	1.0 °C	1.0 °F		
1000 Ω Platinum 385	-2000…+8500	-3280…+15620	-200…+850	-328…+1562	0…16383	-32768…+32767
100 Ω Platinum 3916	-2000…+6300	-3280…+11660	-200…+630	-328…+1166	0…16383	-32768…+32767
200 Ω Platinum 3916	-2000…+6300	-3280…+11660	-200…+630	328…+1166	0…16383	-32768…+32767
500 Ω Platinum 3916	-2000…+6300	-3280…+11660	-200…+630	328…+1166	0…16383	-32768…+32767
1000 Ω Platinum 3916	-2000…+6300	-3280…+11660	-200…+630	328…+1166	0…16383	-32768…+32767
10 Ω Copper 426	-1000…+2600	-1480…+5000	+100…+260	-148…+500	0…16383	-32768…+32767
120 Ω Nickel 618	-1000…+2600	-1480…+5000	-100…+260	-148…+500	0…16383	-32768…+32767
120 Ω Nickel 672	-800…+2600	-1120…+5000	-80…+260	-112…+500	0…16383	-32768…+32767
604 Ω Nickel Iron 518	-1000…+2600	-3280…+1560	-100…+200	-328…+156	0…16383	-32768…+32767

Table 49 - Temperature Range - 1769-IR6

RTD Type[1]		Temperature Range Using 0.5 mA Excitation	Temperature Range Using 1.0 mA Excitation
Platinum 385	100 Ω	-200…850 °C (-328…1562 °F)	-200…850 °C (-328…1562 °F)
	200 Ω	-200…850 °C (-328…1562 °F)	-200…850 °C (-328…1562 °F)
	500 Ω	-200…850 °C (-328…1562 °F)	-200…850 °C (-328…1562 °F)
	1000 Ω	-200…850 °C (-328…1562 °F)	N/A
Platinum 3916	100 Ω	-200C…630 °C (-328…1166 °F)	-200…630 °C (-328…1166 °F)
	200 Ω	-200C…630 °C (-328…1166 °F)	-200…630 °C (-328…1166 °F)
	500 Ω	-200C…630 °C (-328…1166 °F)	-200…630 °C (-328…1166 °F)
	1000 Ω	-200C…630 °C (-328…1166 °F)	N/A
Copper 426	10 Ω	N/A	-100…260 °C (-148…500 °F)
Nickel 618[2]	120 Ω	-100…260 °C (-148…500 °F)	-100…260 °C (-148…500 °F)
Nickel 672	120 Ω	-80…260 °C (-112…500 °F)	-80…260 °C (-112…500 °F)
Nickel-Iron 518	604 Ω	-200…180 °C (-328…338 °F)	-100…+200 °C (-148…392 °F)

(1) Digits following the RTD type represent the temperature coefficient of resistance (α), which is defined as the resistance change per Ω per °C. For instance, Platinum 385 refers to a Platinum RTD with $\alpha = 0.00385\ \Omega/\Omega\text{-}°C$, or simply 0.00385/°C.

(2) Actual value at 0 °C is 100 Ω per DIN standard.

Table 50 - Resistance Device Compatibility - 1769-IR6

Resistance Device Type	Resistance Range (0.5 mA Excitation)	Resistance Range (1.0 mA Excitation)
150 Ω	0…150 Ω	0…150 Ω
500 Ω	0…500 Ω	0…500 Ω
1000 Ω	0…1000 Ω	0…1000 Ω
3000 Ω	0…3000 Ω	N/A

Table 51 - Technical Specifications - 1769-IR6

Attribute	1769-IR6
Inputs	6 RTD inputs
Input range	0…150 Ω 0…500 Ω 0…1000 Ω 0…3000 Ω
Resolution	Input filter and configuration dependent

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Table 51 - Technical Specifications - 1769-IR6

Attribute	1769-IR6
Sensors supported	100, 200, 500, 1000 Ω Platinum 385 100, 200, 500, 1000 Ω Platinum 3916 120 Ω Nickel 672 120 Ω Nickel 618 10 Ω Nickel-iron 518
Current draw @ 5.1V	100 mA
Current draw @ 24V	35 mA
Heat dissipation, max	1.5 W
Converter type	Sigma Delta
Common mode voltage range	±10V DC max
Common mode rejection	110 dB @ 50 Hz with the 10 or 50 Hz filter selected 110 dB @ 60 Hz with the 10 or 60 Hz filter selected
Normal mode rejection ratio	70 dB @ 50 Hz with the 10 or 50 Hz filter selected 70 dB @ 60 Hz with the 10 or 60 Hz filter selected
Cable impedance, max	25 Ω
Input impedance	> 10 MΩ
Accuracy @ 25 °C (77 °F) (1) (50/60 Hz filter)	±0.5 °C (0.9 °F) for Pt 385 ±0.4 °C (0.72 °F) for Pt 3916 ±0.3 °C (0.54 °F) for Ni ±0.3 °C (0.54 °F) for NiFe ±0.8 °C (1.44 °F) for Cu ±0.15 Ω for 150 Ω range ±0.5 Ω for 500 Ω range ±1.0 Ω for 1000 Ω range ±1.5 Ω for 3000 Ω range
Accuracy @ 0…60 °C (32…140 °F) (1) (50/60 Hz filter)	±0.9 °C (1.62 °F) for Pt 385 ±0.8 °C (1.44 °F) for Pt 3916 ±0.5 °C (0.9 °F) for Ni ±0.5 °C (0.9 °F) for NiFe ±1.1 °C (1.98 °F) for Cu ±0.25 Ω for 150 Ω range ±0.8 Ω for 500 Ω range ±1.5 Ω for 1000 Ω range ±2.5 Ω for 3000 Ω range
Accuracy drift @ 0…60 °C (32…140 °F) (1)	±0.026 °C/°C (0.026 °F/°F) for Pt 385 ±0.023 °C/°C (0.023 °F/°F) for Pt 3916 ±0.012 °C/°C (0.012 °F/°F) for Ni\ ±0.015 °C/°C (0.015 °F/°F) for NiFe ±0.032 °C/°C (0.032 °F/°F) for Cu ±0.007 Ω/°C (±0.013Ω/°F) for 150 Ω ±0.023 Ω/°C (±0.041Ω/°F) for 500 Ω ±0.043 Ω/°C (±0.077Ω/°F) for 1000 Ω ±0.072 Ω/°C (±0.130Ω/°F) for 3000 Ω
Nonlinearity	±0.05%
Repeatability(2) (50/60 Hz filter)	±0.01 °C (0.018 °F) for Ni and NiFe ±0.2 °C (0.36 °F) for other RTD inputs ±0.04 Ω for 150 Ω resistances ±0.2 Ω for other resistances
Open circuit detection time(3)	6 ms…303 s
Isolation voltage	720V DC for 1 minute, optical and magnetic (qualification), channel to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	276 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules

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Table 51 - Technical Specifications - 1769-IR6

Attribute	1769-IR6
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Recommended cable	2-wire configuration: Belden 9501 or equivalent 3-wire configuration: Belden 9533 or equivalent 4-wire configuration: Belden 83503 or equivalent
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	37
Enclosure type rating	None (open-style)

(1) Accuracy is dependent upon the Analog/Digital converter output rate selection, excitation current selection, data format, and input noise.
(2) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(3) Open-circuit detection time is equal to channel update time.

Table 52 - RTD Accuracy and Temperature Drift - 1769-IR6

RTD Type		Scaled Accuracy Max 25 °C (77 °F) with Calibration	Scaled Accuracy Max 0…60 °C (32…140 °F) with Calibration)	Temperature Drift Max from 25 °C (77 °F) without Calibration
Copper 426	10 Ω	±0.6 °C (1.08 °F)	±1.1 °C (1.98 °F)	±0.032 °C/°C (0.032 °F/°F)
Nickel 618	120 Ω	±0.2 °C (±0.36 °F)	±0.4 °C (±0.72 °F)	±0.012 °C/°C (±0.012 °F/°F)
Nickel 672	120 Ω	±0.2 °C (±0.36 °F)	±0.4 °C (±0.72 °F)	±0.012 °C/°C (±0.012 °F/°F)
Nickel-Iron 518	604 Ω	±0.3 °C (±0.54 °F)	±0.5 °C (±0.9 °F)	±0.015 °C/°C (±0.015 °F/°F)
Platinum 385	100 Ω	±0.5 °C (±0.9 °F)	±0.9 °C (±1.62 °F)	±0.026 °C/°C (±0.026 °F/°F)
	200 Ω	±0.5 °C (±0.9 °F)	±0.9 °C (±1.62 °F)	±0.026 °C/°C (±0.026 °F/°F)
	500 Ω	±0.5 °C (±0.9 °F)	±0.9 °C (±1.62 °F)	±0.026 °C/°C (±0.026 °F/°F)
	1000 Ω	±0.5 °C (±0.9 °F)	±0.9 °C (±1.62 °F)	±0.026 °C/°C (±0.026 °F/°F)
Platinum 3916	100 Ω	±0.4 °C (±0.7 2°F)	±0.8 °C (±1.44 °F)	±0.023 °C/°C (±0.023 °F/°F)
	200 Ω	±0.4 °C (±0.72 °F)	±0.8 °C (±1.44 °F)	±0.023 °C/°C (±0.023 °F/°F)
	500 Ω	±0.4 °C (±0.72 °F)	±0.8 °C (±1.44 °F)	±0.023 °C/°C (±0.023 °F/°F)
	1000 Ω	±0.4 °C (±0.72 °F)	±0.8 °C (±1.44 °F)	±0.023 °C/°C (±0.023 °F/°F)

Table 53 - RTD Standards - 1769-IR6

RTD Type	α[3]	IEC-751 1983, Amend. 2 1995	DIN 43760 1987	SAMA[4] Standard RC21-4-1966	Japanese Industrial Standard JIS C1604-1989	Japanese Industrial Standard JIS C1604-1997	Minco[5]
100 Ω Pt	0.00385	X	X			X	
200 Ω Pt	0.00385	X	X			X	
500 Ω Pt	0.00385	X	X			X	
1000 Ω Pt	0.00385	X	X			X	
100 Ω Pt	0.03916				X		
200 Ω Pt	0.03916				X		

ALLEN BRADLEY 1769 I_O MODULES

Table 53 - RTD Standards - 1769-IR6

RTD Type	α[3]	IEC-751 1983, Amend. 2 1995	DIN 43760 1987	SAMA[4] Standard RC21-4-1966	Japanese Industrial Standard JIS C1604-1989	Japanese Industrial Standard JIS C1604-1997	Minco[5]
500 Ω Pt	0.03916				X		
1000 Ω Pt	0.03916				X		
10 Ω Cu[1]	0.00426			X			
120 Ω Ni[2]	0.00618		X				
120 Ω Ni	0.00372						X
604 Ω NiFe	0.00518						X

(1) Actual value at 0 °C (32 °F) is 9.04 2 Ω per SAMA standard RC21-4-1966.
(2) Actual value at 0 °C (32 °F) is100 Ω per SAMA standard RC21-4-1966.
(3) α is the temperature coefficient of resistance, which is defined as the resistance change per ohm per °C.
(4) Scientific Apparatus Makers Association
(5) Minco Type "NA" (Nickel) and Minco Type "FA" (Nickel-Iron)

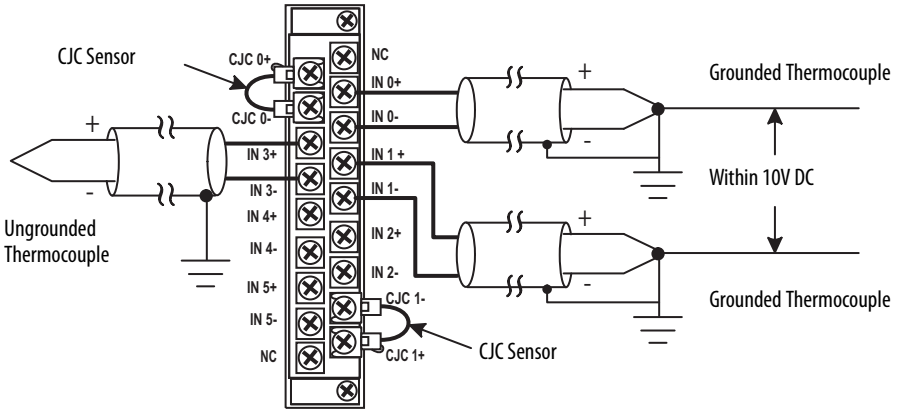
Table 54 - Certifications - 1769-IR6

Certification[1]	1769-IR6
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-IT6

Compact Thermocouple/mV input module



Thermocouple Type	°C Temperature Range	°F Temperature Range
J	-210…+1200 °C	-346…+2192 °F
K	-270…+1370 °C	-454…+2498 °F
T	-270…+400 °C	-454…+752 °F
E	-270…+1000 °C	-454…+1832 °F
R	0…+1768 °C	+32…+3214 °F
S	0…+1768 °C	+32…+3214 °F

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Thermocouple Type	°C Temperature Range	°F Temperature Range
B	+300…+1820 °C	+572…+3308 °F
N	-210…+1300 °C	-346…+2372 °F
C	0…+2315 °C	+32…+ 4199 °F

Millivolt Input Type	Range
± 50 mV	-50…+50 mV
± 100 mV	-100…+100 mV

Input Type	Engineering Units x1		Engineering Units x10		Scaled-for-PID	Raw/ Proportional Data	Percent Range
	0.1 °C	0.1 °F	1.0 °C	1.0 °F			
J	-2100…+12000	-3460…+21920	-210…+1200	-346…+2192	0…+16383	-32767…+32767	0…+10000
K	-2700… +13700	-4540…+24980	-270…+1370	-454…+2498	0…+16383	-32767…+32767	0…+10000
T	-2700…+4000	-4540…+7520	-270…+400	-454…+752	0…+16383	-32767…+32767	0…+10000
E	-2700…+10000	-4540…+18320	-270…+1000	-454…+1832	0…+16383	-32767…+32767	0…+10000
R	0…+17680	+320…32140	0…+1768	+32…3214	0…+16383	-32767…+32767	0…+10000
S	0…+17680	+320…32140	0…+1768	+32…3214	0…+16383	-32767…+32767	0…+10000
B	+3000…18200	+5720…32767(1)	+300…1820	+572…3308	0…+16383	-32767…+32767	0…+10000
N	-2100…+13000	-3460… +23720	-210…+1300	-346…+2372	0…+16383	-32767…+32767	0…+10000
C	0…+23150	+320…32767(1)	0…+2315	+32…4199	0…+16383	-32767…+32767	0…+10000
±50 mV	-5000…+5000(2)		-500…+500(2)		0…+16383	-32767…+32767	0…+10000
±100 mV	-10000…10000(2)		-1000…1000(2)		0…+16383	-32767…+32767	0…+10000

(1) Type B and C thermocouples cannot be represented in engineering units x1 (°F) above 3276.7 °F; therefore, it is treated as an over-range error.

(2) When millivolts are selected, the temperature setting is ignored. Analog input date is the same for °C or °F selection.

IMPORTANT To reduce the effects of electrical noise, install the 1769-IT6 module at least two slots away from the AC power supplies.

Table 55 - Technical Specifications - 1769-IT6

Attribute	1769-IT6
Inputs	6 RTD inputs 2 CJC sensors
Input range	0…150 Ω 0…500 Ω 0…1000 Ω 0…3000 Ω
Resolution	Input filter and configuration dependent
Thermocouples	B, E, J, K, R, S, T, N, C
Bus current draw	5V DC, 140 mA 24V DC, 30 mA
Heat dissipation, max	1.5 W
Converter type	Sigma Delta
Response speed per channel	3…300 ms, depending on input filter and configuration
Rated working voltage(1)	30V AC/30V DC
Common mode voltage range(2)	±10V DC max
Common mode rejection	115 dB @ 50 Hz with 10 Hz or 50 Hz filter 115 dB @ 60 Hz with 10 Hz or 60 Hz filter
Normal mode rejection ratio	85 dB @ 50 Hz with the 10 or 50 Hz filter selected 85 dB @ 60 Hz with the 10 or 60 Hz filter selected
Cable impedance, max	25 Ω
Input impedance	> 10 MΩ

ALLEN BRADLEY 1769 I_O MODULES

Table 55 - Technical Specifications - 1769-IT6

Attribute	1769-IT6
CJC assembly accuracy	±1.0 °C (±1.8 °F)
Nonlinearity (in percent full scale)	±0.03%
Open-circuit detection time	7 ms…2.1 s[3]
Overload at input terminals, max	±35V DC continuous[4]
Isolation voltage	720V DC for 1 min (qualification test) 30V AC/30V DC working voltage, group to bus
Weight, approx	276 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Recommended cable	2-wire configuration: Belden 9501 or equivalent 3-wire configuration: Belden 9533 or equivalent 4-wire configuration: Belden 83503 or equivalent
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
IEC input compatibility	Type 1+
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 series B (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	36
Enclosure type rating	None (open-style)

(1) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 30V DC input signal and 20V DC potential above ground at the input terminal.
(2) For proper operation, both the plus and minus input terminals must be within ±10V DC of analog common.
(3) Open-circuit detection time is equal to the module scan time, which is based on the number of enabled channels, and the filter frequency of each channel.
(4) Maximum current input is limited due to input impedance.

Table 56 - Repeatability at 25 °C (77 °F) - 1769-IT6

Input Type	Repeatability for 10 Hz Filter[1] [2]
Thermocouple J	±0.1 °C [±0.18 °F]
Thermocouple N (-110…+1300 °C [-166…+2372 °F])	±0.1 °C [±0.18 °F]
Thermocouple N (-210…-110 °C [-346…-166 °F])	±0.25 °C [±0.45 °F]
Thermocouple T (-170…+400 °C [-274…+752 °F])	±0.1 °C [±0.18 °F]
Thermocouple T (-270…-170 °C [-454…-274 °F])	±1.5 °C [±2.7 °F]
Thermocouple K (-270…+1370 °C [-454…+2498 °F])	±0.1 °C [±0.18 °F]
Thermocouple (-270…-170 °C [-454…-274 °F])	±2.0 °C [±3.6 °F]
Thermocouple E (-220…+1000 °C [-364…+1832 °F])	±0.1 °C [±0.18 °F]
Thermocouple E (-270…-220 °C [-454…-364 °F])	±1.0 °C [±1.8 °F]
Thermocouples S and R	±0.4 °C [±0.72 °F]

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Table 56 - Repeatability at 25 °C (77 °F) - 1769-IT6

Input Type	Repeatability for 10 Hz Filter[1] [2]
Thermocouple C	±0.7 °C [±1.26 °F]
Thermocouple B	±0.2 °C [±0.36 °F]
±50 mV	±6 µV
±100 mV	±6 µV

(1) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(2) Repeatability at any other temperature in the 0…60 °C (32…140 °F) range is the same as long as the temperature is stable.

Table 57 - Accuracy - 1769-IT6

Input Type[1]	With Autocalibration Enabled		Without Autocalibration
	Accuracy[2] [3] for 10 Hz, 50 Hz, and 60 Hz Filters (max)		Temperature Drift (max)[2] [4]
	@ 25 °C (77 °F) Ambient	@ 0…60 °C (32…140 °F) Ambient	@ 0…60 °C (32…140 °F) Ambient
Thermocouple J (-210…1200 °C [-346…2192 °F])	±0.6 °C [± 1.1 °F]	±0.9 °C [± 1.7 °F]	±0.0218 °C/°C [±0.0218 °F/°F]
Thermocouple N (-200…+1300 °C [-328…2372 °F])	±1 °C [± 1.8 °F]	±1.5 °C [±2.7 °F]	±0.0367 °C/°C [±0.0367 °F/°F]
Thermocouple N (-210…-200 °C [-346…-328 °F])	±1.2 °C [±2.2 °F]	±1.8 °C [±3.3 °F]	±0.0424 °C/°C [±0.0424 °F/°F]
Thermocouple T (-230…+400 °C [-382…+752 °F])	±1°C [± 1.8 °F]	±1.5 °C [±2.7 °F]	±0.0349 °C/°C [±0.0349 °F/°F]
Thermocouple T (-270…-230 °C [-454…-382 °F])	±5.4 °C [± 9.8 °F]	±7.0° C [±12.6 °F]	±0.3500 °C/°C [±0.3500 °F/°F]
Thermocouple K (-230…+1370 °C [-382…+2498 °F])	±1 °C [± 1.8 °F]	±1.5 °C [±2.7 °F]	±0.4995 °C/°C [±0.4995 °F/°F]
Thermocouple K (-270…-225 °C [-454…-373 °F])	±7.5 °C [± 13.5 °F]	±10 °C [± 18 °F]	±0.0378 °C/°C [±0.0378 °F/°F]
Thermocouple E (-210…+1000 °C [-346…+1832 °F])	±0.5 °C [± 0.9 °F]	±0.8 °C [±1.5 °F]	±0.0199 °C/°C [±0.0199 °F/°F]
Thermocouple E (-270…-210 °C [-454…-346 °F])	±4.2 °C [± 7.6 °F]	±6.3 °C [±11.4 °F]	±0.2698 °C/°C [±0.2698 °F/°F]
Thermocouple R	±1.7 °C [± 3.1 °F]	±2.6 °C [± 4.7 °F]	±0.0613 °C/°C [±0.0613 °F/°F]
Thermocouple S	±1.7 °C [± 3.1 °F]	±2.6 °C [± 4.7 °F]	±0.0600 °C/°C [±0.0600 °F/°F]
Thermocouple C	±1.8 °C [±3.3 °F]	±3.5 °C [±6.3 °F]	±0.0899 °C/°C [±0.0899 °F/°F]
Thermocouple B	±3.0 °C [±5.4 °F]	±4.5 °C [±8.1 °F]	±0.1009 °C/°C [±0.1009 °F/°F]
±50 mV	±15 µV	±25 µV	±0.44 µV/°C [±0.80 µV/°F]
±100 mV	±20 µV	±30 µV	±0.69 µV/°C [±01.25 µV/°F]

(1) The module uses the National Institute of Standards and Technology (NIST) ITS-90 standard for thermocouple linearization.
(2) Accuracy and temperature drift information excludes the effects of errors or drift in the cold junction compensation circuit.
(3) Accuracy is dependent upon the analog/digital converter output rate selection, data format, and input noise.
(4) Temperature drift with autocalibration is slightly better than without autocalibration.

Table 58 - Certifications - 1769-IT6

Certification[1]	1769-IT6
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

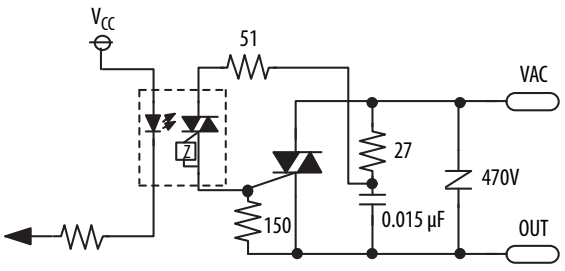
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-OA8

Compact 100/240V AC solid-state output module

Simplified Output Circuit Diagram



1769-OA8

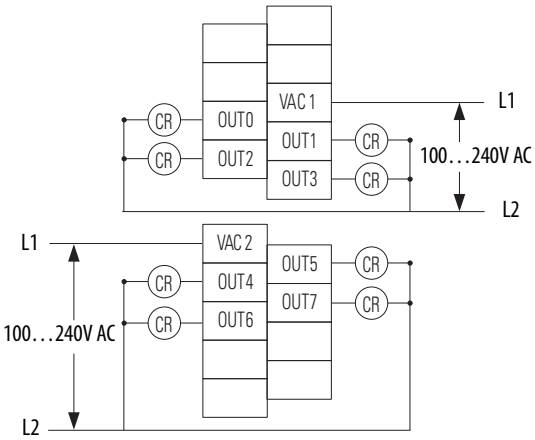


Table 59 - Technical Specifications - 1769-OA8

Attribute	1769-OA8
Outputs	8 (4 points/group)
Voltage category	100/240V AC
Operating voltage range	85…265V AC 47…63 Hz
Output delay, on[1]	1/2 cycle
Output delay, off[1]	1/2 cycle
Current draw @ 5.1V	145 mA
Heat dissipation, max	2.12 W
Off-state leakage current, max[2]	2.0 mA @ 132V AC 2.5 mA @ 265V AC
On-state current, max	10 mA
On-state voltage drop, max	1.5V peak @ 2 A
Current per point, max	0.25 A @ 60 °C 0.5 A @ 30 °C
Current per module, max	2 A @ 60 °C 4 A @ 30 °C
Surge current[3]	10 A for 25 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, group to group 265V AC working voltage (basic insulation) 150V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)

ALLEN BRADLEY 1769 I_O MODULES

Table 59 - Technical Specifications - 1769-OA8

Attribute	1769-OA8
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN10 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	84
Enclosure type rating	None (open style)

(1) Triac outputs turn on and off at AC line zero cross.

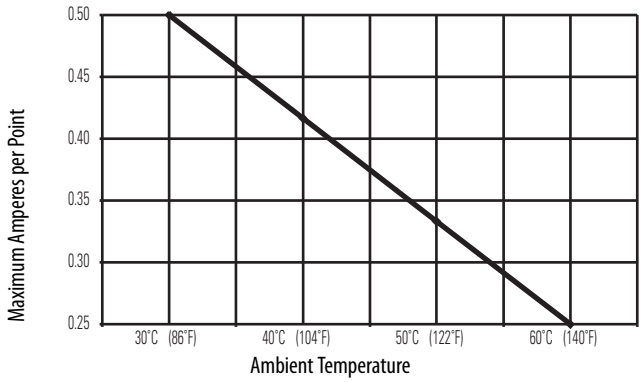
(2) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. For 120V AC operation, use a 15 kΩ, 2 W resistor. For 240V AC operation, use a 5 kΩ, 5 W resistor.

(3) If you connect surge suppressors across your external load, you extend the life of the triac outputs.

ALLEN BRADLEY 1769 I_O MODULES

Temperature Derating - 1769-OA8

1769-OA8 Maximum Amperes per Point Versus Temperature



1769-OA8 Maximum Amperes per Module Versus Temperature

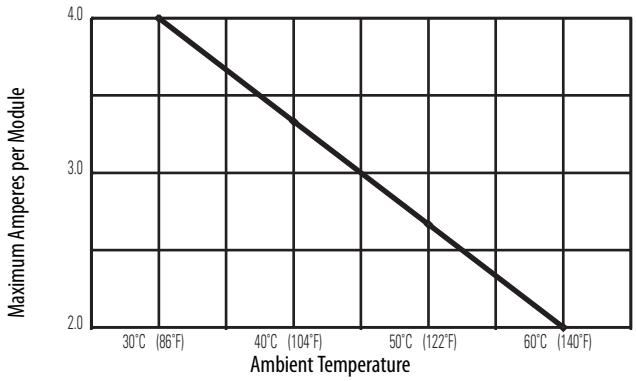


Table 60 - Certifications - 1769-OA8

Certification[1]	1769-OA8
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

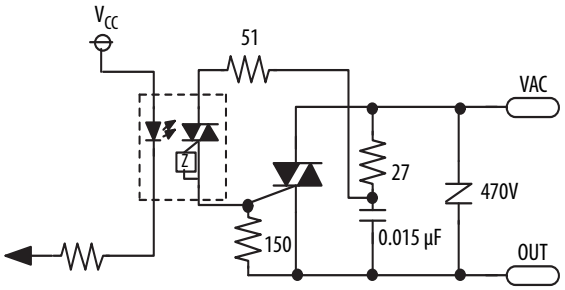
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0A16

Compact 120/240V AC solid-state output module

Simplified Output Circuit Diagram



1769-0A16

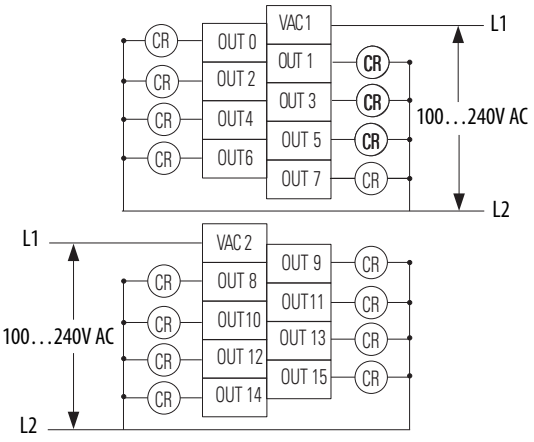


Table 61 - Technical Specifications - 1769-0A16

Attribute	1769-0A16
Outputs	16 (8 points/group)
Voltage category	100/240V AC
Operating voltage range	85…265V AC 47…63 Hz
Output delay, on[1]	1/2 cycle
Output delay, off[1]	1/2 cycle
Current draw @ 5.1V	225 mA
Heat dissipation, max	4.9 W
Off-state leakage current, max[2]	2.0 mA @ 132V AC 2.5 mA @ 265V AC
On-state current, max	10 mA
On-state voltage drop, max	1.5V peak @ 2 A
Current per point, max	0.25 A @ 60 °C 0.5 A @ 30 °C
Current per module, max	2 A @ 60 °C 4 A @ 30 °C
Surge current[3]	5 A for 25 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, output point to bus 265V AC working voltage (IEC Class 2 reinforced insulation) Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, output point to bus 265V AC working voltage (basic insulation) 150V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)

ALLEN BRADLEY 1769 I_O MODULES

Table 61 - Technical Specifications - 1769-0A16

Attribute	1769-0A16
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	93
Enclosure type rating	None (open style)

(1) Triac outputs turn on and off at AC line zero cross.

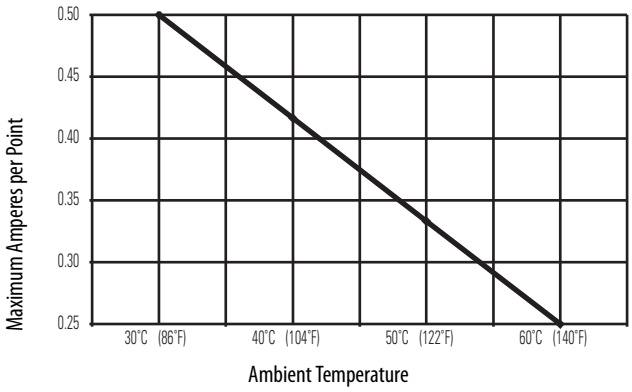
(2) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. For 120V AC operation, use a 15 kΩ, 2 W resistor. For 240V AC operation, use a 5 kΩ, 5 W resistor.

(3) If you connect surge suppressors across your external load, you extend the life of the triac outputs.

ALLEN BRADLEY 1769 I_O MODULES

Temperature Derating - 1769-0A16

1769-0A16 Maximum Amperes per Point Versus Temperature



1769-0A16 Maximum Amperes per Module Versus Temperature

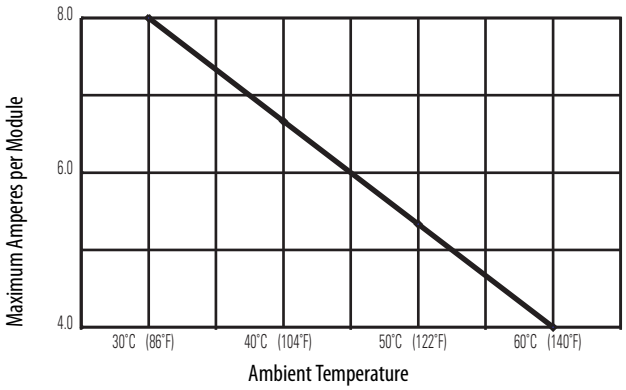


Table 62 - Certifications - 1769-0A16

Certification[1]	1769-0A16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

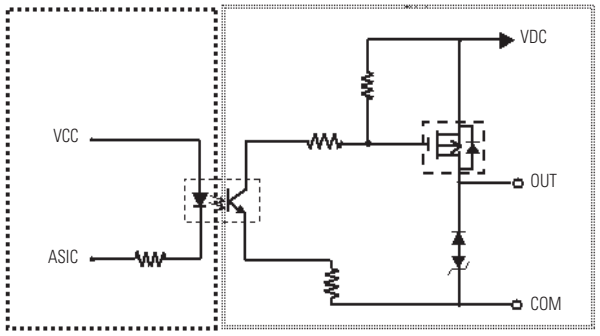
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-OB8

Compact solid-state 24V DC source, high-current output module

Simplified Output Circuit Diagram



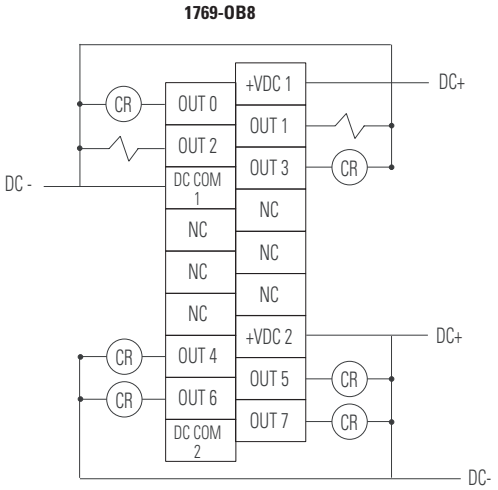


Table 63 - Technical Specifications - 1769-OB8

Attribute	1769-OB8
Outputs	8 (4 points/group)
Voltage category	24V DC source
Operating voltage range	20.4…26.4V DC
Output delay, on	0.1 ms
Output delay, off	1.0 ms @ 60 °C max load 2 A, min V in 20.4V 1.5 ms @ 60 °C max load 1mA, min V in 20.4V
Current draw @ 5.1V	145 mA
Heat dissipation, max	2.20 W
Off-state leakage current, max(1)	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 2 A
Current per point, max	2.0 A @ 60 °C (140 °F)
Current per module, max	8.0 A @ 60 °C (140 °F)
Surge current(2)	4 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus, and group to group 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded

ALLEN BRADLEY 1769 I_O MODULES

Table 63 - Technical Specifications - 1769-0B8

Attribute	1769-0B8
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	70
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Table 64 - Certifications - 1769-0B8

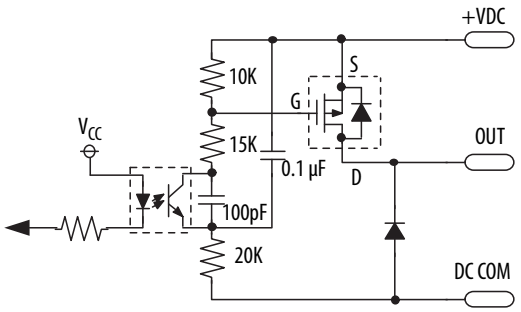
Certification[1]	1769-0B8
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

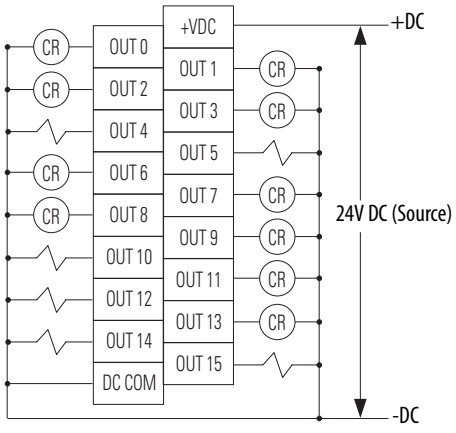
1769-0B16

Compact solid-state 24V DC source output module

Simplified Output Circuit Diagram



1769-0B16



ALLEN BRADLEY 1769 I_O MODULES

Table 65 - Technical Specifications - 1769-0B16

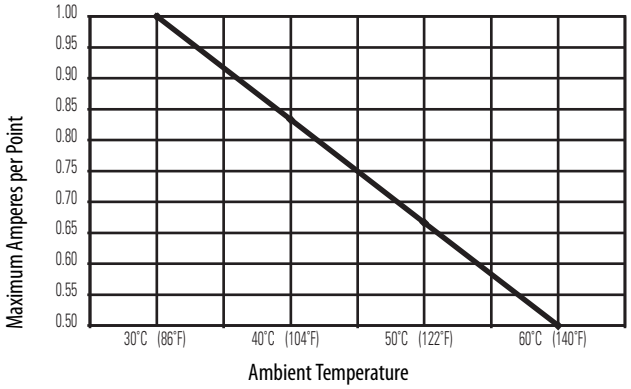
Attribute	1769-0B16
Outputs	16 (16 points/group)
Voltage category	24V DC source
Operating voltage range	20.4…26.4V DC
Output delay, on	0.1 ms
Output delay, off	1.0 ms
Current draw @ 5.1V	200 mA
Heat dissipation, max	2.11 W
Off-state leakage current, max(1)	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 1 A
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F)
Surge current(2)	2.0 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	71
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

ALLEN BRADLEY 1769 I_O MODULES

Temperature Derating - 1769-0B16

1769-0B16 Maximum Amperes per Point Versus Temperature



1769-0B16 Maximum Amperes per Module Versus Temperature

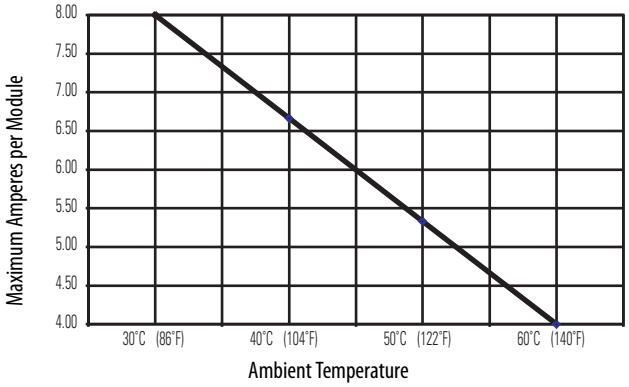


Table 66 - Certifications - 1769-0B16

Certification[1]	1769-0B16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

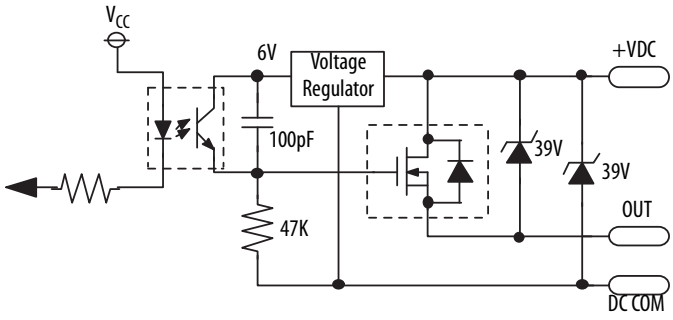
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0B16P

Compact solid-state 24V DC source, protected output module

Simplified Output Circuit Diagram



Protection circuit is not shown.

1769-0B16P

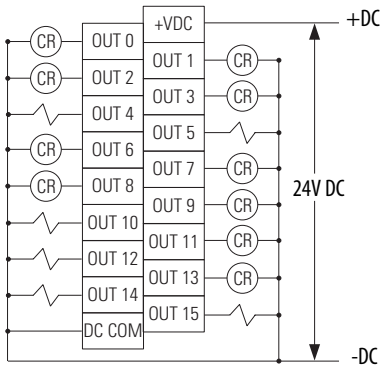


Table 67 - Technical Specifications - 1769-0B16P

Attribute	1769-0B16P
Outputs	16 (16 points/group)
Voltage category	24V DC source
Operating voltage range	20.4…26.4V DC
Output delay, on	1.0 ms
Output delay, off	2.0 ms
Current draw @ 5.1V	160 mA
Heat dissipation, max	2.69 W
Off-state leakage current, max(1)	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	0.5V DC
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F)
Surge current(2)	2.0 A for 10 ms, repeatable every 1 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	255 g (0.56 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded

ALLEN BRADLEY 1769 I_O MODULES

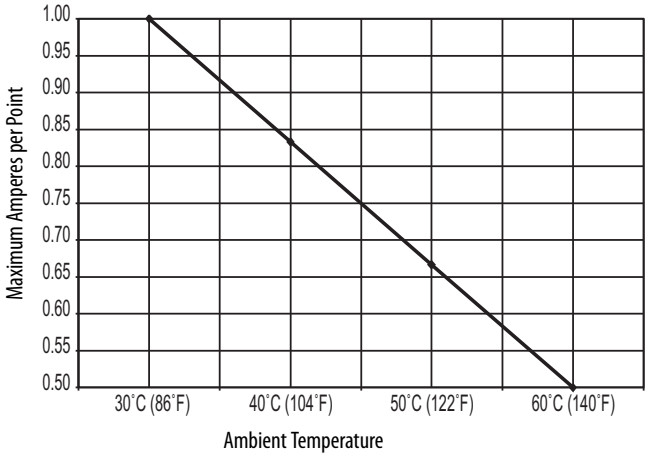
Table 67 - Technical Specifications - 1769-0B16P

Attribute	1769-0B16P
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	91
Enclosure type rating	None (open style)

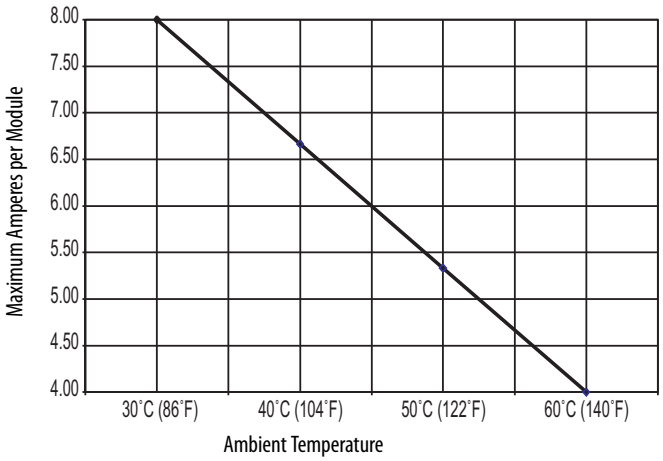
(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Temperature Derating - 1769-0B16P

1769-0B16P Maximum Amperes per Point Versus Temperature



1769-0B16P Maximum Amperes per Module Versus Temperature



ALLEN BRADLEY 1769 I_O MODULES

Table 68 - Certifications - 1769-0B16P

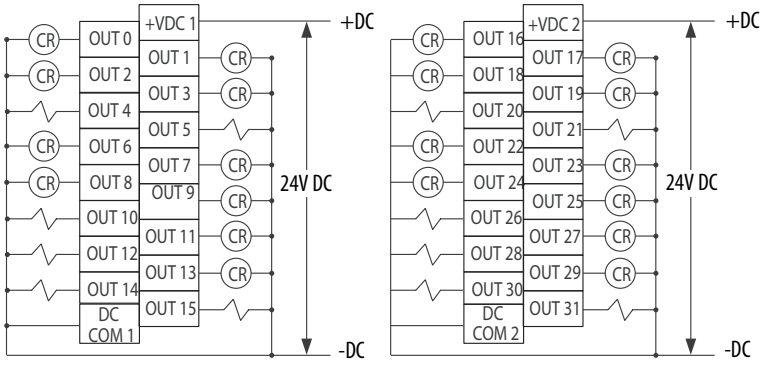
Certification[1]	1769-0B16P
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-0B32

Compact solid-state 24V DC source output module

1769-0B32



Simplified Output Circuit Diagram

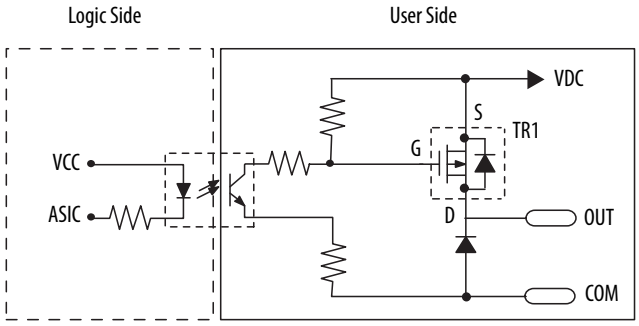


Table 69 - Technical Specifications - 1769-0B32

Attribute	1769-0B32
Outputs	32 (16 points/group)
Voltage category	24V DC source
Operating voltage range	20.4…26.4V DC
Output delay, on	0.1 ms
Output delay, off	1.0 ms
Current draw @ 5.1V	300 mA

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Table 69 - Technical Specifications - 1769-OB32

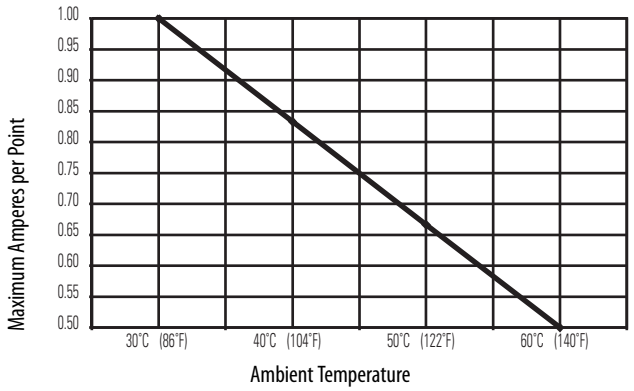
Attribute	1769-OB32
Heat dissipation, max	4.5 W
Off-state leakage current, max(1)	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 1 A
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F)
Surge current(2)	2.0 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	450 g (0.992 lb)
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	6 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	73
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

ALLEN BRADLEY 1769 I_O MODULES

Temperature Derating - 1769-OB32

1769-OB32 Maximum Amperes per Point Versus Temperature



1769-OB32 Maximum Amperes per Module Versus Temperature

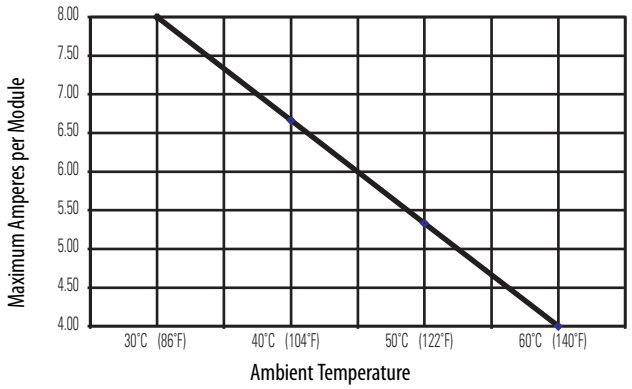


Table 70 - Certifications - 1769-OB32

Certification[1]	1769-OB32
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

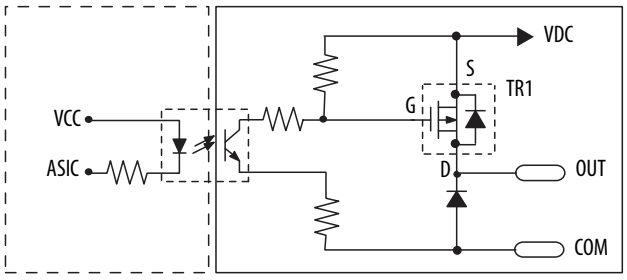
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0B32T

Compact solid-state 24V DC source, terminated output module

Simplified Output Circuit Diagram



1769-0B32T

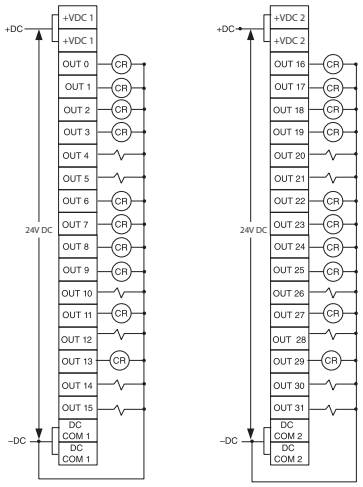


Table 71 - Technical Specifications - 1769-0B32T

Attribute	1769-0B32T
Outputs	32 terminated (16 points/group)
Voltage category	24V DC source
Operating voltage range	10.2…26.4V DC
Output delay, on	0.5 ms
Output delay, off	4.0 ms
Current draw @ 5.1V	220 mA
Heat dissipation, max	4.76 W
Off-state leakage current, max[1]	0.1 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	0.3V DC @ 0.5 A
Current per point, max	0.5 A
Current per module, max	4.0 A
Surge current[2]	2.0 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 2 s or 1697V DC for 2 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	230 g (0.51 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)

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Table 71 - Technical Specifications - 1769-0B32T

Attribute	1769-0B32T
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement connector	1746-N3 (1 connector, 40 terminals)
Vendor ID code	1
Product type code	7
Product code	79
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Table 72 - Certifications - 1769-0B32T

Certification[1]	1769-0B32T
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

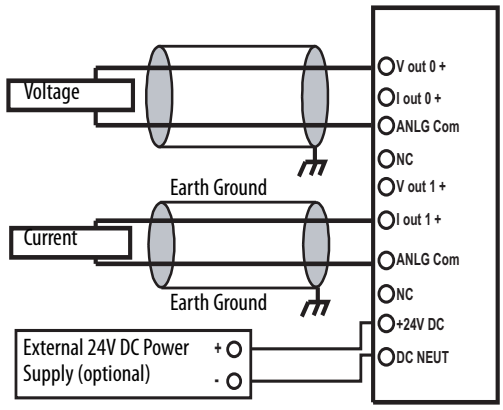
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0F2

Compact voltage/current output analog module

1769-0F2



The external power supply must be rated Class 2, with a 24V DC range of 20.4…26.4V DC and 60 mA minimum. Series B and later modules support this option.

Table 73 - Technical Specifications - 1769-0F2

Attribute	1769-0F2
Outputs	2 single-ended
Output range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Resolution	14 bits (unipolar) 14 bits plus sign (bipolar) ±10V DC: sign + 14 bits, 0.64 mV 0…10V DC: sign + 13 bits, 0.64 mV 0…5V DC: sign + 14 bits, 0.64 mV 1…5V DC: sign + 14 bits, 1.28 µA 0…20 mA: sign + 13 bits, 0.64 mV 4…20 mA: sign + 14 bits, 1.28 µA
Current draw @ 5.1V	120 mA
Current draw @ 24V	120 mA
Converter type	Delta Sigma
Heat dissipation, max	2.63 W
Conversion rate (all channels), max	2.5 ms
Step response to 63%[2]	2.9 ms
Current load on voltage output, max	10 mA
Resistive load on current output	0…500 Ω (includes wire resistance)
Load range on voltage output	> 1 kΩ @ 10V DC
Inductive load (current outputs), max	0.1 mH
Capacitive load (voltage outputs), max	1 µF

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Table 73 - Technical Specifications - 1769-0F2

Attribute	1769-0F2
Field calibration	None required
Accuracy(3)	Voltage: ±0.5% full scale @ 25 °C (77 °F) Current: ±0.35% full scale @ 25 ° C (77 °F)
Accuracy drift with temperature	Voltage: ±0.0086% per °C Current: ±0.0058% per °C
Output ripple(4)	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%
Repeatability(5)	±0.05%
Module error	Voltage: ±0.8% Current: ±0.55%
Offset error	±0.05%
Output impedance	15 Ω
Open and short-circuit protection	Yes
Short-circuit protection, max	21 mA
Output overvoltage protection	Yes
Time to detect open wire condition (current mode)	10 ms, typical 13.5 ms, max
Output response at system powerup and power down	±5V DC spike for < 5 ms
Rated working voltage(6)	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	300 g (0.65 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Optional 24V DC Class 2 power supply voltage range(7)	20.4…26.4V DC
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	32
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.

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(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(7) If the optional 24V DC Class 2 power supply is used, the 24V DC current draw from the bus is 0 mA.

Table 74 - Certifications - 1769-OF2

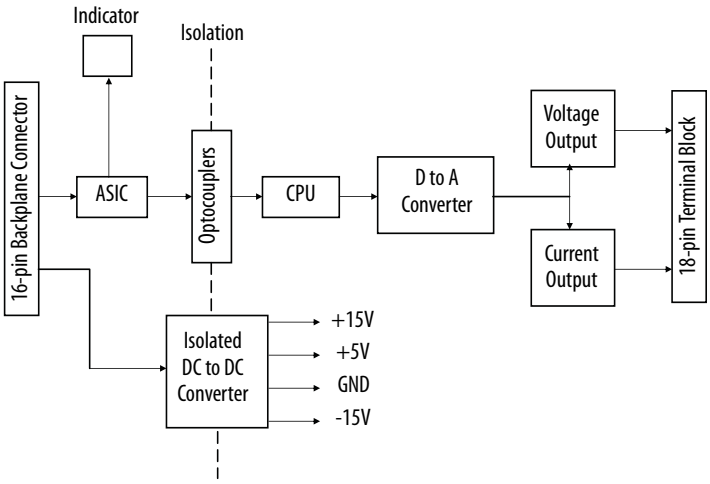
Certification[1]	1769-OF2
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-OF4

Compact voltage/current output analog module

Simplified Schematic



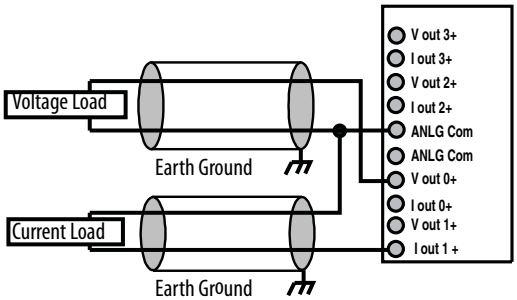


Table 75 - Technical Specifications - 1769-OF4

Attribute	1769-OF4
Outputs	4 single-ended
Output range	±10V 0…10V 0…5V 1…5V 0…20 mA 4…20 mA
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V 0…21 mA 3.2…21 mA
Resolution	15 bits plus sign unipolar and bipolar
Current draw @ 5.1V	120 mA
Current draw @ 24V	170 mA

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Table 75 - Technical Specifications - 1769-0F4

Attribute	1769-0F4
Heat dissipation, max	2.86 W
Conversion rate (all channels), max	Interrupts not enabled: 2.5 ms Interrupts enabled: 3.8 ms
Step response to 63%[2]	2.9 ms
Resistive load	Current: 0…600 Ω (includes wire resistance) Voltage: 1 KΩ or greater
Inductive load, max	0.1 mH (current load) 1.0 µF (voltage load)
Field calibration	None required
Accuracy[3]	0.5% full scale at 25 °C (77 °F)
Accuracy drift with temperature	±0.0086% of full scale per °C
Output ripple[4]	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%
Repeatability[5]	±0.05%
Module error 0…60 °C (32…140 °F)	+/-0.8% of full scale
Output impedance	Voltage output: < 1 Ω Current output: > 1 MΩ
Open and short-circuit protection	Yes
Short-circuit protection, max	40 mA
Output overvoltage protection	Yes
Output response at system power up and power down	2.5…-1.0V DC spike for < 15 ms
Rated working voltage[6]	30V AC/30V DC
Isolation voltage	510V AC or 720V DC for 1 minute (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Optional 24V DC Class 2 power supply voltage range[7]	20.4…26.4V DC
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	48
Input words	5

ALLEN BRADLEY 1769 I_O MODULES

Table 75 - Technical Specifications - 1769-OF4

Attribute	1769-OF4
Output words	5
Configuration words	32
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, drift, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the output module to reproduce output readings when the same controller value is applied to it consecutively, under the same conditions and in the same direction.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a10V DC input signal and 20V DC potential above ground at the input terminal.
(7) If the optional 24V DC Class 2 power supply is used, the 24V DC current draw from the bus is 0 mA.

Table 76 - Certifications - 1769-OF4

Certification[1]	1769-OF4
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0F4CI

Compact current output, individually isolated analog module

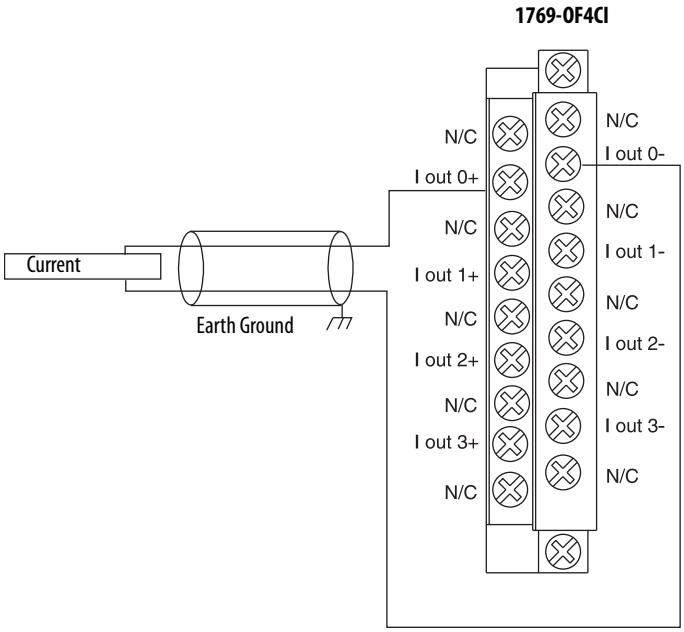


Table 77 - Technical Specifications - 1769-0F4CI

Attribute	1769-0F4CI
Outputs	4 differential, individually isolated
Output range	0…20 mA 4…20 mA
Full scale range(1)	0…21 mA 3.2…21 mA
Resolution	16 bits (unipolar) 0…20 mA: 15.91 bits, 0.323 µA/bit 4…20 mA: 15.59 bits, 0.323 µA/bit
Bus current draw	5V DC, 145 mA 24V DC, 120 mA
Heat dissipation, max	2.68 W
Conversion rate (all channels), max	110 ms
Limited voltage/current(2)	< 2.9 ms
Resistive load on current output	0…500 Ω (includes wire resistance)
Inductive load (current outputs), max	0.1 mH
Field calibration	None required
Accuracy(3)	±0.35% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.0058% FS per °C
Output ripple(4)	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%
Repeatability(5)	±0.05%
Module error	±0.55%
Output impedance	>1 MΩ
Open and short-circuit protection	Yes

ALLEN BRADLEY 1769 I_O MODULES

Table 77 - Technical Specifications - 1769-0F4CI

Attribute	1769-0F4CI
Short-circuit protection, max	21 mA
Output overvoltage protection	Yes
Output response at system powerup and power down	No current glitch
Rated working voltage(6)	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	270 g (0.60 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Recommended cable	Belden 8761 (shielded)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	45
Input words	6
Output words	5
Configuration words	32
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.

Environmental Specifications - 1769-0F4CI

Attribute	1769-0F4CI
Temperature, storage	-40…85 °C (-40…185 °F)
Temperature, operating	0…60 °C (32…140 °F)
Relative humidity	5…95% noncondensing
Altitude, operating	2000 m (6561 ft)
Vibration, operating	10…500 Hz, 5 g, 0.030 in. peak-to-peak
Shock, operating	30 g, 11 ms panel-mounted (20 g, 11 ms DIN rail-mounted)

ALLEN BRADLEY 1769 I_O MODULES

Environmental Specifications - 1769-0F4CI

Attribute	1769-0F4CI
Shock, nonoperating	40 g panel-mounted (30 g DIN rail-mounted)
Radiated and conducted emissions IEC 61000-6-4 CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	4 kV contact 8 kV air 4 kV indirect
Radiated immunity IEC 61000-4-3	10V/m, 80…1000 MHz, 80% amplitude modulation
Burst, fast transient IEC 61000-4-4	2 kV, 5 kHz
Surge immunity IEC 61000-4-5	1 kV galvanic gun
Conducted immunity(1) IEC 61000-4-6	10V DC, 0.15…80 MHz

(1) Conducted immunity frequency range can be 150…30 MHz if the Radiated immunity frequency range is 30…1000 MHz.

Table 78 - Certifications - 1769-0F4CI

Certification(1)	1769-0F4CI
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed UL listed for Class I, Division 2 Group A,B,C,D Hazardous Locations (ANSI/ISA 12.12.01-2007, 120-01,C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0F4VI

Compact voltage output, individually isolated analog module

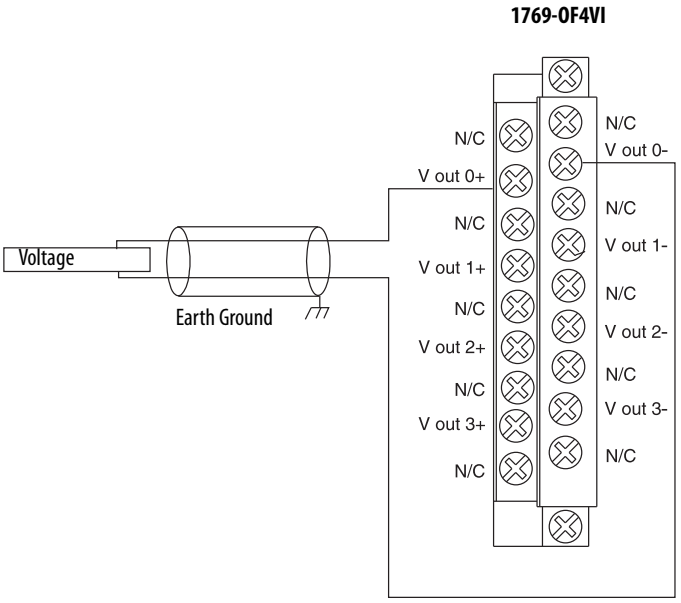


Table 79 - Technical Specifications - 1769-0F4VI

Attribute	1769-0F4VI
Outputs	4 differential, individually isolated
Output range[1]	±10V DC 0…10V DC 0…5V DC 1…5V DC
Full scale range	±10.5V DC -0.5…10.5V DC -0.5…5.25V DC 0.5…5.25V DC
Resolution	15 bits plus sign (bipolar) ±10V DC: 15.89 bits, 330 µV/bit 0…10V DC: 14.89 bits, 330 µV/bit 0…5V DC: 13.89 bits, 330 µV/bit 1…5V DC: 13.57 bits, 330 µV/bit
Bus current draw	5V DC, 145 mA 24V DC, 120 mA
Heat dissipation, max	2.0 W (all points-10 V into 2 k - worst case calculated
Conversion rate (all channels), max	120 ms
Limited voltage/current[2]	< 2.9 ms
Load output current, max	5 mA
Load range output	>= 2 kΩ
Capacitive load (voltage outputs), max	1 µF
Field calibration	None required
Accuracy[3]	±0.5% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.0086% FS per °C
Output ripple[4]	±0.05% @ 0…50 kHz

ALLEN BRADLEY 1769 I_O MODULES

Table 79 - Technical Specifications - 1769-OF4VI

Attribute	1769-OF4VI
Nonlinearity	±0.05%
Repeatability(5)	±0.05%
Module error	±0.8%
Output impedance	< 1 Ω
Open and short-circuit protection	Yes
Short-circuit protection, max	35 mA typical 42 mA, max
Output overvoltage protection	Yes
Output response at system powerup and power down	Powerup: ±1.2V DC spike for < 0.4 ms Power down: ±1.2V DC spike for 21 ms
Rated working voltage(6)	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	270 g (0.60 lbs)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Recommended cable	Belden 8761 (shielded)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	42
Input words	6
Output words	5
Configuration words	32
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.

ALLEN BRADLEY 1769 I_O MODULES

Table 80 - Environmental Specifications - 1769-OF4VI

Attribute	1769-OF4CI
Temperature, storage	-40…85 °C (-40…185 °F)
Temperature, operating	0…60 °C (32…140 °F)
Relative humidity	5…95% noncondensing
Altitude, operating	2000 m (6561 ft)
Vibration, operating	10…500 Hz, 5 g, 0.030 in. peak-to-peak
Shock, operating	30 g, 11 ms panel-mounted (20 g, 11 ms DIN rail-mounted)
Shock, nonoperating	40 g panel-mounted (30 g DIN rail-mounted)
Radiated and conducted emissions IEC 61000-6-4 CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	4 kV contact 8 kV air 4 kV indirect
Radiated immunity IEC 61000-4-3	10V/m, 80…1000 MHz, 80% amplitude modulation
Burst, fast transient IEC 61000-4-4	2 kV, 5 kHz
Surge immunity IEC 61000-4-5	1 kV galvanic gun
Conducted immunity(1) IEC 61000-4-6	10V DC, 0.15…80 MHz

(1) Conducted immunity frequency range can be 150…30 MHz if the Radiated immunity frequency range is 30…1000 MHz.

Table 81 - Certifications - 1769-OF4VI

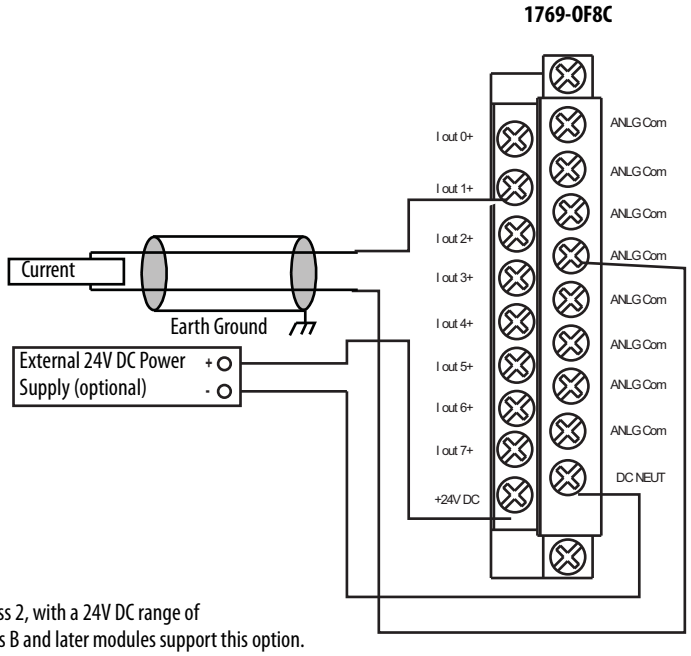
Certification(1)	1769-OF4VI
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed UL listed for Class I, Division 2 Group A,B,C,D Hazardous Locations (ANSI/ISA 12.12.01-2007, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0F8C

Compact current output analog module



The external power supply must be rated Class 2, with a 24V DC range of 20.4…26.4V DC and 60 mA minimum. Series B and later modules support this option.

Table 82 - Technical Specifications - 1769-0F8C

Attribute	1769-0F8C
Outputs	8 single-ended
Output range	0…20 mA 4…20 mA
Full scale range(1)	0…21 mA 3.2…21 mA
Resolution	16 bits (unipolar) 0…20 mA: 15.91 bits, 0.323 µA/bit 4…20 mA: 15.59 bits, 0.323 µA/bit
Bus current draw	5V DC, 145 mA 24V DC, 185 mA
Heat dissipation, max	2.69 W
Conversion rate (all channels), max	5 ms
Step response to 63%(2)	< 2.9 ms
Resistive load on current output	0…500 Ω (includes wire resistance)
Inductive load (current outputs), max	0.1 mH
Field calibration	None required
Accuracy(3)	±0.35% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.0058% per °C
Output ripple(4)	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%

ALLEN BRADLEY 1769 I_O MODULES

Table 82 - Technical Specifications - 1769-0F8C

Attribute	1769-0F8C
Repeatability[5]	±0.05%
Module error	±0.55%
Offset error	±0.05%
Output impedance	> 1 MΩ
Open and short-circuit protection	Yes
Short-circuit protection, max	21 mA
Output overvoltage protection	Yes
Output response at system powerup and power down	±0.5V DC spike for < 5 ms
Rated working voltage[6]	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	281 g (0.62 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Optional 24V DC Class 2 power supply voltage range[7]	20.4…26.4V DC
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	10
Product code	40
Input words	11
Output words	9
Configuration words	64
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(7) If the optional 24V DC Class 2 power supply is used, the 24V DC current draw from the bus is 0 mA.

ALLEN BRADLEY 1769 I_O MODULES

Table 83 - Certifications - 1769-0F8C

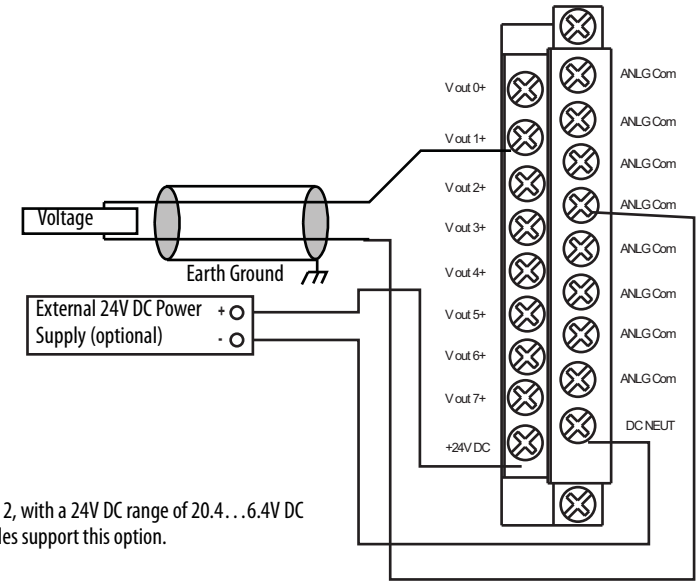
Certification[1]	1769-0F8C
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-0F8V

Compact voltage output analog module

1769-0F8V



The external power supply must be rated Class 2, with a 24V DC range of 20.4…6.4V DC and 60 mA minimum. Series B and later modules support this option.

Table 84 - Technical Specifications - 1769-0F8V

Attribute	1769-0F8V
Outputs	8 single-ended
Output range	±10V 0…10V 0…5V 1…5V
Full scale range[1]	±10.5V -0.5…10.5V -0.5…5.25V 0.5…5.25V

ALLEN BRADLEY 1769 I_O MODULES

Table 84 - Technical Specifications - 1769-OF8V

Attribute	1769-OF8V
Resolution	16 bits plus sign (bipolar) ±10V DC: 15.89 bits, 330 μV/bit 0…10V DC: 14.89 bits, 330 μV/bit 0…5V DC: 13.89 bits, 330 μV/bit 1…5V DC: 13.57 bits, 330 μV/bit
Bus current draw	5V DC, 145 mA 24V DC, 135 mA
Heat dissipation, max	2.16 W
Conversion rate (all channels), max	5.0 ms
Step response to 63%[2]	< 2.9 ms
Load output current, max	10 mA
Load range output	> 1 kΩ
Capacitive load (voltage outputs), max	1 μF
Field calibration	None required
Accuracy[3]	±0.5% full scale @ 25 °C (77 °F)
Accuracy drift with temperature	±0.0086% per °C
Output ripple[4]	±0.05% @ 0…50 kHz
Nonlinearity	±0.05%
Repeatability[5]	±0.05%
Module error	±0.8%
Offset error	±0.05%
Output impedance	< 1 Ω
Open and short-circuit protection	Yes
Short-circuit protection, max	30 mA
Output overvoltage protection	Yes
Output response at system powerup and power down	± 0.5V DC spike for < 5 ms
Rated working voltage[6]	30V AC/30V DC
Isolation voltage	500V AC or 710V DC for 1 min (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	263 g (0.58 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Optional 24V DC Class 2 power supply voltage range[7]	20.4…26.4V DC
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL2 (2 per kit)
Replacement door	1769-RD (2 per kit)

ALLEN BRADLEY 1769 I_O MODULES

Table 84 - Technical Specifications - 1769-OF8V

Attribute	1769-OF8V
Vendor ID code	1
Product type code	10
Product code	39
Input words	11
Output words	9
Configuration words	64
Enclosure type rating	None (open style)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range.
(3) Includes offset, gain, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount that a fixed output varies with time, which assumes a constant load and temperature.
(5) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10V DC input signal and 20V DC potential above ground at the input terminal.
(7) If the optional 24V DC Class 2 power supply is used, the 24V DC current draw from the bus is 0 mA.

Table 85 - Certifications - 1769-OF8V

Certification(1)	1769-OF8V
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

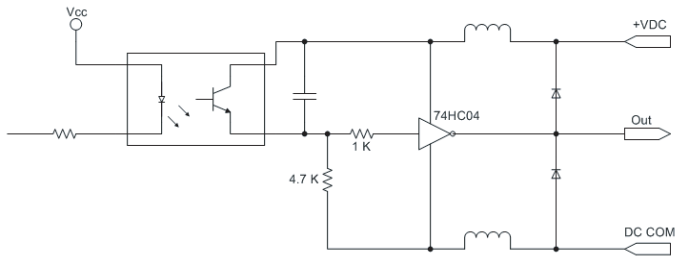
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

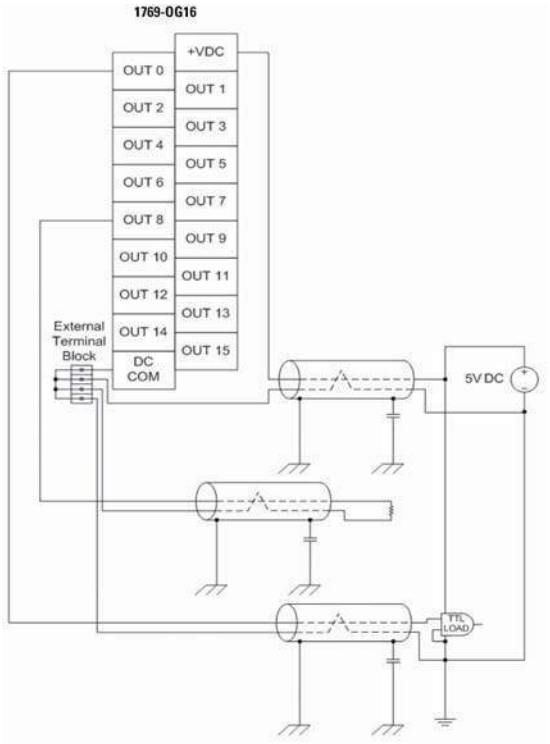
ALLEN BRADLEY 1769 I_O MODULES

1769-0G16

Compact TTL output module

Simplified Output Circuit Diagram





- Use Belden 8761, or equivalent, shielded wire.
- Do not connect more than two wires to any single terminal.
- Do not exceed 10 m (30 ft) with the DC power cable and I/O cables.
- The capacitors that are shown in the diagram must be 0.01 µF and rated for 2000V min.
- User power supply must be rated Class 2 with a 5V DC range of 4.5…5.5V DC.

Low to True Format - 1769-0G16

- 0...0.4V DC = Output on-state is guaranteed
- 0.4...4.5V DC = Output state is not guaranteed
- 4.5...5.5V DC = Output off-state is guaranteed

Table 86 - Technical Specifications - 1769-0G16

Attribute	1769-0G16
Outputs	16
Voltage category	5V DC TTL (Low=True)(1)
Operating voltage range	4.5…5.5V DC 50 mV peak-to-peak ripple max
Output delay, off to on	0.25 ms
Output delay, on to off	0.50 ms
Current draw @ 5.1V	200 mA
Heat dissipation, max	1.2 W
Off-state voltage, typical	4.5…5.5V DC
On-state voltage	0…0.4V DC
Load current, min	0.15 mA
Current per point, max	24 mA
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 2 s or 1697V DC for 2 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)

ALLEN BRADLEY 1769 I_O MODULES

Table 86 - Technical Specifications - 1769-OG16

Attribute	1769-OG16
Weight, approx	250 g (0.55 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Vendor ID code	1
Product type code	7
Product code	78
Input words	1
Output words	1
Configuration words	5
Enclosure type rating	None (open-style)

(1) TTL inputs are inverted (-0.2…0.8 = low voltage = True = On.) Use a NOT instruction in your program to convert to traditional True = High logic.

Table 87 - Certifications - 1769-OG16

Certification(1)	1769-OG16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives

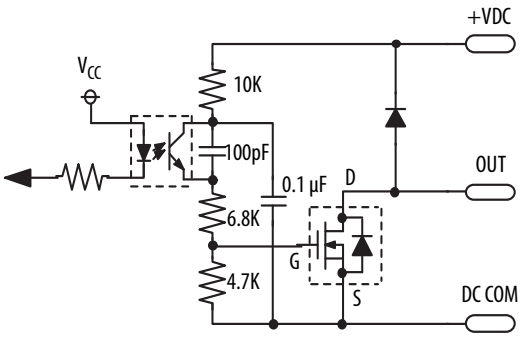
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0V16

Compact solid-state 24V DC sink output module

Simplified Output Circuit Diagram



1769-0V16

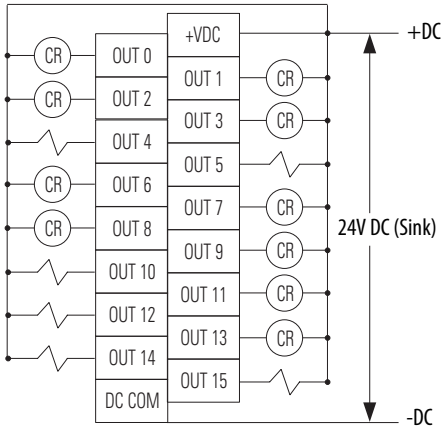


Table 88 - Technical Specifications - 1769-0V16

Attribute	1769-0V16
Outputs	16 (16 points/group)
Voltage category	24V DC sink
Operating voltage range	20.4…26.4V DC
Output delay, on	0.1 ms
Output delay, off	1.0 ms
Current draw @ 5.1V	200 mA
Heat dissipation, max	2.06 W
Off-state leakage current, max(1)	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	1.0V DC @ 1 A
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Current per module, max	4.0 A @ 60 °C (140 °F) 8.0 A @ 30 °C (86 °F)
Surge current(2)	2.0 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded

ALLEN BRADLEY 1769 I_O MODULES

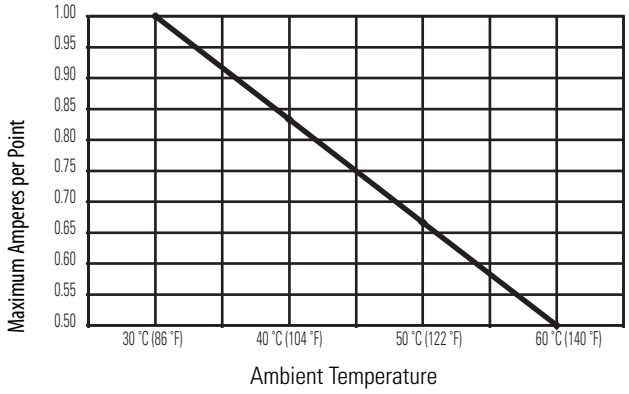
Table 88 - Technical Specifications - 1769-0V16

Attribute	1769-0V16
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	72
Enclosure type rating	None (open style)

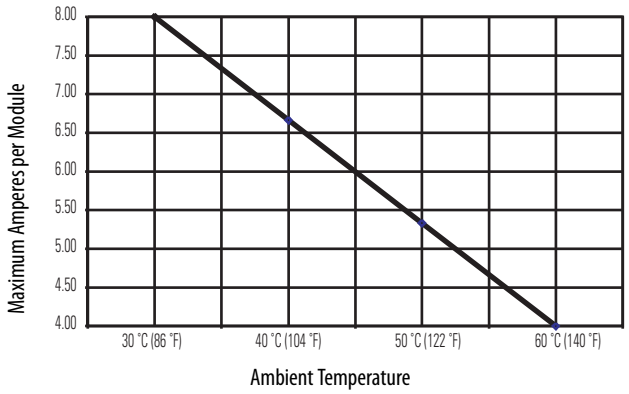
(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Temperature Derating - 1769-0V16

1769-0V16 Maximum Amperes per Point Versus Temperature



1769-0V16 Maximum Amperes per Module Versus Temperature



ALLEN BRADLEY 1769 I_O MODULES

Table 89 - Certifications - 1769-0V16

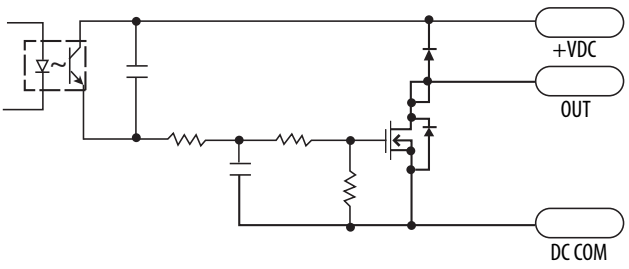
Certification[1]	1769-0V16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

1769-0V32T

Compact solid-state 24V DC sink, terminated output module

Simplified Output Circuit Diagram



1769-0V32T

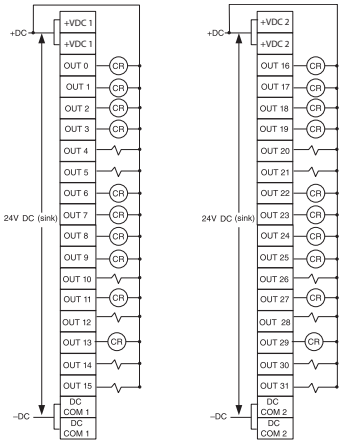


Table 90 - Technical Specifications - 1769-0V32T

Attribute	1769-0V32T
Outputs	32 terminated (16 points/group)
Voltage category	24V DC sink
Operating voltage range	10.2…26.4V DC
Output delay, on	< 16V, 1.5 ms >= 16V, 1.0 ms
Output delay, off	4.0 ms
Bus current draw	5V DC, 0.220 A 24V DC, 0 A
Heat dissipation, max	4.5 W
Off-state leakage current, max[1]	1.0 mA @ 26.4V DC
On-state current, min	1.0 mA
On-state voltage drop, max	0.3V DC @ 0.5 A
Current per point, max	0.5 A
Current per module, max	4.0 A
Surge current[2]	2.0 A for 10 ms, repeatable every 2 s

ALLEN BRADLEY 1769 I_O MODULES

Table 90 - Technical Specifications - 1769-0V32T

Attribute	1769-0V32T
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	450 g (0.992 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement connector	1746-N3 (1 connector, 40 terminals)
Vendor ID code	1
Product type code	7
Product code	75
Enclosure type rating	None (open style)

(1) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. Use a 5.6 kΩ, 1/2 W resistor for transistor outputs, 24V DC operation.
(2) Use a 1N4004 diode reverse-wired across the load for transistor outputs switching 24V DC inductive loads.

Table 91 - Certifications - 1769-0V32T

Certification[1]	1769-0V32T
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

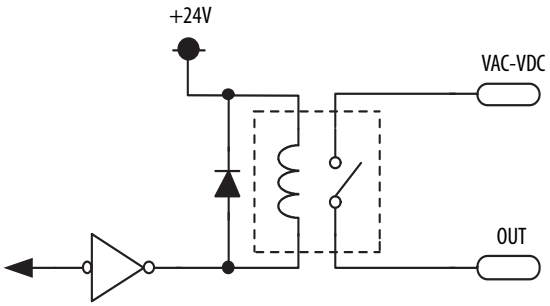
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0W8

Compact AC/DC relay contact module

Simplified Output Circuit Diagram



1769-0W8

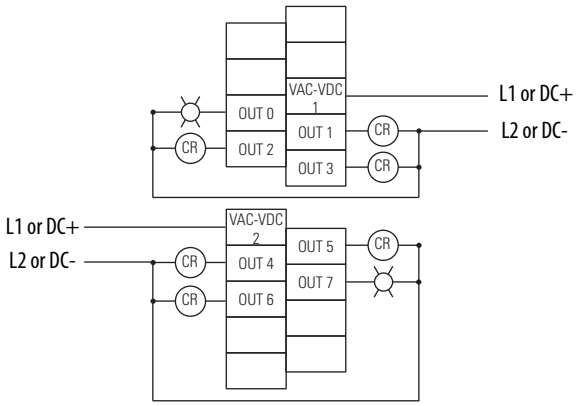


Table 92 - Technical Specifications - 1769-0W8

Attribute	1769-0W8
Outputs	8 normally open (4 points/group)
Operating voltage range	5…265V AC 5…125V DC
Delay, on	10 ms
Delay, off	10 ms
Current draw @ 5.1V	125 mA
Current draw @ 24V	100 mA
Heat dissipation, max	2.83 W
Off-state leakage, max	0 mA
On-state current, min	10 mA @ 5V DC
Current per point, max	2.5 A
Current per module, max	16 A
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, output point to bus and group to group 265V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	280 g (0.61 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN10 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)

ALLEN BRADLEY 1769 I_O MODULES

Table 92 - Technical Specifications - 1769-0W8

Attribute	1769-0W8
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	86
Enclosure type rating	None (open style)

Table 93 - Relay Contact Ratings - 1769-0W8

Volts, max	Continuous Amps per Point, max	Amperes(1)		Voltamperes		NEMA ICS 2-125
		Make	Break	Make	Break	
240V AC	2.5 A	7.5 A	0.75 A	1800VA	180VA	C300
120V AC		15 A	1.5 A			
125V DC	1.0 A	0.22 A(2)		28VA		R150
24V DC	2.0 A	1.2 A(2)		28VA		—

(1) If you connect surge suppressors across your external inductive load, you extend the life of the relay contacts.

(2) For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28VA by the applied DC voltage. For example, 28VA/48V DC = 0.58 A. For DC voltage applications less than 48V, the make/break ratings for relay contacts cannot exceed 2 A.

Table 94 - Certifications - 1769-0W8

Certification(1)	1769-0W8
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

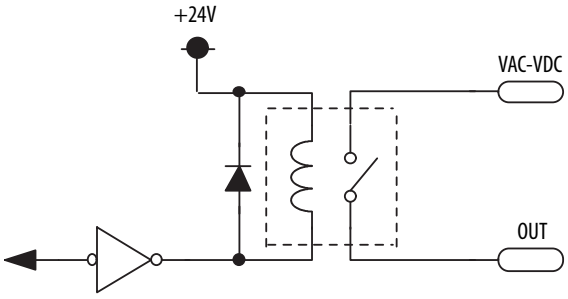
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0W8I

Compact AC/DC individually isolated, relay contact module

Simplified Output Circuit Diagram



1769-0W8I

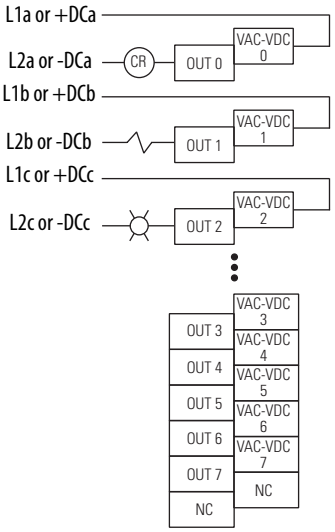


Table 95 - Technical Specifications - 1769-0W8I

Attribute	1769-0W8I
Outputs	8 normally open, individually isolated (4 points/group)
Operating voltage range	5…265V AC 5…125V DC
Delay, on	10 ms
Delay, off	10 ms
Current draw @ 5.1V	125 mA
Current draw @ 24V	100 mA
Heat dissipation, max	2.83 W
Off-state leakage, max	0 mA
On-state current, min	10 mA @ 5V DC
Current per point, max	2.5 A
Current per module, max	16 A
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, output point to bus 265V AC working voltage (IEC Class 2 reinforced insulation) Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, group to group 265V AC working voltage (basic insulation) 150V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	290 g (0.64 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)

ALLEN BRADLEY 1769 I_O MODULES

Table 95 - Technical Specifications - 1769-0W8I

Attribute	1769-0W8I
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	87
Enclosure type rating	None (open style)

Table 96 - Relay Contact Ratings - 1769-0W8I

Volts, max	Continuous Amps per Point, max	Amperes[1]		Voltamperes		NEMA ICS 2-125
		Make	Break	Make	Break	
240V AC	2.5 A	7.5 A	0.75 A	1800VA	180VA	C300
120V AC		15 A	1.5 A			
125V DC	1.0 A	0.22 A[2]		28VA		R150
24V DC	2.0 A	1.2 A[2]		28VA		—

(1) If you connect surge suppressors across your external inductive load, you extend the life of the relay contacts.

(2) For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28VA by the applied DC voltage. For example, 28VA/48V DC = 0.58 A. For DC voltage applications less than 48V, the make/break ratings for relay contacts cannot exceed 2 A.

Table 97 - Certifications - 1769-0W8I

Certification[1]	1769-0W8I
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

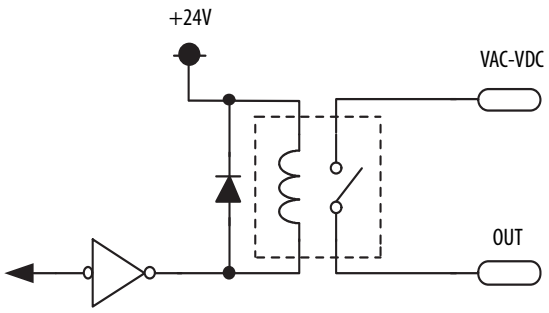
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-0W16

Compact AC/DC relay contact module

Simplified Output Circuit Diagram



1769-0W816

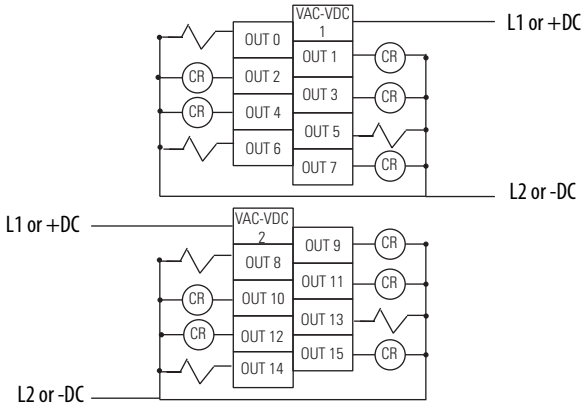


Table 98 - Technical Specifications - 1769-0W16

Attribute	1769-0W16
Outputs	16 normally open (8 points/group)
Operating voltage range	5…265V AC 5…125V DC
Delay, on	10 ms
Delay, off	10 ms
Current draw @ 5.1V	205 mA
Current draw @ 24V	180 mA
Heat dissipation, max	4.75 W
Off-state leakage, max	0 mA
On-state current, min	10 mA @ 5V DC
Current per point, max	2.5 A
Current per module, max	20 A
Isolation voltage	Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, output point to bus 265V AC working voltage (IEC Class 2 reinforced insulation) Verified by one of the following dielectric tests: 1836V AC for 1 s or 2596V DC for 1 s, group to group 265V AC working voltage (basic insulation) 150V AC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	450 g (0.99 lb)
Dimensions (HxWxD), approx	118 x 52.5 x 87 mm (4.65 x 2.07 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1.5
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)

ALLEN BRADLEY 1769 I_O MODULES

Table 98 - Technical Specifications - 1769-0W16

Attribute	1769-0W16
Replacement terminal block	1769-RTBN18 (1 per kit)
Replacement door label	1769-RL1 (2 per kit)
Replacement door	1769-RD (2 per kit)
Vendor ID code	1
Product type code	7
Product code	85
Enclosure type rating	None (open style)

Table 99 - Relay Contact Ratings - 1769-0W16

Volts, max	Continuous Amps per Point, max	Amperes(1)		Voltamperes		NEMA ICS 2-125
		Make	Break	Make	Break	
240V AC	2.5 A	7.5 A	0.75 A	1800VA	180VA	C300
120V AC		15 A	1.5 A			
125V DC	1.0 A	0.22 A(2)		28VA		R150
24V DC	2.0 A	1.2 A(2)		28VA		—

(1) If you connect surge suppressors across your external inductive load, you extend the life of the relay contacts.

(2) For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28VA by the applied DC voltage. For example, 28VA/48V DC = 0.58 A. For DC voltage applications less than 48V, the make/break ratings for relay contacts cannot exceed 2 A.

Table 100 - Certifications - 1769-0W16

Certification(1)	1769-0W16
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

1769-ARM

Compact address reserve module

Use a 1769-ARM module to reserve module slots. To use the 1769-ARM module, first you create an I/O configuration and user program. Then you can remove and replace any module in the system with a 1769-ARM module after you inhibit the removed module in the programming software. If you inhibit a module, it creates an I/O configuration and user program that removes all references to that module.

To use the 1769-ARM module in MicroLogix systems, configure a generic module by using RSLogix 5000® programming software. Any user-program references to the slot position that is occupied by the 1769-ARM module must not use the parameters of another module.

Table 101 - Technical Specifications - 1769-ARM

Attribute	1769-ARM
Current draw @ 5.1V	60 mA
Current draw @ 24V	0 mA
Heat dissipation, max	0.3 W
Weight, approx	280 g (0.62 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Vendor ID code	1
Product type code	7
Product code	74
Enclosure type rating	None (open style)

Table 102 - Certifications - 1769-ARM

Certification(1)	1769-ARM
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

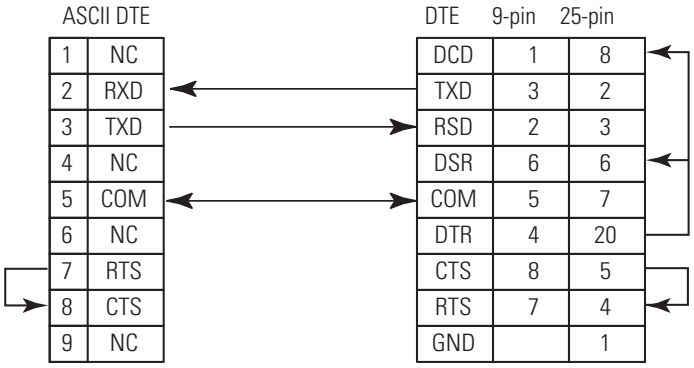
(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

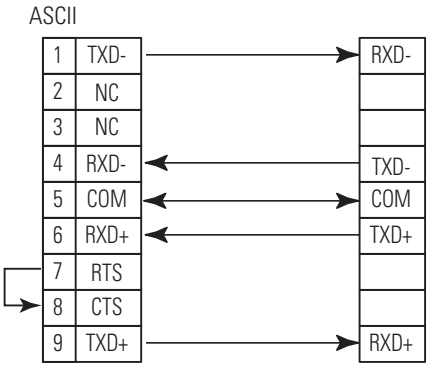
1769-ASCII

Compact ASCII module

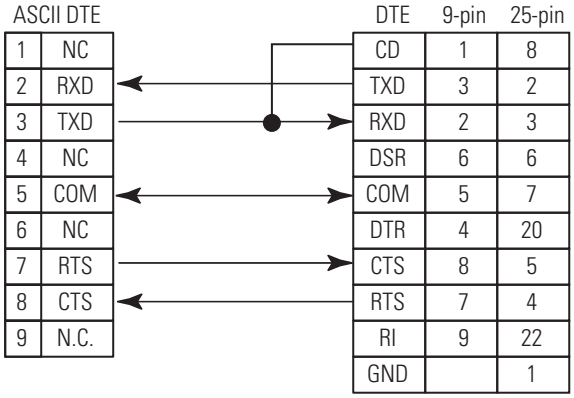
RS-232 Wiring Module to DTE Device (hardware handshaking disabled)



RS-422 Wiring



RS-232 Wiring - Module to Printer (hardware handshaking enabled, standard printer adapter cable)



RS-485 Wiring

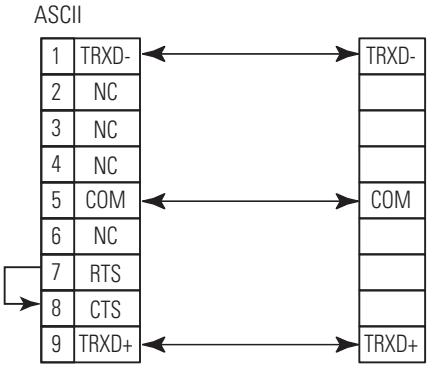


Table 103 - Technical Specifications - 1769-ASCII

Attribute	1769-ASCII
Inputs	2 full-duplex (RS-232, RS-422) 2 half-duplex (RS-485)
Serial input voltage signal	3…25V DC with respect to signal ground (SG) 0, Asserted, ON, Space, Active -3…-25V DC with respect to signal ground (SG) 1, Disasserted, OFF, Mark, Inactive
Current draw @ 5.1V	425 mA
Current draw @ 24V	0 mA
Power dissipation, max	2.13 W
Thermal dissipation, max	7.3 BTU/hr
Isolation voltage	30V Tested to withstand 710V DC for 60 s
Transmit transaction ID	0…255
Handshaking	RTS/CTS hardware handshaking always enabled
Weight, approx	0.18 kg (0.40 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1

ALLEN BRADLEY 1769 I_O MODULES

Table 103 - Technical Specifications - 1769-ASCII

Attribute	1769-ASCII
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	4 modules
Recommended cable	Belden 8761, shielded
Serial port connectors	Two DB-9 male with pins
Wire category	2 - on communication ports(1)
Vendor ID code	1
Product type code	109
Product code	66
Input words	108
Output words	108
Configuration words	31
Enclosure type rating	None (open style)

(1) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 104 - Certifications - 1769-ASCII

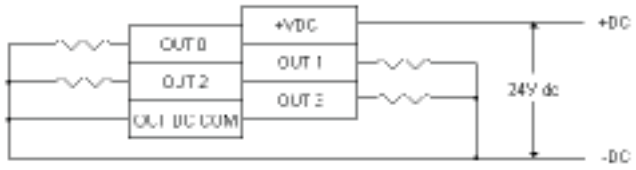
Certification(1)	1769-ASCII
c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada.
CE	European Union 89/335/EEC EMC Directive, compliant with: • EN 50082-2; Industrial Immunity • EN 61326; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

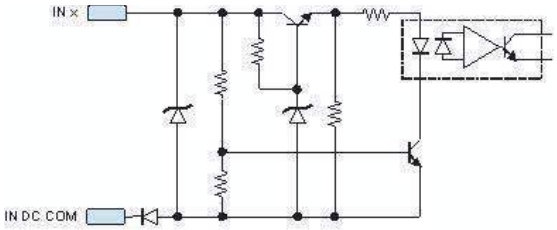
ALLEN BRADLEY 1769 I_O MODULES

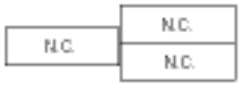
1769-BOOLEAN

Compact combination 24V DC sink input/source output Boolean control module

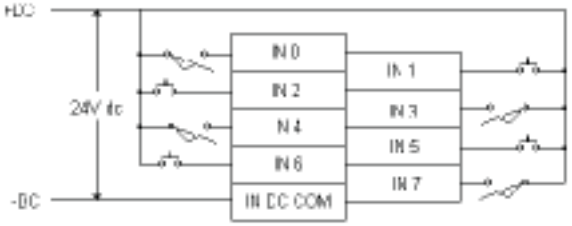


Simplified Input Schematic





Do not use the NC terminals as connection points.



Simplified Output Schematic

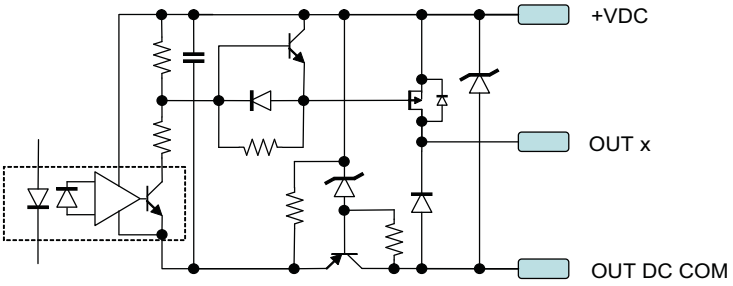


Table 105 - Technical Specifications - 1769-BOOLEAN

Attribute	1769-BOOLEAN
Current draw @ 5.1V	220 mA
Current draw @ 24V	0 mA
Heat dissipation, max	3.55 W
Closed loop time	Output on-state current ≥ 5 mA: 100 µs max Output on-state current < 5 mA: 150 µs max
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s 75V DC working voltage (IEC Class 2 reinforced insulation)
Weight, approx	282 g (0.625 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	8 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)

ALLEN BRADLEY 1769 I_O MODULES

Table 105 - Technical Specifications - 1769-BOOLEAN

Attribute	1769-BOOLEAN
Wire size	(22…14 AWG) solid (22…16 AWG) stranded
Wire type	Cu-90 °C (194 °F)
Vendor ID code	1
Product type code	109
Product code	37
Enclosure type rating	None (open-style)

Table 106 - 1769-BOOLEAN Input Specifications

Attribute	1769-BOOLEAN
Inputs	8 real 8 virtual
Voltage category	24V AC sinking
Operating voltage range	10…30V DC @ 30 °C (86 °F) 10…26V DC @ 60 °C (140 °F)
Digital filter, off to on	0 s, 100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Digital filter, on to off	0 s, 100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Input delay, off to on	10 µs
Input delay, on to off	10 µs
Current draw @ 5.1V	115 mA
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state voltage, min	10V DC
On-state current, min	2 mA
Inrush current, max(1)	250 mA
Input impedance, max	2.0 kΩ @ 24V DC 2.3 kΩ @ 30V DC
IEC input compatibility	Type 1+
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)

(1) A current limiting resistor can be used to limit inrush current; however, the operating characteristics of the AC input circuit are affected. If a 6.8 kΩ (2.5 W minimum) resistor is placed in series with the input, the inrush current is reduced to 35 mA. In this configuration, the minimum on-state voltage increases to 92V AC. Before adding the resistor in a hazardous environment, be sure to consider the operating temperature of the resistor and the temperature limits of the environment. The operating temperature of the resistor must remain below the temperature limit of the environment.

Table 107 - 1769-BOOLEAN Output Specifications

Attribute	1769-BOOLEAN
Outputs	4
Voltage category	24V DC, sourcing
Operating voltage range	20.4…26.4V DC
Output delay, on(1)	10 µs, output on-state current ≥ 5 mA
Output delay, off(1)	10 µs, output on-state current ≥ 5 mA
Off-state leakage current, max(2)	1.0 mA @ 26.4V DC
On-state current, max	1.0 mA
On-state voltage drop, max	1.0V DC @ 1 A

ALLEN BRADLEY 1769 I_O MODULES

Table 107 - 1769-BOOLEAN Output Specifications

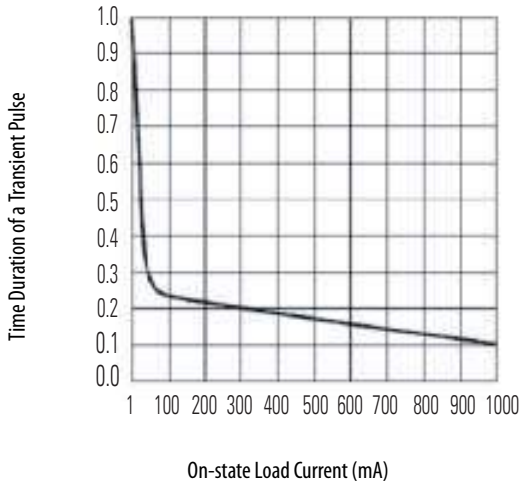
Attribute	1769-BOOLEAN
Current per point, max	0.5 A @ 60 °C (140 °F) 1.0 A @ 30 °C (86 °F)
Surge current(3)	2 A for 10 ms, repeatable every 2 s
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, output point to bus 75V DC working voltage (IEC Class 2 reinforced insulation)

(1) Triac outputs turn on and off at AC line zero cross.

(2) To limit the effects of leakage current through solid-state outputs, a loading resistor can be connected in parallel with your load. For 120V AC operation, use a 15 kΩ, 2 W resistor. For 240V AC operation, use a 5 kΩ, 5 W resistor.

(3) If you connect surge suppressors across your external load, you extend the life of the triac outputs.

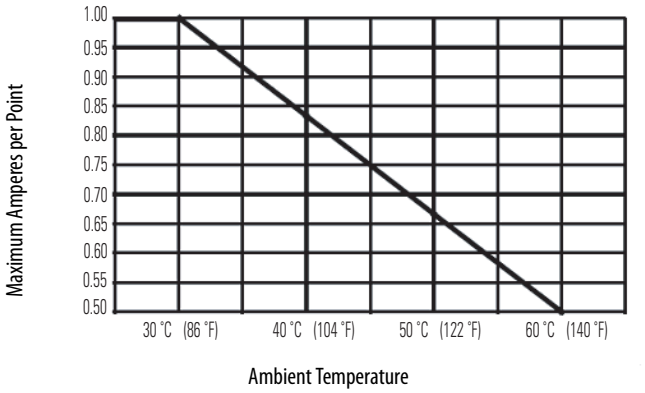
Transistor Output Transient Pulses - 1769-BOOLEAN



ALLEN BRADLEY 1769 I_O MODULES

Temperature Derating - 1769-BOOLEAN

1769-BOOLEAN Maximum Amperes per Point Versus Temperature



1769-BOOLEAN Maximum Amperes per Module Versus Temperature

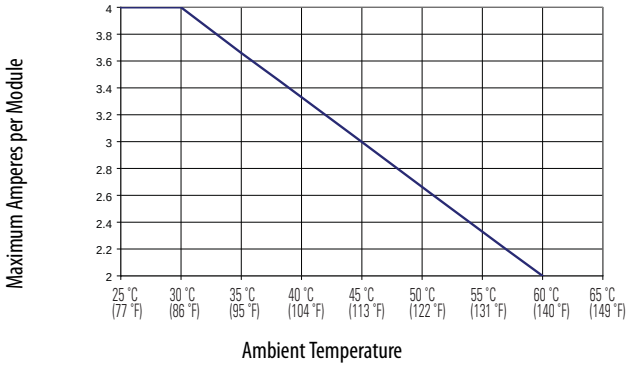


Table 108 - Certifications - 1769-BOOLEAN

Certification[1]	1769-BOOLEAN
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

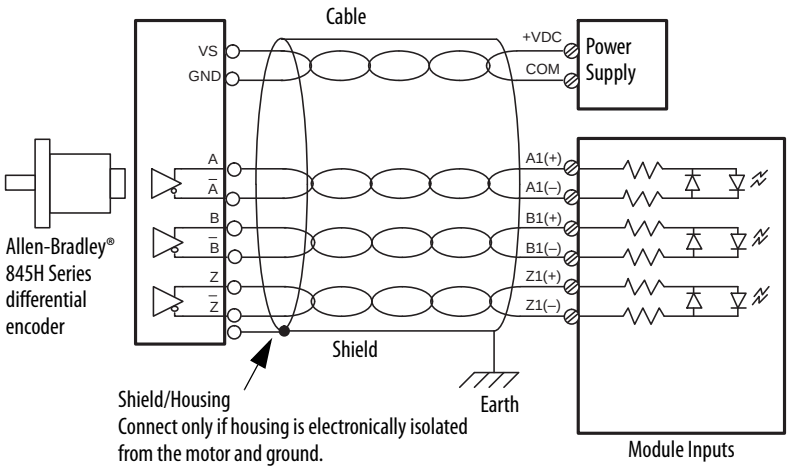
ALLEN BRADLEY 1769 I_O MODULES

1769-HSC

Compact high-speed counter module

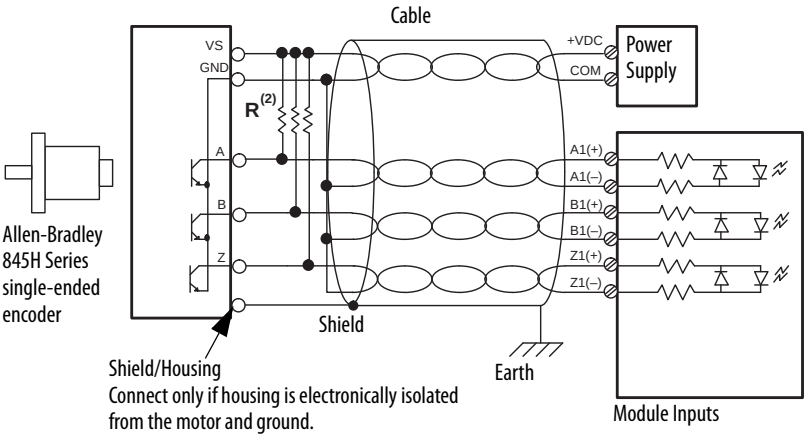
Differential Encoder Wiring

See the encoder manual for proper cable type. Use a twisted pair, individually shielded cable with a maximum length of 300 m (1000 ft).



Single-ended Encoder Wiring

See the encoder manual for proper cable type. Use a twisted pair, individually shielded cable with a maximum length of 300 m (1000 ft).



External resistors are required if they are not internal to the encoder. The pull-up resistor (R) value depends on the power supply value. To calculate the maximum resistor value, the following formula:

$$R = \frac{(Vdc - Vmin)}{Imin}$$

where:

- R = maximum pull-up resistor value
- VDC = power supply voltage
- Vmin = 2.6V DC
- min = 6.8 mA

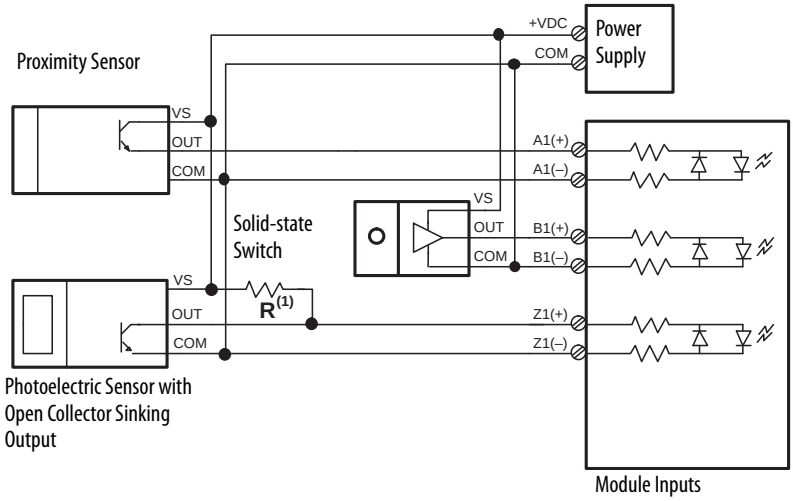
Power Supply Voltage (V DC)	Pull-up Resistor Value Max (R)(1)
5V DC	352 Ω
12V DC	1382 Ω
24V DC	3147 Ω

(1) Resistance values can change, depending upon your application.

ALLEN BRADLEY 1769 I_O MODULES

The minimum resistor (R) value depends on the current sinking capability of the encoder.

Discrete Device Wiring



External resistors are required if they are not internal to the encoder. The pull-up resistor (R) value depends on the power supply value. To calculate the maximum resistor value, the following formula:

$$R = \frac{(Vdc - Vmin)}{Imin}$$

where:

- R = maximum pull-up resistor value
- VDC = power supply voltage
- Vmin = 2.6V DC
- min = 6.8 mA

Power Supply Voltage (V DC)	Pull-up Resistor Value Max (R)(1)
5V DC	352 Ω
12V DC	1382 Ω
24V DC	3147 Ω

(1) Resistance values can change, depending upon your application.

The minimum resistor (R) value depends on the current sinking capability of the encoder.

ALLEN BRADLEY 1769 I_O MODULES

Output Wiring

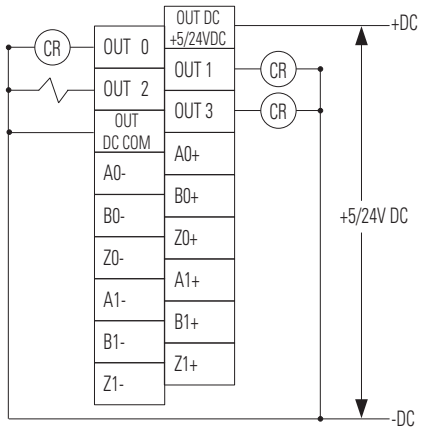


Table 109 - Technical Specifications - 1769-HSC

Attribute	1769-HSC
Bus current draw	425 mA, 5V DC 0 mA, 24V DC
Heat dissipation, max	6.21 W, the watts per point, plus the min watts, with all points energized
Isolation voltage	75V (continuous), reinforced insulation type, channel-to-system and channel-to-channel Type tested at 1200V AC for 2 s
Weight, approx	309 g (0.681 lb)
Dimensions (HxWxD), approx	118 x 35 x 87 mm (4.65 x 1.38 x 3.43 in.) Height with mounting tabs 138 mm (5.43 in.)
Slot width	1
Module location	DIN rail or panel mount
Power supply	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Power supply distance rating	4 modules
Terminal screw torque	0.68 N•m (6 lb•in)
Retaining screw torque	0.46 N•m (4.1 lb•in)
Wire size	0.32…2.1 mm^2 (22…14 AWG) solid copper wire or 0.32…1.3 mm^2 (22…16 AWG) stranded copper wire rated at 90 °C (194 °F) insulation max
Wire type	Cu-90 °C (194 °F)
Recommended cable	Individually shielded, twisted-pair cable (or the type recommended by the encoder or sensor manufacturer)
Wiring Category(1)	2 - on signal ports
Vendor ID code	1
Product type code	109
Product code	19
Enclosure type rating	None (open-style)

(1) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Table 110 - 1769-HSC Input Specifications

Attribute	1769-HSC
Inputs	2 quadrature (ABZ) differential inputs
Input voltage range(1)	2.6…30V DC
On-state voltage, max	30V DC

ALLEN BRADLEY 1769 I_O MODULES

Table 110 - 1769-HSC Input Specifications

Attribute	1769-HSC
On-state voltage, min	2.6V DC
On-state current, min	6.8 mA
Off-state voltage, max	1.0V DC
Off-state current, max	1.5 mA
Off-state leakage current, max	1.5 mA
Input current, max	15 mA
Input current, min	6.8 mA
Input impedance	1950 Ω
Pulse width, min	250 ns
Phase separation, min	131 ns
Input frequency, max	1 MHz
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC or 1697V DC for 1 s, input to bus and input to input 75V DC working voltage (IEC Class 2 reinforced insulation)

(1) See Compact I/O Modules Installation Instructions, publication 1769-IN088.

Table 111 - 1769-HSC Output Specifications

Attribute	1769-HSC
Outputs	16 total, 4 physical and 12 virtual
Output voltage range	5…30V DC
On-state voltage, max	User power - 0.1V DC
On-state output current per point, max	1 A, 30V DC, 40 °C 0.5A, 5V DC, 60 °C
On-state output current per module, max	4 A, 30V DC, 40 °C 2A, 5V DC, 60 °C
On-state output current, min	1 mA
On-state voltage drop, max	0.5V DC
Off-state leakage current, max	5 µA
Turn-on time, max	400 µs(1)
Turn-off time, max	200 µs
Reverse polarity protection	30V DC
Isolation voltage	Verified by one of the following dielectric tests: 1200V AC or 1697V DC for 1 s, output to bus 75V DC working voltage (IEC Class 2 reinforced insulation)

(1) Maximum turn-on time applies to output voltage range of 5…7V DC. For output voltages greater than 7V DC, the maximum turn-on time is 200 µs.

Table 112 - Environmental Specifications - 1769-HSC

Attribute	1769-HSC
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	40 °C (104 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)

ALLEN BRADLEY 1769 I_O MODULES

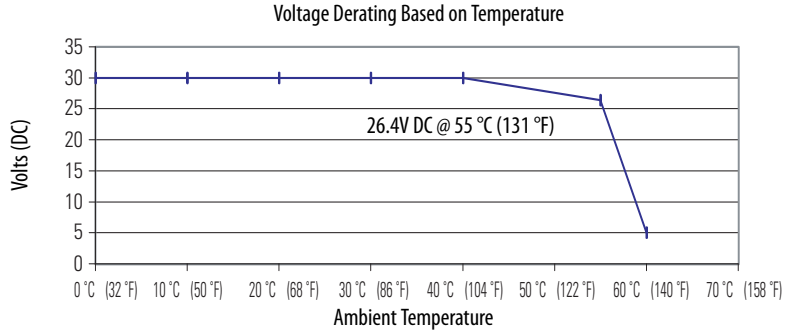
Table 112 - Environmental Specifications - 1769-HSC

Attribute	1769-HSC
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration, operating IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz, peak-to-peak
Vibration, relay operation IEC 60068-2-6	2 g @ 10…500 Hz(1)
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g, 11 ms panel mounted 20 g, 11 ms DIN rail mounted
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	40 g, panel mounted 30 g, DIN rail mounted
Emissions CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 and 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on power ports ±2 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±1 kV line-earth (CM) on shielded ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz

(1) This rating applies for your system if a relay module, such as the 1769-OW8, is used.

Temperature Derating - 1769-HSC

Maximum Input Voltage - 24V DC Operation

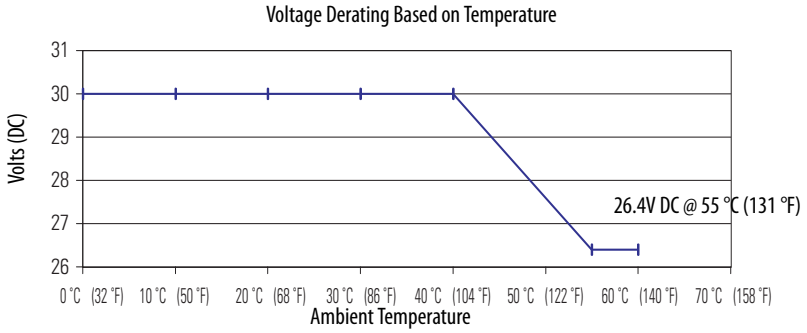


Temperature	Derated Voltage(1)
0…40 °C (32…104 °F)	30V DC
55 ° C (131 °F)	26.4V DC
60 °C (140 °F)	5V DC

(1) Input voltage derating between 55…60°C is achieved by using a dropping resistor.
For 24V DC input voltage, use a 2.4 kΩ, ½ Watt resistor.
For input voltages other than 24V DC, use a ½ Watt resistor with value: 125 x (V_{in} - 5V).

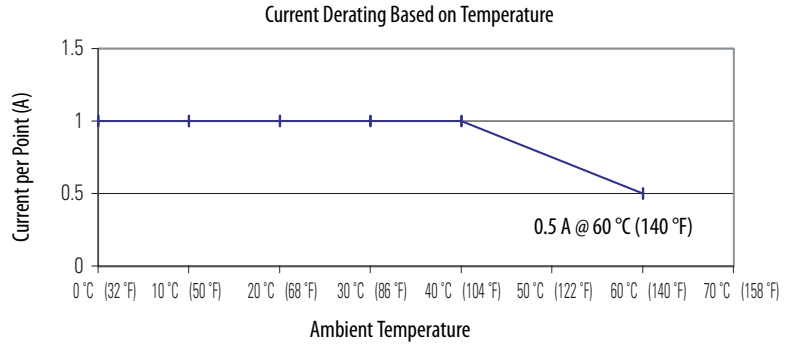
ALLEN BRADLEY 1769 I_O MODULES

Maximum Output Voltage - 24V DC Operation



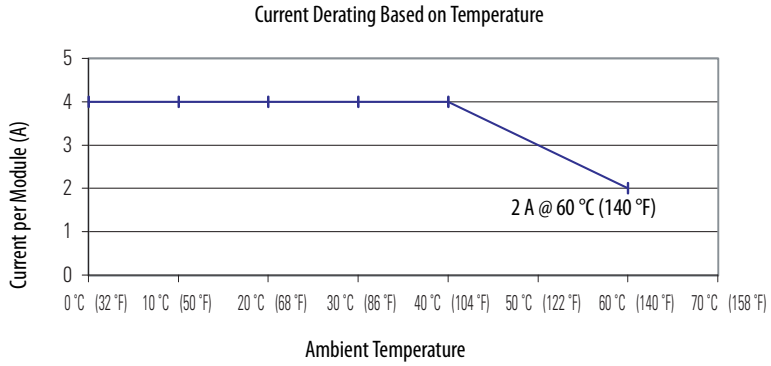
Temperature	Derated Voltage
0…40 °C (32…104 °F)	30V DC
55…60 °C (131…140 °F)	26.4V DC

Maximum Output Current per Point - 5V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
60 °C (140 °F)	0.5 A

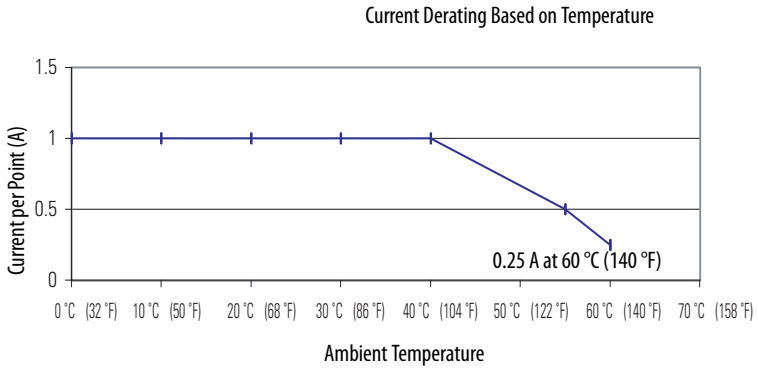
Maximum Output Current per Module - 5V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	4 A
60 °C (140 °F)	2 A

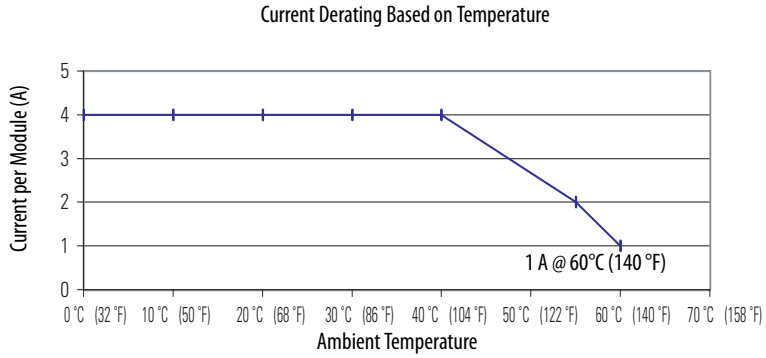
ALLEN BRADLEY 1769 I_O MODULES

Maximum Output Current per Point - 24V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	1 A
55 °C (131 °F)	0.5 A
60 °C (140 °F)	0.25 A

Maximum Output Current per Module - 24V DC Operation



Temperature	Derated Current
0…40 °C (32…104 °F)	4 A
55 °C (131 °F)	2 A
60 °C (140 °F)	1 A

Table 113 - Certifications - 1769-HSC

Certification(1)	1769-HSC
c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada. See UL File E65584
c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E321922
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769 I_O MODULES

Compact I/O Accessories

Category	Cat. No.	Description
End cap	1769-ECL	Left-end cap for Compact I/O system
	1769-ECR	Right-end cap for Compact I/O system
Expansion cable	1769-CLL1	Left bank-to-left bank expansion 305 mm (1 ft)
	1769-CLL3	Left bank-to-left bank expansion 1 m (3.28 ft)
	1769-CRR1	Right bank-to-right bank expansion 305 mm (1 ft)
	1769-CRR3	Right bank-to-right bank expansion 1 m (3.28 ft)
	1769-CRL1	Right bank-to-left bank expansion 305 mm (1 ft)
	1769-CRL3	Right bank-to-left bank expansion 1 m (3.28 ft)
Replacement terminal block	1769-RTBN10	10-pin NEMA terminal block
	1769-RTBN18	18-pin NEMA terminal block
Replacement door labels	1769-RL1	Replacement door labels for digital I/O, 2 per kit
	1769-RL2	Replacement door labels for analog and specialty I/O, 2 per kit
Replacement doors	1769-RD	Door replacement kit, 2 per kit
Replacement connector kit	1746-N3	Connector kit to terminate a cable, which connects field I/O devices to 32-point I/O modules, 1 connector and 40 terminals

End Caps

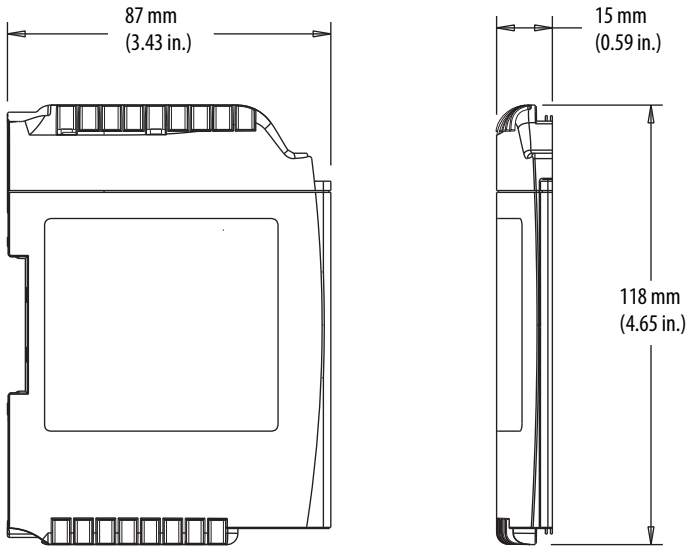
The final I/O bank in Compact system needs an end cap on the end without the expansion cable. The 1769-L23*x* controller comes with a right-end cap, so you do not need to order one separately.

Table 114 - Technical Specifications - 1769-ECL, 1769-ECR

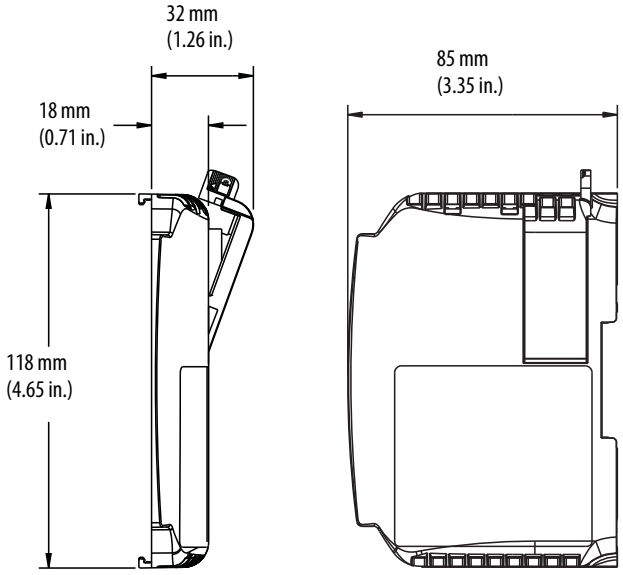
Attribute	1769-ECL	1769-ECR
Current draw @ 5.1V	5 mA	
Current draw @ 24V	0 mA	
Weight, approx	130 g (0.286 lb)	
Location	Left end	Right end
North American temperature code	T3C	
IEC temperature code	N/A	T4
Enclosure type rating	None (open-style)	None (open-style)

ALLEN BRADLEY 1769 I_O MODULES

Mounting Dimensions - 1769-ECL



Mounting Dimensions - 1769-ECR



ALLEN BRADLEY 1769 I_O MODULES

Table 115 - Certifications - 1769-ECL, 1769-ECR

Certification[1]	1769-ECL	1769-ECR
c-UL	UL Listed for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for U.S. and Canada. See UL File E10314	
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions	
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure	—
ATEX	—	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" (II 3 G Ex nA IIC T4 X) • EN 60079-0; General Requirements (Zone 2)

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

Expansion Cables

The 1769-CLL*x*, -CRR*x*, and -CRL*x* cables extend the 1769 bus communication lines. A maximum of two cables can be used in a 1769 system, which allows for three groups or banks of I/O modules. Each bank requires its own power supply.

Table 116 - Technical Specifications - 1769-CLL*x*, 1769-CRR*x*, 1769-CRL*x*

Attribute	1769-CLL1, 1769-CRR1, 1769-CRL1	1769-CLL3, 1769-CRR3, 1769-CRL3
Weight, approx	300 g (0.66 lb)	350 g (0.77 lb)
Length	305 mm (1 ft)	1 m (3.28 ft)

ALLEN BRADLEY 1769 I_O MODULES

Dimensions - 1769-CLLx, 1769-CRRx, 1769-CRLx

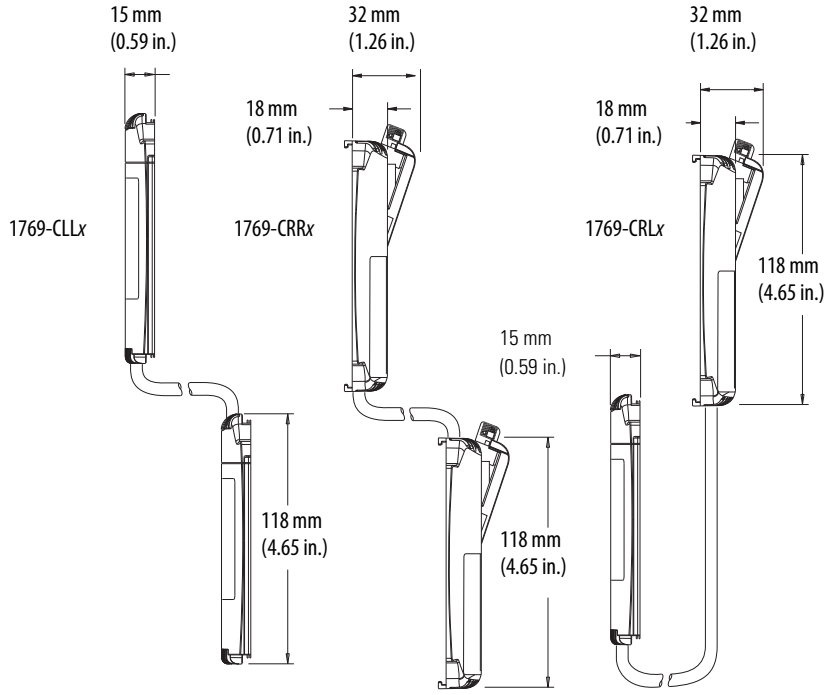


Table 117 - Certifications - 1769-CLL*x*, 1769-CRR*x*, 1769-CRL*x*

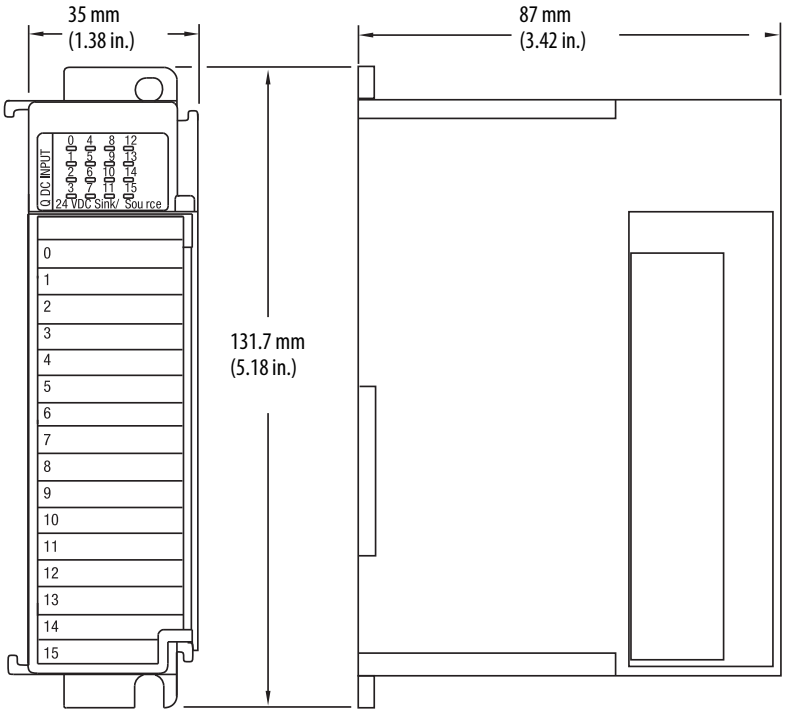
Certification[1]	**1769-CLL*x*, 1769-CRR*x*, 1769-CRL*x***
c-UL	C-UL certified (under CSA C22.2 No. 142) UL 508 listed Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213)
CE	CE compliant for all applicable directives
C-Tick	C-Tick compliant for all applicable directives Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Enclosure

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

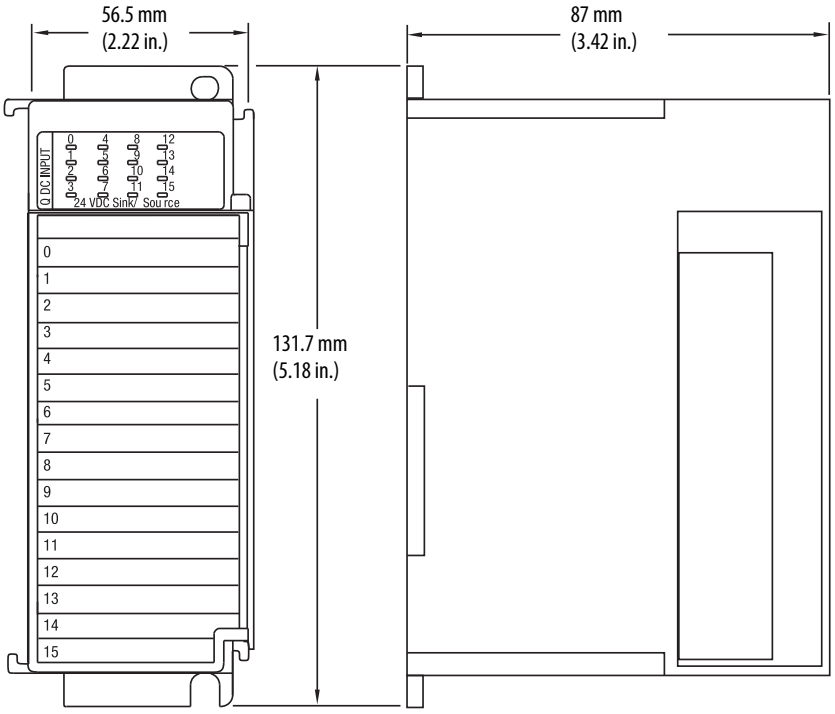
ALLEN BRADLEY 1769 I_O MODULES

Compact I/O Mounting Dimensions

Single 1769 Slot Dimensions



One-and-a-half 1769 Slot Dimensions

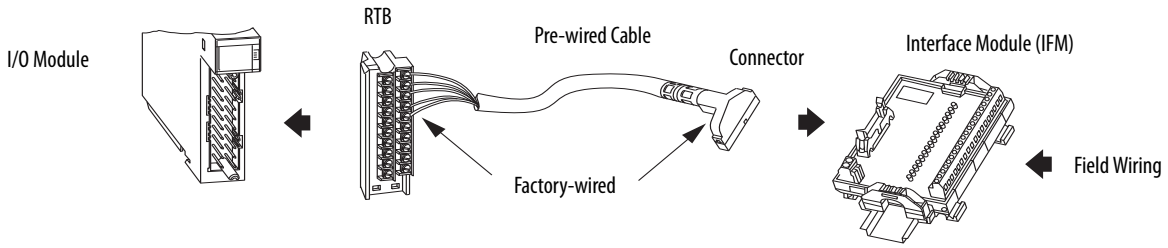


ALLEN BRADLEY 1769 I_O MODULES

Wiring Systems

You can buy removable terminal blocks (RTBs) and connect the wires yourself or you can buy a wiring system of:

- Interface modules (IFMs) that provide the output terminal blocks for digital I/O modules. Use the pre-wired cables that match the I/O module to the IFM.
- Analog interface modules (AIFMs) that provide the output terminal blocks for analog I/O modules. Use the pre-wired cables that match the I/O module to the AIFM.
- I/O module-ready cables. One end of the cable assembly is an RTB that plugs into the front of the I/O module. The other end has individually color-coded conductors that connect to a standard terminal block.



Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Compact I/O Modules Installation Instructions, publication 1769-IN088	Provides installation instructions for all 1769 Compact I/O modules.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

ALLEN BRADLEY 1769 I_O MODULES

Notes:

ALLEN BRADLEY 1769 I_O MODULES

Notes:

ALLEN BRADLEY 1769 I_O MODULES

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Rockwell Automation maintains current product environmental information on its website at
http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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CompactLogix Power Supplies Specifications

1768 CompactLogix Power Supplies Catalog Numbers 1768-PA3, 1768-PB3

1769 Compact I/O Power Supplies Catalog Numbers 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4

Topic	Page
1768 CompactLogix Power Supplies	3
1769 Compact I/O Power Supplies	7

Environmental Specifications - 1768 and 1769 Power Supplies

Attribute	1768-PA3, 1769-PB3 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g

ALLEN BRADLEY 1769-PA2

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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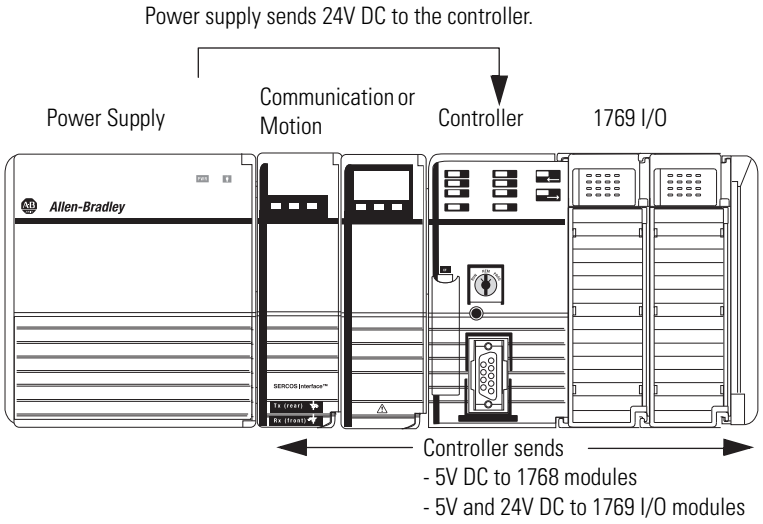
ALLEN BRADLEY 1769-PA2

1768 CompactLogix Power Supplies

The 1768 backplane requires one 1768 power supply. The power supply is a dual input supply that operates in multiple ranges. The power supply also offers a 24V dc external power source. The power supply sends 24V dc to the controller in slot 0.

- The controller converts the 24V dc to 5V dc and 24V dc and distributes it as needed.
  - 5V and 24V power to 1769 I/O modules on the right side of the controller
  - 24V power to 1768 modules on the left side of the controller



The 1768 modules do not have a distance rating to the 1768 power supply. For the 1769 I/O modules in the 1768 system, the distance rating is from the controller and not the 1768 power supply.

Technical Specifications - 1768 CompactLogix Power Supplies

Attribute	1768-PA3	1768-PB3
Input voltage range	85…265V AC 108…132V DC	16.8...31.2V DC
Input voltage, nom	120V/220V AC	24V DC
Input frequency range	47…63 Hz	DC
Input power, max	120VA/120 W	112 W
Output power, max	90 W 24V DC to backplane: 3.5 24V DC to user-accessible terminal block: 0.25 A	
Output power, min	6 W 24V DC to backplane: 0.25 A 24V DC to user-accessible terminal block: 0.0 A	
Power dissipation	30 W	22 W
Inrush current, max	50 A @ 85…132V AC 80 A @ 195…265V AC	50 A @ 16.8...31.2V DC(1)

ALLEN BRADLEY 1769-PA2

Technical Specifications - 1768 CompactLogix Power Supplies

Attribute	1768-PA3	1768-PB3
Isolation voltage	250V, reinforced insulation type, input to system and 24V DC AUX Tested at 4250V DC for 60 s 150V, basic insulation type, 24V DC AUX to system Tested at 2200V dc for 60 s	
Internal overcurrent protection	Non-replaceable fuse is soldered in place	
Recommended external overcurrent protection	4…6 A @ 28.5…36.7 A^2S	8...12 A @ 166...250 A^2S
Overcurrent protection	15 A, user supplied	
Weight, approx.	0.98 kg (2.15 lb)	1.01 kg (2.22 lb)
Dimensions (HxWxD), approx.	131.25 x 132.75 x 105.50 mm (5.17 x 5.23 x 4.15 in.)	
Module location	DIN rail or panel mount	
Mounting screw torque	1.16 N•m (10 lb•in) - use M4 or #8 screws	
Wire category	1 - on power ports[2]	
Wire size, input power terminal	14 AWG (2.5 mm^2) solid or stranded copper wire rated at 75 °C (167 °F) or greater, 1.2 mm (3/64 in.) insulation maximum	
Wire size, output power terminal	14 AWG (2.5 mm^2)…22 AWG (0.25 mm^2) solid or stranded copper wire rated at 75 °C (167 °C) or greater, 1.2 mm (3/64 in.) insulation max	
Conductor screw torque	0.6 N•m (5 lb•in)	
North American temperature code	T4	
Output #1: 24V DC to backplane		
Ride-through interval time, min	25 ms @ 90 W	5 ms @ 90 W
Full power hold-up interval	5 ms @ 90 W	
Extended hold-up interval	8...12 s @ 1.25 W	
Output #2: 24V DC to front panel terminal block		
Voltage	18...27.60V @ front panel	
Output disable	Disable output during hold-up periods	
Enclosure type rating	None (open-style)	

(1) Does not include X-capacitor charging current.

(2) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ALLEN BRADLEY 1769-PA2

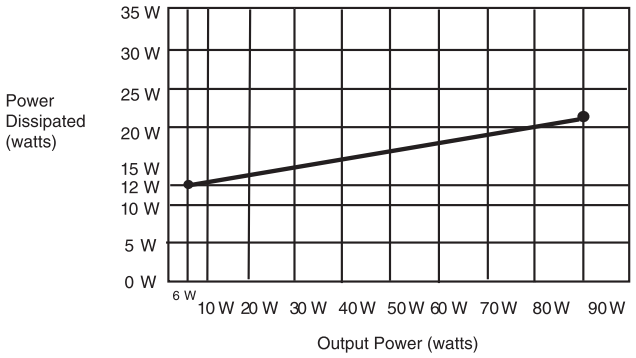
Certifications - 1768 CompactLogix Power Supplies

Certification[1]	1768-PA3, 1768-PB3
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 89/336 EEC EMC Directive, compliant with: • EN 50082-2; Industrial Immunity • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 73/23/EEC LVD Directive, compliant with: • EN 1010-1; Meas./Control/Lab
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

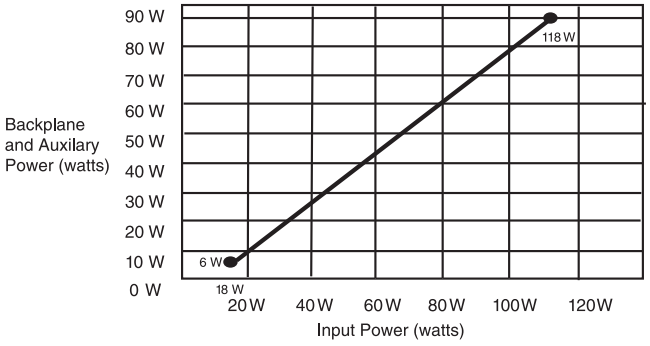
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Power Requirements and Transformer Sizing - 1768 CompactLogix Power Supplies

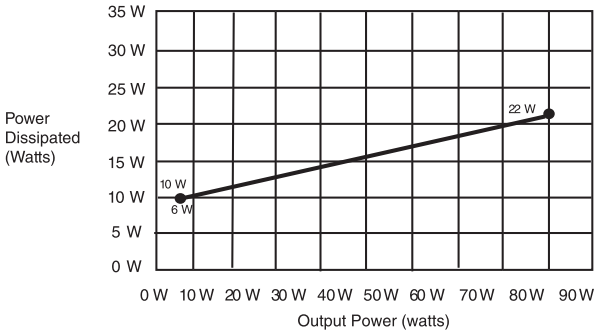
1768-PA3 Power Dissipation



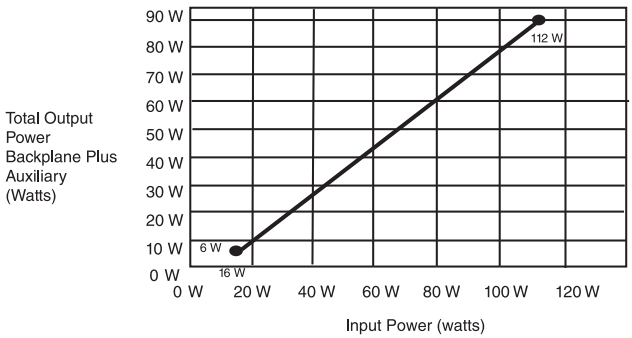
1768-PA3 Input Power Requirements



1768-PB3 Power Dissipation

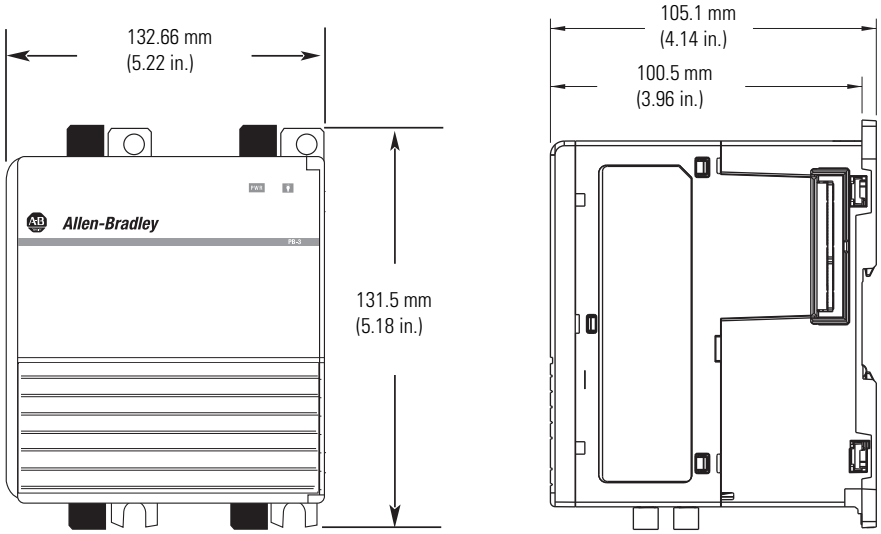


1768-PB3 Input Power Requirements



ALLEN BRADLEY 1769-PA2

Mounting Dimensions - 1768 CompactLogix Power Supplies



ALLEN BRADLEY 1769-PA2

1769 Compact I/O Power Supplies

Each 1769-L3*x* controller and additional bank of I/O modules requires a 1769 power supply. Place 1769 I/O modules to the left or right of the 1769 power supply. As many as eight I/O modules can be placed on each side of the power supply.

Each 1769 module also has a power supply distance rating (the number of modules from the power supply). Each module must be located within its distance rating. See the specifications for the module to determine its distance rating.

Technical Specifications - 1769 Compact I/O Power Supplies

Attribute	1769-PA2	1769-PB2	1769-PA4	1769-PB4
Input voltage range	85…265V AC	19.2...31.2V DC	85…265V AC or 170...265V AC, switch selectable	19.2...31.2V DC
Input voltage, nom	120V/220V AC	24V DC	120V/220V AC	24V DC
Power consumption	100 VA @ 120V AC 130 VA @ 240V AC	50 VA @ 24V DC	200 VA @ 120V AC 240 VA @ 240V AC	100 VA @ 24V DC
Power dissipation	8 W @ 60° C (140° F)	7.5 W @ 60° C (140° F)	18 W @ 60° C (140° F)	14.5 W @ 60° C (140° F)
Current capacity @ 5V	2.0 A	2.0 A	4.0 A	4.0 A
Current capacity @ 24V	0.8 A	0.8 A	2.0 A	2.0 A
Inrush current, max	25 A @ 132V AC	30 A @ 31.2V DC	25 A @ 132V AC	30 A @ 31.2V DC
Isolation voltage	265V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested @ 2596V DC for 1 s, AC power input to system and AC power input to 24V DC user power	75V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 1697V DC for 1 s, DC power input to system	265V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 2596V DC for 1 s, AC power input to system	75V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 1697V DC for 1 s, DC power input to system
Fuse type	Wickmann 19195-3.15A Littelfuse 02183.15MXP	Wickmann 19193-6.3A Littelfuse 021706.3MXP	Wickmann 19195-3.15A Littelfuse 02183.15MXP	Wickmann 19193-6.3A Littelfuse 021706.3MXP
Weight, approx.	525 g (1.16 lb)		630 g (1.39 lb)	
Dimensions (HxWxD), approx.	118 x 70 x 87 mm (4.65 x 2.76 x 3.43 in.)			
Module location	DIN rail or panel mount			
Mounting screw torque	1.16 N•m (10 lb•in) - use M4 or #8 screws			
Power supply distance rating	8 8 I/O modules can be connected on either side of the power supply for a maximum of 16 modules			
Wire category[1]	1 - on power ports	2 - on power ports	1 - on power ports	2 - on power ports
Wire size	14 AWG (2.5 mm^2) solid copper wire rated at 90 °C (194 °F) or greater, 1.2 mm (3/64 in.) insulation max			
North American temperature code	T3C			
IEC temperature code	—	T4	—	T4
Enclosure type rating	None (open-style)			

(1) Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

ALLEN BRADLEY 1769-PA2

Certifications - 1769 Compact Power Supplies

Certification[1]	1769-PA2, 1769-PA4	1769-PB2, 1769-PB4
c-UL-us	UL Listed for Class 1, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E10314	
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions	
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions	
	—	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" (Zone 2) • EN 60079-0; General Requirements (Zone 2)

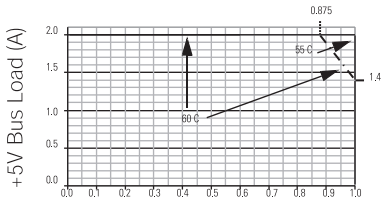
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

ALLEN BRADLEY 1769-PA2

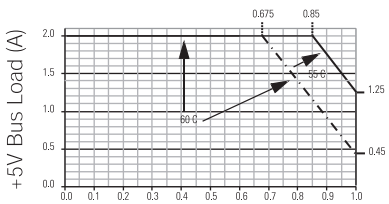
Power Requirements and Transformer Sizing - 1769 CompactLogix Power Supplies

1769-PA2 Output Derating

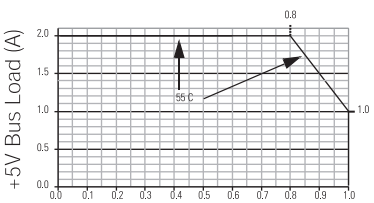
User +24V Current Draw at 0 A



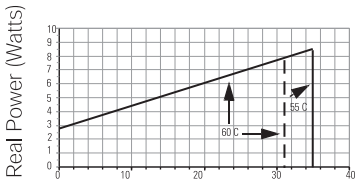
User +24V Current Draw at 0.2 A



User +24V Current Draw at 0.25 A

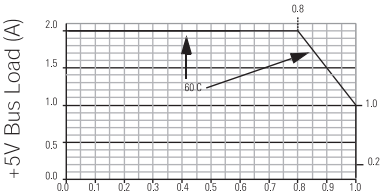


1769-PA2 Power Disspation

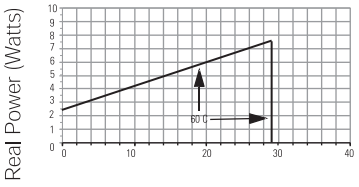


Bus +5V, +24V, and User Load (Watts)

1769-PB2 Output Derating



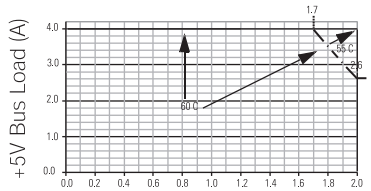
1769-PB2 Power Dissipation



Bus +5V, +24V, and User Load (Watts)

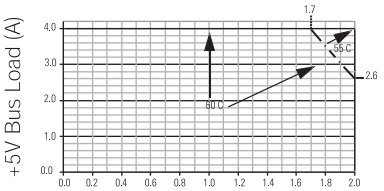
1769-PA4 Output Derating

Total Output: 68 W @ 55 °C (131 °F) or below
61 W @ 60 °C (140 °F) or below

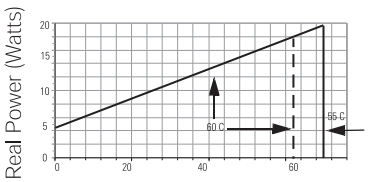


1769-PB4 Output Derating

Total Output: 68 W @ 55 °C (131 °F) or below
61 W @ 60 °C (140 °F) or below

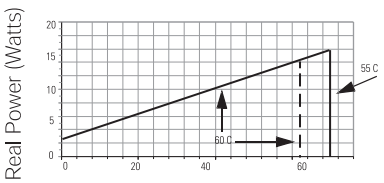


1769-PA4 Power Disspation



Bus +5V, +24V, and User Load (Watts)

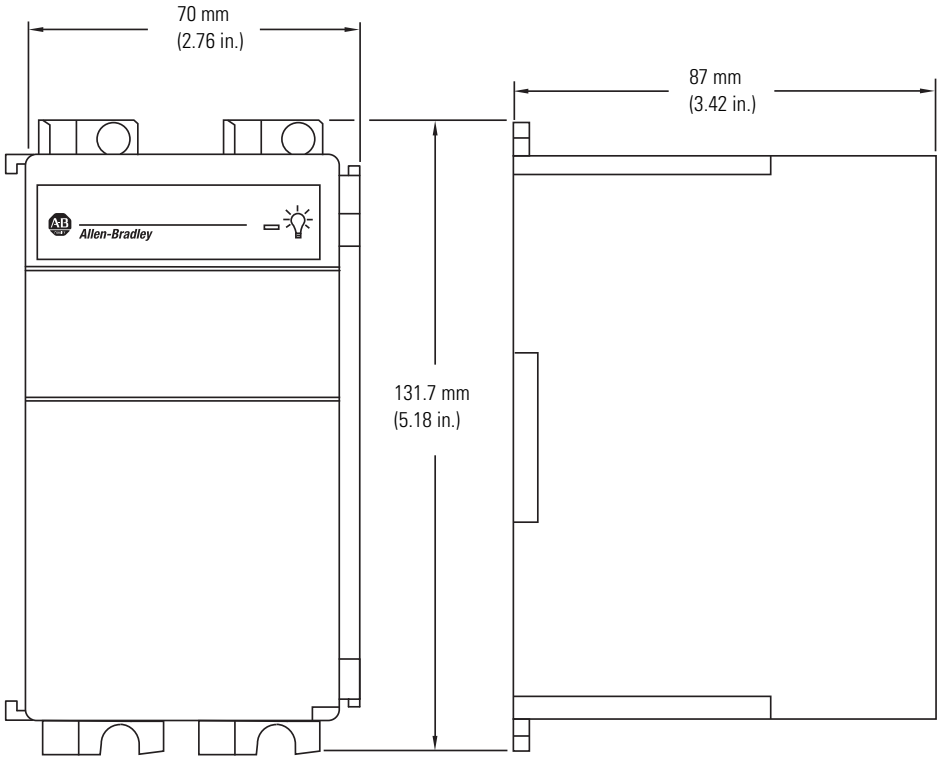
1769-PB4 Power Disspation



Bus +5V, +24V, and User Load (Watts)

ALLEN BRADLEY 1769-PA2

Mounting Dimensions - 1769 CompactLogix Power Supplies



ALLEN BRADLEY 1769-PA2

Notes:

ALLEN BRADLEY 1769-PA2

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience an anomoly within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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ALLEN BRADLEY 4983 SURGE PROTECTION

Technical Data

Original Instructions

Allen-Bradley

Surge Protector and Filter Specifications

Bulletin Numbers 4983-DC, 4983-DD, 4983-DH, 4983-DS, 4983-PF

Topic	Page
Summary of Changes	2
DIN Rail Heavy Duty AC Surge Protectors, 4983-DH	2
DIN Rail AC Power Surge Protective Device, 4983-DS	5
DIN Rail Dataline Surge Protective Device, 4983-DD	8
Panel Mount Filter 4983-PF	10
DIN Rail Combination Filter and Surge Protective Device 4983-DC	13
Additional Resources	15

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ALLEN BRADLEY 4983 SURGE PROTECTION

Summary of Changes

This publication contains new and updated information as indicated in the following table.

Topic	Page
Added 4983-DH Features	2
Added 4983-DH Product Selection	3
Added 4983-DS Features	5
Added 4983-DS Product Selection	5
Added 4983-DD Features	8
Added 4983-DD Product Selection	8
Added 4983-PF Features	10
Added 4983-PF Product Selection	10
Added 4983-DC Features	13
Added 4983-DC Product Selection	13

DIN Rail Heavy Duty AC Surge Protectors, 4983-DH

Bulletin 4983-DH is a heavy-duty surge protector. This SPD combines a high-energy varistor (MOV) network with a gas discharge tube to increase performance in protection level, life duration, and suppression of leakage current. The Bulletin 4983-DH product is connected in parallel.

Features

- Highest energy absorption capability of all Bulletin 4893 products
- Robust design avoids unnecessary replacement
- DIN Rail mounted Type 2
- Visual status indicator (on unit)
- Remote status indicator

ALLEN BRADLEY 4983 SURGE PROTECTION

Product Selection

- N = Neutral
- L/N = Line/neutral
- N/G = Neutral/ground

AC Network	Connection Mode	No. of Poles and Devices Needed	Max. Continuous Operating Voltage (MCOV) (U_c) [V AC]	Lightning Current 10/350 µs (I_{imp}) [kA]	Max. Discharge Current 8/20 µs (I_{max}) [kA]	Nominal Discharge Current 8/20 µs (I_n) [kA]	Protection Level (U_p) [kV]	Measured Limited Voltage [Vpk]	Appropriate Fusing(1) [A Max.]	Cat. No.
120	L/G or N/G	1	150	25	70	20	1.0	1580	250	4983-DH120-25
	L/G, N/G	2								
120/208	L1/G, L2/G, L3/G, N/G	4								
230/400	L/G or N/G	1	330	25	70	20	1.5	1850	250	4983-DH300-25
	L/G, N/G	2								
	L1/G, L2/G, L3/G, N/G	3								
	L1/G, L2/G, L3/G, N/G	4								
277/480Y	L1/G, L2/G, L3/G, N/G	4								
230/400	L/G or N/G	1	330	50	70	20	1.5	1580	500	4983-DH300-50
	L/G, N/G	2								
	L1/G, L2/G, L3/G or N/G	3								
	L1/G, L2/G, L3/G, N/G	4								
277/480 Y	L1/G, L2/G, L3/G, N/G	4								

(1) Fuses required to protect the surge protector in case of short-circuit failure. They must be installed in series with each pole of the surge protector.

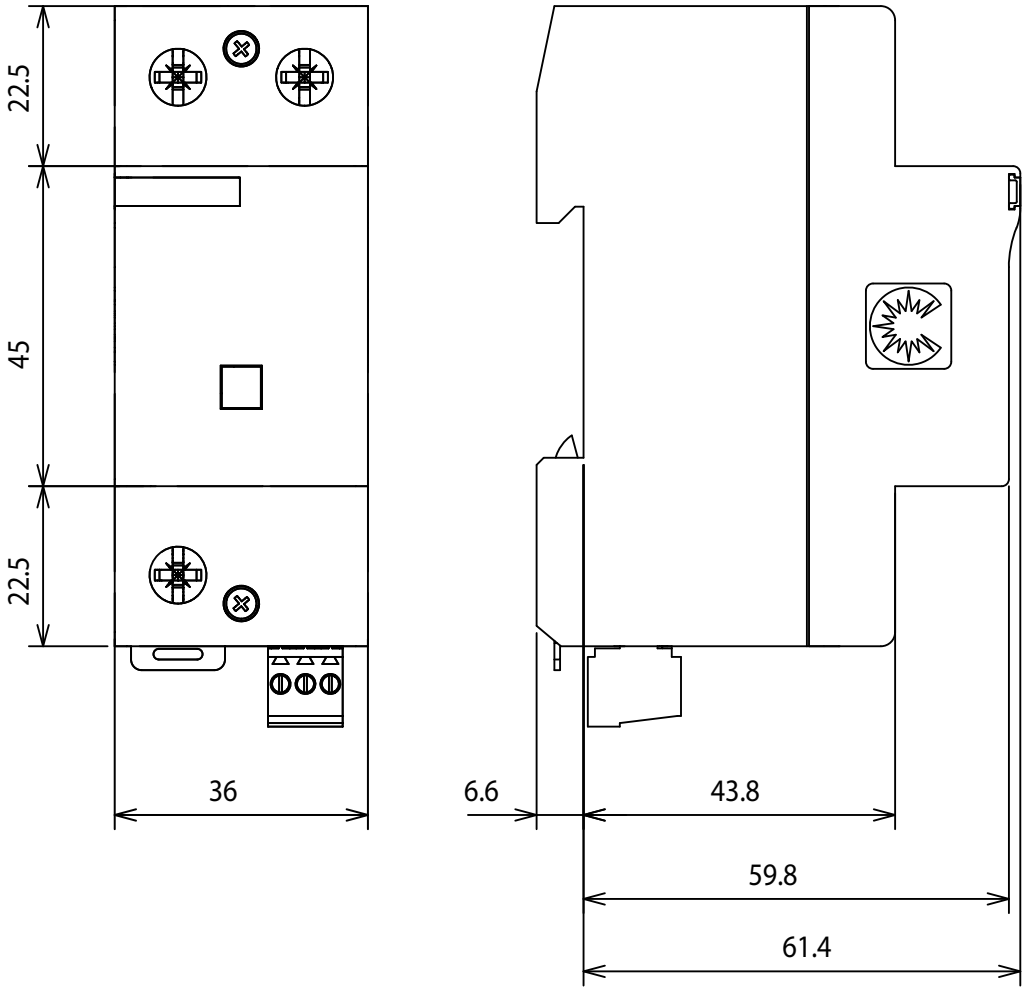
Specifications

Connection/Mounting Type	Parallel/DIN Rail mount
Standards Compliance	UL 1449, CSA 22.2, No.8, IEC 61643-1, EN 61643-11
Certifications	cURus recognized, CE marked, CSA
Conductor Material	Cu, solid or stranded
Conductor Range	#9…3 AWG (6…35 mm^2)
Strip Length	0.6 in. (16 mm)
Tightening Torque	31…35.4 lb•in. (3.5…4 N•m)
No. of Conductors/Terminal	1
Operating Temperature	-40…+80 °C (-40…176 °F)

ALLEN BRADLEY 4983 SURGE PROTECTION

Approximate Dimensions

Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



DIN Rail AC Power Surge Protective Device, 4983-DS

Bulletin 4983-DS offers a number of options to meet your basic surge protection needs. The Bulletin 4983-DS products are connected in parallel and use an MOV to clamp high-voltage surges. The Bulletin 4983-DS devices are primarily used in the main electrical panel for the protection of 1- and 3-phase systems.

Features

- Compact modular design
- Robust design avoids unnecessary replacement
- DIN Rail mounted, Type 2
- Replacement (pluggable) module
- Visual status indicator (on unit)
- Remote status indicator

Product Selection

- N = Neutral
- L/N = Line/neutral
- N/G = Neutral/ground

AC Network	Connection Mode	No. of Poles	Max. Continuous Operating Voltage (MCOV) (U_c) [V AC]	Max. Discharge Current 8/20 µs (I_{max}) [kA]	Nominal Discharge Current 8/20 µs (I_n) [kA]	Protection Level (U_p) [kV]	UL 1449 Voltage Protection Rating (VPR) [V]	Appropriate Fuse[1] [A] Max.	Cat. No. Base and Module	Cat. No. Replacement Module Only	Cat. No. Replacement Module Only Gas Discharge Tube
120	L/G or N/G	1	150	40	20	0.9	700	125	4983-DS120-401	4983-DS120-40	—
	L/G, N/G	2							4983-DS120-402		
120/208Y	L1/G, L2/G, L3/G	3							4983-DS120-403		
	L1/G, L2/G, L3/G, N/G	4							4983-DS120-404		
230/400	L/G or N/G	1	275			1.25	1000		4983-DS230-401	4983-DS230-40	—
	L/G, N/G	2							4983-DS230-402		
	L1/G, L2/G, N/G	3							4983-DS230-403		
277	L/G or N/G	1	420			1.8	1500		4983-DS277-401	4983-DS277-40	—
277/480Y	L1/G, L2/G, L3/G	3							4983-DS277-403		
	L1/G, L2/G, L3/G, N/G	4							4983-DS277-404		
480D	L1/G, L2/G, L3/G	3	550			1.8	1800		4983-DS480-403	4983-DS480-40	—
230/400	L/G, N/G	2	275	40	20	1.25	1000	125	4983-DS230-401G	4983-DS230-40	4983-DS230-40G
	L1/G, L2/G, L3/G, N/G	4					1000		4983-DS230-403G		

ALLEN BRADLEY 4983 SURGE PROTECTION

AC Network	Connection Mode	No. of Poles	Max. Continuous Operating Voltage (MCOV) (U_c) [V AC]	Max. Discharge Current 8/20 µs (I_{max}) [kA]	Nominal Discharge Current 8/20 µs (I_n) [kA]	Protection Level (U_p) [kV]	UL 1449 Voltage Protection Rating (VPR) [V]	Appropriate Fuse(1) [A] Max.	Cat. No. Base and Module	Cat. No. Replacement Module Only	Cat. No. Replacement Module Only Gas Discharge Tube
120	L/G or N/G	1	150	80	20	0.9	700	125	4983-DS120-801	4983-DS120-80	—
	L/G, N/G	2							4983-DS120-802		
120/208Y	L1/G, L2/G, L3/G	3							4983-DS120-803		
230/400	L/G or N/G	1	275			1.25	1000		4983-DS230-801	4983-DS230-80	—
	L/G, N/G	2							4983-DS230-802		
	L1/G, L2/G, N/G	3							4983-DS230-803		
277	L/G or N/G	1	420			1.8	1500		4983-DS277-801	4983-DS277-80	—
277/480Y	L1/G, L2/G, L3/G	3							4983-DS277-803		
	L1/G, L2/G, L3/G, N/G	4							4983-DS277-804		
480D	L1/G, L2/G, L3/G	4	680				2500		4983-DS277-804		
600D	L1/G, L2/G, L3/G	4	690						4983-DS600-804	4983-DS600-80	—

(1) Fuses required to protect the surge protector in case of short-circuit failure. They must be installed in series with each pole of the surge protector.

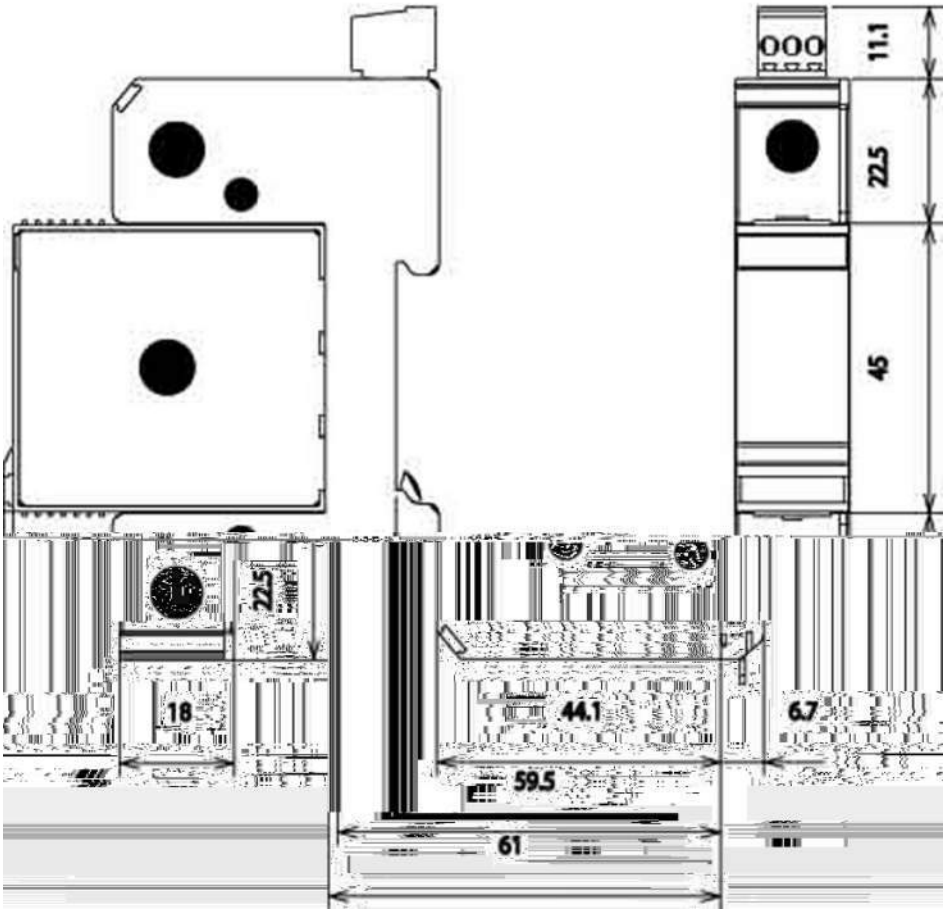
Specifications

Connection/Mounting Type	Parallel/DIN Rail mount
Standards Compliance	UL 1449, CSA 22.2, No.8, IEC 61643-1, EN 61643-11
Certifications	cURus recognized, CSA, CE marked
Conductor Material	Cu, solid or stranded
Conductor Range	#10…4 AWG (4…28 mm^2)
Strip Length	0.4 in. (10 mm)
Tightening Torque	17.8…22.1 lb•in. (2.0…2.5 N•m)
No. of Conductors/Terminal	1
Operating Temperature	-40…+80 °C (-40…176 °F)

ALLEN BRADLEY 4983 SURGE PROTECTION

Approximate Dimensions

Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



ALLEN BRADLEY 4983 SURGE PROTECTION

DIN Rail Dataline Surge Protective Device, 4983-DD

Bulletin 4983-DD surge protective devices are designed to protect industrial communication networks. This device uses a combination of 3-electrode gas discharge tubes and fast-clamping diodes. Typical applications include industrial processing equipment, transmission systems, I/O cards, probes, actuators, and displays.

Features

- Compact, modular design
- Cost-effective to protect individual loads

Product Selection

AC Network	Max. Continuous Operating Voltage (MCOV) [V DC]	Nominal Discharge Current 8/20 µs (I_n) [kA]	Max. Discharge Current 8/20 µs (I_{max}) [kA]	Protection Level (U_p)	Nominal Line Voltage [V]	Line Type	Cat. No.
4…20 mA Loop type	28	5	20	40V	24V	1 pair with shield	4983-DD24
RS232 type	15	5	20	30V	12V	1 pair with shield	4983-DD12
High-speed transmission (LAN) RS485 type, RS422 type	8	5	20	25V	6V	1 pair with shield	4983-DD06

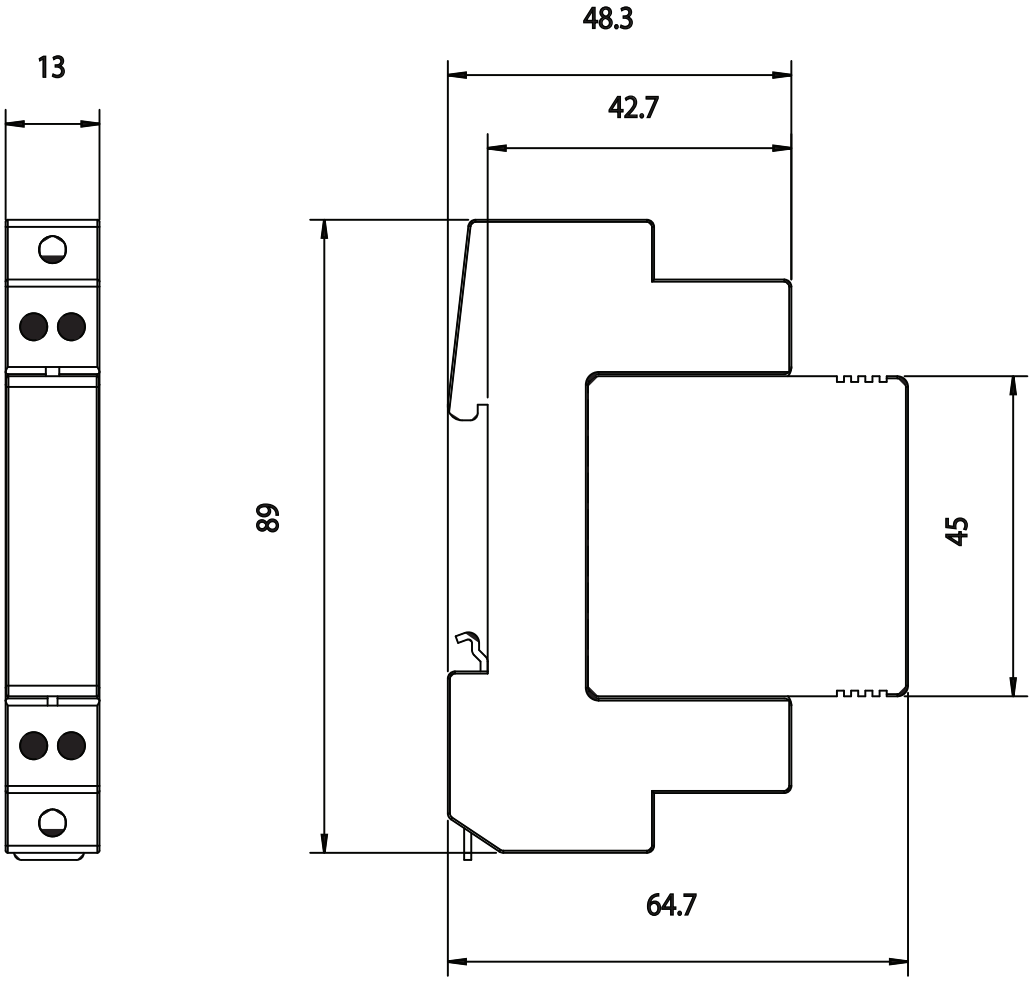
Specifications

Connection/Mounting Type	Series/DIN Rail mount
Standards Compliance	UL 497B, IEC 61643-21
Certifications	CE marked, UL listed
Conductor Material	Cu, solid or stranded
Conductor Range	#21…16 AWG (0.4…1.5 mm^2)
Strip Length	0.2 in. (5 mm)
Tightening Torque	4.4 lb•in. (0.5 N•m)
No. of Conductors/Terminal	1
Operating Temperature	-40…+80 °C (-40…176 °F)

ALLEN BRADLEY 4983 SURGE PROTECTION

Approximate Dimensions

Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.



ALLEN BRADLEY 4983 SURGE PROTECTION

Panel Mount Filter 4983-PF

Bulletin 4983-PF is a panel (flange) mount filter product. The main function of the Bulletin 4983-PF filter is noise protection; it monitors and cleans the wave of high frequency noise disturbances that can cause premature aging.

Features

- Features Islatrol filter technology
- LED power indication
- Panel (flange) mount

Product Selection

Operating Voltage [V AC]	Max. Continuous Operating Voltage	Line Frequency [Hz]	Ampacity [A]	Cat. No.
120	150V rms @ 120	47…63	2.5	4983-PF120-02
			5.0	4983-PF120-05
			15	4983-PF120-15
			30	4983-PF120-30
240	275V rms @ 240		2.5	4983-PF240-02
			5.0	4983-PF240-05
			15	4983-PF240-15
			30	4983-PF240-30

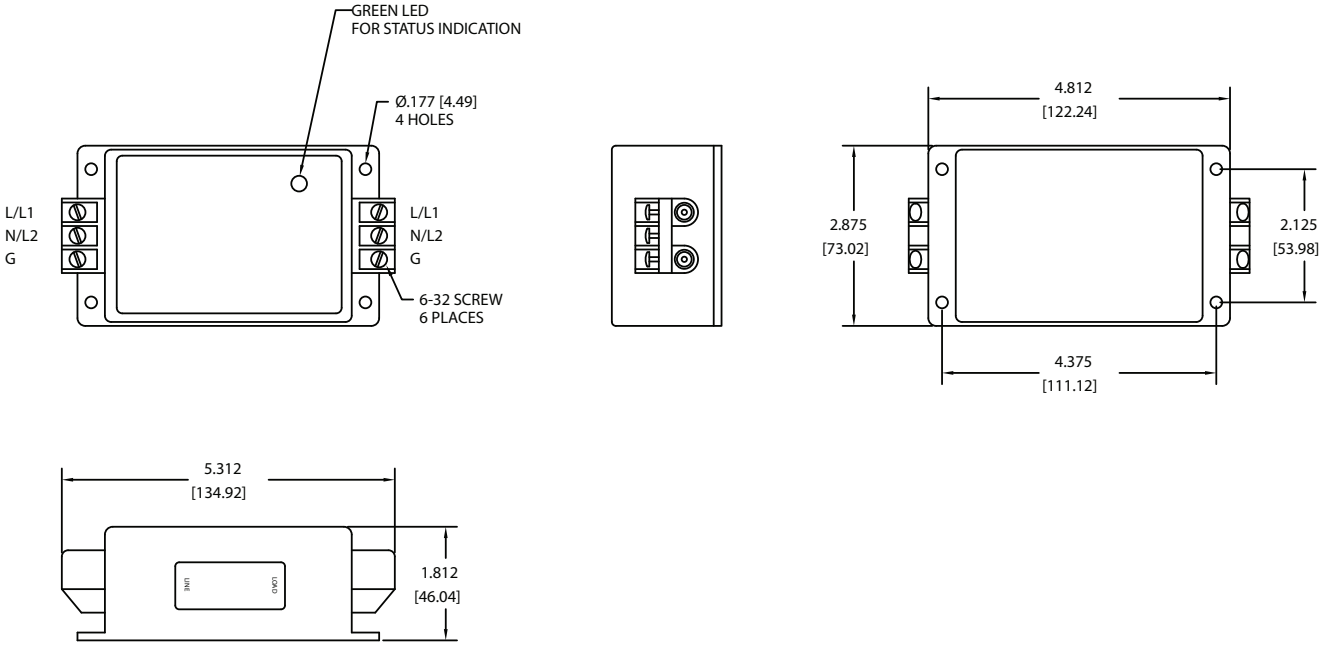
Specifications

Connection/Mounting Type	Series/Panel (Flange) mount
Enclosure	Grey, high-impact plastic, 94V-0, product label
Approximate Weight	2.5 A — 1.5 lb 5.0 A — 1.5 lb 15 A — 4 lb 30 A — 6.5 lb
Modes of Protection	Line — Neutral Line — Line Line — PE Neutral — PE
Certifications	UR recognized component, CE Marked
Typical Cat. A Ringwave Rating	< 10V peak
Typical Cat. B Ringwave Rating	< 50V peak
Status Indication	Single green LED for power indication
Response Time	Normal mode: < 0.5 ns Common Mode: < 5 ns
Operating Temperature	-40…+60 °C derate linearly to 60% @ +70 °C
Fusing	Appropriate external fusing is required
Frequency Response (Forward - Reverse) 100 kHz…50 MHz	Normal Mode — 90 dB min. Common Mode — 60 dB min. 3 kHz cut-off frequency
Peak Surge Current Capability (8 x 20 µs) All Mode Unit Line to Neutral Line to Ground Neutral to Ground	 15 kA 15 kA 15 kA

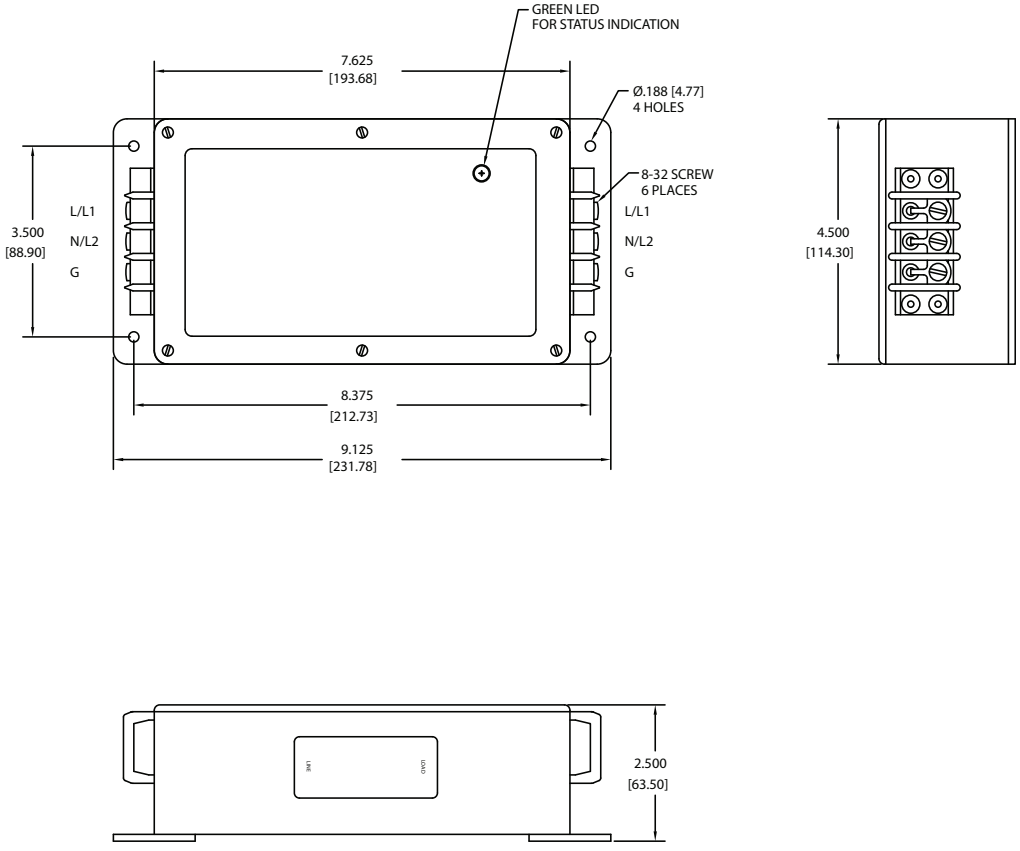
Approximate Dimensions

Dimensions are shown in millimeters. Dimensions are not intended for manufacturing purposes.

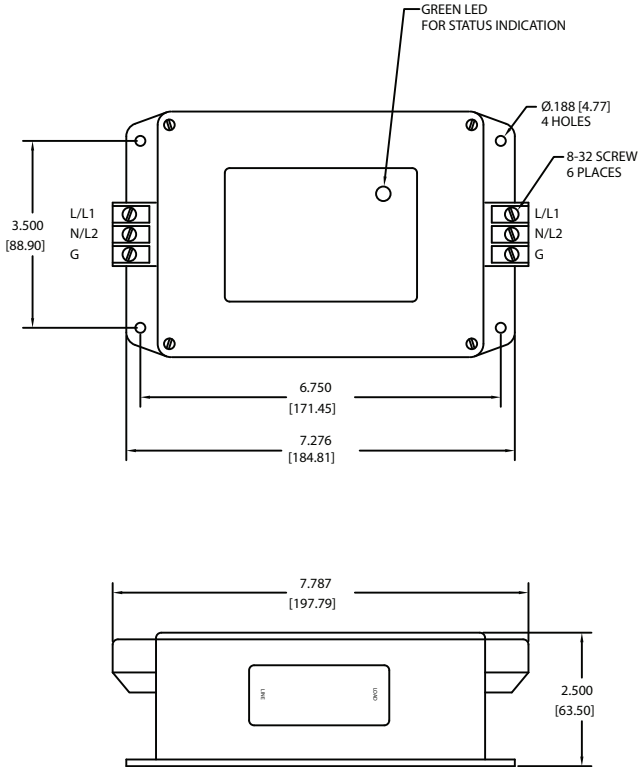
Cat. Nos. 4983-PF120-02, -PF120-05, -PF240-02



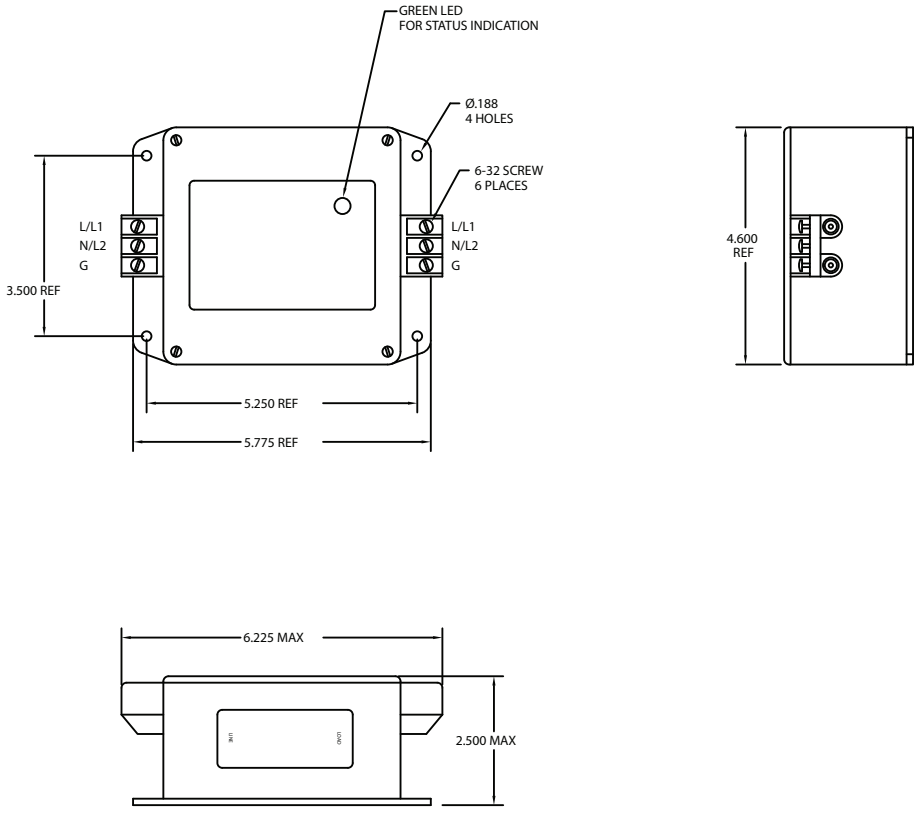
Cat. Nos. 4983-PF120-02, -PF120-05, -PF240-02



Cat. Nos. 4983-PF120-15



Cat. No. 4983-PF240-05



ALLEN BRADLEY 4983 SURGE PROTECTION

DIN Rail Combination Filter and Surge Protective Device 4983-DC

Bulletin 4983-DC is the combination of a filter and a surge protective device. The Bulletin 4983-DC product meets both UL 1449 and UL 1283. This product allows transient and noise protection in one small package.

Features

- Small combination (filter and SPD) package size
- Features Isatrol technology
- All-mode transient protection with exceptional Line to Neutral value of 25 kA
- LED power indication
- Form C contact for remote status indication
- DIN Rail mountable

Product Selection

AC Network	Connection Mode	Frequency [Hz]	Max. Continuous Operating Voltage (MCOV) (Uc) [V AC]	Maximum Discharge Current 8/20 µs (I_{max}) [kA]			Nominal Discharge Current 8/20 µs (I_n) [kA]	UL1449 Voltage Protection Rating (VPR) [V AC]				Ampacity [A]	Cat. No.
				L/G	L/N	N/G		L/G	L/N	N/G	L-L		
120V AC	L/G, L/N, N/G	47…63	150	10	25	10	3	600	400	600	-	3.0	4983-DC120-03
												5.0	4983-DC120-05
												10	4983-DC120-10
												20	4983-DC120-20
240V AC			320					1200	-	-	800	3.0	4983-DC240-03
												5.0	4983-DC240-05
												10	4983-DC240-10
												20	4983-DC240-20

ALLEN BRADLEY 4983 SURGE PROTECTION

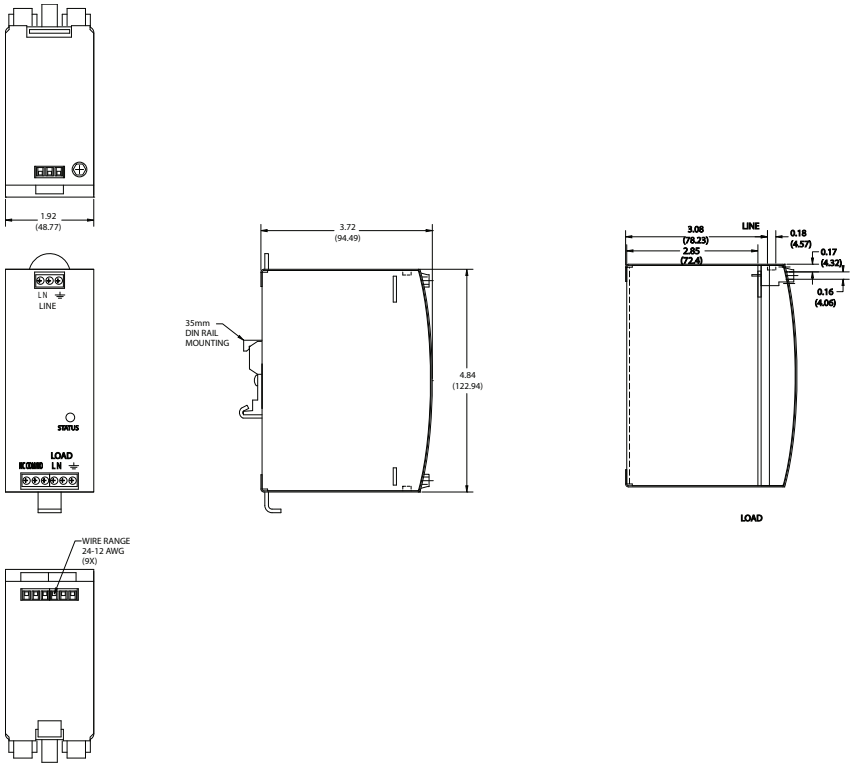
Specifications

Connection/Mounting Type	Series/DIN Rail mount
Enclosure	Metal, DIN Rail mount, product label
Approximate Weight	3 A — 1 lb 5 A — 1 lb 10 A — 1.5 lbs 20 A — 1.5 lbs
Modes of Protection	Line — Neutral Line — Line Line — PE Neutral — PE
Certifications	UR Recognized, CSA, CE Marked
Typical Cat. A Ringwave Rating	< 60V peak
Typical Cat. B Ringwave Rating	< 100V peak
Status Indication	Single green LED indicating MOV integrity Single form C contact (10 A @ 250V AC, 5 A @ 100V DC)
Response Time	Normal mode: < 0.5 ns Common Mode: < 5 ns
Operating Temperature	-40…+60 °C derate linearly to 60% @ +70 °C
Fusing	Appropriate external fusing is required
Frequency Response 100 kHz…50 MHz	Normal Mode (100 kHz…50 MHz) — 90 dB min. Common Mode (5…50MHz) — 60 dB min. 50 kHz cut-off frequency

Approximate Dimensions

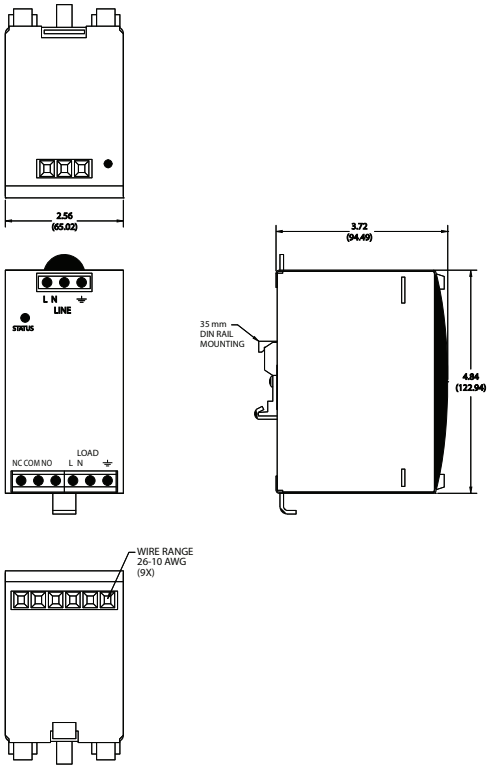
Dimensions are shown in inches (millimeters). Dimensions are not intended for manufacturing purposes.

Cat. Nos. 4983-DCxxx-03, -DCxxx-05



ALLEN BRADLEY 4983 SURGE PROTECTION

Cat. Nos. 4983-DCxxx-03, -DCxxx-05



Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page.

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Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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Technical Data

Allen-Bradley

PanelView Plus 7 Performance Terminals

Catalog Numbers 2711P-T7C22D9P, 2711P-T7C22D9P-B, 2711P-T7C22A9P, 2711P-T7C22A9P-B, 2711P-B7C22D9P, 2711P-B7C22D9P-B, 2711P-B7C22A9P, 2711P-B7C22A9P-B, 2711P-T9W22D9P, 2711P-T9W22D9-B, 2711P-T9W22A9P, 2711P-T9W22A9P-B, 2711P-T10C22D9P, 2711P-T10C22D9P-B, 2711P-T10C22A9P, 2711P-T10C22A9P-B, 2711P-B10C22D9P, 2711P-B10C22D9P-B, 2711P-B10C22A9P, 2711P-B10C22A9-B, 2711P-T12W22D9P, 2711P-T12W22D9P-B, 2711P-T12W22A9P, 2711P-T12W22A9P-B, 2711P-T15C22D9P, 2711P-T15C22D9P-B, 2711P-T15C22A9P, 2711P-T15C22A9P-B, 2711P-B15C22D9P, 2711P-B15C22D9P-B, 2711P-B15C22A9P, 2711P-B15C22A9P-B, 2711P-T19C22D9P, 2711P-T19C22D9P-B, 2711P-T19C22A9P, 2711P-T19C22A9P-B, 2711P-T9W22D9P-BSHK, 2711P-T12W22D9P-BSHK, 2711P-T7C22D9PK, 2711P-T9W22D9PK, 2711P-T10C22D9PK, 2711P-T12W22D9PK, 2711P-T15C22D9PK, 2711P-T19C22D9PK, 2711P-B15C22D9PK, 2711P-T12W22D9P-BM001, 2711P-T12W22D9P-BM002, 2711P-T12W22D9P-BM003, 2711P-T12W22D9P-BM004, 2711P-T12W22D9P-BM005, 2711P-T12W22D9P-BM006, 2711P-T12W22D9P-BM007, 2711P-T12W22D9P-BM008, 2711P-T12W22D9P-BM009, 2711P-T12W22D9P-BM010, 2711P-T12W22D9P-BM011, 2711P-T12W22D9P-BM012, 2711P-T12W22D9P-BM013, 2711P-T12W22D9P-BM014, 2711P-T12W22D9P-BM015, 2711P-T12W22D9P-BM016

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The PanelView™ Plus 7 Performance terminals are operator interface devices. They monitor and control devices that are attached to ControlLogix® and CompactLogix™ 5370 controllers on an EtherNet/IP™ network. Animated graphic and text displays provide operators a view into the operating state of a machine or process. Operators interact with the control system by using touch screen or keypad input.

The PanelView Plus 7 Performance terminals include these features and capabilities:

- FactoryTalk® View Machine Edition software, version 8.1, provides a familiar environment for creating HMI applications
- Windows CE operating system with desktop access for configuration and third-party applications
- Connection to ControlLogix or CompactLogix 5370 controllers
- Ethernet communication that can support Device Level Ring (DLR), linear, or star network topologies
- Web browser, Microsoft® file viewers, text editor, PDF viewer, remote desktop connection, and media player on the terminal desktop

- Conformal-coating available for all DC power, touch-only terminals, and the 15-in. DC power, keypad and touch terminal
- Stainless steel, hygienic, brandless, DC-power, and conformal-coating are available for the 9-in. wide-screen, touch-only units and the 12-in. wide-screen, touch-only units
- On-machine mounting available for the 12.1-in. wide-screen, touch-only terminal

Summary of Changes

This publication contains new and updated information as indicated in the following table.

Topic	Page
Added information about the PanelView Plus 7 Performance, Stainless Steel, Series B terminals.	–
Added footnote # 4 to the Environmental Specifications table.	3
Added information about resistance to chemicals.	4
Updated the Certifications table to include information about the PanelView Plus 7 Performance, Stainless Steel, Series B terminals.	4
Added catalog numbers for the hygienic gaskets available for the Plus 7 Performance, Stainless Steel, Series B terminals.	14

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Environmental Specifications

This table lists environmental specifications for the PanelView Plus 7 Performance terminals and the ArmorView™ Plus 7 terminal (which includes a 12.1-in PanelView Plus 7 Performance terminal).

Attribute	Value
Temperature, operating	6.5-in., 9-in., 10.4-in., 12.1-in., and 15-in. terminals 0…55 °C (32…131 °F) 19-in. terminals 0…50 °C (32…122 °F) ArmorView Plus 7 terminal 0…45 °C (32…113 °F) ambient
Temperature, nonoperating	-25…+70 °C (-13…+158 °F)(1)
Heat dissipation	Typical BTU measurements were taken at 25 °C (77 °F): • 6.5-in. DC (touch, and touch with keypad), 51 BTU (typical) • 6.5-in. AC (touch, and touch with keypad), 53 BTU (typical) • 9-in. DC, 55 BTU (typical) • 9-in. AC, 58 BTU (typical) • 10.4-in. DC (touch, and touch with keypad), 51 BTU (typical) • 10.4-in. AC (touch, and touch with keypad), 56 BTU (typical) • 12.1-in. DC, 60 BTU (typical) • 12.1-in. AC, 67 BTU (typical) • 15-in. DC (touch, and touch with keypad), 61 BTU (typical) • 15-in. AC (touch, and touch with keypad), 68 BTU (typical) • 19-in. DC, 114 BTU (typical) • 19-in. AC, 119 BTU (typical)
Altitude, operating	2000 m (6562 ft)(1)
Relative humidity	5…95% without condensation(1)
Vibration	6.5-in., 9-in., 10.4-in., 12.1-in. terminals, and 12.1-in. terminals in the ArmorView Plus 7 enclosure 0.012 pk-pk, 10…57 Hz 2 g peak at 57…500 Hz 15-in. and 19-in. terminals 0.006 pk-pk, 10...57 Hz 1 g peak at 57...640 Hz
Shock, operating	15 g at 11 ms(2)
Shock, nonoperating	30 g at 11 ms(2)
Enclosure ratings	NEMA and UL Type 12, 13, 4X, also rated IP66 as Classified by UL(3) (4)
Airborne contaminants	For PanelView Plus 7 Performance conformal-coated PCBA level products with catalog numbers that end in K, product meets or exceeds the following requirement: • ANSI/ISA 71.04.2013 G3 environment Tested in accordance with: ASTM B845-97

(1) These values are the same for the ArmorView Plus 7 terminal.
(2) These values are the same for the ArmorView Plus 7 terminal when the VESA mount is used. When the arm mount coupling is used, the values are 5 g at 11 ms.
(3) For the ArmorView Plus 7 terminal, the enclosure ratings are 12, 13, 4, or 4X (see the ArmorView Plus 7 Installation Instructions, publication 2711P-IN013 for more detail) and IP66 as classified by UL.
(4) The PanelView Plus 7 Performance Stainless Steel, Series B terminals are also rated IP69 as Classified by UL and tested for IP69K according to ISO 20653.

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Resistance to Chemicals

The outer surfaces of the terminal including the bezel, touch screen overlay, and panel gasket seal are tested for chemical resistance. Some of the chemicals can cause discoloration, but they do not interfere with the operation of the terminal.

TIP For more information on chemical resistance of the product, go to https://rockwellautomation.custhelp.com and search the Knowledgebase for keywords 'Chemical Resistance PanelView Plus'.

IMPORTANT Do not operate the terminal in direct sunlight. Direct exposure to ultraviolet light can discolor the touch screen.

Certifications

This table lists certifications for the PanelView Plus 7 Performance terminals.

Certification[1]	Value
CE (EMC)	European Union 2014/35/EU EMC Directive, compliant with: • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers
CE (LVD)[2]	European Union 2014/30/EU Low Voltage Directive, compliant with: • EN 61131-2; Programmable Controllers
c-UL-us	The PanelView Plus 7 Performance terminals hold these certifications: c-UL-us Listed Industrial Control Equipment for use in Hazardous Locations (E10314) per standards ANSI / ISA 12.12.01 and CSA C22.2 No. 213. rated: – Class I, Div 2, Groups A, B, C, D Enclosure type ratings per UL50 and CSA C22.2 No. 94.2-07. Enclosure ingress protection that is classified by UL per IEC 60529. The ArmorView Plus 7 terminal holds the following certifications: c-UL-us listed Industrial Control Equipment for US and Canada (E113724) per standards UL 61010-1, UL 61010-2-201, CAN/CSA-C22.2 No. 61010-1, and CAN/CSA-C22.2 No. 61010-2-201. Enclosure type ratings per UL50 and CSA C22.2 No. 94.2-07. Enclosure ingress protection that is classified by UL per IEC 60529.
EtherNet/IP	ODVA conformance that is tested to EtherNet/IP specifications
KCC	Certificate of compliance
NSF	Stainless Steel Series B Terminals only, compliant with: • NSF/ANSI/3-A 14159-1; Hygiene Requirements for the Design of Meat and Poultry Processing Equipment • NSF/ANSI 169; Special Purpose Food Equipment and Devices"
RCM	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions
RoHS	China RoHS, Turkey RoHS, European RoHS 2011/65/EU
EAC	Certificate of compliance

(1) When marked. See the Product Certification link at rok.auto/certification for Declarations of Conformity, Certificates, and other certification details.
(2) This certification is not available for the ArmorView Plus 7 terminal.

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Technical Specifications

The tables in this section provide technical specifications for the PanelView Plus 7 Performance terminals.

PanelView Plus 7 Performance 7-in and 9-in Terminals

Attribute	6.5-in. Touch 2711P--T7C22D9P, 2711P--T7C22D9P-B (1) 2711P-T7C22A9P, 2711P-T7C22A9P-B 2711P-T7C22D9PK(2)	6.5-in. Touch with Keypad 2711P-B7C22D9P, 2711P-B7C22D9P-B (1) 2711P-B7C22A9P, 2711P-B7C22A9P-B	9-in. Touch 2711P-T9W22D9P, 2711P-T9W22D9P-B (1) 2711P-T9W22A9P, 2711P-T9W22A9P-B 2711P-T9W22D9PK(2)
Operator input	Touch	Touch with keypad	Touch
Conformal-coated	Yes	—	Yes
Display type	TFT Color		
Display size, diagonal	6.5-in.		9-in. widescreen
Viewing area (W x H)	132 x 99 mm (5.2 x 3.9 in.)		196 x 118 mm (7.7 x 4.6 in.)
Display resolution	640 x 480 VGA, 18-bit color graphics		800 x 480 WVGA, 18-bit color graphics
Aspect ratio	4:3		5:3
Brightness, typical	300 cd/m^2 (Nits)		
Backlight life	White light-emitting diode, solid state Life: 50,000 h min at 40 °C (104 °F) to half-brightness, backlight is not replaceable		
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams		
Battery (real-time clock backup)	Accuracy: ±2 minutes per month. Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell		
Memory: • System • User	• 1 GB RAM and 512 MB storage • 80 MB, approx, nonvolatile storage for applications		
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards		
USB ports: • Host • Device	• Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage • One high-speed 2.0 device port (type B) that will be functional in a future release		
Operating system	Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support)		
Ethernet ports	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies		
Software	FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later		
Electrical			
Input voltage	24V DC nom (18…30V DC)	100…240V AC	24V DC nom (18…30V DC)	100…240V AC	24V DC nom (18…30V DC)	100…240V AC
Power consumption	50 W max (2.1 A at 24V DC)	105VA	50 W max (2.1 A at 24V DC)	105VA	50 W max (2.1 A at 24V DC)	105VA
Power supply	Supports (SELV) and (PELV) 24V DC supplies(3)	—	Supports (SELV) and (PELV) 24V DC supplies(3)	—	Supports (SELV) and (PELV) 24V DC supplies(3)	—
Mechanical						
Weight, approx	1.2 kg (2.65 lb)		1.47 kg (3.25 lb)		1.58 kg (3.48 lb)	
Dimensions, approx (H x W x D)	170 x 212 x 69.6 mm 6.69 x 8.35 x 2.74 in.		179 x 285 x 69.6 mm 7.05 x 11.22 x 2.74 in.		190 x 280 x 69.6 mm 7.48 x 11.02 x 2.74 in.	
Cutout dimensions, approx (H x W)	142 x 184 mm 5.59 x 7.24 in.		142 x 237 mm 5.59 x 9.33 in.		162 x 252 mm 6.38 x 9.92 in.	

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) Catalog numbers that end with a K denote terminals that are conformal coated.
(3) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

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PanelView Plus 7 Performance 10-in and 12-in Terminals

Attribute	10.4-in. Touch 2711P-T10C22D9P, 2711P-T10C22D9P-B (1) 2711P-T10C22A9P, 2711P-T10C22A9P-B 2711P-T10C22D9PK(2)	10.4-in. Touch with Keypad 2711P-B10C22D9P, 2711P-B10C22D9P-B (1) 2711P-B10C22A9P, 2711P-B10C22A9P-B	12.1-in. Touch 2711P-T12W22D9P, 2711P-T12W22D9P-B (1) 2711P-T12W22A9P, 2711P-T12W22A9P-B 2711P-T12W22D9PK(2)
Operator input	Touch	Touch with keypad	Touch
Conformal-coated	Yes	—	Yes
Display type	TFT Color		
Display size, diagonal	10.4-in.		12.1-in. wide screen
Viewing area (W x H)	211 x 158 mm (8.3 x 6.2 in.)		261 x 163 mm (10.3 x 6.4 in.)
Display resolution	800 x 600 SVGA, 18-bit color graphics		1280 x 800 WXGA, 18-bit color graphics
Aspect ratio	4:3		16:10
Brightness, typical	300 cd/m^2 (Nits)		
Backlight life	White light-emitting diode, solid state Life: 50,000 h min at 40 °C (104 °F) to half-brightness, backlight is not replaceable		
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams		
Battery (real-time clock backup)	Accuracy: ±2 minutes per month. Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell		
Memory: • System • User	• 512 MB RAM and 512 MB storage • 80 MB, approx, nonvolatile storage for applications		
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards		
USB ports: • Host • Device	• Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage • One high-speed 2.0 device port (type B) that will be functional in a future release		
Operating system	Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support)		
Ethernet ports	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies		
Software	FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later		
Electrical			
Input voltage	24V DC nom (18…30V DC) / 100…240V AC	24V DC nom (18…30V DC) / 100…240V AC	24V DC nom (18…30V DC) / 100…240V AC
Power consumption	50 W max (2.1 A at 24V DC) / 105VA	50 W max (2.1 A at 24V DC) / 105VA	50 W max (2.1 A at 24V DC) / 105VA
Power supply	Supports (SELV) and (PELV) 24V DC supplies(3) / —	Supports (SELV) and (PELV) 24V DC supplies(3) / —	Supports (SELV) and (PELV) 24V DC supplies(3) / —
Mechanical			
Weight, approx	2.28 kg (5.03 lb)	2.58 kg (5.69 lb)	2.54 kg (5.60 lb)
Dimensions, approx (H x W x D)	252 x 297 x 69.6 mm 9.92 x 11.69 x 2.74 in.	252 x 385 x 69.6 mm 9.92 x 15.16 x 2.74 in.	240 x 340 x 69.6 mm 9.69 x 13.39 x 2.74 in.
Cutout dimensions, approx (H x W)	224 x 269 mm 8.82 x 10.59 in.	224 x 335 mm 8.82 x 13.19 in.	218 x 312 mm 8.58 x 12.28 in.

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) Catalog numbers that end with a K denote terminals that are conformal coated.
(3) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

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PanelView Plus 7 Performance 15-in and 19-in Terminals

Attribute	15-in. Touch 2711P-T15C22D9P, 2711P-T15C22D9P-B [1] 2711P-T15C22A9P, 2711P-T15C22A9P-B 2711P-T15C22D9PK[2]	15-in. Touch with Keypad 2711P-B15C22D9P, 2711P-B15C22D9P-B [1] 2711P-B15C22A9P, 2711P-B15C22A9P-B 2711P-B15C22D9PK[2]	19-in. Touch 2711P-T19C22D9P, 2711P-T19C22D9P-B [1] 2711P-T19C22A9P, 2711P-T19C22A9P-B 2711P-T19C22D9PK[2]
Operator input	Touch	Touch with keypad	Touch
Conformal-coated	Yes	Yes[4]	Yes
Display type	TFT Color		
Display size, diagonal	15-in.		19-in.
Viewing area (W x H)	304 x 228 mm (12.0 x 9.0 in.)		376 x 301 mm (14.8 x 11.9 in.)
Display resolution	1024 x 768 XGA, 18-bit color graphics		1280 x 1024 SXGA, 18-bit color graphics
Aspect ratio	4:3		5:4
Brightness, typical	300 cd/m^2 (Nits)		
Backlight life	White light-emitting diode, solid state Life: 50,000 h min at 40 °C (104 °F) to half-brightness, backlight is not replaceable		
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams		
Battery (real-time clock backup)	Accuracy: ±2 minutes per month. Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell		
Memory: • System • User	• 512 MB RAM and 512 MB storage • 80 MB, approx, nonvolatile storage for applications		
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards		
USB ports: • Host • Device	• Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage • One high-speed 2.0 device port (type B) that will be functional in a future release		
Operating system	Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support)		
Ethernet ports	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies		
Software	FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later		
Electrical			
Input voltage, DC	24V DC nom (18…30V DC)	100…240V AC	24V DC nom (18…30V DC)	100…240V AC	24V DC nom (18…30V DC)	100…240V AC
Power consumption, DC	50 W max (2.1 A at 24V DC)	105VA	50 W max (2.1 A at 24V DC)	105VA	50 W max (2.1 A at 24V DC)	105VA
Power supply	Supports (SELV) and (PELV) 24V DC supplies[3]	—	Supports (SELV) and (PELV) 24V DC supplies[3]	—	Supports (SELV) and (PELV) 24V DC supplies[3]	—
Mechanical						
Weight, approx	3.69 kg (8.14 lb)		4.14 kg (9.13 lb)		5.62 kg (12.40 lb)	
Dimensions, approx (H x W x D)	318 x 381 x 69.6 mm 12.52 x 15.00 x 2.74 in		322 x 484 x 69.6 mm 12.68 x 19.06 x 2.74 in		411 x 485 x 69.6 mm 16.18 x 19.09 x 2.74 in	
Cutout dimensions, approx (H x W)	290 x 353 mm 11.42 x 13.90 in		290 x 418 mm 11.42 x 16.46 in		383 x 457 mm 15.08 x 17.99 in	

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) Catalog numbers that end with a K denote terminals that are conformal coated.
(3) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.
(4) Only the branded, DC-powered, 15-in. touch with keypad terminal is conformal-coated.

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PanelView Plus 7 Performance Stainless Steel 9-in. and 12-in. Terminals

Attribute	9-in. Touch 2711P-T9W22D9P-BSHK	12.1-in. Touch 2711P-T12W22D9P-BSHK
Operator input	Touch	
Conformal-coated	Yes	
Display type	TFT Color	
Display size, diagonal	9-in. wide screen	12.1-in. wide screen
Viewing area (W x H)	196 x 118 mm (7.7 x 4.6 in.)	261 x 163 mm (10.3 x 6.4 in.)
Display resolution	800 x 480 WVGA, 18-bit color graphics	1280 x 800 WXGA, 18-bit color graphics
Aspect ratio	5:3	16:10
Brightness, typical	300 cd/m^2 (Nits)	
Backlight life	White light-emitting diode, solid state Life: 50,000 h min at 40 °C (104 °F) to half-brightness, backlight is not replaceable	
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams	
Battery (real-time clock backup)	Accuracy: ±2 minutes per month Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell	
Memory: • System • User	• 512 MB RAM and 512 MB storage • 80 MB, approx, nonvolatile storage for applications	
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards	
USB ports: • Host • Device	• Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage • One high-speed 2.0 device port (type B) that will be functional in a future release	
Operating system	Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support)	
Ethernet ports	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies	
Software	FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later	
Electrical		
Input voltage	24V DC nom (18…30V DC)	
Power consumption	50 W max (2.1 A at 24V DC)	
Power supply	Supports (SELV) and (PELV) 24V DC supplies(1)	
Mechanical		
Stainless steel bezel	304 stainless steel with hygienic No. 4A finish	
Silicone gasket	Gasket material is compliant with FDA 21 CFR 177.2600	
Weight, approx	2.1 kg (4.6 lb)	3.7 kg (8.2 lb)
Dimensions, approx (H x W x D)	190 x 280 x 69.6 mm 7.48 x 11.02 x 2.74 in.	240 x 340 x 69.6 mm 9.69 x 13.39 x 2.74 in.
Cutout dimensions, approx (H x W)	162 x 252 mm 6.38 x 9.92 in.	218 x 312 mm 8.58 x 12.28 in.

(1) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

ALLEN BRADLEY PANELVIEW PLUS

ArmorView Plus 7 Terminals

12.1 inch ArmorView Plus 7 Terminals		
Attribute	**2711P-T12W22D9P-BM001…2711P-T12W22D9P-BM002**	**2711P-T12W22D9P-BM003…2711P-T12W22D9P-BM016**
Operator input	Touch	Touch screen and push button, selector switches, or key switches
Display type	TFT Color	
Display size, diagonal	12.1-in. wide screen	
Viewing area (W x H)	261 x 163 mm (10.3 x 6.4 in.)	
Display resolution	1280 x 800 WXGA, 18-bit color graphics	
Aspect ratio	16:10	
Brightness, typical	300 cd/m^2 (Nits)	
Backlight life	White light-emitting diode, solid-state Life: 50,000 h min at 40 °C (104 °F) to half-brightness, backlight is not replaceable	
Touch screen	Analog resistive Actuation rating: 1 million presses Operating force: 100 grams	
E-stop	—	Illuminated twist-to-release 300,000 cycles
Push buttons	—	Momentary push buttons 10,000,000 cycles
Selector switches	—	Two-position selector, three-position selector, three-position key selector 1,000,000 cycles
Battery (real-time clock backup)	Accuracy: ±2 minutes per month Battery life: 4 years min at 25 °C (77 °F) Replacement: CR2032 lithium coin cell	
Memory: • System • User	512 MB RAM and 512 MB storage 80 MB, approx, nonvolatile storage for applications	
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. nos. 1784-SD*x* and 1784-SDHCx cards	
USB ports: • Host • Device	Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage One high-speed 2.0 device port (type B) that will be functional in a future release	
Operating system	Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support)	
Ethernet ports	Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies	
Software	FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later	
Electrical		
Input voltage	24V DC nom (18…30V DC)	
Power consumption	37 W max (1.54 A at 24V DC)	
Power supply	Supports (SELV) and (PELV) 24V DC supplies(1)	
Mechanical		
Weight, approx (with arm adapter)	7.41 kg (16.34 lb)	
Weight, approx (with VESA Kit)	8.19 kg (18.06 lb)	
Dimensions with arm adapter, approx (H x W x D)	381.6 x 345 x 166.6 mm 15.02 x 13.58 x 6.56 in.	
Dimensions with I/O plate, approx (H x W x D)	345 x 345 x 166.6 mm 13.58 x 13.58 x 6.56 in.	

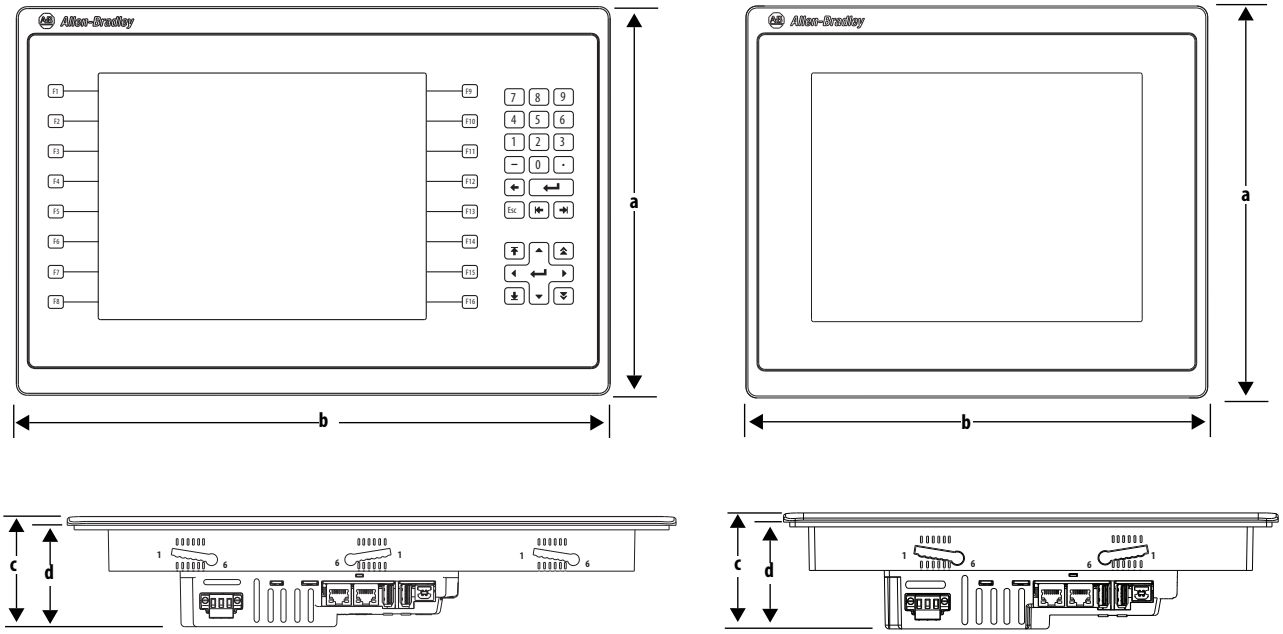
(1) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

ALLEN BRADLEY PANELVIEW PLUS

Product Dimensions

This section provides product dimensions. The PanelView Plus 7 Performance 10.4-inch touch and combination keypad with touch devices are shown for illustrative purposes. Stainless steel terminals use different mounting clips, but the dimensions are the same. All other terminal sizes look similar. Dimensions for the 12.1-in. ArmorView Plus 7 terminal can be found on page 11.

PanelView Plus 7 Performance Terminal Dimensions - 10.4-in. Model



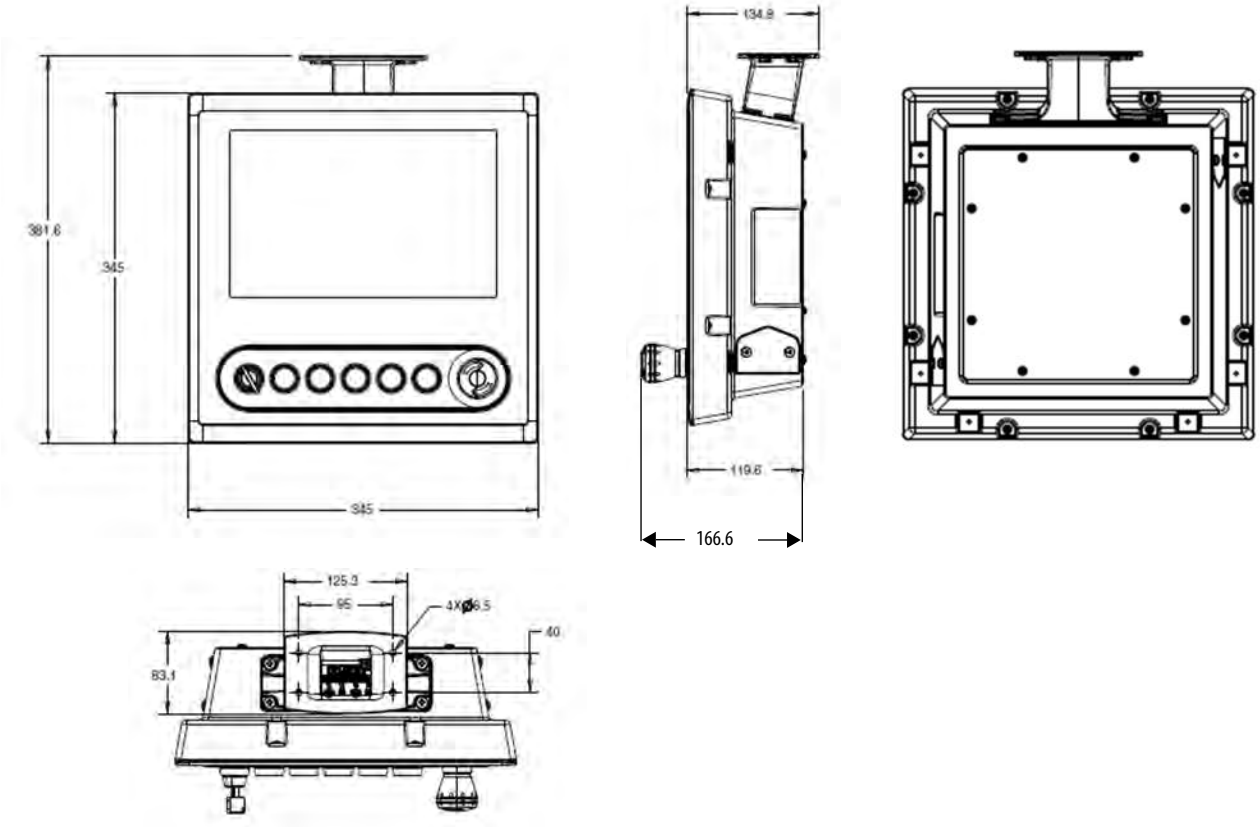
PanelView Plus 7 Performance Terminal Dimensions

Terminal Size	Input Type	Height (a) mm (in.)	Width (b) mm (in.)	Overall Depth (c) mm (in.)	Mounted Depth (d) mm (in.)
6.5-in.	Key/touch	179 (7.05)	285 (11.22)	69.6 (2.74)	63.6 (2.50)
	Touch	170 (6.69)	212 (8.35)		
9-in.	Touch	190 (7.48)	280 (11.02)		
10.4-in.	Key/touch	252 (9.92)	385 (15.16)		
	Touch	252 (9.92)	297 (11.69)		
12.1-in.	Touch	246 (9.69)	340 (13.39)		
15-in.	Key/touch	322 (12.68)	484 (19.06)		
	Touch	318 (12.52)	381 (15.00)		
19-in.	Touch	411 (16.18)	485 (19.09)		

TIP When mounted in a panel, the front of the bezel extends less than 6.36 mm (0.25 in.) from the front of the panel.

This section provides product dimensions for the ArmorView Plus 7 terminal. This terminal provides options for mounting on an arm mount system, a pedestal, or VESA bracket (with the use of an optional VESA kit).

ArmorView Plus 7 Terminal Dimensions with Arm Adapter



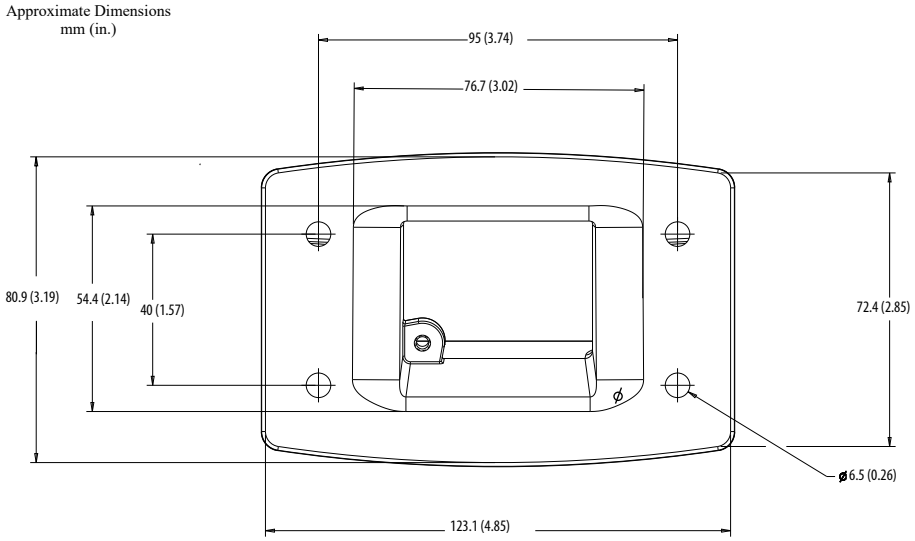
The ArmorView Plus 7 product is designed to be used with couplers that have the same mounting pattern, such as those shown in the table. For information about the dimensions of the arm mount adapter, see Arm Mount Adapter Dimensions on page 12.

	Rittal	Hoffman	Other
Supported Coupling	CP 6501.130 (CP40 120x65) CP 6206.340 (CP60 swivel) CP 6206.360 (CP60 rigid)	S1MFC	Any compatible coupling(1)
Supported Arm Systems	CP40 (steel) CP60 (extruded aluminum)	Syspend 180	
Supported Pedestal Systems	CP 6106.500 with these CP60 couplings: • CP 6206.340 • CP 6206.360	–	

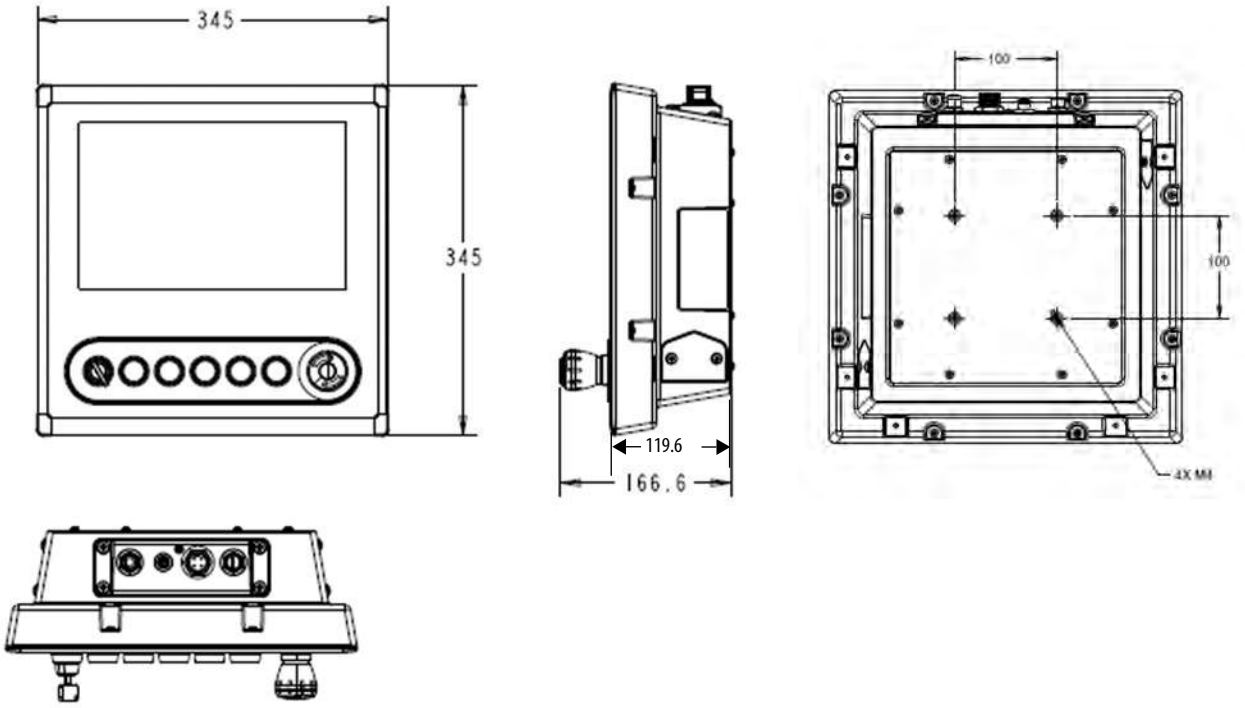
(1) The arm mount adapter accommodates coupling with four M6 mounting screws 95 mm (3.74 in.) x 40 mm (1.58 in.) with a seal that is contained in 80.9 mm (3.19 in.) x 123.1 mm (4.85 in.). The product will only meet specified NEMA, UL Type, and IEC ratings with user-installed accessories (stack light, buttons, indicators, and so on), if the accessories have equivalent ratings and are installed properly.

ALLEN BRADLEY PANELVIEW PLUS

Arm Mount Adapter Dimensions



ArmorView Plus 7 Terminal Dimensions with VESA Mount and I/O Plate



ArmorView Plus 7 Terminals

ArmorView Plus 7 Terminals	Height mm (in.)	Width mm (in.)	Overall Depth without E-stop mm (in.)	Overall Depth with E-stop mm (in.)
With Arm Adapter	381.6 (15.02)	345 (13.58)	119.6 (4.71)	166.6 (6.56)
With VESA Mount and I/O Plate	345 (13.58)	345 (13.58)	119.6 (4.71)	166.6 (6.56)

ALLEN BRADLEY PANELVIEW PLUS

Accessories

This section describes accessories for the PanelView Plus 7 Performance terminals and the ArmorView Plus 7 terminals.

Protective Overlays

Cat. No. (1)	Display Size	Operator Input		Quantity
		Touch	Key and Touch	
2711P-RGT7SP	6.5-in.	•		3
2711P-RGB7P			•	
2711P-RGT9SP	9-in. (wide)	•		
2711P-RGT10SP	10.4-in.	•		
2711P-RGB10P			•	
2711P-RGT12SP(2)	12.1-in. (wide)	•		
2711P-RGT15SP	15-in.	•		
2711P-RGB15P			•	
2711P-RGT19P	19-in.	•		

(1) The use of protective overlays may not be compatible in all hygienic applications. Consult the standards and protocols for your hygienic applications before you use a protective overlay on a stainless steel terminal.
(2) On ArmorView Plus 7 terminals, the protective overlay covers only the touchscreen portion of the product.

Power Supplies and Power Terminal Blocks

Cat. No.	Description	Quantity
1606-XLP95E	DIN rail power supply, 24…28V DC output voltage, 95 W	1
1606-XLP100E	DIN rail power supply, 24…28V DC output voltage, 100 W	1
2711P-RSACDIN	DIN rail power supply, AC-to-DC, 85…265V AC, 47…63 Hz	1
2711P-RTBAP	3-pin AC power terminal block	10
2711P-RTBDSP	3-pin DC power terminal block	10

Mounting Hardware

Cat. No.	Description	Quantity
2711P-RMCP(1)	Mounting levers (black)	16
2711P-RTMC(2)	Mounting clips (only for stainless steel terminals)	8

(1) Catalog number 2711P-RMCP mounting levers are used with PanelView Plus 7 Performance terminals. Do not use gray mounting levers; they are not compatible with PanelView Plus 7 Performance terminals.
(2) Catalog number 2711P-RTMC mounting clips are used for stainless steel terminals, catalog numbers 2711P-T9W22D9P-BSHK or 2711P-T12W22D9P-BSHK. Note that 2711P-T12W22D9P-BSHK requires 10 mounting clips. If you need more than eight clips, order two 2711P-RTMC mounting clip kits.

Secure Digital (SD) Cards

Cat. No.	Description	Quantity
1784-SD1	1 GB SD card	1
1784-SD2	2 GB SD card	2
2711C-RCSD	USB to SD adapter for SD card	1

Battery Replacement

Cat. No.	Description	Quantity
2711P-RY2032	Lithium coin cell battery, CR2032 equivalent	1

IMPORTANT Before you select the appropriate replacement gasket, you must identify the series of the PanelView Plus 7 Performance Stainless Steel terminal. The terminal's series information is located on the terminal's product nameplate label. In the following table, gaskets that are listed for use on Series B terminals are not certified for use on Series A terminals, and gaskets that are listed for use on Series A terminals are not certified for use on Series B terminals.

Hygienic Gasket Replacement Kits for Stainless Steel Terminals

Cat. No.	Description[1]	Terminal Series	Quantity
2711P-RGST9W	Hygienic gasket, blue silicone For 9-in. Series A Stainless Steel Terminals	A	1
2711P-RGST12W	Hygienic gasket, blue silicone For 12-in. Series A Stainless Steel Terminals	A	1
2711P-RGST9WB	Hygienic gasket, blue, silicone, with ribs For 9-in. Series B Stainless Steel Terminals	B	1
2711P-RGST12WB	Hygienic gasket, blue, silicone, with ribs For 12-in. Series B Stainless Steel Terminals	B	1

(1) Gasket material is compliant with FDA 21 CFR 177.2600.

VESA Kit for ArmorView Plus 7 Terminals

Cat. No.	Description	Quantity
2711P-RVESA01	VESA access cover, I/O plate fitted with these cables: • Power to terminal • Connection to E-stop button • Ethernet (I/O Plate to Ethernet I/O Module) • Ethernet (I/O Plate to PanelView terminal) • Ground wire Ethernet (I/O Plate to PanelView terminal)[1] M16 hole plug[2]	1

(1) For units without the Ethernet I /O module that require a DLR connection, you must remove the Ethernet I/O module cable and replace it with the Ethernet I/O module to terminal cable.
(2) For terminals that do not have an E-stop on the I/O plate, you can replace the connector with the M16 hole plug.

Handle Kit for ArmorView Plus 7 Terminals

Cat. No.	Description	Quantity
2711P-RHNDL01[1]	One-handle	1

(1) You can install one, two, or three handles to the ArmorView Plus 7 terminal. Indentations for installing the handle are located opposite the arm mount adapter (or the I/O plate), and on both sides. To install more than one handle, order multiple handle kits.

Stack Light for ArmorView Plus 7 Terminals

Cat. No.	Description	Quantity
854J-BVMC (vertical mount)[1]	Stack light	1

(1) You can install a stack light on either side of the ArmorView Plus 7 terminal. To install two stack lights, order two stack light kits.

ALLEN BRADLEY PANELVIEW PLUS

Cables for ArmorView Plus 7 Terminals

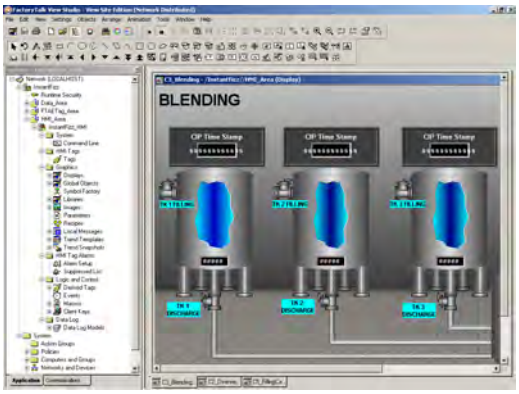
Cat. No.	Description	Quantity
2711P-RIOIN3M	Input point cable for customer-installed switch (3-pin male Pico™ style connector for Ethernet I/O module)	1
2711P-RIOUT3M	Output point cable for customer-installed indicator light (3-pin male Pico style connector for Ethernet I/O module)	1

HMI Software

All PanelView Plus 7 terminals are configured with FactoryTalk View Studio software and have an integrated runtime system called FactoryTalk View Machine Edition Station.

Machine Edition Station runs projects that are developed with FactoryTalk View Studio software and is included on all PanelView Plus 7 terminals.

Two versions of FactoryTalk View Studio software support application development for PanelView Plus 7 terminals.



Cat. No.[1]	Description
9701-VWSTMENE	FactoryTalk View Studio for Machine Edition software - Configuration software for developing and testing machine-level human machine interface (HMI) applications. Includes RSLinx® Enterprise and KEPServer Enterprise software.
9701-VWSTENE	FactoryTalk View Studio software - Configuration software for developing and testing machine-level and supervisory-level human machine interface (HMI) applications.

(1) To order localized versions of the software, replace EN in the catalog number with DE for German, FR for French, JP for Japanese, or ZH for Chinese.

You can import PanelView Standard/PanelBuilder® 32 and PanelView applications into FactoryTalk View Studio software as Machine Edition applications by using the Machine Edition Import Wizard. The Import Wizard steps you through a few options such as scaling to a new screen resolution size, and then converts objects, text, tags, and communication configurations to ones that are available in Machine Edition.

FactoryTalk ViewPoint software, an add-on to FactoryTalk View Studio software, allows plant managers, production supervisors, system integrators, and other key personnel to view and control real-time plant floor operations remotely from a web browser. FactoryTalk ViewPoint enabled displays are fully scalable and animated in the browser. The remote user can also view displays that are not the active display of the terminal.

Each PanelView Plus 7 terminal contains one license that supports one client connection to the terminal. No additional software is required.

For a complete list of available HMI software, visit http://www.rockwellautomation.com/rockwellsoftware.

ALLEN BRADLEY PANELVIEW PLUS

Additional Resources

These documents contain more information about related products from Rockwell Automation.

Resource	Description
PanelView Plus 7 Performance Terminals User Manual, publication 2711P-UM008	Provides instructions on how to install, configure, and operate the PanelView Plus 7 Performance terminals.
ArmorView Plus 7 Installation Instructions, publication 2711P-IN013	Provides instructions on how to install the ArmorView Plus 7 components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines on how to install a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page.

ALLEN BRADLEY PANELVIEW PLUS

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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ALLEN BRADLEY SMC FLEX

Technical Data

Allen-Bradley

SMC-3, SMC Flex, and SMC-50 Smart Motor Controllers

Bulletin 150

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LISTEN. THINK. SOLVE.®

ALLEN BRADLEY SMC FLEX

Overview

Rockwell Automation offers a wide array of starting solutions that range from electromechanical to solid-state. Products that use these methods include across-the-line starters, Smart Motor Controllers (SMC™s), and variable frequency drives.

SMC Controllers

Allen-Bradley SMC controllers are micro-processor based soft starters that are designed to maximize the efficiency of motor starts and stops. SMC controllers are designed to operate 3-phase motors. They feature built-in overload protection and use six silicon-controlled rectifiers (SCRs) (two per phase) to vary the conduction period and control the voltage (and thus, the torque) to the motor during starting, running, and stopping.

Once the motor has been started and is up to speed, full input voltage is applied to the motor. At this point, units with internal bypass power structures bridge the SCRs with their integral bypass contacts, which are rated for AC1 current levels. Bridging the SCR minimizes heat and allows a smaller product for space-conscious applications. In solid-state power structures, the SCRs are always in the circuit switching current. This allows increased robustness for harsher environments (such as shock-type loads) and more aggressive duty cycles.

Allen-Bradley SMCs are ideal for a wide range of applications. The product family consists of three major offerings.

SMC-3

Compact design provides true three-phase control, increased intelligence and unmatched performance. Motor and system diagnostics and an electronic overload with adjustable trip class reduce downtime and protect valuable assets.

- Compact footprint
- Easy and secure setup
- Integrated bypass
- Five start/stop modes

SMC Flex

Modular design features advanced intelligence, performance, and diagnostics; communications flexibility; removable control module, power modules, and fan assembly in a cost-effective package for your demanding production applications.

- Modular for simplified installation and maintenance
- Built-in LCD and keypad or personal computer (PC) software setup
- Integrated bypass
- Nine start/stop modes and three slow-speed modes
- Full metering and diagnostics

SMC-50

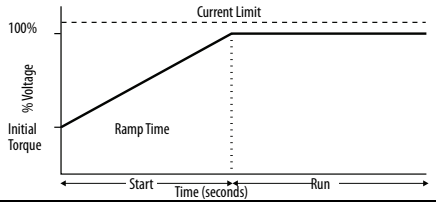
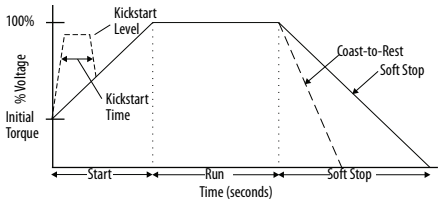
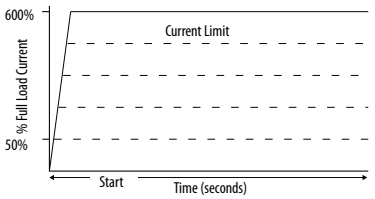
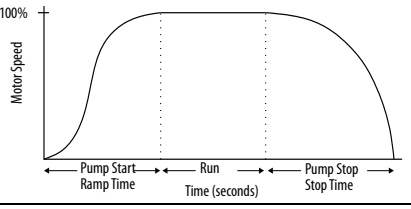
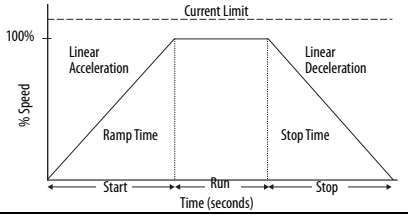
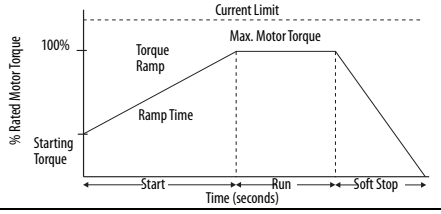
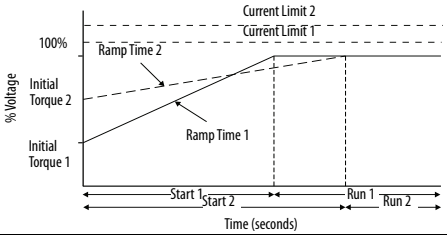
Designed for customer flexibility – advanced monitoring and protection, superior communications capabilities, and energy saver mode help increase efficiency and reduce downtime.

- Application scalability
  - Normal and heavy-duty ratings
  - Expandable I/O and sensor capability
  - Network integration capabilities
- LCD or personal computer PC software setup
- Integrated bypass or solid-state power structures available
- External bypass optional
- Seventeen start/stop modes and three slow-speed modes

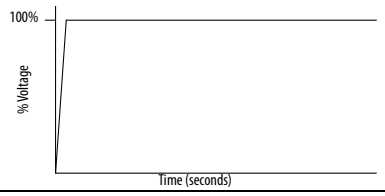
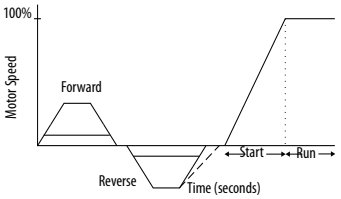
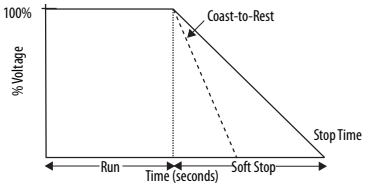
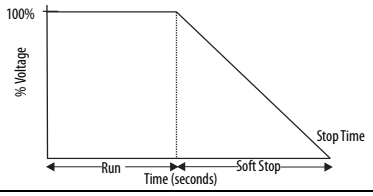
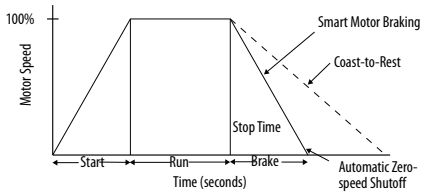
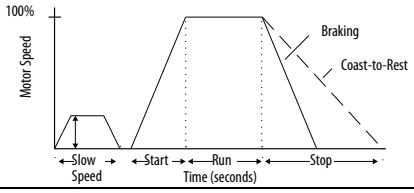
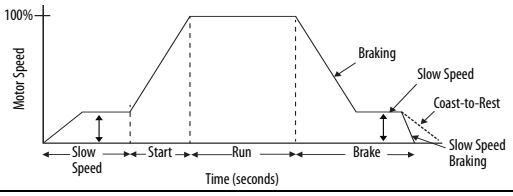
ALLEN BRADLEY SMC FLEX

Control Mode Overview

Allen-Bradley SMC controllers have multiple control modes available to control standard 3-phase induction motors, depending upon the product selected. For a full description of the control modes available for each product type, consult the appropriate product user manual.

Control Mode	Description	Diagram	Available With
Soft Start	Output voltage is ramped from user-adjustable initial torque setting out to user selectable start time.		SMC-3 SMC Flex SMC-50
Kickstart	User-selectable voltage boost at startup to break away loads		SMC-3 SMC Flex SMC-50
Current Limit	User-adjustable current limit start by maintaining a constant current to the motor.		SMC-3 SMC Flex SMC-50
Pump Control	Used to reduce fluid surges during starting and/or stopping of a pump.		SMC Flex SMC-50
Sensorless Linear Speed Acceleration and Deceleration	Motor acceleration and deceleration are kept at a constant rate during starting and/or stopping. Presents the least amount of stress on mechanical components.		SMC-50
Torque Control	Provides a torque ramp from user-selectable initial torque setting to user-selectable maximum torque setting over the defined ramp time.		SMC-50
Dual Ramp Start	Ability to select between two start profiles with separately adjustable ramp times and initial torque levels.		SMC Flex SMC-50

ALLEN BRADLEY SMC FLEX

Control Mode	Description	Diagram	Available With
Full Voltage Start	Full-voltage start in which the SMC performs like a solid-state contactor.		SMC Flex SMC-50
Preset Slow Speed	Used on applications that require slow speed moves for positioning, alignment, or maintenance. Both forward and reverse motion are possible at user selectable speeds.		SMC Flex SMC-50
Coast	Voltage is removed and the motor coasts to rest.		SMC-3 SMC Flex SMC-50
Soft Stop	Output voltage is ramped down from full voltage to zero voltage according to a user selectable ramp time.		SMC-3 SMC Flex SMC-50
Smart Motor Braking (SMB™)	Provides motor braking for Braking applications that require stopping faster than a coast-to-rest.		SMC Flex SMC-50
Slow Speed with Braking	Combines slow-speed operation with smart motor braking. Used in positioning or alignment.		SMC Flex SMC-50
Accu-Stop™	Used for applications that require position stopping. Combines SMB and slow speed.		SMC Flex SMC-50(1)
Resistor Loads	Can directly control 3-phase resistive loads by using phase angle control that is based on a reference value. This mode is typically used for resistive heating applications.		Solid-state SMC-50

(1) Accu-Stop is not included as a parameter/function for the SMC-50 controller. However, the Accu-Stop function can be accomplished with the Stop Option and Slow Speed with Braking functions.

ALLEN BRADLEY SMC FLEX

Controller Features[1]				
	SMC™-3	SMC™ Flex	SMC™-50 Controller	
			Solid-state	with Internal Bypass
	200…690V;	200…690V;	200…690V;	200…690V
	1…480 A	1…1250 A	90…520 A	108…480 A
Soft Start	S	S	S	S
Linear Acceleration/Deceleration	—	S	S	S
Torque Control	—	—	S	S
Kickstart	S	S	S	S
Pump Control	—	O	S	S
Current Limit	S	S	S	S
Dual Ramp Start	—	S	S	S
Full Voltage	—	S	S	S
Energy Saver	—	—	S	S
Phase Rebalance	—	—	S	—
Soft Stop	S	S	S	S
Preset Slow Speed	—	S[2]	S[3]	S[3]
Dual Slow Speed Commands	—	—	S	S
SMB™ Smart Motor Braking	—	O	S	S
Accu-Stop™	—	O	S[4]	S[4]
Slow Speed with Braking	—	O	S	S
Integrated Bypass Contactor (SMC-50 firmware rev. 5.XXX and higher)	S	S	—[5]	S
Integrated Motor Overload Protection	S	S	S	S
DPI™ Communication	—	S	S	S
Metering	—	S	S	S
Real Time Clock	—	—	S	S
Energy Saver Mode	—	—	S	—
Motor Winding Heater Function	—	[6]	S	S
Resistive Load Control (Firmware rev. 5.XXX and higher, solid-state devices only.)	—	—	S	—
Diagnostic Faults and Alarms	—	S	S	S
Parameter Configuration/Programming Tools	—	S	O	O
Human Interface Module (HIM)	—	O	O	O
Parameter Configuration Module	—	—	O	O
DriveExplorer™ and DriveExecutive™	—	O	O	O
Configuration Software: Connected Components Workbench	—	O	O	O
Network Communications	—	O	O	O
Inside-the-Delta Functionality	S	S	S	S
Individual Bit Enable of Faults and Alarms	—	—	S	S
Automatic Tuning of Motor Parameters	—	—	S	S
Digital I/O Expansion Module[7]	—	—	O	O
Analog I/O Expansion Module[7]	—	—	O	O
Ground Fault/CT/PTC Module[7]	—	—	O	O
DeviceLogix™ (Firmware rev. 4.XXX and higher.)	—	—	S	S

(1) S = Standard Feature; O = Optional Feature
(2) Limited slow speed capability
(3) Advanced slow speed capability
(4) Accu-Stop is not included as a parameter/function for the SMC-50 controller. However, the Accu-Stop function can be accomplished with the Stop Option and Slow Speed with Braking functions.
(5) You can add an external bypass contactor as an option.
(6) Option using a Bulletin 1410 motor winding heater
(7) With removable terminal block.

ALLEN BRADLEY SMC FLEX

Notes:

ALLEN BRADLEY SMC FLEX

SMC-3 Controllers

The compact design of the SMC-3 controller provides three-phase control, increased intelligence, and unmatched performance in a cost-effective package with overload protection, integrated bypass, and motor system diagnostics. DIP switches and a rotary dial make secure setup easy. This controller features an electronic overload with adjustable trip class.

Modes of operation include the following:

- Soft Start
- Current Limit Start
- Selectable Kickstart
- Coast-to-rest
- Soft Stop

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Use ProposalWorks to configure the SMC-Flex controller. ProposalWorks is available from http://www.rockwellautomation.com/global/e-tools/overview.page.

150	–	C	30	N	B	D
a		b	c	d	e	f

a	
Bulletin Number	
Code	**Description**
150	Solid-state Controller

b	
Controller Type	
Code	**Description**
C	SMC-3

c	
Ampere Ratings	
Code	**Description**
3	3 A
9	9 A
16	16 A
19	19 A
25	25 A
30	30 A
37	37 A
43	43 A
60	60 A
85	85 A
108	108 A
135	135 A
201	201 A
251	251 A
317	317 A
361	361 A
480	480 A

d	
Enclosure Type	
Code	**Description**
N	Open

e	
Input Line Voltage	
Code	**Description**
B	200…460V AC, 3-Phase, 50/60 Hz
C	200…600V AC, 3-Phase, 50/60 Hz

f	
Control Voltage	
Code	**Description**
D	100…240V AC
R	24V AC/DC

ALLEN BRADLEY SMC FLEX

Product Selection

For use with Line-connected Motors

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 1 - 200/208V AC SMC-3 Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
200/208	1…3	—	0.5	100…240V AC, 50/60 Hz	150-C3NBD
		—		24V AC/DC	150-C3NBR
	3…9	—	0.75…2	100…240V AC, 50/60 Hz	150-C9NBD
		—		24V AC/DC	150-C9NBR
	5.3…16	—	1.5…3	100…240V AC, 50/60 Hz	150-C16NBD
		—		24V AC/DC	150-C16NBR
	6.3…19	—	1.5…3	100…240V AC, 50/60 Hz	150-C19NBD
		—		24V AC/DC	150-C19NBR
	9.2…25	—	3…7.5	100…240V AC, 50/60 Hz	150-C25NBD
		—		24V AC/DC	150-C25NBR
	10…30	—	3…7.5	100…240V AC, 50/60 Hz	150-C30NBD
		—		24V AC/DC	150-C30NBR
	12.3…37	—	5…10	100…240V AC, 50/60 Hz	150-C37NBD
		—		24V AC/DC	150-C37NBR
	14.3…43	—	5…10	100…240V AC, 50/60 Hz	150-C43NBD
		—		24V AC/DC	150-C43NBR
	20…60	—	7.5…15	100…240V AC, 50/60 Hz	150-C60NBD
		—		24V AC/DC	150-C60NBR
	28.3…85	—	10…25	100…240V AC, 50/60 Hz	150-C85NBD
		—		24V AC/DC	150-C85NBR
	27…108	—	20…30	100…240V AC, 50/60 Hz	150-C108NBD
		—		24V AC/DC(2)	150-C108NBR
	34…135	—	25…40	100…240V AC, 50/60 Hz	150-C135NBD
		—		24V AC/DC(2)	150-C135NBR
	67…201	—	40…60	100…240V AC, 50/60 Hz	150-C201NBD
		—		24V AC/DC(2)	150-C201NBR
	84…251	—	50…75	100…240V AC, 50/60 Hz	150-C251NBD
		—		24V AC/DC(2)	150-C251NBR
	106…317	—	60…100	100…240V AC, 50/60 Hz	150-C317NBD
		—		24V AC/DC(2)	150-C317NBR
	120…361	—	75…125	100…240V AC, 50/60 Hz	150-C361NBD
		—		24V AC/DC(2)	150-C361NBR
	160…480	—	100…150	100…240V AC, 50/60 Hz	150-C480NBD
		—		24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.
(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

Table 2 - 230V AC SMC-3 Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
230	1…3	0.55	0.5	100…240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	3…9	2.2	0.75…2	100…240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	5.3…16	4	1.5…5	100…240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	6.3…19	4	2…5	100…240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	9.2…25	5.5	3…7.5	100…240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	10…30	7.5	5…10	100…240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	12.3…37	7.5	5…10	100…240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	14.3…43	11	5…15	100…240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	20…60	15	7.5…20	100…240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	28.3…85	22	15…30	100…240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
	27…108	30	20…40	100…240V AC, 50/60 Hz	150-C108NBD
				24V AC/DC(2)	150-C108NBR
	34…135	37	25…50	100…240V AC, 50/60 Hz	150-C135NBD
				24V AC/DC(2)	150-C135NBR
	67…201	55	40…75	100…240V AC, 50/60 Hz	150-C201NBD
				24V AC/DC(2)	150-C201NBR
	84…251	75	50…100	100…240V AC, 50/60 Hz	150-C251NBD
				24V AC/DC(2)	150-C251NBR
	106…317	90	60…125	100…240V AC, 50/60 Hz	150-C317NBD
				24V AC/DC(2)	150-C317NBR
	120…361	110	75…150	100…240V AC, 50/60 Hz	150-C361NBD
				24V AC/DC(2)	150-C361NBR
	160…480	132	100…200	100…240V AC, 50/60 Hz	150-C480NBD
				24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

Table 3 - 380/400/415/460V AC SMC-3 Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
380/400/415 (kW) 460 (Hp)	1…3	1.1	0.5…1.5	100…240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	3…9	4	1.5…5	100…240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	5.3…16	7.5	5…10	100…240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	6.3…19	7.5	5…10	100…240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	9.2…25	11	7.5…15	100…240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	10…30	15	7.5…20	100…240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	12.3…37	18.5	10…25	100…240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	14.3…43	22	10…30	100…240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	20…60	30	15…40	100…240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	28.3…85	45	25…60	100…240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
	27…108	55	50…75	100…240V AC, 50/60 Hz	150-C108NBD
				24V AC/DC(2)	150-C108NBR
	34…135	75	60…100	100…240V AC, 50/60 Hz	150-C135NBD
				24V AC/DC(2)	150-C135NBR
	67…201	95…110	75…150	100…240V AC, 50/60 Hz	150-C201NBD
				24V AC/DC(2)	150-C201NBR
	84…251	95…132	100…200	100…240V AC, 50/60 Hz	150-C251NBD
				24V AC/DC(2)	150-C251NBR
	106…317	95…160	125…250	100…240V AC, 50/60 Hz	150-C317NBD
				24V AC/DC(2)	150-C317NBR
	120…361	110…200	250…300	100…240V AC, 50/60 Hz	150-C361NBD
				24V AC/DC(2)	150-C361NBR
	160…480	160…250	300…400	100…240V AC, 50/60 Hz	150-C480NBD
				24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

Table 4 - 500/575V AC SMC-3 Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
500 (kW) 575 (Hp)	1…3	1.5	0.75…2	100…240V AC, 50/60 Hz	150-C3NCD
				24V AC/DC	150-C3NCR
	3…9	5.5	3…7.5	100…240V AC, 50/60 Hz	150-C9NCD
				24V AC/DC	150-C9NCR
	5.3…16	7.5	5…10	100…240V AC, 50/60 Hz	150-C16NCD
				24V AC/DC	150-C16NCR
	6.3…19	11	7.5…15	100…240V AC, 50/60 Hz	150-C19NCD
				24V AC/DC	150-C19NCR
	9.2…25	15	7.5…20	100…240V AC, 50/60 Hz	150-C25NCD
				24V AC/DC	150-C25NCR
	10…30	18.5	10…25	100…240V AC, 50/60 Hz	150-C30NCD
				24V AC/DC	150-C30NCR
	12.3…37	22	15…30	100…240V AC, 50/60 Hz	150-C37NCD
				24V AC/DC	150-C37NCR
	14.3…43	22	15…40	100…240V AC, 50/60 Hz	150-C43NCD
				24V AC/DC	150-C43NCR
	20…60	37	20…50	100…240V AC, 50/60 Hz	150-C60NCD
				24V AC/DC	150-C60NCR
	28.3…85	55	30…75	100…240V AC, 50/60 Hz	150-C85NCD
				24V AC/DC	150-C85NCR
	27…108	75	60…100	100…240V AC, 50/60 Hz	150-C108NCD
				24V AC/DC(2)	150-C108NCR
	34…135	90	75…125	100…240V AC, 50/60 Hz	150-C135NCD
				24V AC/DC(2)	150-C135NCR
	67…201	75…132	100…200	100…240V AC, 50/60 Hz	150-C201NCD
				24V AC/DC(2)	150-C201NCR
	84…251	90…160	125…250	100…240V AC, 50/60 Hz	150-C251NCD
				24V AC/DC(2)	150-C251NCR
	106…317	100…200	200…300	100…240V AC, 50/60 Hz	150-C317NCD
				24V AC/DC(2)	150-C317NCR
	120…361	132…250	200…350	100…240V AC, 50/60 Hz	150-C361NCD
				24V AC/DC(2)	150-C361NCR
	160…480	200…315	250…500	100…240V AC, 50/60 Hz	150-C480NCD
				24V AC/DC(2)	150-C480NCR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

For use with Delta-connected Motors

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 5 - 200/208V AC SMC-3 Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
200/208	1.7…5.1	—	1	100…240V AC, 50/60 Hz	150-C3NBD
		—		24V AC/DC	150-C3NBR
	5.1…16	—	1.5…3	100…240V AC, 50/60 Hz	150-C9NBD
		—		24V AC/DC	150-C9NBR
	9.1…27.6	—	3…7.5	100…240V AC, 50/60 Hz	150-C16NBD
		—		24V AC/DC	150-C16NBR
	10.9…32.8	—	3…10	100…240V AC, 50/60 Hz	150-C19NBD
		—		24V AC/DC	150-C19NBR
	14.3…43	—	3…10	100…240V AC, 50/60 Hz	150-C25NBD
		—		24V AC/DC	150-C25NBR
	17.3…52	—	5…10	100…240V AC, 50/60 Hz	150-C30NBD
		—		24V AC/DC	150-C30NBR
	21…64	—	7.5…20	100…240V AC, 50/60 Hz	150-C37NBD
		—		24V AC/DC	150-C37NBR
	25…74	—	7.5…20	100…240V AC, 50/60 Hz	150-C43NBD
		—		24V AC/DC	150-C43NBR
	34.6…104	—	15…30	100…240V AC, 50/60 Hz	150-C60NBD
		—		24V AC/DC	150-C60NBR
	50…147	—	15…40	100…240V AC, 50/60 Hz	150-C85NBD
		—		24V AC/DC	150-C85NBR
	47…187	—	20…60	100…240V AC, 50/60 Hz	150-C108NBD
		—		24V AC/DC(2)	150-C108NBR
	59…234	—	20…75	100…240V AC, 50/60 Hz	150-C135NBD
		—		24V AC/DC(2)	150-C135NBR
	116…348	—	75…100	100…240V AC, 50/60 Hz	150-C201NBD
		—		24V AC/DC(2)	150-C201NBR
	145…435	—	100…150	100…240V AC, 50/60 Hz	150-C251NBD
		—		24V AC/DC(2)	150-C251NBR
	183…549	—	100…200	100…240V AC, 50/60 Hz	150-C317NBD
		—		24V AC/DC(2)	150-C317NBR
	208…625	—	125…200	100…240V AC, 50/60 Hz	150-C361NBD
		—		24V AC/DC(2)	150-C361NBR
	277…831	—	200…300	100…240V AC, 50/60 Hz	150-C480NBD
		—		24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.
(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

Table 6 - 230V AC SMC-3 Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
230	1.7…5.1	0.25…1.1	1	100…240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	5.1…16	1.1…4	1…5	100…240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	9.1…27.6	2.2…7.5	3…7.5	100…240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	10.9…32.8	2.2…7.5	3…10	100…240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	14.3…43	4…11	3…15	100…240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	17.3…52	4…15	5…15	100…240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	21…64	5.5…18.5	7.5…20	100…240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	25…74	5.5…22	7.5…25	100…240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	34.6…104	7.5…30	15…40	100…240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	50…147	15…45	20…50	100…240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
	47…187	55	20…60	100…240V AC, 50/60 Hz	150-C108NBD
				24V AC/DC(2)	150-C108NBR
	59…234	75	25…75	100…240V AC, 50/60 Hz	150-C135NBD
				24V AC/DC(2)	150-C135NBR
	116…348	110	75…125	100…240V AC, 50/60 Hz	150-C201NBD
				24V AC/DC(2)	150-C201NBR
	145…435	132	100…150	100…240V AC, 50/60 Hz	150-C251NBD
				24V AC/DC(2)	150-C251NBR
	183…549	160	125…200	100…240V AC, 50/60 Hz	150-C317NBD
				24V AC/DC(2)	150-C317NBR
	208…625	200	150…250	100…240V AC, 50/60 Hz	150-C361NBD
				24V AC/DC(2)	150-C361NBR
	277…831	250	200…300	100…240V AC, 50/60 Hz	150-C480NBD
				24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

ALLEN BRADLEY SMC FLEX

Table 7 - 380/400/415/460V AC SMC-3 Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
380/400/415 (kW) 460 (Hp)	1.7…5.1	0.55…2.2	0.5…2	100…240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	5.1…16	2.2…7.5	2…7.5	100…240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	9.1…27.6	4…11	5…15	100…240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	10.9…32.8	4…15	5…15	100…240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	14.3…43	5.5…22	7.5…20	100…240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	17.3…52	7.5…22	7.5…30	100…240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	21…64	7.5…30	10…40	100…240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	25…74	11…37	10…50	100…240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	34.6…104	15…55	20…75	100…240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	50…147	22…75	25…100	100…240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
	47…187	90	40…125	100…240V AC, 50/60 Hz	150-C108NBD
				24V AC/DC(2)	150-C108NBR
	59…234	132	50…150	100…240V AC, 50/60 Hz	150-C135NBD
				24V AC/DC(2)	150-C135NBR
	116…348	160	150…250	100…240V AC, 50/60 Hz	150-C201NBD
				24V AC/DC(2)	150-C201NBR
	145…435	250	200…350	100…240V AC, 50/60 Hz	150-C251NBD
				24V AC/DC(2)	150-C251NBR
	183…549	315	250…450	100…240V AC, 50/60 Hz	150-C317NBD
				24V AC/DC(2)	150-C317NBR
	208…625	355	300…500	100…240V AC, 50/60 Hz	150-C361NBD
				24V AC/DC(2)	150-C361NBR
	277…831	450	350…700	100…240V AC, 50/60 Hz	150-C480NBD
				24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

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Table 8 - 500/575V AC SMC-3 Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.
500 (kW) 575 (Hp)	1.7…5.1	0.75…3	1…3	100…240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	5.1…16	3…7.5	3…10	100…240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	9.1…27.6	5.5…15	7.5…20	100…240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	10.9…32.8	5.5…22	7.5…30	100…240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	14.3…43	7.5…22	10…40	100…240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	17.3…52	11…30	15…50	100…240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	21…64	11…37	15…60	100…240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	25…74	15…45	20…60	100…240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	34.6…104	22…55	30…100	100…240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	50…147	30…90	40…150	100…240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
	47…187	132	50…150	100…240V AC, 50/60 Hz	150-C108NBD
				24V AC/DC(2)	150-C108NBR
	59…234	160	60…200	100…240V AC, 50/60 Hz	150-C135NBD
				24V AC/DC(2)	150-C135NBR
	116…348	250	250…300	100…240V AC, 50/60 Hz	150-C201NBD
				24V AC/DC(2)	150-C201NBR
	145…435	315	250…400	100…240V AC, 50/60 Hz	150-C251NBD
				24V AC/DC(2)	150-C251NBR
	183…549	400	300…500	100…240V AC, 50/60 Hz	150-C317NBD
				24V AC/DC(2)	150-C317NBR
	208…625	450	350…600	100…240V AC, 50/60 Hz	150-C361NBD
				24V AC/DC(2)	150-C361NBR
	277…831	560	400…900	100…240V AC, 50/60 Hz	150-C480NBD
				24V AC/DC(2)	150-C480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly.

(2) Separate 120V or 240V single phase is required for fan operation.

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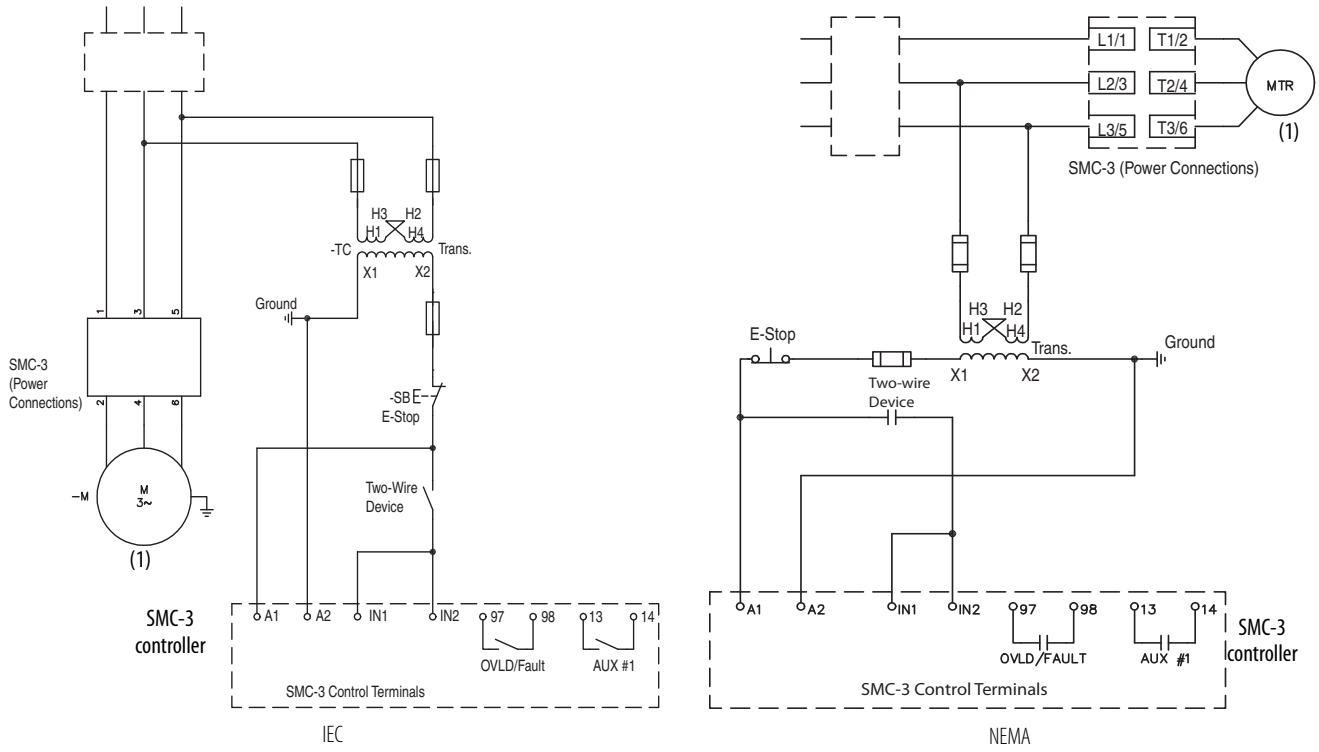
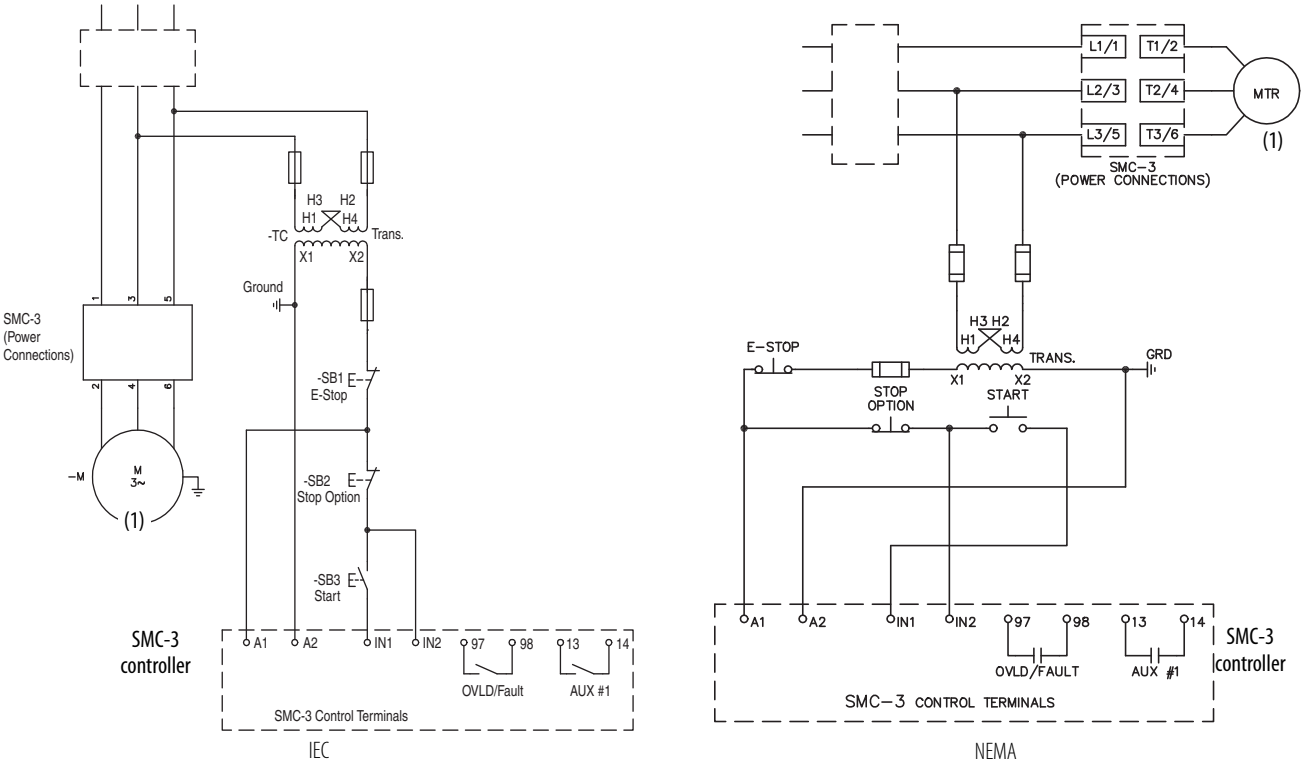
Typical Wiring Diagrams

Figure 1 - Two-wire Configuration



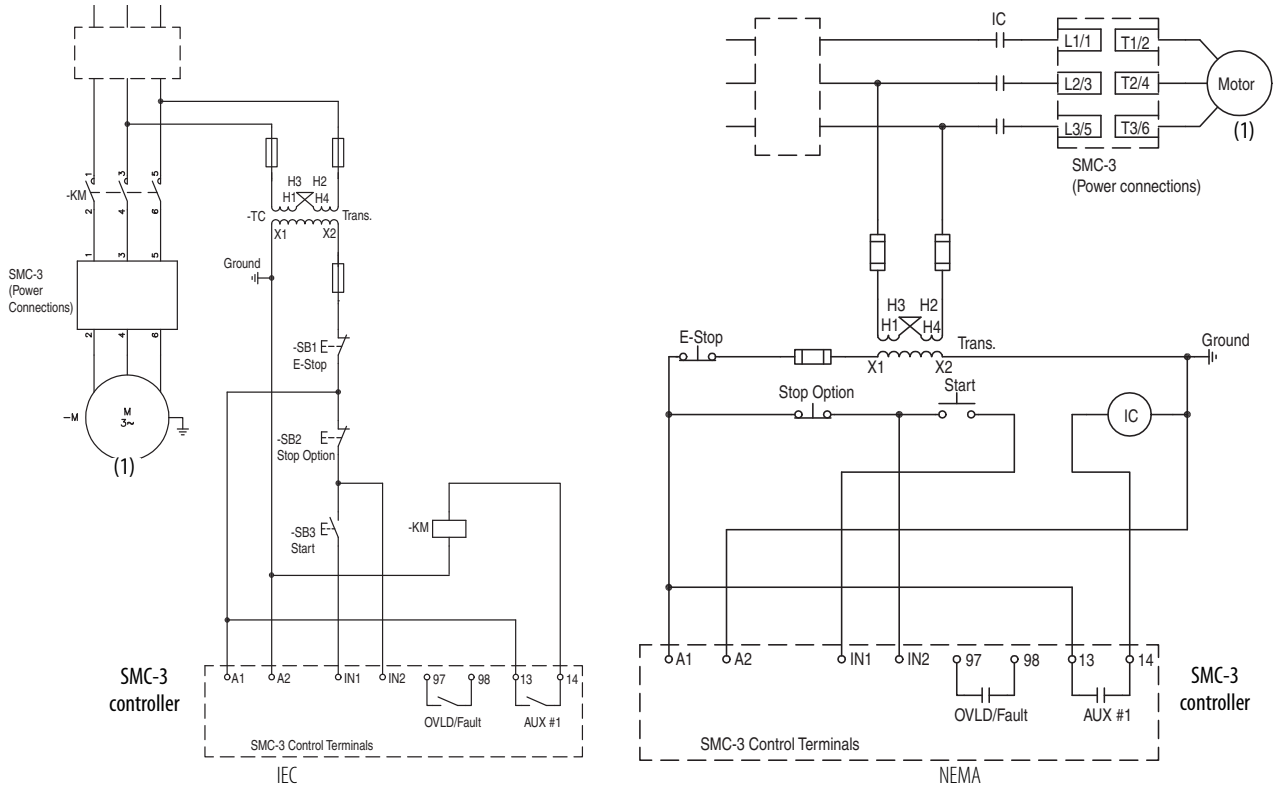
(1) Customer supplied.

Figure 2 - Three-wire Configuration



(1) Customer supplied.

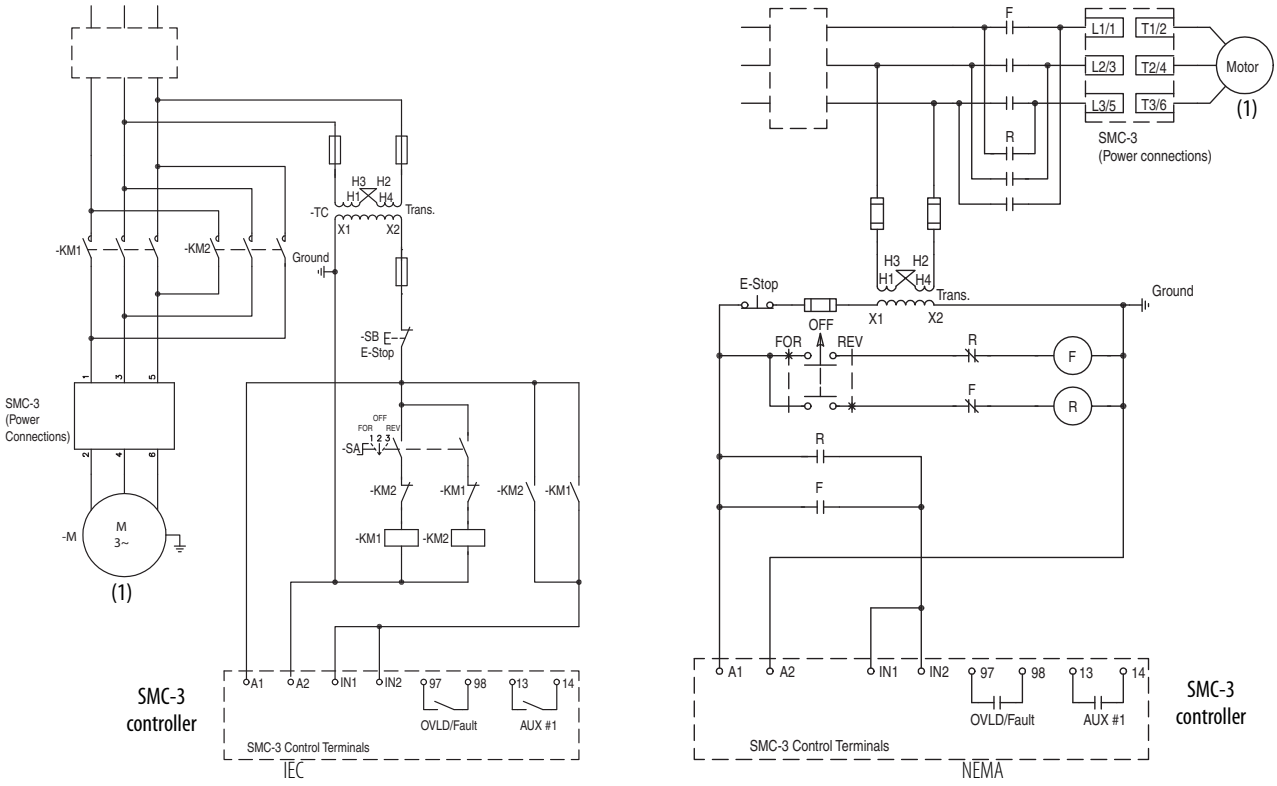
Figure 3 - Isolation Contactor Configuration



(1) Customer supplied.

Figure 4 - Reversing Configuration

- Note: Minimum off time = 1 second



(1) Customer supplied.

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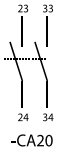
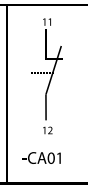
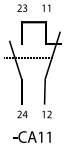
Accessories

Auxiliary Contact Blocks

Description	N.O.	N.C.	Connection Diagram	Cat. No.
Auxiliary Contact Blocks for side mounting with sequence terminal designations • 1- and 2-pole • Quick and easy mounting without tools • One block per device only	1	0	-CA10	150-CA10
	2	0	 -CA20	150-CA20
	0	1	 -CA01	150-CA01
	1	1	 -CA11	150-CA11 (Form C)

Fans

Description		For Use With	Pkg. Qty.	Cat. No.
Fan • Field installed	Optional	150-C3…37	1	150-CF64
	Replacement	150-C43…85		150-CF147
		150-C108, 150-C135		41391-801-03
		150-C201, 150-C251		41391-801-01
		150-C317…C480		41391-801-02

Connecting Modules

Description	For Use With	Pkg. Qty.	Cat. No.
Connecting modules to 140-M • Electrical interconnection between SMC-3 and 140-M. • Motor protector and SMC-3 must be mounted separately.	Connects 140-M-C to 150-C3…25	1	150-CC25
	Connects 140-M-D to 150-C3…25	1	150-CD25
	Connects 140-M-F to 150-C3…37	1	150-CF45
Connecting modules to 100-C • Electrical interconnection between SMC-3 and 100-C. • Contactor and SMC-3 must be mounted separately.	Connects 100-C09…23 to 150-C3…19	1	150-CI23
	Connects 100-C30…37 to 150-C3…37	1	150-CI37

Protective Modules

Do not place protective modules on the load side of a device when using an inside-the-delta connection.

Description		For Use With	Pkg. Qty.	Cat. No.
	480V Protective Module	150-C3…37NB	1	150-C84
		150-C43…85NB	1	150-C84P
		150-C108…480NB (line and/or load)	1	150-F84L
	600V Protective Module	150-C3…37NC	1	150-C86
		150-C43…85NC (line and/or load)	1	150-C86P
		150-C108…480NC (line and/or load)	1	150-F86L

IEC Line- or Load-side Terminal Covers

	Description[1] [2]	Current Range [A]	Pkg. Qty.	Cat. No.
	• Dead front protection • IP2X finger safe when used with 250 MCM cable	108…135	1	150-TC1
		201…251	1	150-TC2
	• Dead front protection • IP2X finger safe when used with 500 MCM cable	317…480	1	150-TC3

(1) 3…85 A units have terminal covers as standard. No additional terminal guards are required.

(2) SMC-3 controllers that are rated from 108…480 A are shipped with one terminal cover as standard.

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Terminal Lug Kits

	Connection Type	Current Range [A](1)	Wire Size Range	Total No. of Terminal Lugs Possible Each Side		Pkg. Qty.	Cat. No.
				Line Side	Load Side		
	Line	108…135(2)	#6…250 MCM AWG 16 mm²…120 mm²	3	3	3	199-LF1
		201…251(2)		6	6	3	
		317…480(2)	#4…500 MCM AWG 25 mm²…240 mm²	6	6	3	199-LG1
	Delta	108…135	#4…500 MCM AWG 25 mm²…240 mm²	1	6(3)		1494R-N15
		201…251	1/0…250 MCM AWG 50 mm²…120 mm²	2	12(3)		1494R-N14
		317…480	3/0…500 MCM AWG 95 mm²…240 mm²	1	12(4)		150-LGSMC

(1) 3…85 A units have box lugs standard. No additional lugs are required.

(2) When a multi-conductor lug is required, refer to the installation instructions for appropriate lug catalog number.

(3) When connected in an inside-the-delta configuration, use Cat. No. 199-LF1 for load-side connections (T1…T6).

(4) When connected in an inside-the-delta configuration, use Cat. No. 199-LG1 for load-side connections (T1…T6).

Marking Tags and Covers

Description		For Use With	Pkg. Qty.	Cat. No.
	Marking Tag Sheet • 160 perforated paper labels each, 6 x 17 mm, to be used with a transparent cover	150-C, 150-D	10	100-FMP
	Transparent Cover • To be used with marking tag sheets		100	100-FMC

Remote Reset Solenoid

Description		For Use With	Pkg. Qty.	Cat. No.
	Remote Reset Solenoid • for remote reset of electronic overload	193-T all, 150-C	1	193-ER1⊗

⊗ Voltage Suffix Codes

- Available Coil Voltages: 12...600V 50 Hz/12...600V 60 Hz
- Standard Coil Voltages:

Voltage	24	48	110	115	120	220	240
50 Hz	J	—	D	—	—	A	—
60 Hz	J	—	—	—	D	—	A
DC	Z24	Z48	—	Z01	—	—	—

- Surcharge for special voltages up to 20 pieces (no surcharge for quantities greater than 20 pieces.)

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Specifications

Table 9 - Standard Features

Attribute	Description
Selectable Start Times	2, 5, 10, 15, 20, 25, or 30 s
Selectable Initial Torque	15%, 25%, 35%, and 65% of locked rotor torque
Selectable Current Limit	150%, 250%, 350%, and 450% of full load current
Selectable Kick Start — 450% FLA	0, 0.5, 1.0, or 1.5 s
Selectable Soft Stop	Off, 100%, 200%, or 300% of the start time setting when wired
Selectable Overload Trip Class	Trip Class 10, 15, or 20

Table 10 - Power Circuit Ratings

Attribute		UL/CSA/NEMA	IEC
Rated Operation Voltage		200…480V AC (-15%, +10%) 200…600V AC(-15%, +10%)	200…480V AC — 400V AC 500V AC — 500V AC
Rated Insulation Voltage		600V AC	500V AC
Dielectric Withstand		2200V AC	2500V AC
Repetitive Peak		200…480V AC: 1400V 200…600V AC: 1600V	200…480V AC: 1400V 500V AC: 1600V
Operating Frequency		50/60 Hz	50/60 Hz
Utilization Category	1…37 A	—	AC-53b: 3.5-15:3585
	43…60 A	—	AC-53b: 4.5-30:1770
	85 A	—	AC-53b: 4.5-30:3570
	108 A	—	AC-53b: 4.5-30:1770
	135 A	—	AC-53b: 3.5-30: 1770
	201…251 A	—	AC-53b: 3.5-30: 1770
	317…480 A	—	AC-53b: 3.5-30: 1770
Number of Poles		Equipment is designed for 3-phase only	
Rated Impulse Voltage		6 kV	
DV/DT Protection		1000V/µs	
Overvoltage Category		III	

Table 11 - Standards Compliance and Certifications

Standards Compliance
UL 508
CSA C22.2 No.14
EN/IEC 60947-1
EN/IEC 60947-4-2

Certifications
c-UL-us Listed (Open Type) (File No. E96956, Guides NMFT, NMFT7)
CSA Certified (File No. LR 1234)
CE Marked (Open Type) per EMC and Low Voltage Directive
CCC Certified

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Table 12 - Short-circuit Protection Ratings

Attribute		Description			
SCPD Performance		Type 1[1]			
		Non-Time Delay		Thermal Magnetic Circuit Breaker	
SCPD List[2]		Max. Standard Available Fault	Max. Standard Fuse [A][3]	Max. Standard Available Fault	Max. Circuit Breaker [A]
Line Device Operational Current Rating [A]	3	5 kA	12	5 kA	15
	9	5 kA	30	5 kA	30
	16	5 kA	60	5 kA	60
	19	5 kA	70	5 kA	70
	25	5 kA	100	5 kA	100
	30	10 kA	110	10 kA	110
	37	10 kA	125	10 kA	125
	43	10 kA	150	10 kA	150
	60	10 kA	225	10 kA	225
	85	10 kA	300	10 kA	300
	108	10 kA	400	10 kA	300
	135	10 kA	500	10 kA	400
	201	18 kA	600	18 kA	600
	251	18 kA	700	18 kA	700
	317	30 kA	800	30 kA	800
	361	30 kA	1000	30 kA	1000
	480	42 kA	1200	42 kA	1200
Delta Device Operational Current Rating [A]	5.1	5 kA	15	5 kA	15
	16	5 kA	60	5 kA	60
	27.6	5 kA	70	5 kA	70
	32.8	5 kA	125	5 kA	125
	43	5 kA	150	5 kA	150
	52	10 kA	200	10 kA	200
	64	10 kA	250	10 kA	250
	74	10 kA	250	10 kA	250
	104	10 kA	400	10 kA	300
	147	10 kA	400	10 kA	400
	187	10 kA	600	10 kA	500
	234	10 kA	700	10 kA	700
	348	18 kA	1000	18 kA	1000
	435	18 kA	1200	18 kA	1200
	549	30 kA	1600	30 kA	1600
	625	30 kA	1600	30 kA	1600
	831	42 kA	1600	30 kA	1600
	831	42 kA	1600	42 kA	1200

(1) Type 1 performance/protection indicates that, under a short-circuit condition, the fused or circuit breaker-protected starter shall cause no danger to persons or installation but may not be suitable for further service without repair or replacement.

(2) Consult local codes for proper sizing of short-circuit protection.

(3) Non-time delay fuses (K5).

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Table 13 - Short-circuit Protection Performance, High Fault, Type 1

SCPD Performance[1]			Type 1 Ratings[2]				
Motor Connection Type	Cat. No.	Current Rating [A]	Class J or Class L Fuse[3]		Inverse Time (Thermal Magnetic) Circuit Breaker 480V, 65 kA Max.		
			Max. High Capacity Available Fault (600V) [kA]	Max. Current [A]	Max. Current [A]	Cat. No.	Rating Plug Cat. No.
Line Connection	150-C3N…	3	65	6	15	140G-G6C3-C15	—
	150-C9N…	9		15	30	140G-G6C3-C30	—
	150-C16N…	16		30	60	140G-G6C3-C60	—
	150-C19N…	19		40	70	140G-G6C3-C70	—
	150-C25N…	25	70	50	100	140G-J6F3-D10	—
	150-C30N…	30		60	110	140G-J6F3-D11	—
	150-C37N…	37		60	125	140G-J6F3-D12	—
	150-C43N…	43		90	150	140G-J6F3-D15	—
	150-C60N…	60		125	225	140G-J6F3-D22	—
	150-C85N…	85		175	250	140G-J6F3-D25	—
	150-C108N…	108		200	300	140G-K6F3-D30	—
	150-C135N…	135		250	400	140G-K6F3-D40	—
	150-C201N…	201		350	600	140G-M6F3-D60	—
	150-C251N…	251		400	700	140G-M6F3-D80	—
	150-C317N…	317	69	500	800	140G-N6H3-E12	140G-NRP-D80
	150-C361N…	361		600	1000	140G-N6H3-E12	140G-NRP-E10
	150-C480N…	480		800	1200	140G-N6H3-E12	—
Inside-the-Delta Connection	150-C3N…	3	69	10	20	140G-G6C3-C20	—
	150-C9N…	9		30	60	140G-G6C3-C60	—
	150-C16N…	16		60	100	140G-G6C3-D10	—
	150-C19N…	19		70	125	140G-G6C3-D12	—
	150-C25N…	25	70	90	150	140G-J6F3-D15	—
	150-C30N…	30		100	200	140G-J6F3-D20	—
	150-C37N…	37		100	250	140G-J6F3-D25	—
	150-C43N…	43		150	250	140G-J6F3-D25	—
	150-C60N…	60		225	250	140G-J6F3-D25	—
	150-C85N…	85		300	250	140G-J6F3-D25	—
	150-C108N…	108		400	400	140G-K6F3-D40	—
	150-C135N…	135		400	400	140G-K6F3-D40	—
	150-C201N…	201		600	800	140G-M6F3-D80	—
	150-C251N…	251		800	800	140G-M6F3-D80	—
	150-C317N…	317	69	1000	1200	140G-N6H3-E12	—
	150-C361N…	361		1200	1200	140G-N6H3-E12	—
	150-C480N…	480		1600	1200	140G-N6H3-E12	—

(1) Consult local codes for proper sizing of short-circuit protection.

(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.

(3) High Capacity fault ratings when used with time delay Class J or time delay Class L fuse.

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Electrical Ratings

Table 14 - Control Circuits

	UL/CSA/NEMA	IEC
Rated Operational Voltage (+10%, –15%)	100…240V AC, 24V AC/DC	100…240V AC, 24V AC/DC
Rated Insulation Voltage	250V	250V AC
Rated Impulse Voltage	2.5 kV	4 kV
Dielectric Withstand	1500V AC	2000V AC
Overvoltage Category	II	III(1)
Operating Frequency	50/60 Hz	50/60 Hz
Input on-state voltage minimum, during start (IN1, IN2)	85V AC, 19.2V DC / 19.2V AC	
Input on-state current (IN1, IN2)	9.8 mA @120V AC/19.6 mA @ 240V AC, 7.3 mA @ 24V AC/DC	
Input off-state voltage maximum (IN1, IN2)	40V AC, 17V DC / 12V AC	
Input off-state current @ input off-state voltage (IN1, IN2)	<10 mA, <12 mA	

(1) Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

Table 15 - Control Power During Start

		UL/CSA/NEMA	IEC
With Fan	3…37 A	215 mA @ 120V AC / 180 mA @ 240V AC, 800 mA @ 24V DC / 660 mA @ 24V AC	
	43…85 A	200 mA @ 120V AC / 100 mA @ 240V AC, 700 mA @ 24V AC/DC	
		Fan Power	Control Power
	108…135 A	20VA	200 mA @ 120V AC / 120 mA @ 240V AC, 600 mA @ 24V AC/DC
	201…251 A	40VA	
	317…480 A	60VA	
Without Fan	3…37 A	205 mA @ 120V AC / 145 mA @ 240V AC, 705 mA @ 24V DC / 580 mA @ 24V AC	

Table 16 - Steady-state Heat Dissipation and Overload Current Range

Controller Rating [A]	Steady State Heat Dissipation [W]	Overload Current Range [A]
3	11	1…3
9	12	3…9
16	14	5.3…16
19	15	6.3…19
25	17	8.3…25
30	19	10…30
37	24	12.3…37
43	34	14.3…43
60	50	20…60
85	82	28.3…85
108	62	27…108
135	75	34…135
201	129	67…201
251	147	84…251
317	174	106…317
361	194	120…361
480	239	160…480

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Table 17 - Environmental Ratings

Attribute	Rating
Operating Temperature Range	-5…+50 °C (23…122 °F) (open) -5…+40 °C (23…104 °F) (enclosed)
Storage and Transportation Temperature Range	-25…+85 °C (-13…+185 °F)
Altitude	2000 m (6560 ft)
Humidity	5…95% (noncondensing)
Pollution Degree	2
Type of Protection	IP2X

Table 18 - Mechanical Ratings

Attribute			Rating
Resistance to Vibration	Operational		1.0 G Peak, 0.15 mm (0.006 in.) displacement
	Non-Operational		2.5 G Peak, 0.38 mm (0.015 in.) displacement
Resistance to Shock	Operational		15 G
	Non-Operational		30 G
Line Power Terminals	Cable Size Tightening Torque	3…37 A	2.5…25 mm^2 (14…4 AWG); 2.3…3.4 N•m (30 in•lbs) if 1 25 mm^2 (4 AWG) wire in top terminal, 4.0 N•m (35 lb•in.)
		43…85 A	2.5…95 mm^2 (14…3/0 AWG) 11.3…12.4 N•m (100…110 in•lbs)
	Power Pole Holes	108…135 A	One M10 x 1.5 diameter hole per power pole
		201…251 A	Two M10 x 1.5 diameter holes per power pole
		317…480 A	Two M12 x 1.75 diameter holes per power pole
Load Power Terminals	Cable Size Tightening Torque	3…37 A	2.5…16 mm^2 (14…6 AWG) 2.3…2.5 N•m (20…22.5 in•lbs)
		43…85 A	2.5…50 mm^2 (14…1 AWG) 11.3…12.4 N•m (100…110 in•lbs)
	Power Pole Holes	108…135 A	One M10 x 1.5 diameter hole per power pole
		201…251 A	Two M10 x 1.5 diameter holes per power pole
		317…480 A	Two M12 x 1.75 diameter holes per power pole
Control Terminals	Cable Size Tightening Torque	All	0.2…2.5 mm^2 (24…14 AWG) 0.45…0.9 N•m (4.0…8.0 in•lbs)

Table 19 - Other Ratings

		UL/CSA/NEMA	IEC
EMC Emission Levels	Conducted Radio Frequency Emissions	—	Class A
	Radiated Emissions	—	Class A
EMC Immunity Levels	Electrostatic Discharge	4 kV Contact and 8 kV Air Discharge	8 kV Air Discharge
	Radio Frequency Electromagnetic Field	—	Per EN/IEC 60947-4-2
	Fast Transient	—	Per EN/IEC 60947-4-2
	Surge Transient	—	Per EN/IEC 60947-4-2

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Table 20 - Auxiliary Contacts

		UL/CSA/NEMA	IEC
Rated Operational Voltage		250V AC/30V DC	250V AC/30V DC
Rated Insulation Voltage		250V	250V AC
Rated Impulse Voltage		2.5 kV	4 kV
Dielectric Withstand		1500V AC	2000V AC
Overvoltage Category		II	III(1)
Operating Frequency		50/60 Hz	50/60 Hz
Utilization Category		D300/D300	AC-15/DC
TB-97, -98 (OVLD/Fault)	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	0.6 A @ 120V AC and 0.3 A @ 240V AC	
	Conventional Thermal Current I_{th}	1 A	
	Make/Break VA	432/72	
TB-13, -14 Aux 1 (Normal/Up-to-Speed)	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	0.6 A @ 120V AC and 0.3 A @ 240V AC	
	Conventional Thermal Current I_{th}	1 A	
	Make/Break VA	432/72	

(1) Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

Table 21 - Side-mount Auxiliary Contacts

		UL/CSA/NEMA	IEC
Rated Operational Voltage		250V AC/30V DC	250V AC/30V DC
Rated Insulation Voltage		250V	250V AC
Rated Impulse Voltage		2.5 kV	4 kV
Dielectric Withstand		1500V AC	2000V AC
Overvoltage Category		II	III(1)
Operating Frequency		50/60 Hz	50/60 Hz
TB-23, -24 (Normal/Up-to-Speed) TB-33, -34 (Normal/Up-to-Speed)	Utilization Category	C300/R150	AC-15/DC-13
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	1.5 A @ 120V AC, 0.75 A @ 240V AC, 1.17 A @ 24V DC	
	Conventional Thermal Current I_{th}	2.5 A	
	Make/Break VA	1800/180V AC, 28V DC (resistive)	
TB-11, -12 (Normal/Up-to-Speed)	Type of Control Circuit	B300/R300	AC-15/DC-13
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Closed (N.C.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	3 A @ 120V AC, 1.5 A @ 240V AC, 1.17 A @ 24V DC	
	Conventional Thermal Current I_{th}	5 A	
	Make/Break VA	3600/360VA, 28VA (DC resistive)	

(1) Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

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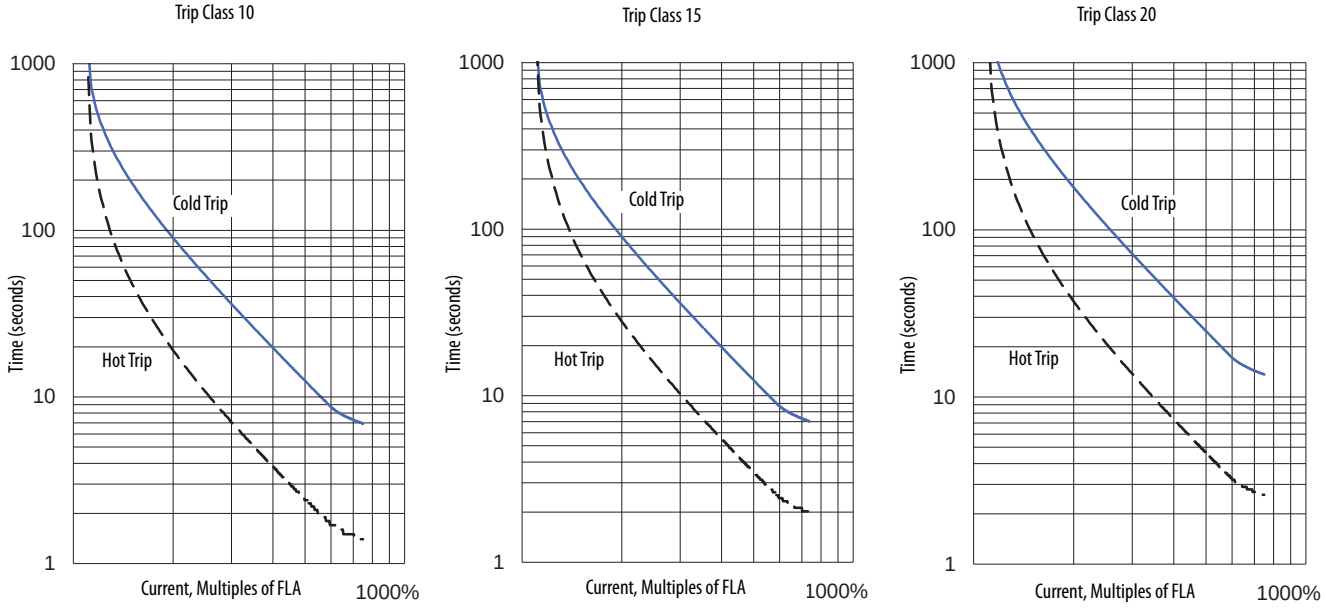
Overload Trip Curves

Figure 5 - SMC-3 Overload Trip curves—Trip Class 10, 15, and 20



Starts per Hour Curves

Figure 6 - SMC-3 Starts per hour (3…37 A) 40 °C, 100% Duty Cycle, 10 s, 350%

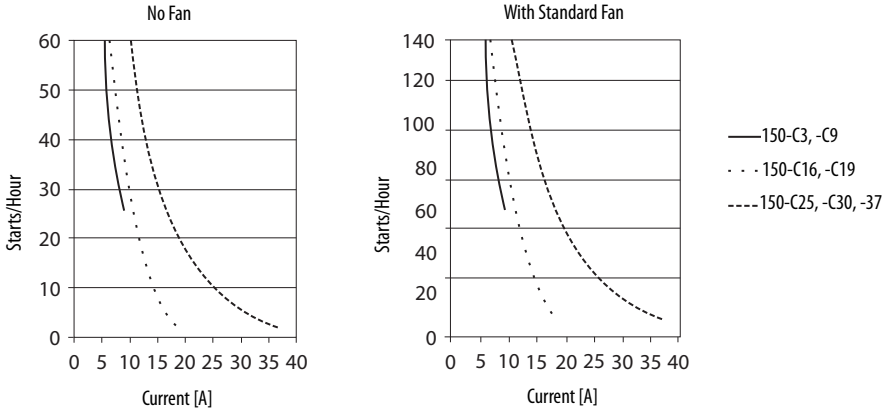


Figure 7 - SMC-3 Starts per hour (43…85 A) 40 °C, 100% Duty Cycle, 20 s, 350%

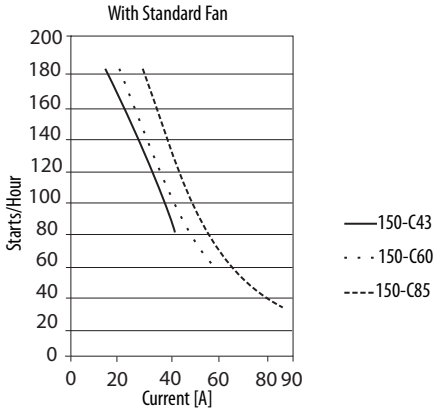


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Figure 8 - SMC-3 Starts per hour (108…135 A) 40 °C, 100% Duty Cycle, 20 s, 350%

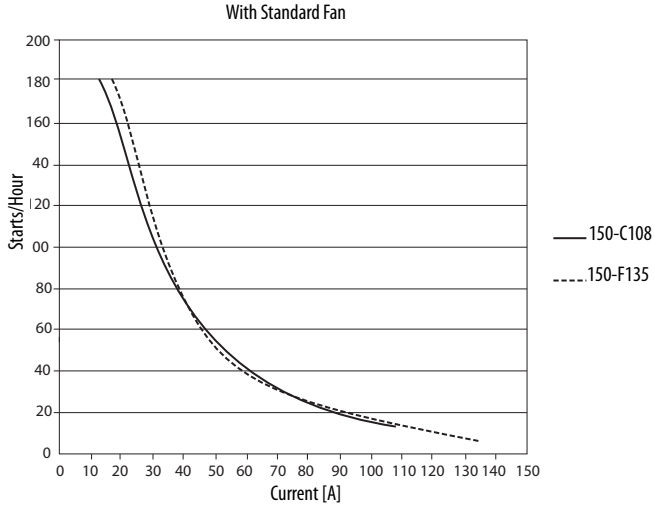
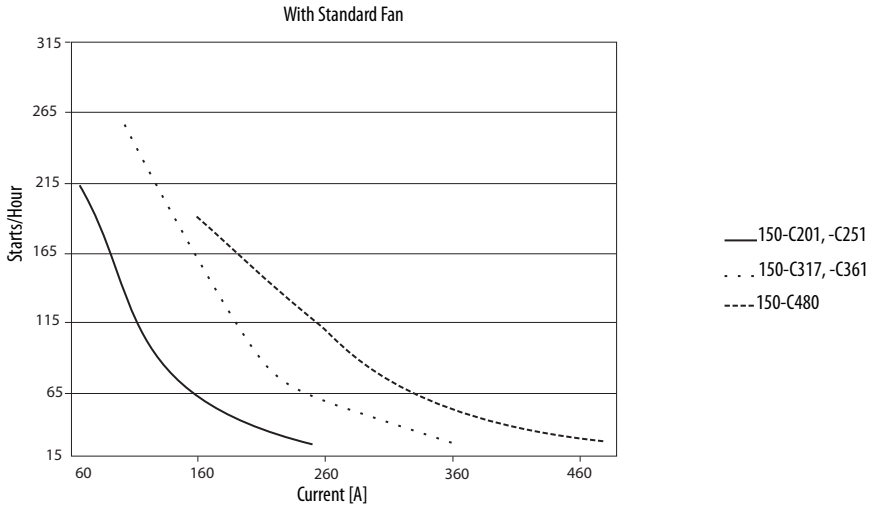


Figure 9 - SMC-3 Starts per hour (201…480 A) 40 °C, 100% Duty Cycle, 20 s, 350%



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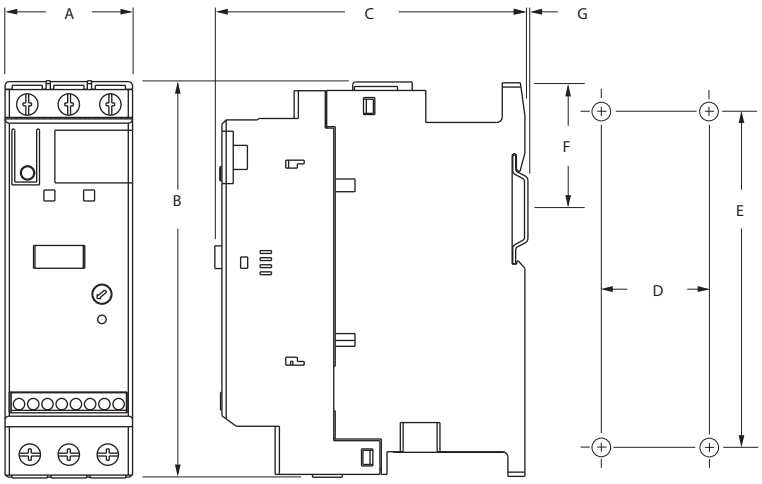
Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

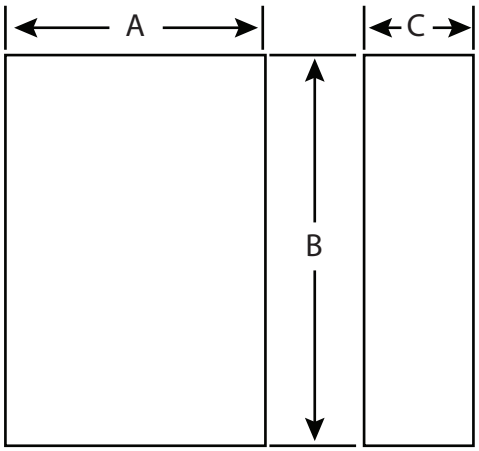
Figure 10 - Open Type Controllers



Controller Rating [A]	A	B	C	D	E	F	G	Mounting Hole Size	Weight kg (lbs)
1…37(1)	44.8 (1-49/64)	139.7 (5-1/2)	110 (4-21/64)	35 (1-3/8)	132 (5-13/64)	46.4 (1.81)	2 (1/16)	4.6 (0.18)	0.86 (1.9)
43…85(2)	72 (2.83)	206 (8.11)	130 (5.12)	55 (2.17)	198 (7.8)	102 (4.02)	2 (1/16)	5.3 (0.21)	2.25 (5.0)
108…135(2)	196.4 (7.74)	443.7 (17.47)	205.2 (8.08)	166.6 (6.56)	367 (14.45)	—	—	7.5 (0.295)	15 (33)
201…251(2)	225 (8.86)	560 (22.05)	265.3 (10.45)	150 (5.91)	504.1 (19.85)	—	—	11.5 (0.45)	30.4 (67)
317…480(2)	290 (11.42)	600 (23.62)	298 (11.73)	200 (7.87)	539.2 (21.23)	—	—	11.5 (0.45)	45.8 (101)

(1) Optional fan does not increase dimension B.
(2) Fan is standard.

Figure 11 - Minimum Enclosure Size



Controller Rating [A]	B Height	A Width	C Depth	Fan Requirements
1…37	305 (12)	224 (9)	152 (6)	none
43…85	406 (16)	305 (12)	203 (8)	none
108…135	762 (30)	610 (24)	305 (12)	none
201…251	965 (38)	762 (30)	356 (14)	none
317…480	1295 (51)	914 (36)	356 (14)	none

SMC Flex Controllers

The SMC Flex controller is modular so that it can help simplify installation and commissioning. A built-in LCD display, keypad, and flexible communications provide optimized configuration, advanced performance, diagnostics, and protection. Three-phase control, electronic overload, and integrated bypass along with removable control module, power modules, and fan assembly are combined in a cost-effective package for your demanding applications.

Modes of operation include the following:

- Soft Start
- Current Limit Start
- Selectable Kickstart
- Coast-to-rest
- Soft Stop
- Full Voltage Start
- Dual Ramp Start
- Pump Start
- Preset Slow Speed
- Pump Stop
- Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking
- Linear Speed Acceleration (Tachometer required)

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Use ProposalWorks to configure the SMC Flex controller. ProposalWorks is available from http://www.rockwellautomation.com/global/e-tools/overview.page.

150	–	F135	N	B	D	B
a		b	c	d	e	f

a	
Bulletin Number	
Code	**Description**
150	Solid-state Controller

b	
Controller Rating	
Code	**Description**
F5	5 A, 3 Hp @ 460V AC
F25	25 A, 15 Hp @ 460V AC
F43	43 A, 30 Hp @ 460V AC
F60	60 A, 40 Hp @ 460V AC
F85	85 A, 60 Hp @ 460V AC
F108	108 A, 75 Hp @ 460V AC
F135	135 A, 100 Hp @ 460V AC
F201	201 A, 150 Hp @ 460V AC
F251	251 A, 200 Hp @ 460V AC
F317	317 A, 250 Hp @ 460V AC
F361	361 A, 300 Hp @ 460V AC
F480	480 A, 400 Hp @ 460V AC
F625	625 A, 500 Hp @ 460V AC
F780	780 A, 600 Hp @ 460V AC
F970	970 A, 800 Hp @ 460V AC
F1250	1250 A, 1000 Hp @ 460V AC

c	
Enclosure Type	
Code	**Description**
N	Open

d	
Input Line Voltage	
Code	**Description**
B	200…460V AC, 3-Phase, 50 and 60 Hz
C	200…575V AC, 3-Phase, 50 and 60 Hz
Z	230…690V AC, 3-Phase, 50 and 60 Hz (Open only, 108 A and above) (690V AC line connected only)

e	
Control Voltage	
Code	**Description**
D	100…240V AC (5…480 A units)
R	24V AC/DC (5…480 A units)
E	110/120V AC (625…1250 A units)
A	230/240V AC (625…1250 A units)

f	
Options - Select only one	
Code	**Description**
Blank	Standard
B	Pump Control
D	Braking Control

ALLEN BRADLEY SMC FLEX

Product Selection

For use with Line-connected Motors

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 22 - 200/208V AC SMC Flex Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
200/208	1…5	—	1	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	5...25	—	5	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	8.6...43	—	10	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	12...60	—	15	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	17...85	—	25	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	27…108	—	30	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	34…135	—	40	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	67…201	—	60	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	84…251	—	75	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	106…317	—	100	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	120…361	—	125	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	160…480	—	150	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	208…625	—	200	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	260…780	—	250	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	323…970	—	350	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	416…1250	—	400	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller in the Full Voltage starting mode. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 23 - 230V AC SMC Flex Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
230	1…5	1.1	1	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	5...25	5.5	7.5	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	8.6...43	11	15	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	12...60	15	20	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	17...85	22	30	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	27…108	30	40	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	34…135	37	50	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	67…201	55	75	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	84…251	75	100	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	106…317	90	125	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	120…361	110	150	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	160…480	132	200	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	208…625	200	250	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	260…780	250	300	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	323…970	315	400	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	416…1250	400	500	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 24 - 400/415/460V AC SMC Flex Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
400/415 (kW) 460 (Hp)	1…5	2.2	3	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	5...25	11	15	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	8.6...43	22	30	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	12...60	30	40	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	17...85	45	60	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	27…108	55	75	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	34…135	75	100	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	67…201	110	150	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	84…251	132	200	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	106…317	160	250	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	120…361	200	300	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	160…480	250	400	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	208…625	355	500	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	260…780	450	600	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	323…970	560	800	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	416…1250	710	1000	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 25 - 500/575V AC SMC Flex Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
500 (kW) 575 (Hp)	1...5	2.2	3	100…240V AC, 50/60 Hz	150-F5NCD
				24V AC/DC	150-F5NCR
	5...25	15	20	100…240V AC, 50/60 Hz	150-F25NCD
				24V AC/DC	150-F25NCR
	8.6...43	22	40	100…240V AC, 50/60 Hz	150-F43NCD
				24V AC/DC	150-F43NCR
	12...60	37	50	100…240V AC, 50/60 Hz	150-F60NCD
				24V AC/DC	150-F60NCR
	17...85	55	75	100…240V AC, 50/60 Hz	150-F85NCD
				24V AC/DC	150-F85NCR
	27…108	75	100	100…240V AC, 50/60 Hz	150-F108NCD
				24V AC/DC	150-F108NCR
	34…135	90	125	100…240V AC, 50/60 Hz	150-F135NCD
				24V AC/DC	150-F135NCR
	67…201	132	200	100…240V AC, 50/60 Hz	150-F201NCD
				24V AC/DC	150-F201NCR
	84…251	160	250	100…240V AC, 50/60 Hz	150-F251NCD
				24V AC/DC	150-F251NCR
	106…317	200	300	100…240V AC, 50/60 Hz	150-F317NCD
				24V AC/DC	150-F317NCR
	120…361	250	350	100…240V AC, 50/60 Hz	150-F361NCD
				24V AC/DC	150-F361NCR
	160…480	315	500	100…240V AC, 50/60 Hz	150-F480NCD
				24V AC/DC	150-F480NCR
	208…625	450	600	110/120V AC, 50/60 Hz	150-F625NCE
				230/240V AC, 50/60 Hz	150-F625NCA
	260…780	560	800	110/120V AC, 50/60 Hz	150-F780NCE
				230/240V AC, 50/60 Hz	150-F780NCA
	323…970	710	1000	110/120V AC, 50/60 Hz	150-F970NCE
				230/240V AC, 50/60 Hz	150-F970NCA
	416…1250	900	1300	110/120V AC, 50/60 Hz	150-F1250NCE
				230/240V AC, 50/60 Hz	150-F1250NCA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 26 - 690V AC SMC Flex Controllers for Use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type Cat. No.(2)
690/Y (kW)(3) 600 (Hp)	27…108	90	100	100…240V AC, 50/60 Hz	150-F108NZD
	34…135	132	125	100…240V AC, 50/60 Hz	150-F135NZD
	67…201	160	200	100…240V AC, 50/60 Hz	150-F201NZD
	84…251	200	250	100…240V AC, 50/60 Hz	150-F251NZD
	106…317	315	400	100…240V AC, 50/60 Hz	150-F317NZD
	120…361	355	450	100…240V AC, 50/60 Hz	150-F361NZD
	160…480	450	600	100…240V AC, 50/60 Hz	150-F480NZD
	208…625	630	800	110/120V AC, 50/60 Hz	150-F625NZE
				230/240V AC, 50/60 Hz	150-F625NZA
	260…780	800	1000	110/120V AC, 50/60 Hz	150-F780NZE
				230/240V AC, 50/60 Hz	150-F780NZA
	323…970	1000	1300	110/120V AC, 50/60 Hz	150-F970NZE
				230/240V AC, 50/60 Hz	150-F970NZA
	416…1250	1200	1600	110/120V AC, 50/60 Hz	150-F1250NZE
				230/240V AC, 50/60 Hz	150-F1250NZA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

(3) To be used only in a Y-type system.

ALLEN BRADLEY SMC FLEX

For Use with Delta-connected Motors

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 27 - 200/208V AC SMC Flex Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
200/208	1.7…8.7	—	2	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	8.7…43	—	10	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	14.9…74	—	20	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	20.8…104	—	30	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	29.4…147	—	40	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	47…187	—	60	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	59…234	—	75	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	116…348	—	100	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	145…435	—	150	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	183…549	—	200	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	208…625	—	200	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	277…831	—	300	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	283…850	—	300	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300…900	—	300	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400…1200	—	400	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533…1600	—	500	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 28 - 230V AC SMC Flex Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
230	1.7…8.7	2.2	2	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	8.7…43	11	15	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	14.9…74	22	25	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	20.8…104	30	40	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	29.4…147	45	50	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	47…187	55	60	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	59…234	75	75	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	116…348	110	125	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	145…435	132	150	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	183…549	160	200	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	208…625	200	250	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	277…831	250	350	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	283…850	250	350	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300…900	250	350	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400…1200	400	400	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533…1600	500	600	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

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Table 29 - 400/415/460V AC SMC Flex Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
400/415 (kW) 460 (Hp)	1.7…8.7	4	5	100…240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	8.7…43	22	30	100…240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	14.9…74	37	50	100…240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	20.8…104	55	75	100…240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	29.4…147	75	100	100…240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	47…187	90	125	100…240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	59…234	132	150	100…240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	116…348	160	250	100…240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	145…435	250	350	100…240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	183…549	315	450	100…240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	208…625	355	500	100…240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	277…831	450	700	100…240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	283…850	500	700	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300…900	500	700	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400…1200	710	1000	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533…1600	900	1400	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 30 - 500/575V AC SMC Flex Controllers for Use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Open Type Cat. No.(3)
500 (kW) 575 (Hp)	1.7…8.7	5.5	7.5	100…240V AC, 50/60 Hz	150-F5NCD
				24V AC/DC	150-F5NCR
	8.7…43	15	40	100…240V AC, 50/60 Hz	150-F25NCD
				24V AC/DC	150-F25NCR
	14.9…74	45	60	100…240V AC, 50/60 Hz	150-F43NCD
				24V AC/DC	150-F43NCR
	20.8…104	55	100	100…240V AC, 50/60 Hz	150-F60NCD
				24V AC/DC	150-F60NCR
	29.4…147	90	150	100…240V AC, 50/60 Hz	150-F85NCD
				24V AC/DC	150-F85NCR
	47…187	132	150	100…240V AC, 50/60 Hz	150-F108NCD
				24V AC/DC	150-F108NCR
	59…234	160	200	100…240V AC, 50/60 Hz	150-F135NCD
				24V AC/DC	150-F135NCR
	116…348	250	350	100…240V AC, 50/60 Hz	150-F201NCD
				24V AC/DC	150-F201NCR
	145…435	315	400	100…240V AC, 50/60 Hz	150-F251NCD
				24V AC/DC	150-F251NCR
	183…549	400	500	100…240V AC, 50/60 Hz	150-F317NCD
				24V AC/DC	150-F317NCR
	208…625	450	600	100…240V AC, 50/60 Hz	150-F361NCD
				24V AC/DC	150-F361NCR
	277…831	560	900	100…240V AC, 50/60 Hz	150-F480NCD
				24V AC/DC	150-F480NCR
	283…850	560	900	110/120V AC, 50/60 Hz	150-F625NCE
				230/240V AC, 50/60 Hz	150-F625NCA
	300…900	630	900	110/120V AC, 50/60 Hz	150-F780NCE
				230/240V AC, 50/60 Hz	150-F780NCA
	400…1200	800	1300	110/120V AC, 50/60 Hz	150-F970NCE
				230/240V AC, 50/60 Hz	150-F970NCA
	533…1600	1100	1600	110/120V AC, 50/60 Hz	150-F1250NCE
				230/240V AC, 50/60 Hz	150-F1250NCA

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex controller. Contact Rockwell Automation technical support for further guidance.

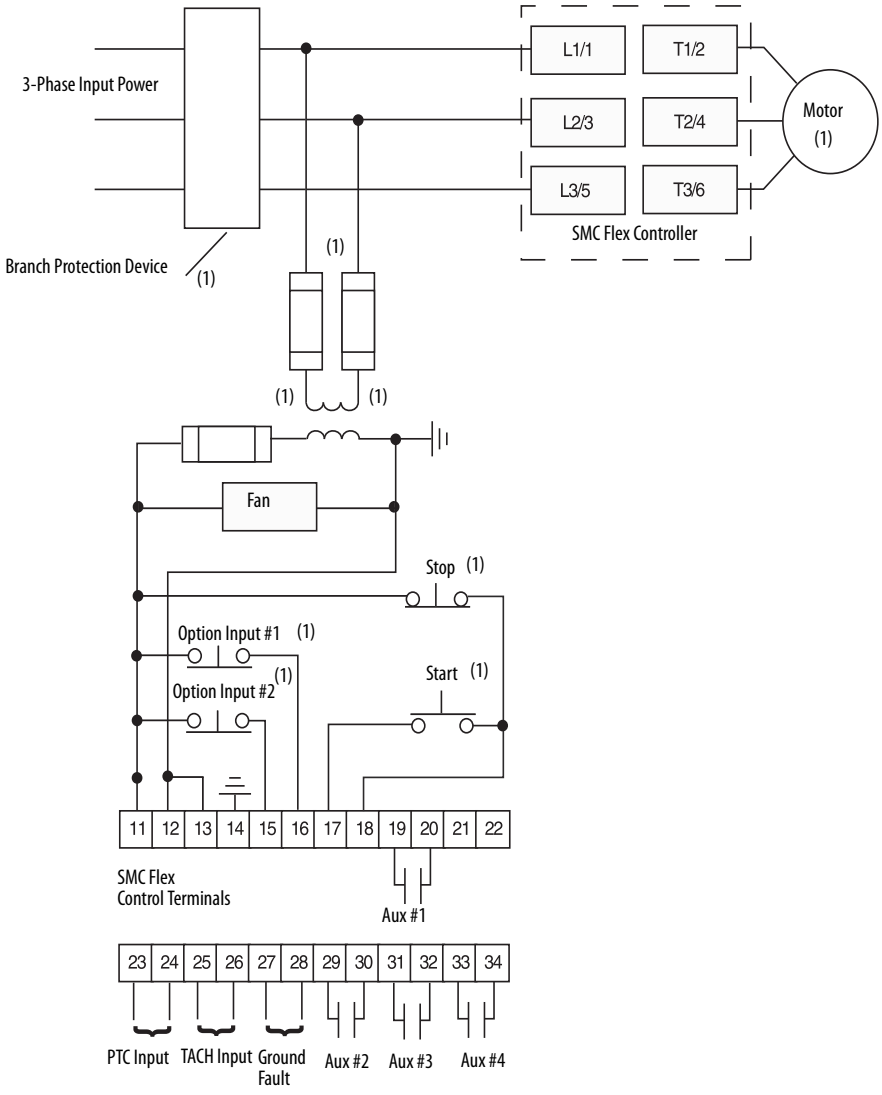
(2) For controllers with 24V AC/DC control power, separate 120V or 240V single-phase power supply is required for fan operation.

(3) Devices rated 108 A and greater are not equipped with line and load terminal lugs. See page 40 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Typical Wiring Diagrams

Figure 12 - Wiring Diagram for SMC Flex—Line Controller



(1) Customer supplied.

ALLEN BRADLEY SMC FLEX

Accessories

Protective Modules

The same protective module mounts on the line or load side of the SMC Flex controller. Use of protective modules is highly recommended. For applications that require both line and load side protection, you must order two protective modules.

- Note: You must not place protective modules on the load (motor) side of an SMC Flex controller when using an inside-the-delta connection or with pump or braking control options.

Current Rating [A]	Description	Cat. No.
5…85	480V Protective Module	150-F84
108…1250		150-F84L
5…85	600V Protective Module	150-F86
108…1250		150-F86L

Terminal Lug Kits

Connection Type	Current Range [A](1)	Wire Size Range	Total No. of Terminal Lugs Possible Each Side		Pkg. Qty.	Cat. No.
			Line Side	Load Side		
Line	108…135(2)	#6…250 MCM AWG 16 mm²…120 mm²	3	3	3	199-LF1
	201…251(2)		6	6	3	
	317…480(2)	#4…500 MCM AWG 25 mm²…240 mm²	6	6	3	199-LG1
	625…780	2/0…500 MCM	6	6	3	100-DL630
	970	4/0…500 MCM	3	3	3	100-DL860
	1250(3)	2/0…500 MCM	3	3	3	100-DL630
		4/0…500 MCM	3	3	3	100-DL860
Delta	108…135	#4…500 MCM AWG 25 mm²…240 mm²	1	6(5)		1494R-N15
	201…251	1/0…250 MCM AWG 50 mm²…120 mm²	2	12(5)		1494R-N14
	317…480	3/0…500 MCM AWG 95 mm²…240 mm²	1	12(6)		150-LGSMC
	625…780	#4…500 MCM AWG 25 mm²…240 mm²	6(4)	6	3	100-DL630
	970…1250	#4…500 MCM AWG 25 mm²…240 mm²	6(4)	6	3	100-DL860

(1) 5…85 A units have box lugs standard. No additional lugs are required.
(2) When a multi-conductor lug is required, refer to the User Manual for appropriate lug catalog number.
(3) The 1250 A device requires (1) 100-DL630 and (1) 100-DL860 per connection.
(4) For 625…1250 A inside-the-delta connections, terminal blocks are required for line-side connections. For **fuse-protected** controllers, use Allen-Bradley Cat. No. 1492-BG (625…780 A devices: 2 per phase; 970…1250 A devices, 4 per phase). For **circuit breaker-protected** controllers, use Cooper Bussmann Cat. No. 16504-2 (625…780 A devices: 1 per phase; 970…1250 A devices, 2 per phase).
(5) When connected in an inside-the-delta configuration, use Cat. No. 199-LF1 for load-side connections (T1…T6).
(6) When connected in an inside-the-delta configuration, use Cat. No. 199-LG1 for load-side connections (T1…T6).

IEC Line or Load Terminal Covers

Description(1)	Current Range [A]	Pkg. Quantity	Cat. No.
• Dead front protection • IP2X finger safe when used with 250 MCM cable	108…135	1	150-TC1
	201…251	1	150-TC2
• Dead front protection • IP2X finger safe when used with 500 MCM cable	317…480	1	150-TC3

(1) 5…85 A units have terminal guards as standard. No additional terminal guards are required.

Human Interface Modules (HIMs) and Communication Modules

Description				Cat. No.
	Hand-held HIM	LCD display, Full Numeric Keypad[2]		20-HIM-A3
		LCD display, Programmer only[2]		20-HIM-A5
	Door-mounted HIM	Remote (panel mount) LCD Display, Full Numeric Keypad		20-HIM-C3S
		LCD Display, programmer only (includes 3 m cable)		20-HIM-C5S
	HIM Interface Cables	HIM Interface Cable, 1 m (39 in)		20-HIM-H10
		Cable Kit (Male-Female) 0.33 m (1.1 ft)		1202-H03
		Cable Kit (Male-Female) 1 m (3.3 ft)		1202-H10
		Cable Kit (Male-Female) 3 m (9.8 ft)		1202-H30
		Cable Kit (Male-Female) 9 m (29.5 ft)		1202-H90
		DPI/SCANport™ One to Two Port Splitter Cable		1203-S03
Description			**For Use With**	**Cat. No.**
	Communication Modules	RS-485 DF1 Communication Adapter	SMC Flex	20-COMM-S
		PROFIBUS™ DP Communication Adapter		20-COMM-P
		ControlNet™ Communication Adapter (Coax)		20-COMM-C
		Interbus™ Communication Adapter		20-COMM-I
		Modbus/TCP Communication Adapter		20-COMM-M
		DeviceNet™ Communication Adapter		20-COMM-D
		EtherNet/IP™ Communication Adapter		20-COMM-E
		Dual-port EtherNet/IP Communication Adapter		20-COMM-ER
		HVAC Communication Adapter		20-COMM-H
		ControlNet™ Communication Adapter (Fiber)		20-COMM-Q
Connected Components Workbench™ Software		Programming Software	Windows 7/2000/XP/Vista	Available for download at www.rockwellautomation.com
DriveExecutive™				9303-4DTE01ENE
DriveTools™ SP [1]				9303-4DTS01ENE
AnaCANda™ RS-232 to DPI		PC Interface	Serial	1203-SSS[3]
DPI to USB			USB	1203-USB[4]

(1) Includes DriveExecutive™ and DriveObserver™
(2) Requires a 20-HIM-H10 cable to connect to the SMC Flex.
(3) Includes Cat. No. 1203-SFC and 1202-C10 cables.
(4) Includes Cat. No. 20-HIM-H10 and 22-HIM-H10 cables.

ALLEN BRADLEY SMC FLEX

Upgrade Kits

These kits allow you to upgrade from SMC Flex controllers to SMC-50 controllers with internal bypass. Kits contain SMC-50 control module, programming device, optional I/O card (if needed) and plastic mounting/transition cover (if needed).

- Important: Carefully check current range, line voltage and control input voltage when selecting an upgrade kit. Not all control voltages or current ranges can be upgraded.

Description	Kit Contents[1]	Rated Current [A]	Line Voltage [V AC]	Control Voltage[2]	Cat. No.
Frame 3 SMC Flex to SMC-50 controllers with bypass upgrade kit	• 150-SCMD control module • 150-SM4 digital I/O module • 20-HIM-A6 LCD HIM	108	200…690	100…240V AC	150-S108UPGD
		135			150-S135UPGD
	• 150-SCMR control module • 20-HIM-A6 LCD HIM	108	200…690	24V DC[3]	150-S108UPGR[4]
		135			150-S135UPGR[4]
Frame 4 SMC Flex to SMC-50 controllers with bypass upgrade kit	• 150-SCMD control module • 150-SM4 digital I/O module • 20-HIM-A6 LCD HIM • Plastic mounting/transition cover	201	200…480	100…240V AC	150-S201UPGBD
			200…575		150-S201UPGCD
			200…690		150-S201UPGUD
		251	200…480		150-S251UPGBD
			200…575		150-S251UPGCD
			200…690		150-S251UPGUD
	• 150-SCMR control module • 20-HIM-A6 LCD HIM • Plastic mounting/transition cover	201	200…480	24V DC[3]	150-S201UPGBR[4]
			200…575		150-S201UPGCR[4]
			200…690		150-S201UPGUR[4]
		251	200…480		150-S251UPGBR[4]
			200…575		150-S251UPGCR[4]
			200…690		150-S251UPGUR[4]

(1) Kit contains one of each catalog number listed.
(2) The SMC-50 control module provides two (2) 24V DC control inputs. If you need additional inputs, you must use 100…240V AC inputs (requires 150-SM4 option module).
(3) 24V DC control voltage ONLY. Not compatible with 24V AC control voltage.
(4) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

ALLEN BRADLEY SMC FLEX

Specifications

Table 31 - SMC Flex Feature Specifications

Attribute		Description
Standard Features		
Installation	Power Wiring	standard squirrel-cage induction motor or a Wye-Delta, six-lead motor
	Control Wiring	2- and 3-wire control for a wide variety of applications
Configuration/Setup	Keypad	Front keypad with backlit LCD display. Optional 20-HIM-A module can be connected using the available DPI port.
	Software	parameter values are downloaded to the SMC Flex controller by using the Connected Components Workbench, DriveTools, and DriveExplorer programming software packages
Communications		One DPI provided for connection to optional human interface and one DPI provided for connection to communication modules.
Starting and Stopping Modes		Soft Start Current Limit Start Dual Ramp Full Voltage Linear Speed Acceleration Preset Slow Speed Soft Stop
Protection and Diagnostics		Power loss, line fault, voltage unbalance, excessive starts/hour, phase reversal, undervoltage, overvoltage, controller temp, stall, jam, open gate, overload, underload, communication fault.
Metering		Amps, volts, kW, kWh, MW, MWH, elapsed time, power factor, motor thermal capacity usage.
Alarm Contact		Overload, underload, undervoltage, overvoltage, unbalance, jam, stall, and ground fault
Status Indication		Stopped, starting, stopping, at speed, alarm, and fault.
Auxiliary Contacts		Four fully programmable contacts as normal/up-to-speed/fault/alarm/network (N.O./N.C.), or external bypass (N.O. only).
Optional Features		
Pump Control		Helps reduce fluid surges in centrifugal pumping systems during starting and stopping period. Starting time is adjustable from 0 . . . 30 s. Stopping time is adjustable from 0 . . . 120 s.
Braking Control[1]	SMB Smart Motor Braking	Provides motor braking without additional equipment for applications that require the motor to stop quickly. Braking current is adjustable from 0 . . . 400% of the motor's full-load current rating.
	Accu-Stop	Provides controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0 . . . 450% of full-load current.
	Slow Speed with Braking	Used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop.

(1) Not intended to be used as an emergency stop. See the applicable standards for emergency stop requirements.

ALLEN BRADLEY SMC FLEX

Table 32 - Power and Control Circuit Ratings

Attribute	Device Rating	UL/CSA/NEMA	IEC
Power Circuit			
Rated Operation Voltage	480V	200…480V AC (–15%, +10%)	200…415V
	600V	200…600V AC (–15%, +10%)	200…500V
	690V	230…600V AC (–15%, +10%)	230…690V/Y (–15%, +10%)
Rated Insulation Voltage	480V	—	500V
	600V		500V
	690V		690V
Rated Impulse Voltage	480V	—	6000V
	600V		
	690V		
Dielectric Withstand	480V	2200V AC	2500V
	600V		
	690V		
Repetitive Peak Inverse Voltage Rating	480V	1400V	1400V
	600V	1600V	1600V
	690V	1800V	1800V
Operating Frequency	All	50/60 Hz	
Utilization Category	5…480 A	MG 1	AC-53b:3.0-50:1750
	625…1250 A	MG 1	AC-53b:3.0-50:3550
Protection Against Electrical Shock	5…85 A	—	IP20
	108…480 A		IP2X (with terminal covers)
	625…1250 A		IP00 (open device)
DV/DT Protection	480V and 600V	RC Snubber Network	
	690V	None	
Transient Protection	480V and 600V	Metal Oxide Varistors: 220 Joules (optional)	
	690V	None	
Control Circuit			
Rated Operational Voltage(1)	5…480 A	100…240V AC or 24V AC/DC	
	625…1250 A	110/120V AC and 230/240V AC	
Rated Insulation Voltage	All	—	240V
Rated Impulse Voltage	All	—	3000V
Dielectric Withstand	All	1600V AC	2000V
Operating Frequency	All	50/60 Hz	
Input on-state voltage minimum		85V AC, 19.2V DC / 20.4V AC	
Input on-state current		20 mA @120V AC / 40 mA @ 240V AC, 7.6 mA @ 24V AC/DC	
Input off-state voltage maximum		50V AC, 10V DC / 12V AC	
Input off-state current @ input off-state voltage		<10 mA AC, <3 mA DC	

(1) 690V power is only available with 100…240V control.

ALLEN BRADLEY SMC FLEX

Table 33 - Short-circuit Protection Performance, 200…600V, Type 1 Coordination[1][2]

SCCR List[3]	Device Rating	Max. Standard Available Fault	Max. Standard Fuse [A][4]	Max. Standard Available Fault	Max. Circuit Breaker [A]
Line Device Operational Current Rating [A]	5	5 kA	20	5 kA	20
	25	5 kA	100	5 kA	100
	43	10 kA	150	10 kA	150
	60	10 kA	225	10 kA	225
	85	10 kA	300	10 kA	300
	108	10 kA	400	10 kA	300
	135	10 kA	500	10 kA	400
	201	18 kA	600	18 kA	600
	251	18 kA	700	18 kA	700
	317	30 kA	800	30 kA	800
	361	30 kA	1000	30 kA	1000
	480	42 kA	1200	42 kA	1200
	625	42 kA	1600	42 kA	1600
	780	42 kA	1600	42 kA	2000
	970	85 kA	2500	85 kA	2500
	1250	85 kA	3000	85 kA	3200
Delta Device Operational Current Rating [A]	8.7	5 kA	35	5 kA	35
	43	5 kA	150	5 kA	150
	74	10 kA	300	10 kA	300
	104	10 kA	400	10 kA	400
	147	10 kA	400	10 kA	400
	187	10 kA	600	10 kA	500
	234	10 kA	700	10 kA	700
	348	18 kA	1000	18 kA	1000
	435	18 kA	1200	18 kA	1200
	549	30 kA	1600	30 kA	1600
	625	30 kA	1600	30 kA	1600
	831	42 kA	1600	30 kA	1600
	831	42 kA	1600	42 kA	1200
	850	42 kA	1600	42 kA	2000
	900	42 kA	1600	42 kA	2000
	1200	85 kA	3000	85 kA	3200
	1600	85 kA	3000	85 kA	3200

(1) Type 1 performance/protection indicates that, under a short-circuit condition, the fuse- or circuit breaker-protected starter shall cause no damage to persons or the installation but it may not be suitable for further service without repair or replacement.
(2) For short-circuit current rating (SCCR) information for an enclosed panel with external bypass or isolation contactor, see www.rockwellautomation.com/global/support/global-sccr.page.
(3) Consult local codes for proper sizing of short circuit protection.
(4) Non-time delay fuses (K5 — 5…480A (8.7…831 A) devices; Class L — 625…1250A (850…1600 A) devices).

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Table 34 - Short-circuit Protection Performance, 200…600V, Type 1 Coordination

SCPD Performance[1]			Type 1 Ratings[2]				
Motor Connection Type	Cat. No.	Current Rating [A]	Class J or Class L Fuse[3]		Inverse Time (Thermal Magnetic) Circuit Breaker 480V, 65 kA Max.		
			Max. High Capacity Available Fault (600V) [kA]	Max. Current [A]	Max. Current [A]	Cat. No.	Rating Plug Cat. No.
Line Connection	150-F5N…	5	70	10	Pending		
	150-F25N…	25		50			
	150-F43N…	43		90			
	150-F60N…	60		125			
	150-F85N…	85		175			
	150-F108N…	108		200	300	140G-K6F3-D30	—
	150-F135N…	135		225	400	140G-K6F3-D40	—
	150-F201N…	201		350	600	140G-M6F3-D60	—
	150-F251N…	251		400	700	140G-M6F3-D80	—
	150-F317N…	317	69	500	800	140G-N6H3-E12	140G-NRP-D80
	150-F361N…	361		600	1000	140G-N6H3-E12	140G-NRP-E10
	150-F480N…	480		800	1200	140G-N6H3-E12	—
	150-F625N…	625	74	1600	Pending		
	150-F780N…	780		1600			
	150-F970N…	970	85	2500			
	150-F1250N…	1250		3000			
Inside-the-Delta Connection	150-F5N…	8.7	70	17.5	Pending		
	150-F25N…	43		90			
	150-F43N…	74		150			
	150-F60N…	104		200			
	150-F85N…	147		200			
	150-F108N…	187		300	400	140G-K6F3-D40	—
	150-F135N…	234		400	400	140G-K6F3-D40	—
	150-F201N…	348		600	800	140G-M6F3-D80	—
	150-F251N…	435		800	800	140G-M6F3-D80	—
	150-F317N…	549	69	1000	1200	140G-N6H3-E12	—
	150-F361N…	625		1200	1200	140G-N6H3-E12	—
	150-F480N…	831		1600	1200	140G-N6H3-E12	—
	150-F625N…	850	74	1600	Pending		
	150-F780N…	900		1600			
	150-F970N…	1200	85	3000			
	150-F1250N…	1600		3000			

(1) Consult local codes for proper sizing of short-circuit protection.
(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.
(3) High Capacity fault ratings when used with time delay Class J or time delay Class L fuse.

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Table 35 - Short-circuit Protection Performance, 690V, Type 1 Coordination(1)

SCCR List(2)	Device Rating	Max. Standard Available Fault	Max. Ampere Tested — North American Style	Max. Ampere Tested — European Style
Maximum FLC	108	70 kA	A070URD33xxx500	6,9 gRB 73xxx400 6,6URD33xxx500
	135	70 kA	A070URD33xxx500	6,9 gRB 73xxx400 6,6URD33xxx500
	201	70 kA	A070URD33xxx700	6,9 gRB 73xxx630 6,6URD33xxx700
	251	70 kA	A070URD33xxx700	6,9 gRB 73xxx630 6,6URD33xxx700
	317	70 kA	A070URD33xxx900	6,9 gRB 73xxx800 6,6URD33xxx900
	361	70 kA	A070URD33xxx900	6,9 gRB 73xxx800 6,6URD33xxx900
	480	70 kA	A070D33xxx1250 A100URD73xxx1250	9 URD 73xxx1250 6,6URD33xxx1250
	625	70 kA	A070URD33xxx1400	6,6URD33xxx1400
	780	70 kA	A070URD33xxx1400	6,6URD33xxx1400
	970	85 kA	Two fuses in parallel A070URD33xxx1250	Two fuses in parallel 6,6URD33xxx1250
	1250	85 kA	Two fuses in parallel A070URD33xxx1250	Two fuses in parallel 6,6URD33xxx1250

(1) Type 1 performance/protection indicates that, under a short-circuit condition, the fuse- or circuit breaker-protected starter shall cause no damage to persons or the installation but it may not be suitable for further service without repair or replacement.

(2) Consult local codes for proper sizing of short circuit protection.

Table 36 - Power Requirements

	Device Rating [A]	Control Power	Description	
Control Module	1…480	100…240V AC (-15%, +10%)	Transformer	75 VA
		24V AC (-15%, +10%)	Transformer	130 VA
		24V DC (-15%, +10%)	Inrush Current	5 A
			Inrush Time	250 ms
			Transient Watts	60 W
			Transient Time	500 ms
			Steady State Watts	24 W
			Minimum Allen-Bradley Power Supply	1606-XLP50E
	625…1250	751 VA (recommended 800 VA)		
Heatsink Fan(s)(1)		5…135 A, 20 VA		
		201…251 A, 40 VA		
		317…480 A, 60 VA		
		625…1250 A, 150 VA		

(1) Heatsink fans can be powered by either 110/120V AC or 220/240V AC.

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Table 37 - Steady-state Heat Dissipation

Controller Rating [A]	Steady-state Heat Dissipation with Control and Fan Power [W]
5	70
25	70
43	81
60	97
85	129
108	91
135	104
201	180
251	198
317	225
361	245
480	290
625	446
780	590
970	812
1250	1222

Table 38 - Auxiliary Contact Ratings

Contact Type	Attribute	Value
Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit	Electromagnetic relay
	Number of Contacts	1
	Type of Contacts	programmable N.O./N.C.
	Type of Current	AC
	Rated Operational Current	3 A @ 120V AC, 1.5 A @ 240V AC
	Conventional Thermal Current I_{th} AC/DC	5 A
	Make/Break VA	3600/360
	Utilization Category	AC-15/DC

Table 39 - Input Ratings

Input Type	Attribute	Value
PTC Input Ratings	Response Resistance	3400 Ω ±150 Ω
	Reset Resistance	1600 Ω ±100 Ω
	Short-circuit Trip Resistance	25 Ω ±10 Ω
	Max. Voltage at PTC Terminals (RPTC = 4 kΩ)	< 7.5V
	Max. Voltage at PTC Terminals (RPTC = open)	30V
	Max. No. of Sensors.	6
	Max. Cold Resistance of PTC Sensor Chain	1500 Ω
	Response Time	800 ms
Tachometer Input		0…5V DC, 4.5V DC = 100% Speed

Table 40 - Environmental Ratings

Attribute	Value
Operating Temperature Range	-5…+50 °C (23…+122 °F) (open); -5…+40 °C (23…+104 °F) (enclosed)
Storage and Transportation Temperature Range	-20…+75 °C (-4…+167 °F)
Altitude	2000 m (6560 ft)
Humidity	5…95% (noncondensing)
Pollution Degree	2

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Table 41 - Mechanical Ratings

Attribute		Device Rating	Value
Resistance to Vibration	Operational	All	1.0 G Peak, 0.15 mm (0.006 in.) displacement
	Non-Operational	5…480 A	2.5 G Peak, 0.38 mm (0.015 in.) displacement
		625…1250 A	1.0 G Peak, 0.15 mm (0.006 in.) displacement
Resistance to Shock	Operational	5…85 A	15 G
		108…480 A	5.5 G
		625…1250 A	4 G
	Non-Operational	5…85 A	30 G
		108…480 A	25 G
		625…1250 A	12 G
Construction	Power Poles	5…85 A	Heatsink thyristor modular design
	Power Poles	108…1250 A	Heatsink hockey puck thyristor modular design
	Control Modules		Thermoset and Thermoplastic Moldings
	Metal Parts		Plated Brass, Copper, or Painted Steel

Table 42 - Power and Control Terminals

Attribute	Device Rating	Value	
		Line Side	Load side
Power Terminals	5…85 A	Cable size — Upper — 2.5…95 mm^2 (14…3/0 AWG) Lower — 0.8…2.5 mm^2 (18…14 AWG)	Cable size — Upper — 2.5…50 mm^2 (14…1 AWG) Lower — 0.8…2.5 mm^2 (18…14 AWG)
		Tightening torque — 14.7 N•m (130 lb.-in.) Wire strip length—18…20 mm (0.22…0.34 in.)	
	108…135 A	One M10 x 1.5 diameter hole per power pole	
	201…251 A	Two M10 x 1.5 diameter holes per power pole	
	317…480 A	Two M12 x 1.75 diameter holes per power pole	
	625…1250 A	Two 13.5 mm (0.53 in.) diameter holes per power pole	
Power Terminal Markings		NEMA, CENELEC EN50 012	
Control Terminals	M3 screw clamp	Clamping yoke connection	

Table 43 - EMC Emission Ratings

Attribute		Value
EMC Emission Levels	Conducted Radio Frequency Emissions	Class A
	Radiated Emissions	Class A
EMC Immunity Levels	Electrostatic Discharge	8 kV Air Discharge
	Radio Frequency Electromagnetic Field	Per EN/IEC 60947-4-2
	Fast Transient	Per EN/IEC 60947-4-2
	Surge Transient	Per EN/IEC 60947-4-2

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Table 44 - Overload Characteristics

Current Range [A]	Line-connected Controllers	Delta-connected Controllers
5	1...5	1.7…9
25	5...25	8.6…43
43	8.6...43	14.8…75
60	12...60	20.8…104
85	17...85	29.4…147
108	27…108	47…187
135	34…135	59…234
201	67…201	116…348
251	84…251	145…435
317	106…317	183…549
361	120…361	208…625
480	160…480	277…831
625	208…625	283…850
780	260…780	300…900
970	323…970	400…1200
1250	416…1250	533…1600
Trip Classes	10, 15, 20, and 30	
Trip Current Rating	117% of Motor FLC	
Number of Poles	3	

Standards Compliance and Certifications

Standards Compliance
UL 508
CSA C22.2 No.14
EN/IEC 60947-1
EN/IEC 60947-4-2

Certifications
c-UL-us Listed (Open Type) (File No. E96956, Guides NMFT, NMFT7)
CSA Certified (File No. LR 1234)
CE Marked
CCC Certified

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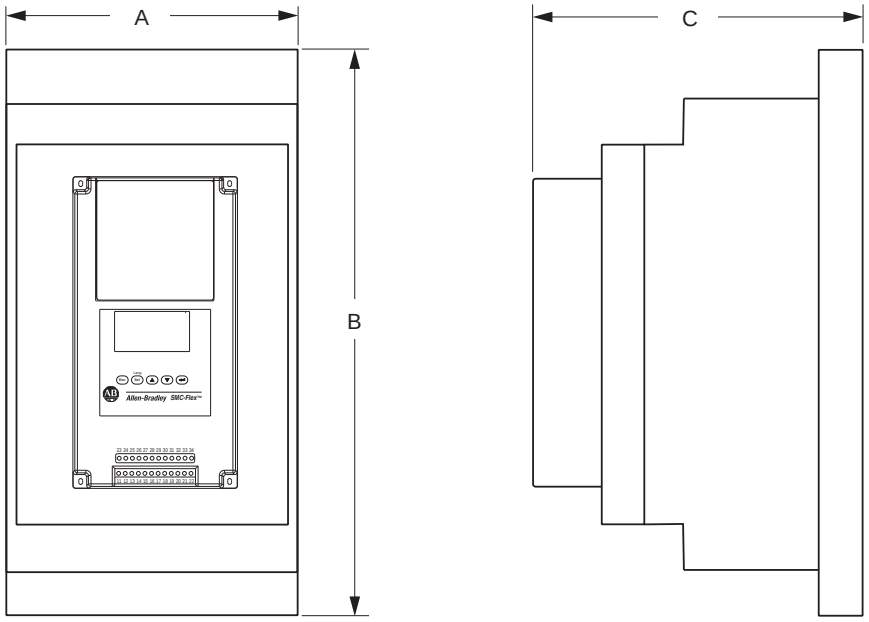
Approximate Dimensions and Shipping Weights

Dimensions are in millimeters (inches). Dimensions are not intended for manufacturing purposes.

Open Controllers



Rated Current [A]	B Height	A Width	C Depth	Weight
5…85	321.0 (12.60)	150.0 (5.90)	203.0 (8.00)	5.7 kg (12.5 lb)
108…135	443.7 (17.47)	196.4 (7.74)	212.2 (8.35)	15.0 kg (33.0 lb)
201…251	560.0 (22.05)	225.0 (8.86)	253.8 (9.99)	30.4 kg (67.0 lb)
317…480	600.0 (23.62)	290.0 (11.42)	276.5 (10.89)	45.8 kg (101 lb)
625…780	1041.1 (41.00)	596.9 (23.50)	346.2 (13.63)	179 kg (395 lb)
970…1250	1041.1 (41.00)	596.9 (23.50)	346.2 (13.63)	224 kg (495 lb)

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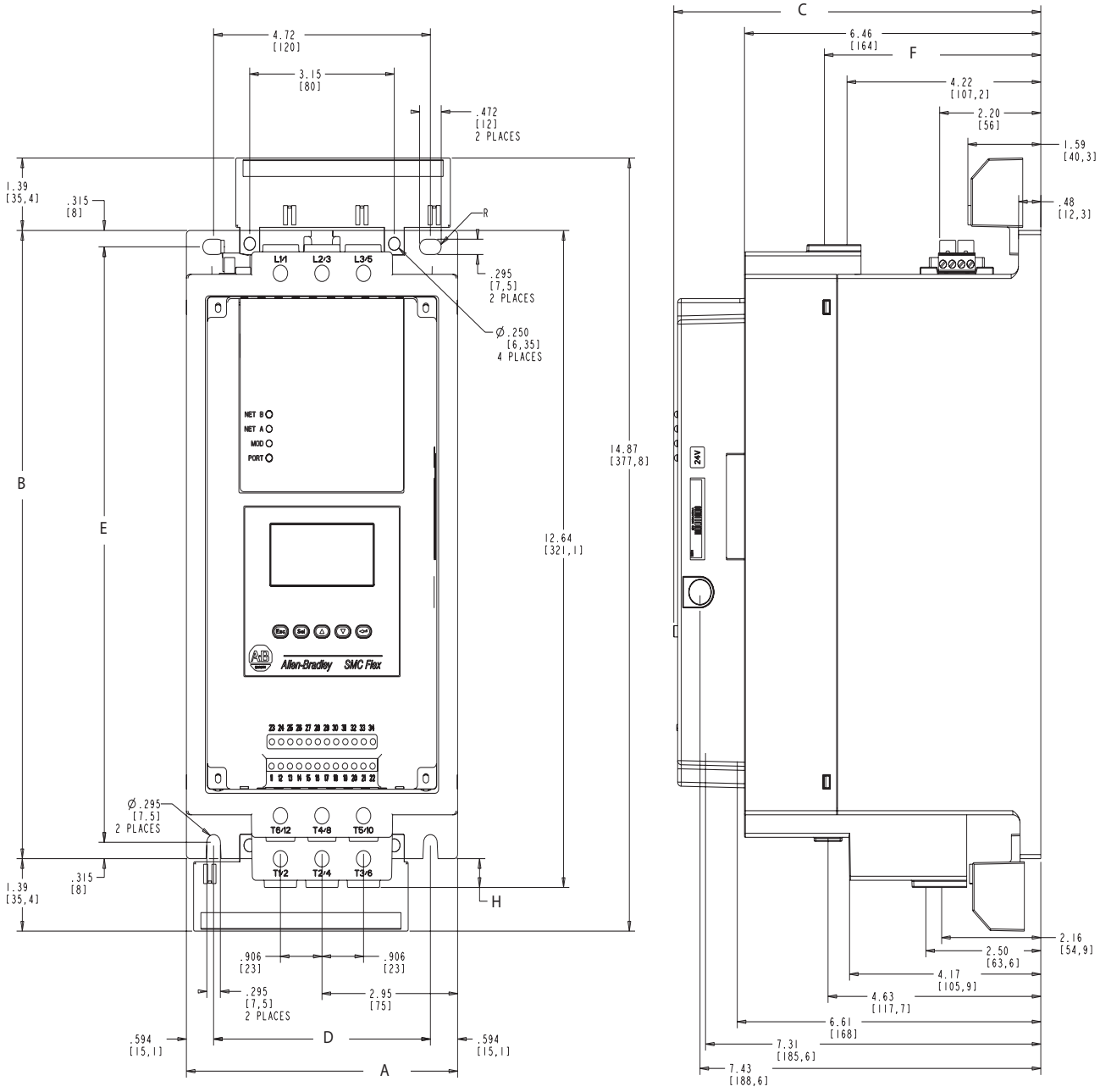
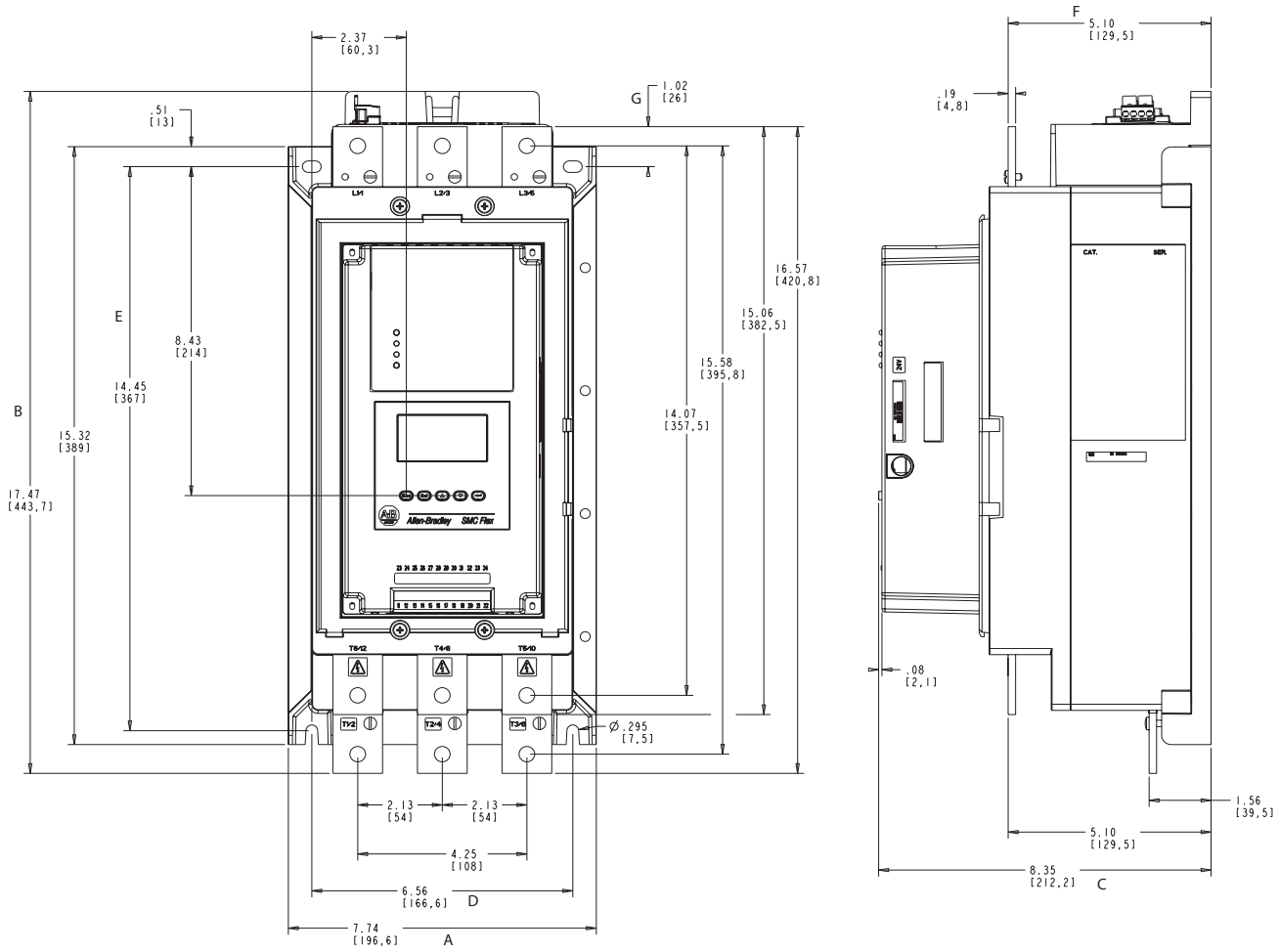
Figure 13 - 5…85 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	H	Approx. Ship. Wt.
mm	150.1	307	203.1	120	291	119.8	14.1	5.7 kg
in.	5.91	12.09	8.00	4.72	11.46	4.72	0.56	12.6 lb.

Figure 14 - 108…135 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	G	Approx. Ship. Wt.
mm	196.4	443.7	212.2	166.6	367	129.5	26	15 kg
in.	7.74	17.47	8.35	6.56	14.45	5.10	1.02	33 lb.

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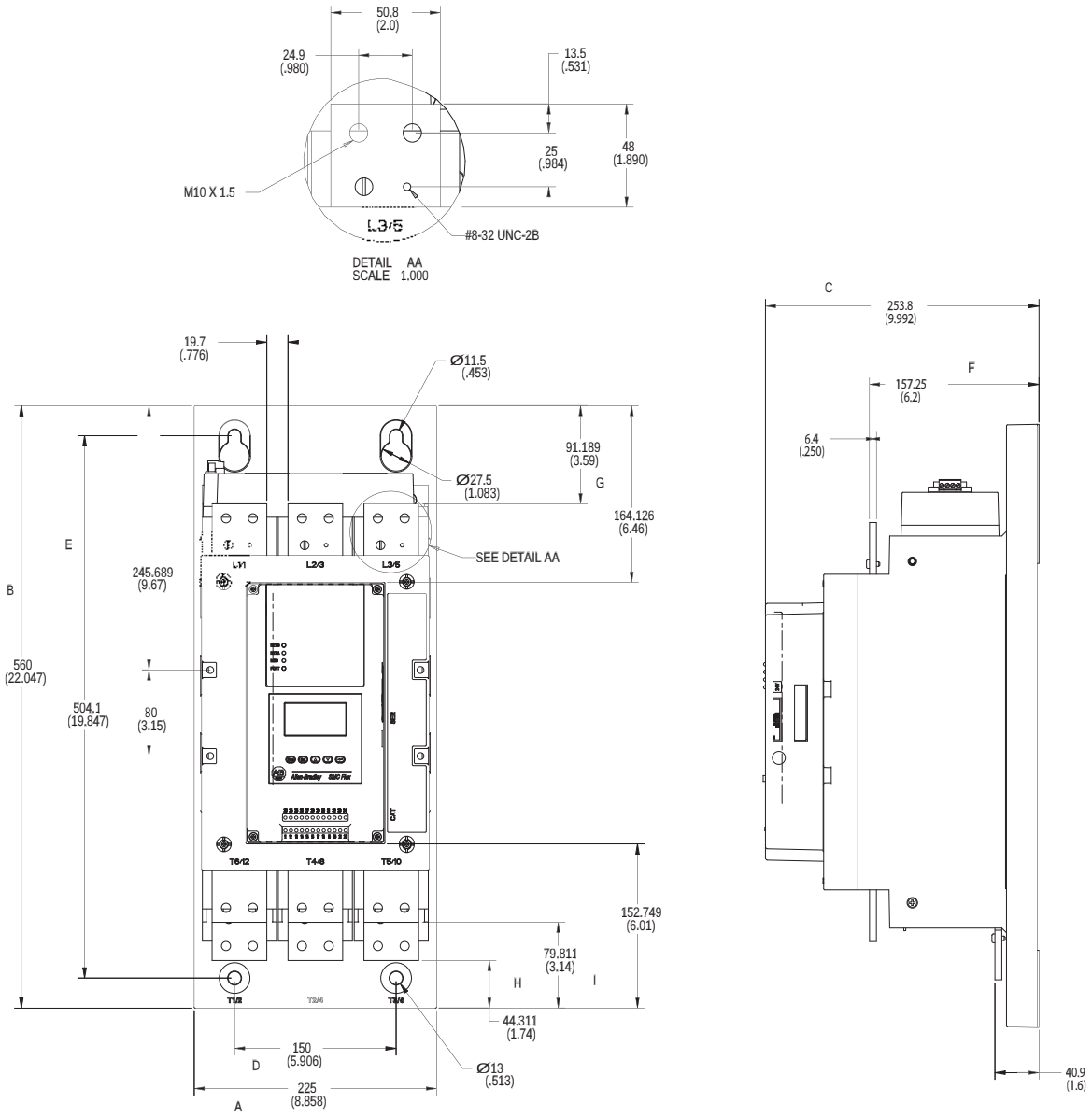
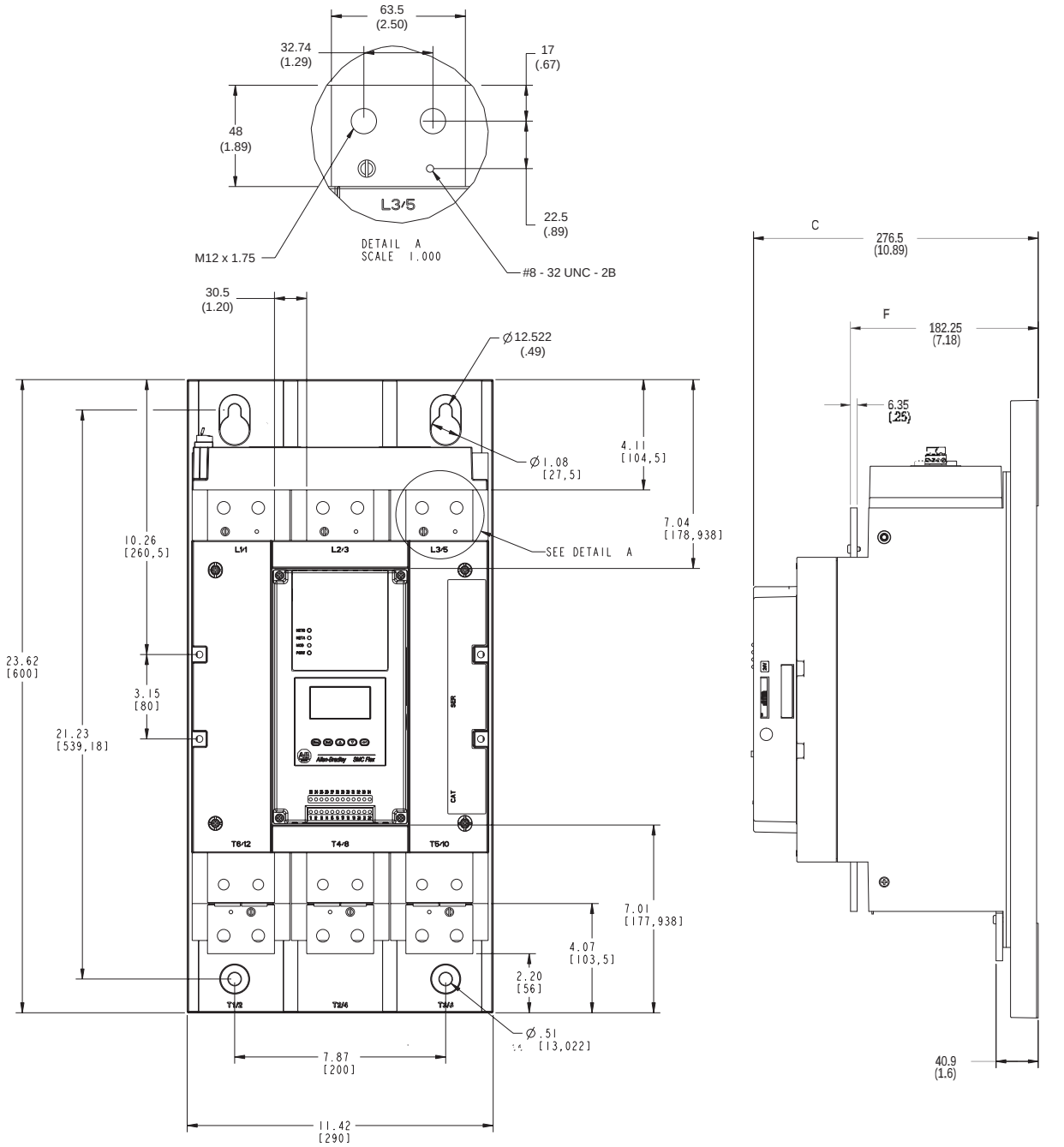
Figure 15 - 201…251 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	G	H	I	Approx. Ship. Wt.
mm	225	560	253.8	150	504.1	157.25	91.189	44.311	79.811	30.4 kg
in.	8.858	22.047	9.992	5.906	19.847	6.2	3.59	1.74	3.14	67 lb.

Figure 16 - Dimensions: 317…480 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	G	H	I	Approx. Ship. Wt.
mm	290	600	276.5	200	539.18	182.25	104.5	55.5	103.5	45.8 kg
in.	11.42	23.62	10.89	7.87	21.23	7.18	4.11	2.19	4.07	101 lb.

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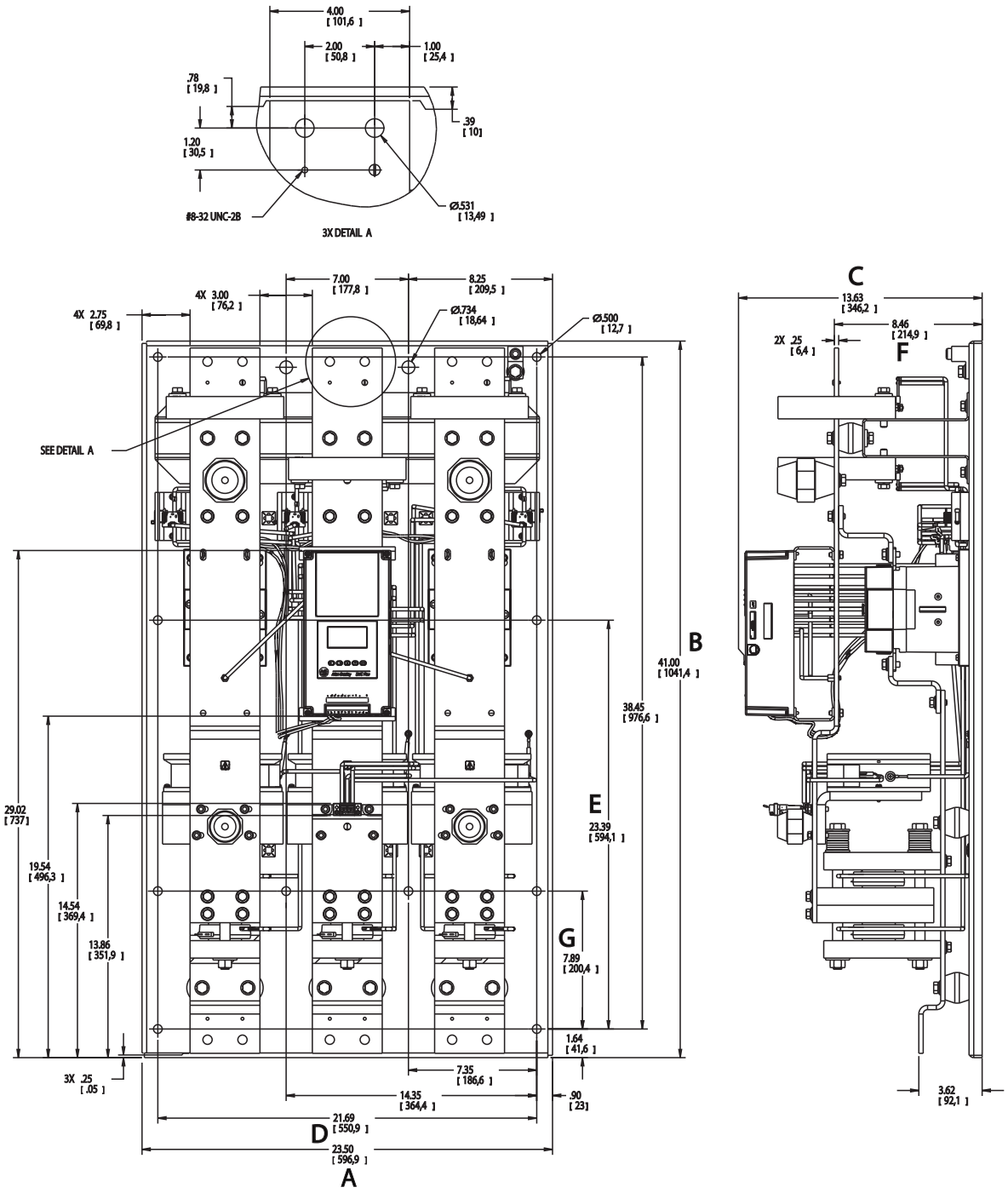
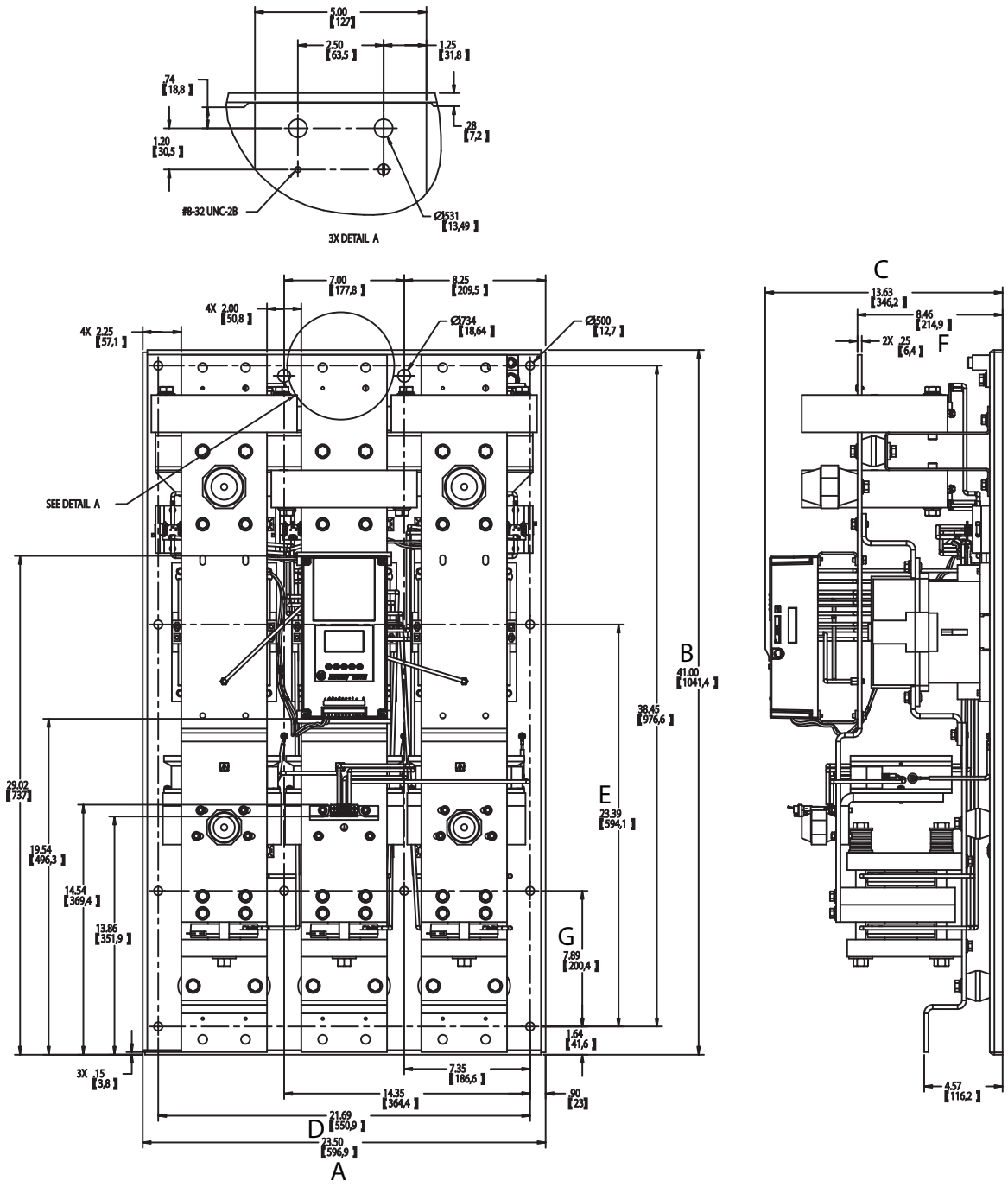
Figure 17 - Dimensions: 625…780 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	G	Approx. Ship. Wt.
mm	596.9	1041.4	346.2	550.9	594.1	214.9	200.4	179 kg
in.	23.5	41.0	13.63	21.69	23.39	8.46	7.89	395 lb.

Figure 18 - 970…1250 A Controllers



Unit	A Width	B Height	C Depth	D	E	F	G	Approx. Ship. Wt.
mm	596.9	1041.4	346.2	550.9	594.1	214.9	200.4	224 kg
in.	23.5	41.0	13.63	21.69	23.39	8.46	7.89	495 lb.

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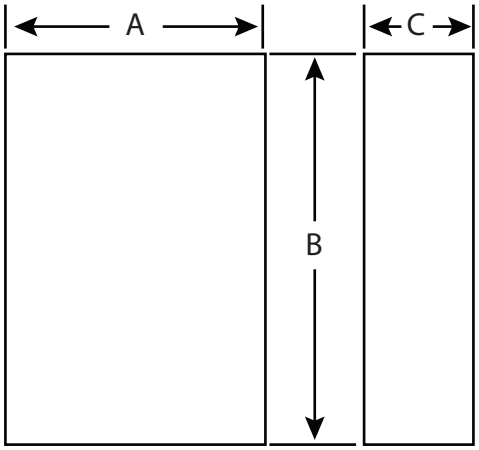
Figure 19 - Minimum Enclosure Size



Rated Current [A]	B Height [mm (in.)]	A Width [mm (in.)]	C Depth [mm (in.)]
5	610 (24)	406 (16)	254 (10)
25	610 (24)	406 (16)	254 (10)
43	610 (24)	406 (16)	254 (10)
60	610 (24)	406 (16)	254 (10)
85	610 (24)	406 (16)	254 (10)
108	762 (30)	610 (24)	305 (12)
135	762 (30)	610 (24)	305 (12)
201	965 (38)	762 (30)	356 (14)
251	965 (38)	762 (30)	356 (14)
317	1295 (51)	914 (36)	356 (14)
361	1295 (51)	914 (36)	356 (14)
480	1295 (51)	914 (36)	356 (14)
625	2286 (90)	762 (30)	508 (20)
780	2286 (90)	762 (30)	508 (20)
970(1)	2286 (90)	762 (30)	508 (20)
1250(1)	2286 (90)	762 (30)	508 (20)

(1) 970 and 1250 A SMC-Flex controllers require a door-mounted fan that is capable of delivering 240 cfm. Appropriate inlet and outlet filtering is required.

ALLEN BRADLEY SMC FLEX

SMC-50 Controllers

The SMC-50 controller has a scalable design, allowing you the flexibility to satisfy a wide variety of control needs. Advanced monitoring and protection, superior communications capabilities, and Energy Saver mode help increase efficiency and reduce downtime. Three-phase control, built-in overload, removable control module and removable terminal blocks are combined in a cost-effective package with your choice of internal bypass or solid-state power structures. Normal- and heavy-duty ratings, expandable I/O and sensor capability, LCD screen or personal computer software setup and network integration capabilities increase application scalability.

Modes of operation include the following:

- Soft Start
- Current Limit Start
- Selectable Kickstart
- Coast-to-rest
- Soft Stop
- Full Voltage Start
- Dual Ramp Start
- Pump Start
- Preset Slow Speed
- Pump Stop
- Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking
- Sensorless Linear Speed Acceleration
- Sensorless Linear Speed Deceleration
- Torque Control
- Integral Motor Winding Heater
- Energy Saver
- Emergency Run
- External Bypass
- Resistive Load

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Use ProposalWorks to configure the SMC-50 controller. ProposalWorks is available from http://www.rockwellautomation.com/global/e-tools/overview.page.

150-S	135	N	B	D
a	b	c	d	e

a	
Bulletin Number	
Code	**Description**
150-S	SMC-50 Motor Controller

b			
Controller Type and Rating			
SMC-50 Controller with Internal Bypass		**Solid-state SMC-50 Controller**	
Code	**Description**	**Code**	**Description**
108	108 A with Internal Bypass	B1	90 A
135	135 A with Internal Bypass	B2	110 A
201	201 A with Internal Bypass	B3	140 A
251	251 A with Internal Bypass	B4	180 A
317	317 A with Internal Bypass	C1	210 A
361	361 A with Internal Bypass	C2	260 A
480	480 A with Internal Bypass	C3	320 A
		D1	361 A
		D2	420 A
		D3	520 A

c	
Enclosure Type	
Code	**Description**
N	Open

d	
Line Voltage	
Code	**Description**
B	200…480V AC, 3-Phase, 50 and 60 Hz
U	200…690V AC, 3-Phase, 50 and 60 Hz

e	
Control Voltage	
Code	**Description**
D	100…240V AC (two 24V DC inputs and two relay outputs standard)
R	24V DC (two 24V DC inputs and two relay outputs standard)

ALLEN BRADLEY SMC FLEX

Product Selection— SMC-50 Controller with Internal Bypass

For Use with Line-connected Motors

Utilization Category: AC-53b:3.0-50:1750. Start Not to Exceed: 300% of the controller maximum current rating, 50 second start time, two starts per hour with 50 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 45 - 200/208V AC and 230V AC SMC-50 Controllers with Internal Bypass for use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Cat. No.(3)
200/208	27…108	—	30	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	34…135	—	40	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	67…201	—	60	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	84…251	—	75	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	106…317	—	100	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	120…361	—	125	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	160…480	—	150	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR
230	27…108	30	40	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	34…135	37	50	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	67…201	55	75	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	84…251	75	100	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	106…317	90	125	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	120…361	110	150	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	160…480	132	200	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(2) For controllers with 24V DC control power, consult your local Rockwell Automation sale office or Allen-Bradley distributor for availability.
(3) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 46 - 400/415/460V AC, 500/575V AC, and 690V AC SMC-50 Controllers with Internal Bypass for use with Line-connected Motors

Rated Voltage [V AC]	Motor Current [A][2]	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power[3]	Cat. No.[4]
400/415 (kW) 460 (Hp)	27…108	55	75	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	34…135	75	100	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	67…201	110	150	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	84…251	132	200	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	106…317	160	250	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	120…361	200	300	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	160…480	250	400	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR
500 (kW) 575 (Hp)	27…108	75	100	100…240V AC, 50/60 Hz	150-S108NUD
				24V DC	150-S108NUR
	34…135	90	125	100…240V AC, 50/60 Hz	150-S135NUD
				24V DC	150-S135NUR
	67…201	132	200	100…240V AC, 50/60 Hz	150-S201NUD
				24V DC	150-S201NUR
	84…251	160	250	100…240V AC, 50/60 Hz	150-S251NUD
				24V DC	150-S251NUR
	106…317	200	300	100…240V AC, 50/60 Hz	150-S317NUD
				24V DC	150-S317NUR
	120…361	250	350	100…240V AC, 50/60 Hz	150-S361NUD
				24V DC	150-S361NUR
	160…480	315	500	100…240V AC, 50/60 Hz	150-S480NUD
				24V DC	150-S480NUR
690/Y (kW)[1] 600 (Hp)	27…108	90	100	100…240V AC, 50/60 Hz	150-S108NUD
				24V DC	150-S108NUR
	34…135	132	175	100…240V AC, 50/60 Hz	150-S135NUD
				24V DC	150-S135NUR
	67…201	160	200	100…240V AC, 50/60 Hz	150-S201NUD
				24V DC	150-S201NUR
	84…251	200	250	100…240V AC, 50/60 Hz	150-S251NUD
				24V DC	150-S251NUR
	106…317	315	400	100…240V AC, 50/60 Hz	150-S317NUD
				24V DC	150-S317NUR
	120…361	355	450	100…240V AC, 50/60 Hz	150-S361NUD
				24V DC	150-S361NUR
	160…480	450	600	100…240V AC, 50/60 Hz	150-S480NUD
				24V DC	150-S480NUR

(1) To be used only in a Y-type system.
(2) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(3) For controllers with 24V DC control power, consult your local Rockwell Automation sale office or Allen-Bradley distributor for availability.
(4) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

For Use with Delta-connected Motors

Utilization Category: AC-53b:3.0-50:1750. Start Not to Exceed: 300% of the controller maximum current rating, 50 second start time, two starts per hour with 50 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 47 - 200/208V AC and 230V AC SMC-50 Controllers with Internal Bypass for use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Cat. No.(3)
200/208	47…187	—	60	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	59…234	—	75	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	116…348	—	100	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	145…435	—	150	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	183…549	—	200	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	208…625	—	200	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	277…831	—	300	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR
230	47…187	55	60	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	59…234	75	75	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	116…348	110	100	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	145…435	132	150	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	183…549	160	200	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	208…625	200	200	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	277…831	250	300	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(2) For controllers with 24V DC control power, consult your local Rockwell Automation sale office or Allen-Bradley distributor for availability.
(3) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 48 - 400/415/460V AC and 500/575V AC SMC-50 Controllers with Internal Bypass for use with Delta-connected Motors

Rated Voltage [V AC]	Motor Current [A](1)	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power(2)	Cat. No.(3)
400/415 (kW) 460 (Hp)	47…187	90	125	100…240V AC, 50/60 Hz	150-S108NBD
				24V DC	150-S108NBR
	59…234	132	150	100…240V AC, 50/60 Hz	150-S135NBD
				24V DC	150-S135NBR
	116…348	160	250	100…240V AC, 50/60 Hz	150-S201NBD
				24V DC	150-S201NBR
	145…435	250	350	100…240V AC, 50/60 Hz	150-S251NBD
				24V DC	150-S251NBR
	183…549	315	450	100…240V AC, 50/60 Hz	150-S317NBD
				24V DC	150-S317NBR
	208…625	355	500	100…240V AC, 50/60 Hz	150-S361NBD
				24V DC	150-S361NBR
	277…831	450	700	100…240V AC, 50/60 Hz	150-S480NBD
				24V DC	150-S480NBR
500 (kW) 575 (Hp)	47…187	132	150	100…240V AC, 50/60 Hz	150-S108NUD
				24V DC	150-S108NUR
	59…234	160	200	100…240V AC, 50/60 Hz	150-S135NUD
				24V DC	150-S135NUR
	116…348	250	350	100…240V AC, 50/60 Hz	150-S201NUD
				24V DC	150-S201NUR
	145…435	315	400	100…240V AC, 50/60 Hz	150-S251NUD
				24V DC	150-S251NUR
	183…549	400	500	100…240V AC, 50/60 Hz	150-S317NUD
				24V DC	150-S317NUR
	208…625	450	600	100…240V AC, 50/60 Hz	150-S361NUD
				24V DC	150-S361NUR
	277…831	560	900	100…240V AC, 50/60 Hz	150-S480NUD
				24V DC	150-S480NUR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(2) For controllers with 24V DC control power, consult your local Rockwell Automation sale office or Allen-Bradley distributor for availability.
(3) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Product Selection—SMC-50 Solid-state Controller

For Use with Line-connected Motors

Normal/Standard Duty Ratings (for pumps, compressors, elevators, and short conveyors)

Utilization Category: AC-53a:3.5-10:99-2. Start Not to Exceed: 350% of the controller maximum current rating, 10 second start time, 99% ON load factor, two starts per hour with 40 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 49 - 200/208V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Normal/Standard Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
200/208	30…90	—	10…25	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	37…110		15…30	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	47…140		20…40	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	60…180		25…60	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	70…210		25…60	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	87…260		30…75	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	107…320		40…100	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	120…361		50…125	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	140…420		50…150	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	174…520		75…150	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 50 - 230V AC and 400/415/460V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Normal/Standard Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
230	30…90	10…25	15…30	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	37…110	11…32	15…40	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	47…140	15…45	20…50	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	60…180	18.5…55	25…60	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	70…210	22…63	30…75	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	87…260	30…80	40…100	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	107…320	37…100	50…125	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	120…361	40…110	50…150	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	140…420	45…132	60…150	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	174…520	63…160	75…200	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
400/415 (kW) 460 (Hp)	30…90	17…50	25…60	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	37…110	20…55	30…75	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	47…140	30…75	40…100	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	60…180	37…90	50…150	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	70…210	40…110	60…150	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	87…260	50…132	75…200	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	107…320	63…160	100…250	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	120…361	75…200	100…300	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	140…420	80…220	125…350	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	174…520	100…300	150…450	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 51 - 500/575V AC and 690V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Normal/ Standard Duty

Rated Utilization Voltage [V AC]	Motor Current [A](2)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(3)
500 (kW) 575 (Hp)	30…90	20…63	30…75	100…240V AC; 50/60 Hz	150-SB1NUD
				24V DC	150-SB1NUR
	37…110	25…75	40…100	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	47…140	32…90	50…125	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	60…180	45…125	60…150	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	70…210	50…150	75…200	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	87…260	63…185	100…250	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	107…320	75…220	125…300	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	120…361	90…250	125…350	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	140…420	100…300	150…450	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	174…520	125…375	200…500	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR
690/Y (kW)(1) 600 (Hp)	30…90	30…80	30…75	100…240V AC; 50/60 Hz	150-SB1NUD
				24V DC	150-SB1NUR
	37…110	37…100	40…100	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	47…140	45…132	50…125	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	60…180	63…160	60…150	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	70…210	75…200	75…200	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	87…260	90…250	100…250	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	107…320	110…315	125…300	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	120…361	125…355	125…350	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	140…420	160…400	150…450	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	174…520	185…500	200…500	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR

(1) To be used only in a Y-type system.
(2) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(3) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Heavy-duty Ratings (for centrifugal fans, crushers, mixers, long conveyors, etc.)

Utilization Category: AC-53a:3.5-30:99-1. Start Not to Exceed: 350% of the controller maximum current rating, 30 second start time, 99% ON load factor, one start per hour with 50 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 52 - 200/208V AC and 230V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Heavy Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
200/208	30…90	—	10…25	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	37…110		15…30	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	47…140		20…40	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	60…180		25…60	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	70…210		25…60	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	87…260		30…75	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	107…320		40…100	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	120…361		50…125	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	140…420		50…150	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
230	30…90	10…25	15…30	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	37…110	11…32	15…40	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	47…140	15…45	20…50	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	60…180	18.5…55	25…60	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	70…210	22…63	30…75	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	87…260	30…80	40…100	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	107…320	37…100	50…125	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	120…361	40…110	50…150	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	140…420	45…132	60…150	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 53 - 400/415/460V AC and 500/575V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Heavy Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
400/415 (kW) 460 (Hp)	30…90	17…50	25…60	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	37…110	20…55	30…75	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	47…140	30…75	40…100	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	60…180	37…90	50…150	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	70…210	40…110	60…150	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	87…260	50…132	75…200	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	107…320	63…160	100…250	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	120…361	75…200	100…300	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	140…420	80…220	125…350	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
500 (kW) 575 (Hp)	30…90	20…63	30…75	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	37…110	25…75	40…100	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	47…140	32…90	50…125	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	60…180	45…125	60…150	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	70…210	50…150	75…200	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	87…260	63…185	100…250	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	107…320	75…220	125…300	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	120…361	90…250	125…350	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	140…420	100…300	150…450	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 54 - 690V AC SMC-50 Solid-state Controllers for Use with Line-connected Motors, Heavy Duty

Rated Utilization Voltage [V AC]	Motor Current [A][2]	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.[3]
690/Y (kW)[1] 600 (Hp)	30…90	30…80	30…75	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	37…110	37…100	40…100	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	47…140	45…132	50…125	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	60…180	63…160	60…150	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	70…210	75…200	75…200	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	87…260	90…250	100…250	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	107…320	110…315	125…300	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	120…361	125…355	125…350	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	140…420	160…400	150…450	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR

(1) To be used only in a Y-type system.
(2) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.
(3) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

For Use with Delta-connected Motors

Normal/Standard Duty Ratings (for pumps, compressors, elevators, and short conveyors)

Utilization Category: AC-53a:3.5-10:99-2. Start Not to Exceed: 350% of the controller maximum current rating, 10-second start time, 99% ON load factor, two starts per hour with 40 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 55 - 200/208V AC and 230V AC SMC-50 Solid-state Controllers for Use with Delta-connected Motors, Normal/Standard Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
200/208	52…155	—	20…50	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	65…190		25…60	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	82…242		30…75	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	104…311		40…100	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	122…363		50…125	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	151…450		60…150	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	186…554		75…200	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	210…625		75…200	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	243…727		100…250	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	302…900		125…300	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
230	52…155	17…50	20…60	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	65…190	20…55	25…60	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	82…242	30…75	40…75	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	104…311	37…100	40…100	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	122…363	40…110	50…125	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	151…450	50…132	60…150	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	186…554	63…160	75…200	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	210…625	75…200	100…250	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	243…727	80…220	100…300	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	302…900	100…300	125…350	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 56 - 400/415/460V AC and 500/575V AC SMC-50 Solid-state Controllers for Use with Delta-connected Motors, Normal/Standard Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
400/415 (kW) 460 (Hp)	52…155	30…80	40…100	100…240V AC; 50/60 Hz	150-SB1NBD
				24V DC	150-SB1NBR
	65…190	37…100	50…150	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	82…242	50…132	75…200	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	104…311	63…160	100…250	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	122…363	75…200	100…300	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	151…450	90…250	125…350	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	186…554	110…315	200…450	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	210…625	125…355	200…500	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	243…727	150…400	250…600	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	302…900	185…530	250…700	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
500 (kW) 575 (Hp)	52…155	37…100	50…150	100…240V AC; 50/60 Hz	150-SB1NUD
				24V DC	150-SB1NUR
	65…190	50…132	75…150	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	82…242	63…160	100…250	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	104…311	75…220	125…300	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	122…363	90…250	125…350	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	151…450	110…315	200…450	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	186…554	132…400	200…500	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	210…625	150…450	250…600	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	243…727	185…530	300…700	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	302…900	220…670	350…900	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Heavy-duty Ratings (for centrifugal fans, crushers, mixers, long conveyors, etc.)

Utilization Category: AC-53a:3.5-30:99-1. Start Not to Exceed: 350% of the controller maximum current rating, 30 second start time, 99% ON load factor, one start per hour with 50 °C surrounding air ambient temperature.

- NOTE: See and use the SMC Estimation Wizard and SMC Thermal Estimation Wizard to confirm that the SMC controller selection meets the application requirements. See Sizing and Selection Tools for more information. For additional assistance, visit ab.rockwellautomation.com or contact Industrial Controls Technical Support by email at raictechsupport@ra.rockwell.com or by phone at 440-646-5800.

Table 57 - 200/208V AC and 230V AC SMC-50 Solid-state Controllers for Use with Delta-connected Motors, Heavy Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
200/208	52…155	—	20…50	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	65…190		25…60	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	82…242		30…75	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	104…311		40…100	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	122…363		50…125	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	151…450		60…150	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	186…554		75…200	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	210…625		75…200	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	243…727		100…250	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
230	52…155	17…50	20…60	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	65…190	20…55	25…60	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	82…242	30…75	40…75	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	104…311	37…100	40…100	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	122…363	40…110	50…125	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	151…450	50…132	60…150	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	186…554	63…160	75…200	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	210…625	75…200	100…250	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	243…727	80…220	100…300	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

ALLEN BRADLEY SMC FLEX

Table 58 - 400/415/460V AC and 500/575V AC SMC-50 Solid-state Controllers for Use with Delta-connected Motors, Heavy Duty

Rated Utilization Voltage [V AC]	Motor Current [A](1)	Motor kW, 50 Hz	Motor Hp, 60 Hz	Control Power	Cat. No.(2)
400/415 (kW) 460 (Hp)	52…155	30…80	40…100	100…240V AC; 50/60 Hz	150-SB2NBD
				24V DC	150-SB2NBR
	65…190	37…100	50…150	100…240V AC; 50/60 Hz	150-SB3NBD
				24V DC	150-SB3NBR
	82…242	50…132	75…200	100…240V AC; 50/60 Hz	150-SB4NBD
				24V DC	150-SB4NBR
	104…311	63…160	100…250	100…240V AC; 50/60 Hz	150-SC1NBD
				24V DC	150-SC1NBR
	122…363	75…200	100…300	100…240V AC; 50/60 Hz	150-SC2NBD
				24V DC	150-SC2NBR
	151…450	90…250	125…350	100…240V AC; 50/60 Hz	150-SC3NBD
				24V DC	150-SC3NBR
	186…554	110…315	200…450	100…240V AC; 50/60 Hz	150-SD1NBD
				24V DC	150-SD1NBR
	210…625	125…355	200…500	100…240V AC; 50/60 Hz	150-SD2NBD
				24V DC	150-SD2NBR
	243…727	150…400	250…600	100…240V AC; 50/60 Hz	150-SD3NBD
				24V DC	150-SD3NBR
500 (kW) 575 (Hp)	52…155	37…100	50…150	100…240V AC; 50/60 Hz	150-SB2NUD
				24V DC	150-SB2NUR
	65…190	50…132	75…150	100…240V AC; 50/60 Hz	150-SB3NUD
				24V DC	150-SB3NUR
	82…242	63…160	100…250	100…240V AC; 50/60 Hz	150-SB4NUD
				24V DC	150-SB4NUR
	104…311	75…220	125…300	100…240V AC; 50/60 Hz	150-SC1NUD
				24V DC	150-SC1NUR
	122…363	90…250	125…350	100…240V AC; 50/60 Hz	150-SC2NUD
				24V DC	150-SC2NUR
	151…450	110…315	200…450	100…240V AC; 50/60 Hz	150-SC3NUD
				24V DC	150-SC3NUR
	186…554	132…400	200…500	100…240V AC; 50/60 Hz	150-SD1NUD
				24V DC	150-SD1NUR
	210…625	150…450	250…600	100…240V AC; 50/60 Hz	150-SD2NUD
				24V DC	150-SD2NUR
	243…727	185…530	300…700	100…240V AC; 50/60 Hz	150-SD3NUD
				24V DC	150-SD3NUR

(1) Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC-50 controller. Contact Rockwell Automation technical support for further guidance.

(2) Devices are not equipped with line and load terminal lugs. See page 78 for terminal lug kits.

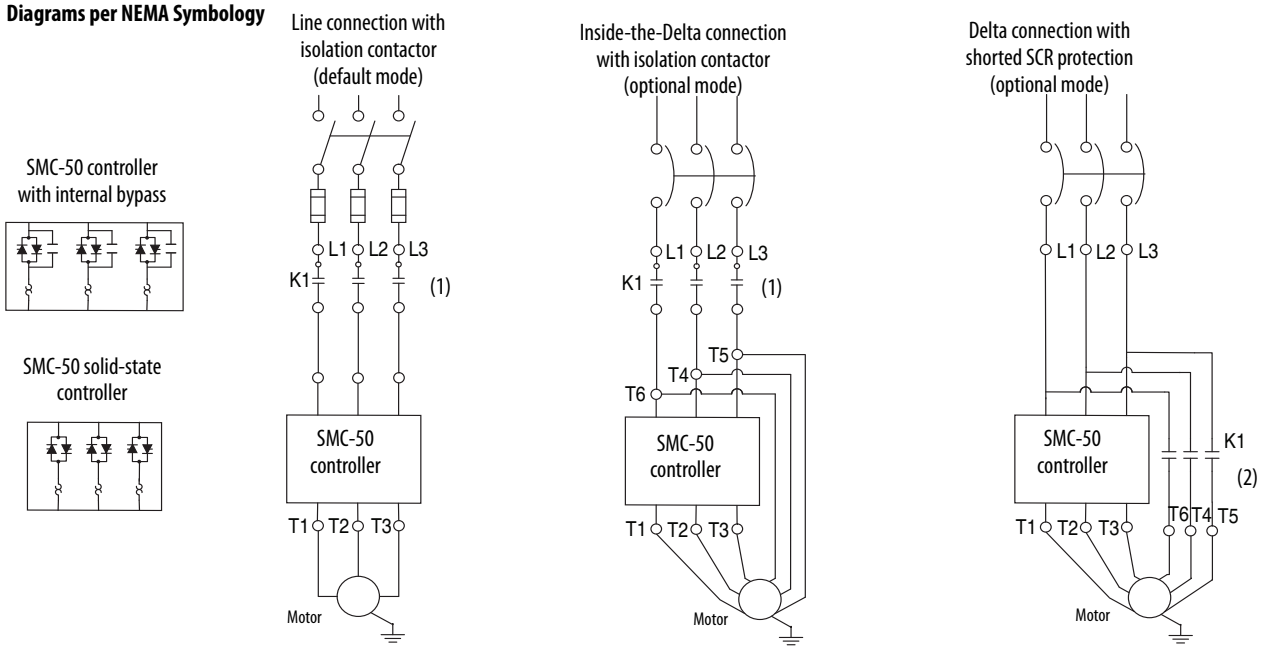
ALLEN BRADLEY SMC FLEX

Typical Wiring Diagrams

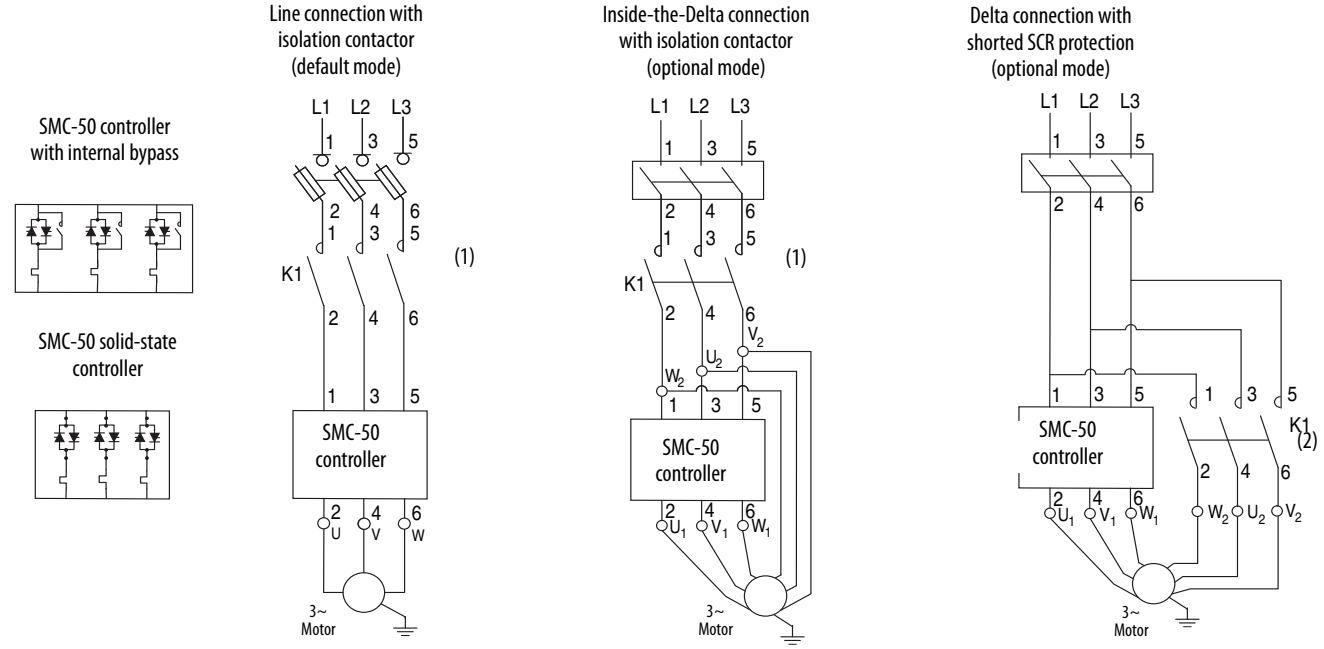
Typical Power Wiring Diagrams

Figure 20 - Power Wiring Diagrams

Diagrams per NEMA Symbology



Diagrams per IEC Symbology



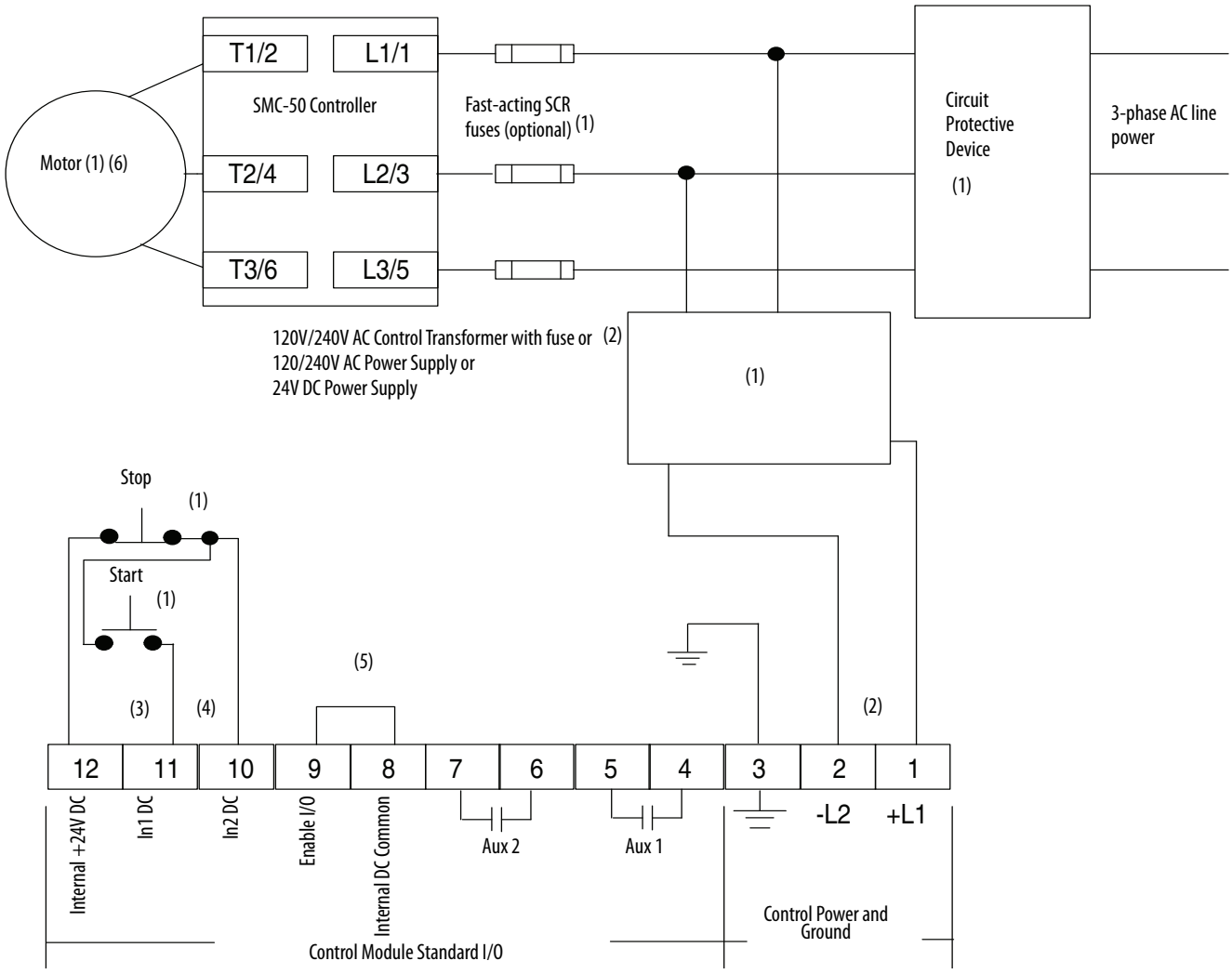
(1) Contactor must be fully rated for motor Hp/kW and FLA.

(2) For North American applications, size the contactor according to the motor Hp and FLA. For IEC applications, size the contactor according to the motor AC-1 or AC-3 rating. the short-circuit current rating of the contactor must be similar to that of the SMC-50 controller.

ALLEN BRADLEY SMC FLEX

Typical Control Wiring Diagrams

Figure 21 - For Standard 3-Wire Control—DC Inputs, No DPI Control



(1) Customer supplied.

(2) See the controller nameplate to verify control power input ratings (100...240V AC or 24V DC).

(3) Terminal 11 (In 1 DC) 24V DC input configured for START input using Parameter 56.

(4) Terminal 10 (In 2 DC) 24V DC input configured for COAST, STOP option, etc. using Parameter 57.

NOTE: The controller generates an I/O configuration fault if any input is configured for START or SLOW speed and no input is selected for COAST or STOP.

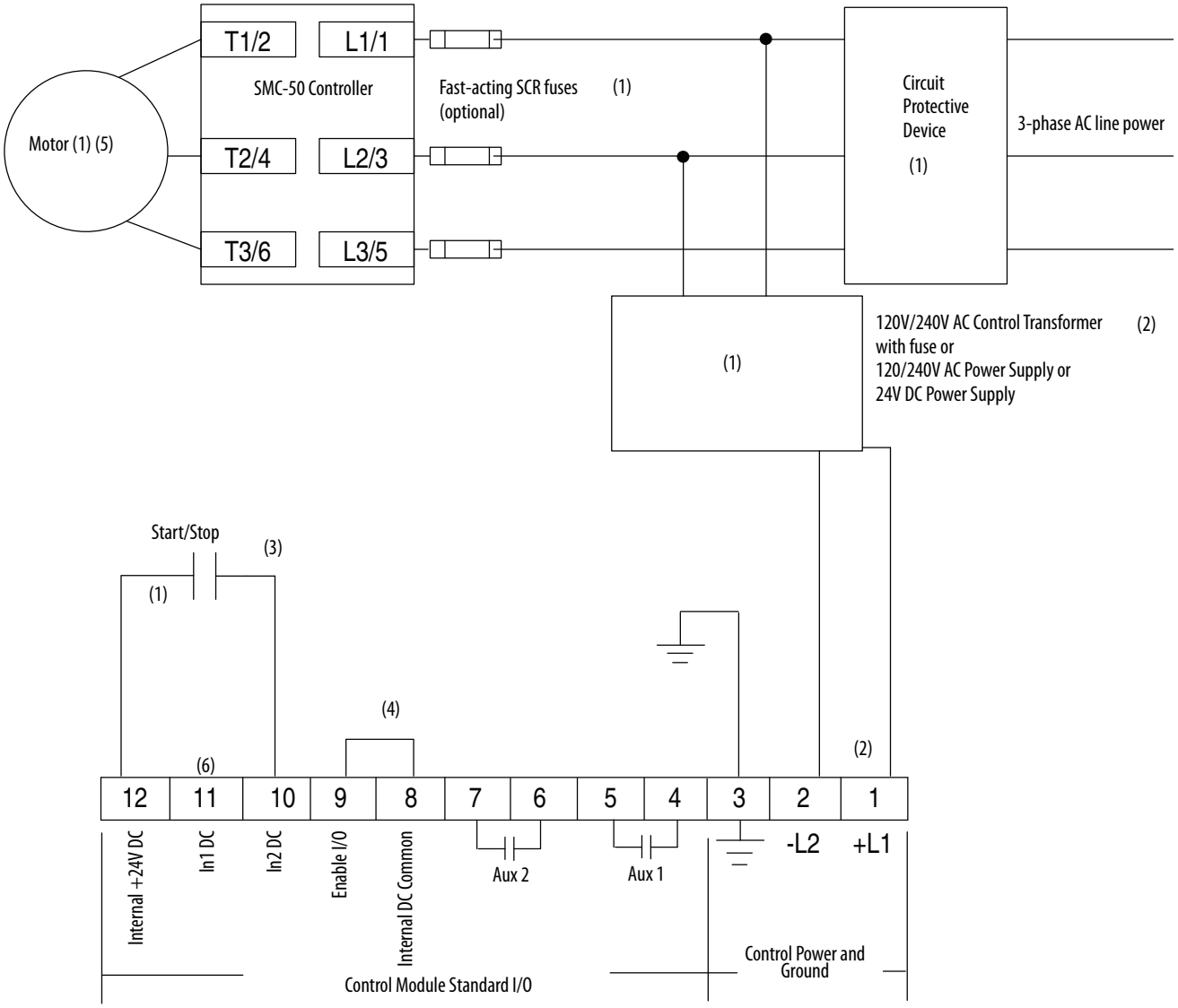
(5) A customer-supplied jumper is required to enable standard I/O operation.

(6) Due to current leakage through an SCR in the OFF state (controller stopped), some form of off-stream line power isolation is recommended if maintenance is required on the motor. See the Isolation Contactor Applications diagram for details.

NOTE: In addition to a small amount of leakage current flowing through an SCR in the off-state, failure of one or more solid-state power switching components allows uncontrolled current to flow to the motor winding(s). This could potentially result in overheating or damage to the motor. To help prevent potential personal injury or equipment damage, the installation of an isolation contactor or shunt trip-type circuit breaker capable of interrupting the motor locked rotor current on the line side of the SMC-50 controller is recommended. Operation of the isolation device should be coordinated using one of the SMC-50 controller auxiliary contacts configured to NORMAL.

ALLEN BRADLEY SMC FLEX

Figure 22 - For 2-Wire Control with Stopping Capability—DC Inputs, No DPI Control



(1) Customer supplied.

(2) See the controller nameplate to verify control power input ratings (100...240V AC or 24V DC).

(3) Terminal 10 (In 2 DC) 24V DC N.O. input is configured for start/stop or start/coast using Parameter 57 (contact closed start initiated, contact open, stop initiated). When using start/stop or start/coast, a N.O. input contact **must** be used.

NOTE: The controller generates an I/O configuration fault if any input is configured for START or SLOW speed and no input is selected for COAST or STOP.

(4) A customer-supplied jumper is required to enable controller standard I/O operation.

(5) Due to current leakage through an SCR in the OFF state (controller stopped), some form of upstream line power isolation is recommended if maintenance is required on the motor. See the Isolation Contactor Applications diagram for details.

(6) Configure In1 (Input 1—Parameter 56) to "Disable".

NOTE: In addition to a small amount of leakage current flowing through an SCR in the off-state, failure of one or more solid-state power switching components allows uncontrolled current to flow to the motor winding(s). This could potentially result in overheating or damage to the motor. To help prevent potential personal injury or equipment damage, the installation of an isolation contactor or shunt trip-type circuit breaker capable of interrupting the motor's locked rotor current on the line side of the SMC-50 controller is recommended. Operation of the isolation device should be coordinated using one of the SMC-50 controller Aux contacts configured to NORMAL.

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Accessories

Option Modules

Option modules can be used to add or expand the functionality of the SMC-50 Control Module. Option modules are installed into the control module's three expansion ports, 7 through 9.

- NOTE: If the application requires network communication, a Cat. No. 20-COMM-X communication adapter must be inserted in expansion port 9.

Description		Compatible Control Module Ports	Maximum No. of Option Modules of this Type Per Controller	Cat. No.
	PTC, Ground Fault, and Current Feedback Option Module	7 and 8	1	150-SM2
	Analog I/O Option Module: 2 analog inputs (voltage or current) and 2 analog outputs (voltage or current)	7, 8, 9	3	150-SM3
	Digital I/O Option Module: 4 100…240V AC inputs and 3 relay outputs	7, 8, 9	3	150-SM4
	Parameter Configuration Module — DIP and rotary dial	7, 8, 9	1	150-SM6

Converter Modules

Description		For Use With	Rated Current [A]	Cat. No.
	Three-Phase Current Monitoring Module	Used with a Cat. No. 150-SM2 to provide current feedback to the SMC-50 controller when in external bypass configuration.(1)	30…180	825-MCM180
			181…520	825-MCM20
	Connection Cable (replacement) Cat. No. 150-SM2 to Bul. 825-MCM connection	All	—	825-MCA
	Core Balance Ground Fault Sensor	Used with a Cat. No. 150-SM2 to provide ground current feedback.(2)	Turns Ratio: 100:1	825-CBCT

(1) Requires user-supplied current transformers with 5 A secondary.
(2) The ground fault sensing feature of the SMC-50 controller is intended for monitoring purposes only. It is not to be used as a ground fault circuit interrupter for personnel protection as defined by Article 100 of the NEC. The sensing feature has not been evaluated to UL 1053.

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Protective Modules

The same protective module mounts on the line or load side of the SMC-50 controller. Use of protective modules is highly recommended. For applications that require both line and load side protection, you must order two protective modules.

- Note: You must not place protective modules on the load (motor) side of an SMC-50 controller when using an inside-the-delta connection or with pump, braking, or linear speed acceleration/deceleration control.

	Current Rating	Description	Cat. No.
	90...520 108…480	480V protective module	150-F84L
		600V protective module	150-F86L

Terminal Lug Kits

	For Use With Controller Type		Current Range [A]	Wire Size Range	Total No. of Terminal Lugs Possible Each Side		Pkg. Qty.	Cat. No.
					Line Side	Load Side		
	Integrated bypass	150-S108… 150-S135…	108…135	#6…250 MCM AWG 16 mm^2…120 mm^2	3	3	3	199-LF1
		150-S201… 150-S251…	201…251	#6…250 MCM AWG 16 mm^2…120 mm^2	6	6	3	199-LF1
		150-S317… 150-S361… 150-S480…	317…480	#4…500 MCM AWG 25 mm^2…240 mm^2	6	6	3	199-LG1
	Solid -state (no external bypass)	150-SB…	90…180	#6…250 MCM AWG 16 mm^2…120 mm^2	3	3	3	199-LF1
		150-SC…	210…320	#6…250 MCM AWG 16 mm^2…120 mm^2	6	6	3	199-LF1
		150-SD…	361…520	#4…500 MCM AWG 25 mm^2…240 mm^2	6	6	3	199-LG1
	Solid -state (with external bypass)	150-SB…	90…180	(2) 1/0…250 MCM AWG 50 mm^2…120 mm^2	3	3	3	1494R-N14
		150-SC…	210…320	#6…250 MCM AWG 16 mm^2…120 mm^2	6 (6 additional needed for bypass kit)	6	3	199-LF1
		150-SD…	361…520	#4…500 MCM AWG 25 mm^2…240 mm^2	6 (6 additional needed for bypass kit)	6	3	199-LG1
	Integrated bypass— (inside-the-delta terminal lugs)	150-S108… 150-S135…	187…234	#4…500 MCM AWG 25 mm^2…240 mm^2	3	6(1)	3	1494R-N15
		150-S201… 150-S251…	348…435	(2) 1/0…250 MCM AWG 50 mm^2…120 mm^2	6	12(1)	3	1494R-N14
		150-S317… 150-S361… 150-S480…	549…831	(3) 3/0…500 MCM AWG 95 mm^2…240 mm^2	3	12(2)	3	150-LG5MC

(1) When connected in an inside-the-delta configuration, use terminal Cat. No. 199-LF1 for load-side connections (T1…T6).
(2) When connected in an inside-the-delta configuration, use terminals Cat. No. 199-LG1 for load-side connections (T1…T6).

Distribution Blocks

	For Use With Controller Type		Current Range [A]	Wire Size Range		Total No. Distribution Blocks Needed		Pkg. Qty.	Cat. No.
				Line Side	Load Side	Line Side	Load Side		
	Solid-state (inside-the-delta)	150-SB…	155…311	(2) #4 AWG…500 MCM 25…240 mm^2	(2) #4 AWG…500 MCM 25…240 mm^2	3	—	1	1492-BG
		150-SC…	363…554	(2) 1/0 AWG…750 MCM 54…400 mm^2	(6) 6 AWG…250 MCM 16…120 mm^2	1	—	1	Marathon Special Products Cat. No. 1353703
		150-SD…	625…900	(4) 1/0 AWG…750 MCM 54…400 mm^2	(4) 1/0 AWG…750 MCM 54…400 mm^2	3	—	1	Marathon Special Products Cat. No. 1352702

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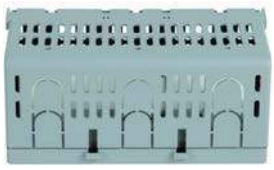
External Bypass Kits

For Use With Controller Type		Current Range [A]	Cat. No.
Solid -state (with external bypass)	150-SC…	210…320	150-SCBK
	150-SD…	361…520	150-SDBK

IEC Line or Load Terminal Covers

	Description	For Use With	Pkg. Quantity	Cat. No.
	• Dead front protection • IP2X finger safe when used with 250 MCM cable	150-S108… 150-S135…	1	150-TC1
	• Dead front protection • IP2X finger safe when used with 250 MCM cable	150-S201… 150-S251…	1	150-TC2
	• Dead front protection • IP2X finger safe when used with 500 MCM cable	150-S317… 150-S361… 150-S480…	1	150-TC3
	• Dead front protection • IP2X finger safe when used with 250 MCM cable	150-SB… (90…180 A units only)	1	150-STCB

Capacitor Module

	Description	For Use With	Cat. No.
	Required for EMC directive compliance (EN60947-4-2)	150-SB… (90…180 A units only)	150-SMCAP

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Human Interface Modules (HIMs) and Communication Modules

	Description			Cat. No.
	SMC-50 Controller — bezel mounted	Enhanced, LCD, Full Numeric Keypad		20-HIM-A6
	Door-mounted HIM	Remote (panel mount) LCD Display, Full Numeric Keypad (version of Cat. No. 20-HIM-A6)		20-HIM-C6S[3]
	HIM interface cables	HIM Interface Cable, 1 m (39 in)		20-HIM-H10[4]
		Cable Kit (Male-Female) 0.33 m (1.1 ft)		1202-H03
		Cable Kit (Male-Female) 1 m (3.3 ft)		1202-H10
		Cable Kit (Male-Female) 3 m (9.8 ft)		1202-H30
		Cable Kit (Male-Female) 9 m (29.5 ft)		1202-H90
		DPI/SCANport™ One to Two Port Splitter Cable		1203-S03
	Description		**For Use With**	
	Communication modules (installed into the physical space assigned to control module expansion port 9; connected to DPI port 4 via cable)	RS-485 DF1 Communication Adapter	Bulletin 150-Sxx	20-COMM-S
		PROFIBUS™ DP Communication Adapter		20-COMM-P
		ControlNet® Communication Adapter (Coax)		20-COMM-C
		Interbus™ Communication Adapter		20-COMM-I
		Modbus/TCP Communication Adapter		20-COMM-M
		DeviceNet® Communication Adapter		20-COMM-D
		EtherNet/IP™ Communication Adapter		20-COMM-E
		Dual-port EtherNet/IP Communication Adapter		20-COMM-ER
		HVAC Communication Adapter		20-COMM-H
		ControlNet® Communication Adapter (Fiber)		20-COMM-Q
Connected Components Workbench Software		Programming Software	Windows 7/2000/XP/Vista Windows 10[2]	Available for download at www.rockwellautomation.com
DriveExecutive™				9303-4DTE01ENE
DriveTools™ SP [1]				9303-4DTS01ENE
AnaCANda™ RS-232 to DPI		Personal computer Interface	Serial	1203-SSS[5]
DPI to USB			USB	1203-USB[6]

(1) Includes DriveExecutive™ and DriveObserver™ software.
(2) Connected Components Workbench software only.
(3) A 3 m (9.8 ft.) Cat. No. 1202-C30 cable is provided.
(4) A cable is required if 20-HIM-A6 is connected to the SMC-50 DPI Port #2 and used as a hand-held device.
(5) Includes Cat. No. 1203-SFC and 1202-C10 cables.
(6) Includes Cat. No. 20-HIM-H10 and 22-HIM-H10 cables.

Replacement Parts

For All Controller Types

Description			Cat. No.
SMC-50 Control Module	100. . . 240V AC control power; two 24V DC inputs, two relay outputs		150-SCMD
	24V DC control power; two 24V DC inputs, two relay outputs		150-SCMR[1]
Replacement Cover	Replacement control module front cover		150-SCMRC
Replacement Removable Terminal Block	Control module control I/O replacement removable terminal block	Control module	150-SCMRTB
	PTC module replacement removable terminal block (set of 3)	150-SM2	150-SM2RTB
	Analog I/O option replacement removable terminal block	150-SM3	150-SM3RTB
	Digital I/O module replacement removable terminal block	150-SM4	150-SM4RTB

(1) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

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For Units with Integrated Bypass

Description		100…240V AC Control Voltage	24V DC Control Voltage
		Cat. No.	Cat. No.
Frame 3 Power Structure Assembly • Contains all three power poles in one package and includes the pole-to-control module transition cover and cooling fan.	108 A, 200…480V AC line	150-SPP108BD	150-SPP108BR (1)
	135 A, 200…480V AC line	150-SPP135BD	150-SPP135BR(1)
	108 A, 200…690V AC line	150-SPP108UD	150-SPP108UR(1)
	135 A, 200…690V AC line	150-SPP135UD	150-SPP135UR(1)
Frame 4 Power Pole • Contains one power pole	201 A, 200…480V AC line	150-SPP201B	
	251 A, 200…480V AC line	150-SPP251B	
	201 A, 200…690V AC line	150-SPP201U	
	251 A, 200…690V AC line	150-SPP251U	
Frame 5 Power Pole • Contains one power pole	317 A, 200…480V AC line	150-SPP317B	
	361 A, 200…480V AC line	150-SPP361B	
	480 A, 200…480V AC line	150-SPP480B	
	317 A, 200…690V AC line	150-SPP317U	
	361 A, 200…690V AC line	150-SPP361U	
	480 A, 200…690V AC line	150-SPP480U	
Base Plate • for mounting power poles	201…251 A	41391-803-01	
	317…480 A	41391-803-02	

(1) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

Description		Rated Control Voltage	For Use With	Cat. No.
Replacement Fan	for SMC-50 Frame 3 controllers	100…240V AC	150-S108…-S135	150-SRF135D
		24V DC		150-SRF135R(1)
	for SMC-50 Frame 4 controllers	100…240V AC	150-S201…-S251	150-SRF251D
		24V DC		150-SRF251R(1)
	for SMC-50 Frame 5 controllers	100…240V AC	150-S317…-S480	150-SRF480D
		24V DC		150-SRF480R(1)

(1) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

Description	Rated Current [A]	Line Voltage [V AC]	Control Voltage	Cat. No.
SMC-50 with Bypass Replacement Controller Cover	201	200…480	100…240V AC	150-S201RCBD
			24V DC(1)	150-S201RCBR(2)
		200…690	100…240V AC	150-S201RCUD
			24V DC(1)	150-S201RCUR(2)
	251	200…480	100…240V AC	150-S251RCBD
			24V DC(1)	150-S251RCBR(2)
		200…690	100…240V AC	150-S251RCUD
			24V DC(1)	150-S251RCUR(2)
	317	200…480	100…240V AC	150-S317RCBD
			24V DC(1)	150-S317RCBR(2)
		200…690	100…240V AC	150-S317RCUD
			24V DC(1)	150-S317RCUR(2)
	361	200…480	100…240V AC	150-S361RCBD
			24V DC(1)	150-S361RCBR(2)
		200…690	100…240V AC	150-S361RCUD
			24V DC(1)	150-S361RCUR(2)
	480	200…480	100…240V AC	150-S480RCBD
			24V DC(1)	150-S480RCBR(2)
		200…690	100…240V AC	150-S480RCUD
			24V DC(1)	150-S480RCUR(2)

(1) 24V DC Control Inputs ONLY. Not compatible with 24V AC Control Inputs.
(2) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

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For Solid-state Units

Description		100…240V AC Control Voltage	24V DC Control Voltage
		Cat. No.	Cat. No.
Frame B Power Structure Assembly • Contains all three power poles in one package and includes the pole-to-control module transition cover and cooling fan	90 A, 200…480V AC line	150-SPPB1B	150-SPPB1BR
	110 A, 200…480V AC line	150-SPPB2B	150-SPPB2BR
	140 A, 200…480V AC line	150-SPPB3B	150-SPPB3BR
	180 A, 200…480V AC line	150-SPPB4B	150-SPPB4BR
	90 A, 200…690V AC line	150-SPPB1U	150-SPPB1UR
	110 A, 200…690V AC line	150-SPPB2U	150-SPPB2UR
	140 A, 200…690V AC line	150-SPPB3U	150-SPPB3UR
	180 A, 200…690V AC line	150-SPPB4U	150-SPPB4UR
Frame C Power Pole • Contains one power pole — SCR, heatsink assembly, and cable	210 A, 200…480V AC line	150-SPPC1B	
	260 A, 200…480V AC line	150-SPPC2B	
	320 A, 200…480V AC line	150-SPPC3B	
	210 A, 200…690V AC line	150-SPPC1U	
	260 A, 200…690V AC line	150-SPPC2U	
	320 A, 200…690V AC line	150-SPPC3U	
Frame D Power Pole • Contains one power pole — SCR, heatsink assembly, and cable	361 A, 200…480V AC line	150-SPPD1B	
	420 A, 200…480V AC line	150-SPPD2B	
	520 A, 200…480V AC line	150-SPPD3B	
	361 A, 200…690V AC line	150-SPPD1U	
	420 A, 200…690V AC line	150-SPPD2U	
	520 A, 200…690V AC line	150-SPPD3U	

Description			Cat. No.
Replacement Cover	Replacement controller cover	210…320 A units	150-SCRC
		361…520 A units	150-SDRC

Description		Rated Control Voltage	For Use With	Cat. No.
Replacement Fan	for SMC-50 Frame B controllers	100…240V AC	150-SB units (90…180 A)	150-SF1
		24V DC		150-SF1R
	for SMC-50 Frame C controllers	100…240V AC	150-SC units (210…320 A)	150-SF2D
		24V DC		150-SF2R
	for SMC-50 Frame D controllers	100…240V AC	150-SD units (361…520 A)	150-SF3D
		24V DC		150-SF3R
Replacement Fan Cover	fan cover for SMC-50 Frame B controllers	—	150-SB units (90…180 A)	150-SBFC
	fan cover for SMC-50 Frame C controllers	—	150-SC units (210…320 A)	150-SCFC
	fan cover for SMC-50 Frame D controllers	—	150-SD units (361…520 A)	150-SDFC

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Upgrade Kits

These kits allow you to upgrade from SMC Flex controllers to SMC-50 controllers with internal bypass. Kits contain SMC-50 control module, programming device, optional I/O card (if needed), and plastic mounting/transition cover (if needed).

- Important: Carefully check current range, line voltage, and control input voltage when selecting an upgrade kit. Not all control voltages or current ranges can be upgraded.

Description	Kit Contents[1]	Rated Current [A]	Line Voltage [V AC]	Control Voltage[2]	Cat. No.
Frame 3 SMC Flex to SMC-50 controllers with bypass upgrade kit	• 150-SCMD control module • 150-SM4 digital I/O module • 20-HIM-A6 LCD HIM	108	200…690	100…240V AC	150-S108UPGD
		135			150-S135UPGD
	• 150-SCMR control module • 20-HIM-A6 LCD HIM	108	200…690	24V DC[3]	150-S108UPGR[4]
		135			150-S135UPGR[4]
Frame 4 SMC Flex to SMC-50 controllers with bypass upgrade kit	• 150-SCMD control module • 150-SM4 digital I/O module • 20-HIM-A6 LCD HIM • Plastic mounting/transition cover	201	200…480	100…240V AC	150-S201UPGBD
			200…575		150-S201UPGCD
			200…690		150-S201UPGUD
		251	200…480		150-S251UPGBD
			200…575		150-S251UPGCD
			200…690		150-S251UPGUD
	• 150-SCMR control module • 20-HIM-A6 LCD HIM • Plastic mounting/transition cover	201	200…480	24V DC[3]	150-S201UPGBR[4]
			200…575		150-S201UPGCR[4]
			200…690		150-S201UPGUR[4]
		251	200…480		150-S251UPGBR[4]
			200…575		150-S251UPGCR[4]
			200…690		150-S251UPGUR[4]

(1) Kit contains one of each catalog number listed.
(2) The SMC-50 control module provides two (2) 24V DC control inputs. If you need additional inputs, you must use 100…240V AC inputs (requires 150-SM4 option module).
(3) 24V DC control voltage ONLY. Not compatible with 24V AC control voltage.
(4) Consult your local Rockwell Automation sales office or Allen-Bradley distributor for availability.

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Specifications

Table 59 - Functional Design

Standard Features		Description
Installation	Power Wiring	standard squirrel-cage induction motor or a Wye-Delta, six-lead motor
	Control Wiring	2- and 3-wire control for a wide variety of applications
Configuration/Setup(1)	Keypad	Cat. No. 20-HIM-A6 full numeric keypad with LCD display Cat. No. 20-HIM-C6S remote panel mount full numeric keypad with LCD display
	Software	parameter values are downloaded to the SMC-50 with the Connected Components Workbench, DriveTools, and DriveExplorer programming software packages
	Parameter Configuration Option Module (PCM)	Cat. No. 150-SM6 provides simple and limited configuration by DIP and rotary dial switches
Communications		four DPI ports for local serial communications. Network communication supported by optional 20- COMM-X modules
Starting and Stopping Modes		modes include: Soft Start, Coast-to-Stop, Soft Stop, Current Limit Start, Dual Ramp, Full Voltage, Linear Speed Acceleration (start), Linear Speed Deceleration (stop), Torque Start, and Preset Slow Speed
Pump Control	Start and Stop	helps reduce fluid surges in centrifugal pumping systems during the starting and stopping period
Braking Control(2)	SMB Smart Motor Braking	provides motor braking without additional equipment for applications that require the motor to stop quickly
	Accu-Stop(5)	provides controlled position stopping; during stopping, brake torque is applied to the motor until the motor reaches the preset slow speed and holds the motor at this speed until a stop command is given - braking torque is then applied until the motor reaches zero speed - braking current is programmable
	Slow Speed with Braking	used on applications that require slow speed (in the forward or reverse direction) for positioning or alignment and requires braking control to stop
	External Braking	activates the external braking device by using aux. relay output
Protection and Diagnostics(3)		displays: Power Loss, Line Fault, Voltage Unbalance, Excessive Starts/Hour, Phase Reversal, Undervoltage, Overvoltage, Controller Temperature, Stall, Jam, Open Gate, Overload, Underload, and Communication Fault
Metering Indication(4)		provides: Phase Current, Current Average, Phase-to-Phase Voltage, Voltage P-P Average, Phase-to-neutral Voltage, Calculated Torque, Real Phase Power, Real Power, Real Energy, Real Demand, Max Real Demand, Reactive Power, Reactive Energy + and -, Reactive Energy, Reactive Demand, Max Reactive Demand, Apparent Power, Apparent Energy, Apparent Demand, Number of Periods, Power Factor, Energy Savings, Elapsed Time 1 and 2, Running Time, Motor Speed, Start Time 1-5, Peak Current 1-5, Total Starts, THD V, THD I, THD V Average, THD I Average, Line Frequency, Current Imbalance, and Voltage Unbalance
LED Status Indication by Multi-color (standard)		displays fault and alarm codes: Running - with alarm, Running - no alarm, Ready - with alarm, Ready - no alarm, Ready - tuning enabled on next start, and Firmware Download Active - with alarm
Auxiliary Contacts (two standard)		two fully programmable contacts as: normal, UTS, fault, alarm, external brake, auxiliary control, network, external bypass, or fan control

(1) The configuration method must be ordered separately from the controller, which does not include a setup tool.
(2) Not intended to be used as an emergency stop. See the applicable standards for emergency stop requirements.
(3) Diagnostic indication depends on the type of configuration tool used. The standard LED status indication displays: Inhibit (stop enabled), Fault (non- resettable), Fault (resettable). For full local access, a HIM or personal computer software is required. For network access, full access to data can also be obtained.
(4) Metering Indication depends on the type of configuration tool being used. Metering Indication requires the use of a HIM or a personal computer software configuration tool for full local access. Full access to data can also be obtained via network.
(5) Accu-Stop is not included as a parameter/function like that of the SMC-Flex. However, the Accu-Stop function can be accomplished with the SMB mode and Slow Speed with Braking functions.

Electrical Ratings

Table 60 - Power Circuit Ratings

Description	Device Rating	UL/CSA/NEMA	IEC
Rated Operation Voltage	480V	200…480V AC (–15%, +10%)	200…415V (-15%, +10%)
	690V	200…600V AC (–15%, +10%)	200…690V/Y (–15%, +10%)
Rated Insulation Voltage	480V	—	500V
	690V	—	690V
Rated Impulse Voltage	480V	—	6000V
	690V	—	6000V
Dielectric Withstand	480V	2200V AC	2500V
	690V	2200V AC	2500V
Repetitive Peak Inverse Voltage Rating	480V	1400V	1400V
	690V	1800V	1800V
Operating Frequency	All	47...63 Hz	47...63 Hz

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Table 61 - Utilization Category

Description		Device Rating	UL/CSA/NEMA	IEC
Integrated Bypass		108…480A	MG 1	AC-53b:3.0-50:1750
Solid-state	Normal Duty	90…520 A		AC-53a:3.5-10:99-2
	Heavy Duty			AC-53a:3.5-30:99-1
Protection Against Electrical Shock	Integrated Bypass	108…480A	—	IP00 (IP20 - Control Terminals only)
		108…480A		IP2X (with Optional Terminal Cover)
	Solid-state	90…520 A		IP00 (IP20 - Control Terminals only)
		90…180 A		IP2X (with Optional Terminal Cover)
DV/DT Protection		480V	RC Snubber Network	
		690V		
Transient Protection		480...600V	Metal Oxide Varistors: 220 Joules	
		690V	None	

Table 62 - Control Power Specifications

Description	UL/CSA/NEMA	IEC
Rated Operational Voltage	100…240V AC (-15%…+10%) or 24V DC (-10%…+10%)	
Rated Insulation Voltage	—	240V
Rated Impulse Voltage	—	3000V
Dielectric Withstand	1500V AC	1500V
Operating Frequency	47…63 Hz or DC	
Control Power Ride Through	22 ms	
Max. Output of 24V DC Supply (Terminals 8 and 12)	300 mA	
Control Module Battery Type	CR 2032	

This product contains a sealed lithium battery that may need to be replaced during the life of the product.
At the end of its life, the battery contained in this product should be collected separately from any unsorted municipal waste.
The collection and recycling of batteries helps protect the environment and contributes to the conservation of natural resources as valuable materials are recovered.

ATTENTION: There is a danger of explosion if the lithium battery or real-time clock module in this product is incorrectly replaced. Do not replace the battery or real-time clock module unless power has been removed and the area is known to be nonhazardous.

Replace the battery only with catalog number 2711P-RY2032 or an equivalent CR2032 coin-cell battery.

Do not dispose of the lithium battery or real-time clock module in a fire or incinerator. Dispose of used batteries in accordance with local regulations.

For safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication AG 5-4.

Perchlorate material – special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate.
This perchlorate warning only applies to primary Lithium Manganese Dioxide ($LiMnO_2$) cells or batteries, and products containing these cells or batteries, sold or distributed in California, USA.

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Table 63 - Control Module Standard Inputs: Terminals 10 and 11

Description		UL/CSA/NEMA	IEC
Nominal Operating Voltage		24V DC	
Operating Voltage Range		15…30V DC	
On State	Current, min.	2.8 mA	
	Voltage, min.	10V DC	
Off State	Current, max.	3 mA	
	Voltage, max.	10.9V DC	
Inrush Current Maximum		7 mA	
Input Delay Time		On-to-Off: 30 ms, Off-to-On: 20 ms	
Reverse Polarity Protection		Yes	
Rated Insulation Voltage		—	60V
Rated Impulse Voltage		—	500V
Dielectric Withstand		500V AC	1000V AC

Table 64 - Control Module Standard Outputs: Terminals 4/5 and 6/7

Description	UL/CSA/NEMA	IEC
Outputs	Aux 1, Aux 2	
Type of Control Circuit	Electromagnetic Relay	
Number of Contacts per Relay	1	
Type of Contacts	Programmable N.O./N.C. (electrically held closed)	
Type of Current	AC	
Rated Operational Current	3 A @ 120V AC, 1.5 A @ 240V AC	
Conventional Thermal Current I_{th} AC/DC	5 A	
Make/Break VA	3600/360	
Utilization Category	B300	AC-15
Off-State Leakage Current	0.024 mA @ 24V	
Off-State Leakage Current	0.12 mA @120V	
Off-State Leakage Current	0.24 mA @ 240V	

Table 65 - Wiring Terminals (applies to Control Module Standard I/O and Expansion Module Terminals 150-SM2, 150-SM3, 150-SM4)

Description	Device Rating
Terminal Style	M3 Screw Clamp
Terminal Type	Removable
Screw Terminal Torque	0.8 N•m (7.0 lb•in)
Terminal Wire Size	0.2…2.5 mm^2 (24…14 AWG)
Wire Strip Length	7.0 mm (0.27 in.)

Table 66 - Cat. No. 150-SM4 Optional Digital Control Inputs: Terminals A1, A2

Description		UL/CSA/NEMA	IEC
Nominal Operating Voltage		100…240V AC	
Operating Voltage Range		85V…264V AC @ 47 Hz…63 Hz	
On State	Current, min.	9.7 mA @ 47 Hz, 9.7 mA @ 62.4 Hz	
	Voltage, min.	74.5V AC @ 47 Hz, 55.9V AC @ 62.4 Hz	
Off State	Current, max.	9.0 mA @ 47 Hz, 9.3 mA @ 62.4 Hz	
	Voltage, max.	68.8V AC @ 47 Hz, 53.6V AC @ 62.4 Hz	
Inrush Current Maximum		3.64 A	
Input Delay Time		On-to-Off: 30 ms, Off-to-On: 25 ms	
Rated Insulation Voltage		—	240V
Rated Impulse Voltage		—	3000V
Dielectric Withstand		1600V AC	2000V AC

Table 67 - Cat. No. 150-SM4 Optional Digital Control Inputs: Terminals A3 and A4

Description		UL/CSA/NEMA	IEC[1]
Nominal Operating Voltage		100…240V AC	
Operating Voltage Range		85V…264V AC @ 47 Hz…63 Hz	
On State	Current, min.	5.1 mA @ 47 Hz, 5.0 mA @ 62.4 Hz	
	Voltage, min.	74.5V AC @ 47 Hz, 55.8V AC @ 62.4 Hz	
Off State	Current, max.	4.7 mA @ 47 Hz, 4.8 mA @ 62.4 Hz	
	Voltage, max.	68.6V AC @ 47 Hz, 53.5V AC @ 62.4 Hz	
Inrush Current Maximum		3.64 A	
Input Delay Time		On-to-Off: 30 ms, Off-to-On: 25 ms	
Rated Insulation Voltage		—	240V
Rated Impulse Voltage		—	3000V
Dielectric Withstand		1600V AC	2000V AC

(1) Meets IEC Type 2 specifications for inputs per IEC 60947-1 for 240V AC only.

Table 68 - Cat. No. 150-SM4 Optional Outputs: Terminals A6/A7, A8/A9, A10/A11

Description	UL/CSA/NEMA	IEC
Outputs	Aux 1, Aux 2, Aux 3	
Type of Control Circuit	Electromagnetic Relay	
Number of Contacts per Relay	1	
Type of Contacts	Programmable N.O./N.C. (electrically held closed)	
Type of Current	AC	
Rated Operational Current	3 A @ 120V AC, 1.5 A @ 240V AC	
Conventional Thermal Current I_{th} AC/DC	5 A	
Make/Break VA	3600/360	
Utilization Category	B300	AC-15
Off-State Leakage Current	0.024 mA @ 24V	
	0.12 mA @120V	
	0.24 mA @ 240V	

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Table 69 - Cat. No. 150-SM3 Optional Analog Control Inputs: Terminals B5…B10

Description	Rating
Number of Inputs	2 differential inputs
Normal Operating Input Ranges	±10V, 0…10V, 0…5V, 1…5V, 0…20 mA, 4…20 mA
Full-scale Operating Input Ranges	±10.5V, 0…10.5V, -0.5…5.25V, 0.5…5.25V, 0…21 mA, 3.5…21 mA
Input Resolution	16 bit (sample rate = 60 Hz)/13 bit (sample rate = 250 Hz)
Data Refresh Rate	Filter dependent: 100 ms (sample rate = 60 Hz); 24 ms (sample rate = 250 Hz)
Rated Working Voltage	24V DC / 17V AC
Common Mode Voltage Range	±10V DC / channel
Input Impedance	220 kΩ: voltage mode
	249 Ω: current mode
Input Channel Diagnostics	Over and Under Range and Open Circuit
Open Circuit Detection Time	Positive Full Scale Reading: within 3 seconds (max)
Maximum Overload at Input Terminals	Voltage: ±24V DC continuous at 0.1 mA
	Current: ±30 mA continuous at 7V DC
External Calibration	Not required: auto-calibration performed by the module if required to meet specs.
Module Isolation to Control Board	Yes (1000V AC)
Removable Terminal Block	Yes (Cat. No.150-SM3RTB as a spare replacement part)
Cable Type	Belden 8760 (or equiv.) 0.750 mm^2 (18 AWG twisted pair 100% shield with drain)

Table 70 - Cat. No. 150-SM3 Optional Analog Control Outputs: Terminals B1…B4

Description	Rating
Number of Outputs	2 Single-ended
Normal Operating Ranges	±10V, 0…10V, 0…5V, 0…20 mA, 4…20 mA
Full Scale Operating Ranges	±10.5V, 0…10.5V, -0.5…5.25V, 0…21 mA, 3.5…21 mA
Output Resolution	16 bit (15 plus sign bipolar)
Resistive Load on Current Output	0…750 Ω
Load Range on Voltage Output	1 kΩ at 10V DC
Max. Inductive Load (Current Outputs)	15 mH
Max. Capacitive Load (Voltage Outputs)	100 µF
Overall Accuracy	Voltage Terminal: ±0.5% full scale at 25 °C
	Current Terminal: ±0.35% full scale at 25 °C
Accuracy Drift with Temperature	±5 PPM / °C
Output Impedance	15 Ω (typical)
Open and Short-circuit Protection	Yes
Maximum Short-circuit Current	45 mA
Output Overvoltage Protection	Yes

Table 71 - PTC Input Ratings (Cat. No. 150-SM2 required)

Description	Rating
Response Resistance	3400 Ω ± 150 Ω
Reset Resistance	1600 Ω ± 100 Ω
Short-circuit Trip Resistance	25 Ω ± 10 Ω
Max. Voltage at PTC Terminals (RPTC = 4 kΩ)	< 7.5 V
Max. Voltage at PTC Terminals (RPTC = open)	30V
Max. No. of Sensors (wired in series)	6
Max. Cold Resistance of PTC Sensor Chain	1500 Ω
Response Time	800 ms

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Table 72 - Control Power Requirements (Maximum Control Circuit Consumption)

Description		Current Range [A]	Control Voltage	
			100…240V AC	24V DC
Base Power Draw: Control Module with Heat Sink Fan	Integrated Bypass	108…135	150 VA	75 W
		201…251	175 VA	75 W
		317…480	225 VA	180 W
	Solid-state	90…180	150 VA	75 W
		210…260	150 VA	75 W
		361…520	300 VA	300 W
Option Power Adder (for each option installed, add to base power to obtain total power requirement)	Human Interface Module (HIM)	—	10 VA	2 W
	150-SM2(1)	—	30 VA	4 W
	150-SM3	—	30 VA	4 W
	150-SM4	—	50 VA	2 W
	150-SM6(1)	—	5 VA	1 W
	20-COMM-X(1)	—	25 VA	4 W

(1) Max. one of each option type per control module.

Table 73 - Continuous Duty Power Structure Heat Dissipation at Rated Current (Watts)

Description		Current Range [A]	Heat Dissipation [W]
Controller Rating [A]	Integrated Bypass	108	27
		135	40
		201	75
		251	93
		317	100
		361	120
		480	165
	Solid-state	90	270
		110	330
		140	420
		180	540
		210	630
		260	780
		320	960
		361	1083
		420	1260
		520	1560

Power Calculation:

$$\text{Max. Total Power Dissipation} = \underset{\text{Base Power}}{____} + \underset{\text{Options}}{____} + \underset{\text{Power Structure}}{____} \text{ Watts}$$

Example: Solid-state 361 A device with a 20-COMM-X, HIM, and Cat. No. 150-SM4

$$\text{Max. Total Power Dissipation} = \underset{\text{Base Power}}{300} + \underset{\text{Options}}{(25+10+50)} + \underset{\text{Power Structure}}{1083} \text{ Watts}$$

Max. Total Power Dissipation = 1468 W

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Performance Ratings: Integrated Bypass Devices

Table 74 - Integrated Bypass SCPD Performance, 600V Maximum, Type 1

SCPD Performance[1]			Type 1 Ratings[2]			
			Non-time Delay Fuse[3]		Inverse Time (Thermal Magnetic) Circuit Breaker	
Motor Connection Type	Cat. No	Current Rating [A]	Max. Standard Available Fault [kA]	Max. Current [A]	Max. Standard Available Fault [kA]	Max. Current [A]
Line	150-S108N...	108	10	400	10	300
	150-S135N...	135		500		400
	150-S201N...	201	18	600	18	600
	150-S251N...	251		700		700
	150-S317N...	317	30	800	30	800
	150-S361N...	361		1000		1000
	150-S480N...	480	42	1200	42	1200
Inside Delta	150-S108N...	187	10	600	10	500
	150-S135N...	234		700		700
	150-S201N...	348	18	1000	18	1000
	150-S251N...	435		1200		1200
	150-S317N...	549	30	1600	30	1600
	150-S361N...	625		1600		1600
	150-S480N...	831	42	1600	42	1200

(1) Consult local codes for proper sizing of short-circuit protection.
(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.
(3) Non-Time Delay Fuses: Class K5 up to 600 A, Class L above 600 A.

Table 75 - Integrated Bypass SCPD Performance, 690V Maximum, Type 1, Line Connected Motors Only

SCPD Performance[1]			Type 1 Ratings[2]		
Motor Connection Type	Cat. No	Current Rating [A]	Max. Standard Available Fault [kA]	Max. Ampere Tested — North American Style	Max. Ampere Tested — European Style
Line	150-S108N...	108	70	A070URD33xxx500	6,9 gRB 73xxx400 6,6URD33xxx500
	150-S135N...	135		A070URD33xxx500	6,9 gRB 73xxx400 6,6URD33xxx500
	150-S201N...	201		A070URD33xxx700	6,9 gRB 73xxx630 6,6URD33xxx700
	150-S251N...	251		A070URD33xxx700	6,9 gRB 73xxx630 6,6URD33xxx700
	150-S317N...	317		A070URD33xxx900	6,9 gRB 73xxx800 6,6URD33xxx900
	150-S361N...	361		A070URD33xxx900	6,9 gRB 73xxx800 6,6URD33xxx900
	150-S480N...	480		A070D33xxx1250 A100URD73xxx1250	9 URD 73xxx1250 6,6URD33xxx1250

(1) Consult local codes for proper sizing of short-circuit protection.
(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.

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Table 76 - Integrated Bypass SCPD Performance, High Fault, Type 1

SCPD Performance[1]			Type 1 Ratings[2]				
Motor Connection Type	Cat. No	Current Rating [A]	Class J or Class L Fuse[3]		Inverse Time (Thermal Magnetic) Circuit Breaker[4] 480V, 65kA Maximum		
			Max. High Capacity Available Fault (600V) [kA]	Max. Current [A]	Max. Current [A]	Cat. No.	Rating Plug Cat. No.
Line	150-S108N...	108	70	200	300	140G-K6F3-D30	—
	150-S135N...	135		225	400	140G-K6F3-D40	—
	150-S201N...	201		350	600	140G-M6F3-D60	—
	150-S251N...	251		400	700	140G-M6F3-D80	—
	150-S317N...	317	69	500	800	140G-N6H3-E12	140G-NRP-D80
	150-S361N...	361		600	1000	140G-N6H3-E12	140G-NRP-E10
	150-S480N...	480		800	1200	140G-N6H3-E12	—
Inside Delta	150-S108N...	187	70	300	400	140G-K6F3-D40	—
	150-S135N...	234		400	400	140G-K6F3-D40	—
	150-S201N...	348		600	800	140G-M6F3-D80	—
	150-S251N...	435		800	800	140G-M6F3-D80	—
	150-S317N...	549	69	1000	1200	140G-N6H3-E12	—
	150-S361N...	625		1200	1200	140G-N6H3-E12	—
	150-S480N...	831		1600	1200	140G-N6H3-E12	—

(1) Consult local codes for proper sizing of short-circuit protection.
(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.
(3) High Capacity fault ratings when used with time delay Class J or time delay Class L fuse.
(4) Circuit Breaker must be of the designated 140G Frame.

Table 77 - Integrated Bypass Semiconductor Fusing Recommendations

Semiconductor (SCR) Fusing[1]							
Cat. No.	Current Rating [A]		I^2t Reference (10^3A^2s)	North America[4] [5]		European[4] [5]	
	Line[2]	Inside Delta[3]		Max. Available Fault (480V) [kA]	Ferraz-shawmut Fuse Part No.	Max. Available Fault (500V) [kA]	Ferraz-shawmut Fuse Part No.
150-S108N...	108	187	87	65	A70QS200	50	6,9URD31*0250
150-S135N...	135	234	90		A70QS200		6,9URD31*0250
150-S201N...	201	348	200		A70QS400		6,9URD32*0450
150-S251N...	251	435	238		A70QS400		6,9URD32*0450
150-S317N...	317	549	300		A70QS450		6,9URD33*0550
150-S361N...	361	625	320		A70QS450		6,9URD33*0550
150-S480N...	480	831	1200		A70QS700	65	6,9URD32*0700

(1) Consult local codes for proper sizing of short-circuit protection.
(2) For line-connected motors, connect fuses to the SMC-50 in line with three-phase power terminals L1, L2, and L3.
(3) For delta-connected motors, connect fuses to the SMC-50 inside the delta after terminals L1-T6, L2-T4, and L3-T5.
(4) Calculated only, NOT tested.
(5) Fuse size based on a start profile of 300% of the controller maximum current rating for 50 seconds. Contact Technical Support at raictechsupport@ra.rockwell.com or 440-646-5800 for applications with a longer start time or higher starting current.

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Performance Ratings: Solid-state Devices

Table 78 - Solid-state SCPD Performance, 600V Maximum, Type 1

SCPD Performance[1]			Type 1 Ratings[4]								
Motor Connection Type	Cat. No	Current Rating [A]	Non-time Delay Fuse[5]			Time Delay Fuse[7]			Inverse Time (Thermal Magnetic) Circuit Breaker		
			Max. Standard Available Fault [kA]	Typical Current [A]	Max. Current [A]	Max. Standard Available Fault [kA]	Typical Current [A]	Max. Current [A]	Max. Standard Available Fault [kA]	Typical Current [A]	Max. Current [A]
Line[2]	150-SB1N…	90	10	250	350	10	150	200	10	225	350
	150-SB2N…	110		300	400		175	225		250	300
	150-SB3N…	140		400	500		225	300		350	400
	150-SB4N…	180		500	500		300	400		450	500
	150-SC1N…	210	18	600	600	18	350	450	18	500	600
	150-SC2N…	260		700	700		450	500		600	700
	150-SC3N…	320		800	800		500	700		800	800
	150-SD1N…	361	30/18[6]	1000	1000	30/18[6]	600	800	30/18[6]	800	1000
	150-SD2N…	420		1200	1200		700	800		1000	1200
	150-SD3N…	520		1200	1200		800	1000		1200	1200
Inside Delta[3]	150-SB1N…	155	18	450	450	18	250	300	18	350	450
	150-SB2N…	190		500	500		300	400		450	500
	150-SB3N…	242		700	700		400	500		600	700
	150-SB4N…	311		800	800		500	600		700	800
	150-SC1N…	363	30	1000	1000	30	600	800	30	800	1000
	150-SC2N…	450		1200	1200		700	1000		1000	1200
	150-SC3N…	554		1600	1600		800	1200		1200	1600
	150-SD1N…	625	42	1600	1600	42	1000	1200	42	1200	1600
	150-SD2N…	727		2000	2000		1200	1600		1600	2000
	150-SD3N…	900		2500	2500		1200	2000		2000	2500

(1) Consult local codes for proper sizing of short-circuit protection.
(2) UL/CSA (Type 1) and EN 60947-4-2 (Type 1) for Line-Connected Motors: Suitable for use on a circuit capable of delivering not more than the listed max. RMS symmetrical amperes (UL: 600V maximum, IEC: 690V max.).
(3) UL/CSA (Type 1) and EN 60947-4-2 (Type 1) for Inside-the-Delta Connected Motors: Suitable for use on a circuit capable of delivering not more than the listed max. RMS symmetrical amperes (UL and IEC: 600V maximum).
(4) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.
(5) Non-Time Delay Fuses: Class K5 up to 600 A, Class L above 600 A.
(6) UL/CSA applications = 30 kA, 600V maximum. IEC applications = 18 kA, 690V maximum.
(7) Time Delay Fuse: Devices rated 90…180 A (155…311 A): Class RK5. Devices rated 210…520 A (363…900 A): Class RK5 or Class J up to 600 A, Class L above 600 A.

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Table 79 - Solid-state SCPD Performance, High Fault, Type 1

SCPD Performance[1]			Type 1 Ratings[2]					
Motor Connection Type	Cat. No	Current Rating [A]	Class J or Class L Fuse[3]			Inverse Time (Thermal Magnetic) Circuit Breaker 480V, 65 kA Maximum		
			Max. High Capacity Available Fault (600V) [kA]	Typical Current [A]	Max. Current [A]	Max. Current [A]	Cat. No.	Rating Plug Cat. No.
Line	150-SB1N...	90	100	150	200	350	140G-K6F3-D40	—
	150-SB2N...	110		175	225	300	140G-K6F3-D30	—
	150-SB3N...	140		225	300	400	140G-K6F3-D40	—
	150-SB4N...	180		300	400	400	140G-K6F3-D40	—
	150-SC1N...	210		350	450	600	140G-M6F3-D60	—
	150-SC2N...	260		450	500	700	140G-M6F3-D80	—
	150-SC3N...	320		500	700	800	140G-M6F3-D80	—
	150-SD1N...	361		601	800	1000	140G-N6H3-E12	140G-NRP3-E10
	150-SD2N...	420		700	800	1200	140G-N6H3-E12	—
	150-SD3N...	520		800	1000	1200	140G-N6H3-E12	—
Inside Delta	150-SB1N...	155	65	250	300	450	140G-M6F3-D60	—
	150-SB2N...	190		300	400	500	140G-M6F3-D60	—
	150-SB3N...	242		400	500	700	140G-M6F3-D80	—
	150-SB4N...	311		500	600	700	140G-M6F3-D80	—
	150-SC1N...	363		601	800	1000	140G-N6H3-E12	140G-NRP3-E10
	150-SC2N...	450		700	1000	1200	140G-N6H3-E12	—
	150-SC3N...	554		800	1200	1200	140G-N6H3-E12	—
	150-SD1N...	625		1000	1200	Pending[4]		
	150-SD2N...	727		1200	1600			
	150-SD3N...	900		1200	2000			

(1) Consult local codes for proper sizing of short-circuit protection.
(2) Basic Requirements for Type 1 Coordination: Under the short-circuit condition, the starter shall cause no danger to persons or to the installation. The starter may not be suitable for further service without repair or replacement of parts. For further details, refer to UL 508/CSA C22.2 No. 14 and EN 60947-4-2.
(3) High Capacity fault ratings when used with time delay Class J or time delay Class L fuse.
(4) Other circuit breakers pending.

Table 80 - Solid-state Semiconductor Fusing Recommendations

Semiconductor (SCR) Fusing[1]							
Cat. No.	Current Rating [A]		I^2t Reference (10^3A^2s)	North America[4] [5]		Type 2 Coordination Per EN 60947-4-2[5] [6]	
	Line[2]	Inside Delta[3]		Max. Available Fault (480V) [kA]	Ferraz-shawmut Fuse Part No.	Max. Available Fault (500V) [kA]	Ferraz-shawmut Fuse Part No.
150-SB1N...	90	155	92	65	A70QS150	65	6,9URD30*0200
150-SB2N...	110	190	95		A70QS175		6,9URD30*0200
150-SB3N...	140	242	100		A70QS200		6,9URD30*0250
150-SB4N...	180	311	106		A70QS250		6,9URD31*0315
150-SC1N...	210	363	200		A70QS350		6,9URD30*0315
150-SC2N...	260	450	238		A70QS400		6,9URD31*0400
150-SC3N...	320	554	320		A70QS450		6,9URD31*0450
150-SD1N...	361	625	1000		A70QS500		6,9URD31*0500
150-SD2N...	420	727	1100		A70QS600		6,9URD31*0630
150-SD3N...	520	900	1200		A70QS700		6,9URD31*0700

(1) Consult local codes for proper sizing of short-circuit protection.
(2) For line-connected motors, connect fuses to the SMC-50 in line with three-phase power terminals T6, T4, and T5.
(3) For delta-connected motors, connect fuses to the SMC-50 inside the delta after terminals L1-T6, L2-T4, and L3-T5.
(4) Calculated only, NOT tested.
(5) Fuse size based on a start profile of 350% of the controller maximum current rating for 10 seconds. Contact Technical Support at raictechsupport@ra.rockwell.com or 440-646-5800 for applications with a longer start time or higher starting current.
(6) Basic Requirements for Type 2 Coordination: Per EN 60947-4-2 under short-circuit conditions, the device shall cause no danger to persons or installation and shall be suitable for further use.

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Environmental, Mechanical, and Other Ratings

Table 81 - Environmental Ratings

Attribute		Rating
Operating Ambient Temperature Range (surrounding air ambient)	Integrated Bypass Devices	-20…+50 °C (-4…+122 °F) (no derating) — For operation 50...65 °C (122...149 °F), refer to Thermal Wizard. -20…+40 °C (-4…104 °F) (Enclosed)
	Solid-state Devices	-20…+40 °C (-4…+104 °F) (no derating) — For operation 40...65 °C (104...149 °F), refer to Thermal Wizard. -20…+40 °C (-4…104 °F) (Enclosed)
Storage and Transportation Temperature Range		–25…+75 °C (-13…+167 °F)
Altitude		2000 m (6560 ft) without derating; for operation above 2000...7000 m (6560...22965 ft) maximum, refer to Thermal Wizard
Humidity		5…95% (noncondensing)
Pollution Degree		2
Mounting Orientation		Vertical
Atmospheric Protection		ANSI/ISA - 71.04-2013; Class G3 Environment

Table 82 - Mechanical Ratings

Attribute					Rating
Resistance to Vibration		Operational		All Devices	1.0 G Peak, 0.15 mm (0.006 in.) Displacement
		Non-Operational			2.5 G Peak, 0.38 mm (0.015 in.) Displacement
Resistance to Shock	Integrated Bypass	Operational		108…480 A	5.5 G
		Non-Operational			25 G
	Solid-state	Operational		90...520 A	15 G
		Non-Operational			30 G
Construction		Power Poles			Heatsink Hockey Puck Thyristor Modular Design
		Control Modules			Thermoset and Thermoplastic Moldings
		Metal Parts			Plated Brass, Copper, or Steel
Terminals		Power Terminal Lugs	Integrated Bypass	108…135 A	One M10 x 1.5 diameter hole per power pole
				201…251 A	Two M10 x 1.5 diameter hole per power pole
				317…480 A	Two M12 x 1.75 diameter hole per power pole
			Solid-state	90…180 A	One 10.5 mm (0.41 in.) diameter hole per power pole
				210…320 A	Two 10.5 mm (0.41 in.) diameter holes per power pole
				361…520 A	Two 13.5 mm (0.53 in.) diameter holes per power pole
		Power Terminal Markings			NEMA, CENELEC EN50 012
		Control Terminals		M3 Screw Clamp	Clamping Yoke Connection

Table 83 - Electromagnetic Compatibility (EMC) Ratings

Attribute		Rating
EMC Emission Levels	Conducted Radio Frequency Emissions	Class A (per EN 60947-4-2)
	Radiated Emissions	Class A (per EN 60947-4-2)
EMC Immunity Levels	Electrostatic Discharge	8 kV Air Discharge Per EN 60947-4-2
	Radio Frequency Electromagnetic Field	Per EN 60947-4-2
	Fast Transient	Per EN 60947-4-2
	Surge Transient	Per EN 60947-4-2

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Table 84 - Overload Characteristics

Overload Characteristics	Device Type	Rated Current [A]	Line-connected Devices	Delta-connected Devices
Current Range	Integrated Bypass Devices	108	27…108	47…187
		135	34…135	59…234
		201	67…201	116…348
		251	84…251	145…435
		317	106…317	183…549
		361	120…361	208…625
		480	160…480	277…831
	Solid-state Devices	90	30…90	52…155
		110	37…110	65…190
		140	47…140	82…242
		180	60…180	104…311
		210	70…210	122…363
		260	87…260	151…450
		320	107…320	186…554
		361	120…361	210…625
		420	140…420	243…727
		520	174…520	302…900
Overload Type			Electronic - using I^2t algorithm	
Trip Classes			5 to 30	
Trip Current Rating			118% of Motor FLC	
Number of Poles			3	

Table 85 - Standards Compliance and Certifications

Standards Compliance
UL 508
EN 60947-4-2

Certifications
c-UL-us Listed (Open Type) (File No. E96956)
CE Marked per EMC Directive and Low Voltage Directive
CCC[1]
C-Tick[1]
EAC[1]
KCC[1]
ABS[1]

(1) For updated certification status of controllers with 24V DC control power, consult your local Rockwell Automation sales office or Allen-Bradley distributor, or www.rockwellautomation.com/global/certification/overview.page.

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Table 86 - Integrated Bypass Devices: Protection Device and Bypass Component Selection—Line-connected Motor

Description	SMC-50 Cat. No.[3]						
	150-S108N	150-S135N	150-S201N	150-S251N	150-S317N	150-S361N	150-S480N
Rated Current [A]	108	135	201	251	317	361	480
Voltage	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC
Short-circuit Current Ratings (SCCR)[1]							
Standard Fault SCCR at 600V							
Std. Available Fault [kA]	10		18		30		42
Max. Non-Time Delay Fuse	400	500	600	700	800	1000	1200
Max. Inverse Time Circuit Breaker (CB)	300	400	600	700	800	1000	1200
High Fault SCCR							
High Available Fault with Fuses at 600V [kA]	70				69		
Max. Class J or L Time Delay Fuse	200	225	350	400	500	600	800
High Available Fault with Circuit Breaker at 480V [kA]	Pending						
Max. Inverse Time CB (Bul. 140G required)[2]							
Bul. 140G MCCB Frame Size							
Branch Protection Reference[1]							
Inverse Time Circuit Breaker Selections[3]							
35 kA at 600V Maximum	140G- K6F3-D…	140G- K6F3-D…	140G- M6F3-D…	140G- M6F3-D…	140G- M6F3-D…	—	—
50 kA at 600V Maximum	—	—	—	—	—	140G- N6H3-E…[4]	140G- N6H3-E12
65 kA at 480V Maximum[2]	Pending						
Fused Disconnect Selections, For Use With Non-Time Delay Fuses	194R-J400-1753	194R-J600-1753	194R-J600-1753	194R-L800-1753	194R-L800-1753	—	—

(1) Always refer to local codes for proper selection of branch circuit components.
(2) Circuit Breaker must be of the designated 140G Frame size for high fault short circuit ratings.
(3) For complete catalog numbers, see the product directory: www.ab.rockwellautomation.com.
(4) Requires rating plug selection based on application; see the product directory: www.ab.rockwellautomation.com.

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Table 87 - Solid-state Devices: Protection Device and Bypass Component Selection Overview—Line-connected Motor

Description		SMC-50 Cat. No.[5]									
		150-SB1N	150-SB2N	150-SB3N	150-SB4N	150-SC1N	150-SC2N	150-SC3N	150-SD1N	150-SD2N	150-SD3N
Rated Current	[A]	90	110	140	180	210	260	320	361	420	520
Voltage	[V AC]	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600
Short-circuit Current Ratings (SCCR)[1]											
Standard Fault SCCR at 600V											
Std. Available Fault	[kA]	10				18			30		
Max. Non-Time Delay Fuse	[A]	350	400	500	500	600	700	800	1000	1200	1200
Max. Time Delay Fuse	[A]	200	225	300	400	450	500	700	800	800	1000
Max. Inverse Time Circuit Breaker (CB)	[A]	350	300	400	500	600	700	800	1000	1200	1200
High Fault SCCR											
High Available Fault with Fuses at 600V	[kA]	100									
Max. Class J or L Time Delay Fuse	[A]	200	225	300	400	450	500	700	800	800	1000
High Available Fault with Circuit Breaker at 480V	[kA]	65									
Max. Inverse Time CB (Bul. 140G required)[2]	[A]	350	300	400	400	600	700	800	1000	1200	1200
Bul. 140G MCCB Frame Size		K				M			N		
Branch Protection Reference[1]											
Inverse Time Circuit Breaker Selections[5]											
35 kA at 600V Maximum		140G- K6F3-D	140G- K6F3-D	140G- K6F3-D	140G- M6F3-D	140G- M6F3-D	140G- M6F3-D	140G- M6F3-D	—	—	—
50 kA at 600V Maximum		—	—	—	—	—	—	—	140G- N6H3-E[6]	140G- N6H3-E12	140G- N6H3-E12
65 kA at 480V Maximum[2]		140G-K6F3-D	140G-K6F3-D	140G-K6F3-D	140G-K6F3-D	140G-M6F3-D	140G-M6F3-D	140G-M6F3-D	140G- N6H3-E12[6]	140G- N6H3-E12	140G- N6H3-E12
Fused Disconnect Selections, For Use With Non-Time Delay Fuses		194R-J200-1753	194R-J400-1753	194R-J400-1753	194R-J400-1753	194R-J600-1753	194R-J600-1753	194R-L800-1753	—	—	—
Bypass Contactor Reference[2] [3]											
AC-3 Rated per UL/CSA[4], Standard Fault SCCR											
Short-circuit current ratings @ 600V with:[5]		100-C97	100-D115	100-D140	100-D180	100-D250	100-D250	100-D300	100-D630	100-D630	100-D630
Standard Available Fault	[kA]	10				18			30		
Max. Non-Time Delay Fuse	[A]	350 A	250 A	350 A	450 A	600 A	700 A	700 A	1000 A	1200 A	1200 A
High Fault SCCR											
Short-circuit current ratings with:[5]		100-C97	100-D115	100-D140	100-D180	100-D210	100-D250	100-D300	100-D420	100-D630	100-D630
High Available Fault with Fuses at 600V	[kA]	100				100			100	42	
Max. Class J or Class L Time Delay Fuse	[A]	120	150	200	225	300	350	450	500 A	600 A	700 A

(1) Always refer to local codes for proper selection of branch circuit components.
(2) Circuit Breaker must be of the designated 140G Frame size for high fault short circuit ratings.
(3) For the most up-to-date information, including voltage ratings other than 600V, see the Global SCCR Tables at www.rockwellautomation.com.
(4) In IEC regulated regions when sizing the bypass contactor per AC-1 or AC-3 ratings, the short circuit rating of the bypass contactor must be similar to that of the SMC-50 controller.
(5) For complete catalog numbers, see the product directory: www.ab.rockwellautomation.com.
(6) Requires rating plug selection based on application; see the product directory: www.ab.rockwellautomation.com.

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Table 88 - Integrated Bypass Devices: Protection Device and Bypass Component Selection—Delta-connected Motor

Description	SMC-50 Cat. No.[3]						
	150-S108N	150-S135N	150-S201N	150-S251N	150-S317N	150-S361N	150-S480N
Rated Current [A]	187	234	348	435	549	625	831
Voltage	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC	230…600V AC
Short-circuit Current Ratings (SCCR)[1]							
Standard Fault SCCR at 600V							
Std. Available Fault [kA]	10		18		30		42
Max. Non-Time Delay Fuse	600	700	1000	1200	1600	1600	1600
Max. Inverse Time Circuit Breaker (CB)	500	700	1000	1200	1600	1600	1200
High Fault SCCR							
High Available Fault with Fuses at 600V [kA]	70				69		
Max. Class J or L Time Delay Fuse	300	400	600	800	1000	1200	1600
High Available Fault with Circuit Breaker at 480V [kA]	Pending						
Max. Inverse Time CB (Bul. 140G required)[2]							
Bul. 140G MCCB Frame Size							
Branch Protection Reference[1]							
Inverse Time Circuit Breaker Selections[3]							
35 kA at 600V Maximum	140G- M6F3-D…	140G- M6F3-D…	—	—	—	—	—
50 kA at 600V Maximum	—	—	140G- N6H3-E…[4]	140G- N6H3-E12	140G-R12I3-E[4]	140G-R12I3-E[4]	140G-N6H3-E12
65 kA at 480V Maximum[2]	Pending						
Fused Disconnect Selections, For Use With Non-Time Delay Fuses	194R-J600-1753	194R-L800-1753	—	—	—	—	—

(1) Always refer to local codes for proper selection of branch circuit components.
(2) Circuit Breaker must be of the designated 140G Frame size for high fault short circuit ratings.
(3) For complete catalog numbers, see the product directory: www.ab.rockwellautomation.com.
(4) Requires rating plug selection based on application; see the product directory: www.ab.rockwellautomation.com.

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Table 89 - Solid-state Devices: Protection Device and Bypass Component Selection—Delta-connected Motor

Description		SMC-50 Cat. No.[5]									
		150-SB1N	150-SB2N	150-SB3N	150-SB4N	150-SC1N	150-SC2N	150-SC3N	150-SD1N	150-SD2N	150-SD3N
Rated Current	[A]	155	190	242	311	363	450	554	625	727	900
Voltage	[V AC]	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600	230…600
Short-circuit Current Ratings (SCCR)[1]											
Standard Fault SCCR at 600V											
Std. Available Fault	[kA]	18				30			42		
Max. Non-Time Delay Fuse	[A]	450	500	700	800	1000	1200	1600	1600	2000	2500
Max. Time Delay Fuse	[A]	300	400	500	600	800	1000	1200	1200	1600	2000
Max. Inverse Time Circuit Breaker (CB)	[A]	450	500	700	800	1000	1200	1600	1600	2000	2500
High Fault SCCR											
High Available Fault with Fuses at 600V	[kA]	65									
Max. Class J or L Time Delay Fuse	[A]	300	400	500	600	800	1000	1200	1200	1600	2000
High Available Fault with Circuit Breaker at 480V	[kA]	65									
Max. Inverse Time CB (Bul. 140G required)[2]	[A]	450	500	700	700	1000	1200	1200	—	—	—
Bul. 140G MCCB Frame Size		M				N			Pending		
Branch Protection Reference[1]											
Inverse Time Circuit Breaker Selections[5]											
35 kA at 600V Maximum		140G- K6F3-D	140G- M6F3-D	140G- M6F3-D	140G- M6F3-D	—	—	—	—	—	—
50 kA at 600V Maximum		—	—	—	—	140G- N6H3-E[6]	140G-N6H3-E12	140G-R12I3-E[6]	140G-R12I3-E[6]	140G- R12I3-E20	140G- R12I3-E25
65 kA at 480V Maximum[2]		140G-M6F3-D	140G-M6F3-D	140G-M6F3-D	140G-M6F3-D	140G- N6H3-E[6]	140G- N6H3-E12	140G- N6H3-E12	Pending		
Fused Disconnect Selections, For Use With Non-Time Delay Fuses		194R-J400-1753	194R-J400-1753	194R-J600-1753	194R-J600-1753	194R-L800-1753	—	—	—	—	—
Bypass Contactor Reference[1] [3]											
AC-3 Rated per UL/CSA[4], Standard Fault SCCR											
Short-circuit current ratings @ 600V with:[5]		100-D250	100-D250	100-D250	100-D300	100-D630	100-D630	100-D630	100-D860	100-D860	—
Standard Available Fault	[kA]	18				30			42		
Max. Non-Time Delay Fuse	[A]	450	500	700	700	1000	1200	1600	1600	2000	—
High Fault SCCR											
Short-circuit current ratings with:[5]		100-D180	100-D180	100-D250	100-D300	100-D420	100-D630	100-D630	100-D630	100-D860	100-G1200
High Available Fault with Fuses at 600V	[kA]	65				65	42		42		65
Max. Class J or Class L Time Delay Fuse	[A]	225	225	350	450	500	600	700	800	1000	1300

(1) Always refer to local codes for proper selection of branch circuit components.
(2) Circuit Breaker must be of the designated 140G Frame size for high fault short circuit ratings. Other circuit breakers pending.
(3) For the most up-to-date information, including voltage ratings other than 600V, see the Global SCCR Tables at www.rockwellautomation.com.
(4) In IEC regulated regions when sizing the bypass contactor per AC-1 or AC-3 ratings, the short circuit rating of the bypass contactor must be similar to that of the SMC-50 controller.
(5) For complete catalog numbers, see the product directory: www.ab.rockwellautomation.com.
(6) Requires rating plug selection based on application; see the product directory: www.ab.rockwellautomation.com.

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Approximate Dimensions

Dimensions are in inches (mm) unless otherwise noted. Dimensions are not to be used for manufacturing purposes.

Table 90 - SMC-50 Controller Enclosure Requirements

Enclosure Ratings		
Standard Device Rating:		IP00 (NEMA Open Type)
Minimum Required Enclosure:		IP23 (NEMA Type 1)
Recommended Enclosure:(1)		IP54 (NEMA Type 12)
Ambient temperature range (open air) or internal enclosure temperature range without derating:	Internal Bypass	-20…+50 °C (-4…+122 °F)
	Solid-state	-20...40 °C (-4...104 °F)
Orientation and Clearance		
Mounting Orientation:		Vertical ONLY
Minimum Clearance:	Horizontal	0 cm (0 in.)
	Vertical	15 cm (6 in.)

(1) See Table 91 for minimum enclosure size.

The guidelines in Table 91 result from the open design of the SMC-50 controller and the minimum clearance requirements of 150 mm (6 in.) above and below the controller.

Table 91 - SMC-50 Controller Minimum Enclosure Size

SMC-50 Controller with Internal Bypass			
Catalog Number	mm (in.)(1)		
	Width	Height	Depth
150-S108… / 150-S135…	609.6 (24.0)	762.0 (30.0)	304.8 (12.0)
150-S201… / 150-S251…	762.0 (30.0)	965.2 (38.0)	355.6 (14.0)
150-S317… / 150-S361… / 150-S480…	914.4 (36.0)	1295.4 (51.0)	355.6 (14.0)

Solid-state SMC-50 Controller				
Catalog Number	Configuration	mm (in.)(1)		
		Width	Height	Depth
150-SB…	Line/Wye	609.6 (24.0)	762.0 (30.0)	304.8 (12.0)
	Inside-the-Delta	762.0 (30.0)	965.2 (38.0)	355.6 (14.0)
150-SC…	All	762.0 (30.0)	965.2 (38.0)	355.6 (14.0)
150-SD…	All	914.4 (36.0)	1295.4 (51.0)	355.6 (14.0)

(1) Actual enclosure size changes based on heat dissipation, duty cycle, ambient temperature, and external cooling. See the user manual, publication 150-UM011, for more information.

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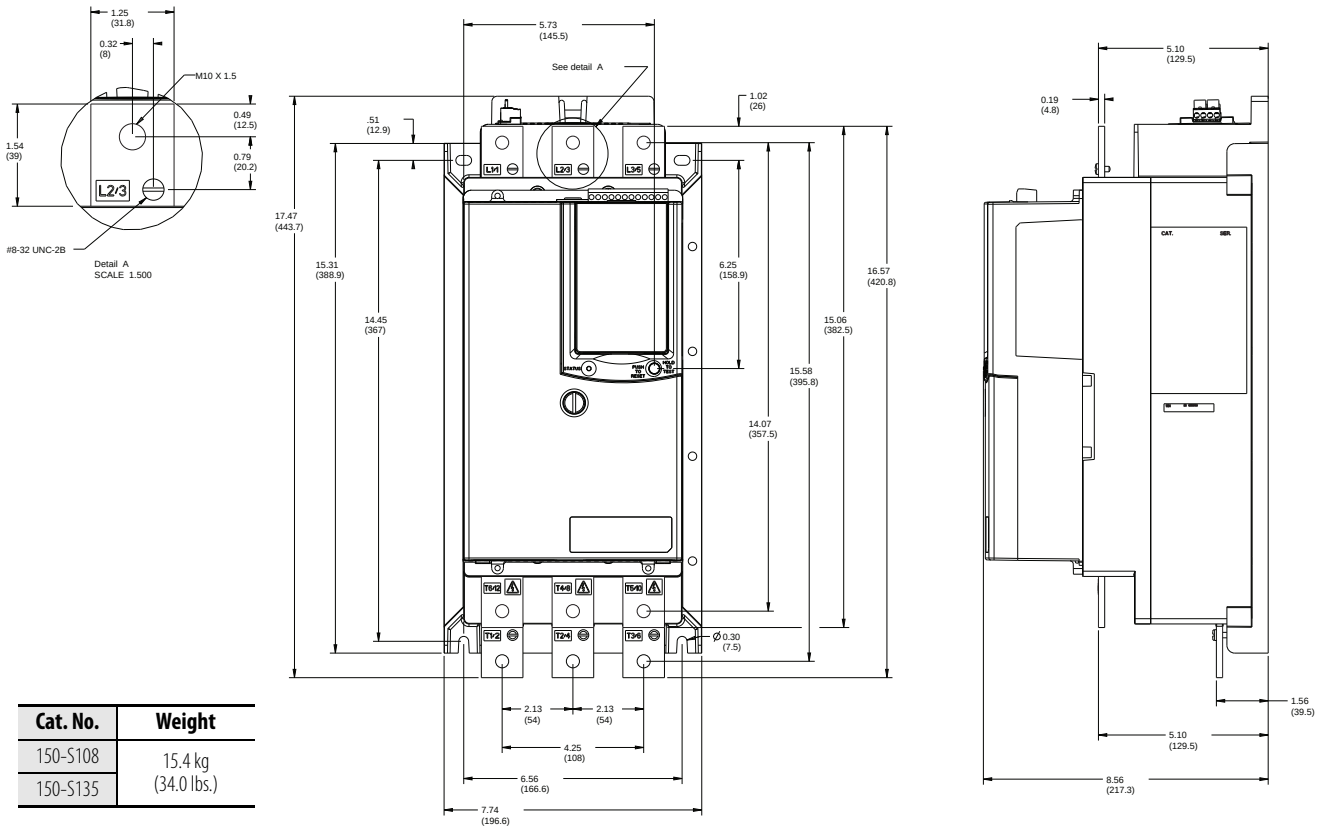
Controllers with Internal Bypass

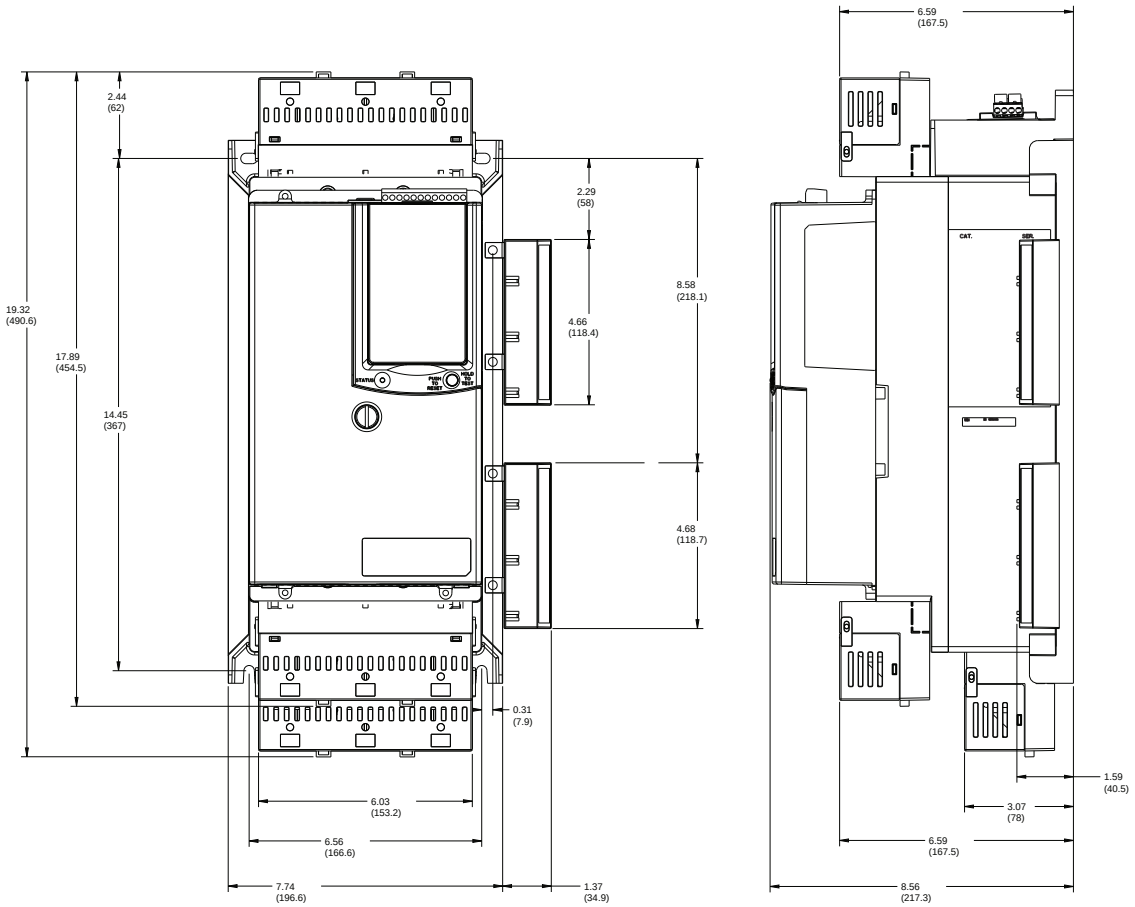
Figure 23 - 108/135 A Controller with Internal Bypass: Without Terminal Covers



Cat. No.	Weight
150-S108	15.4 kg (34.0 lbs.)
150-S135	

- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

Figure 24 - 108/135 A Controller with Internal Bypass: With Terminal Covers and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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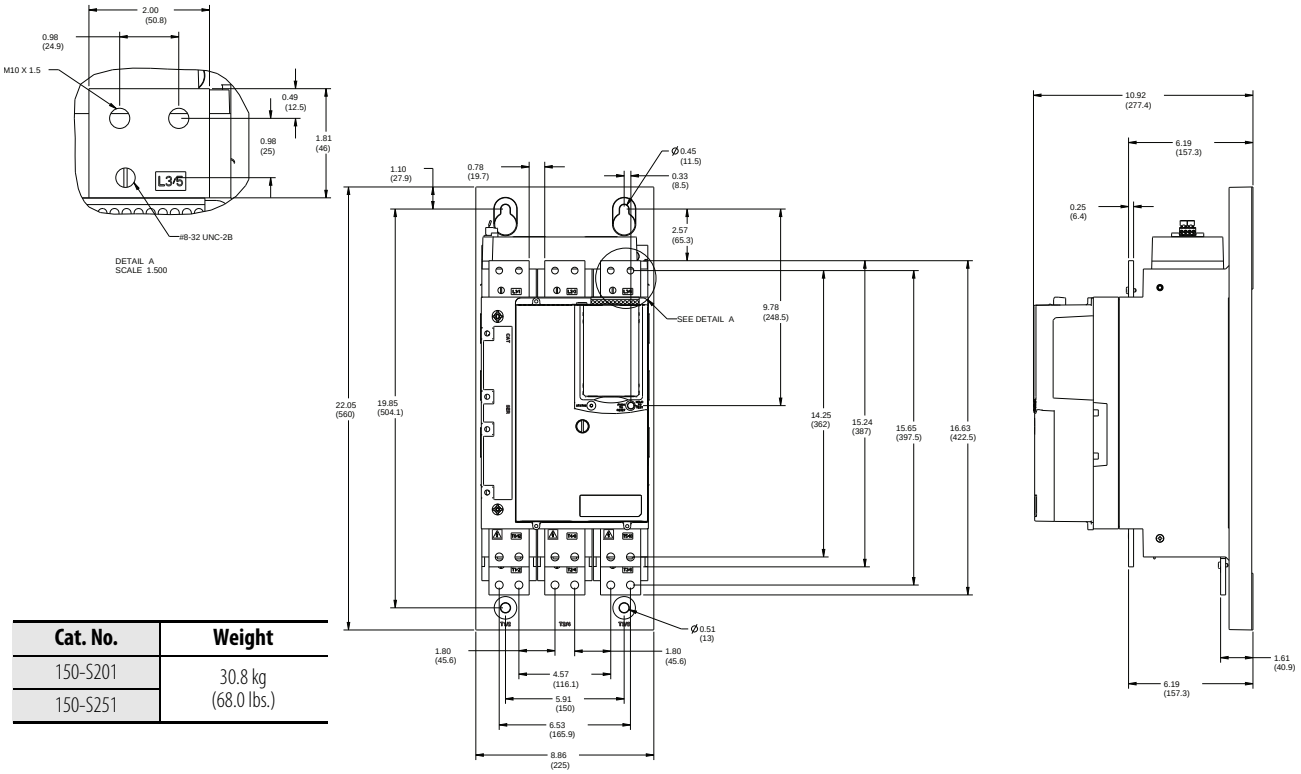
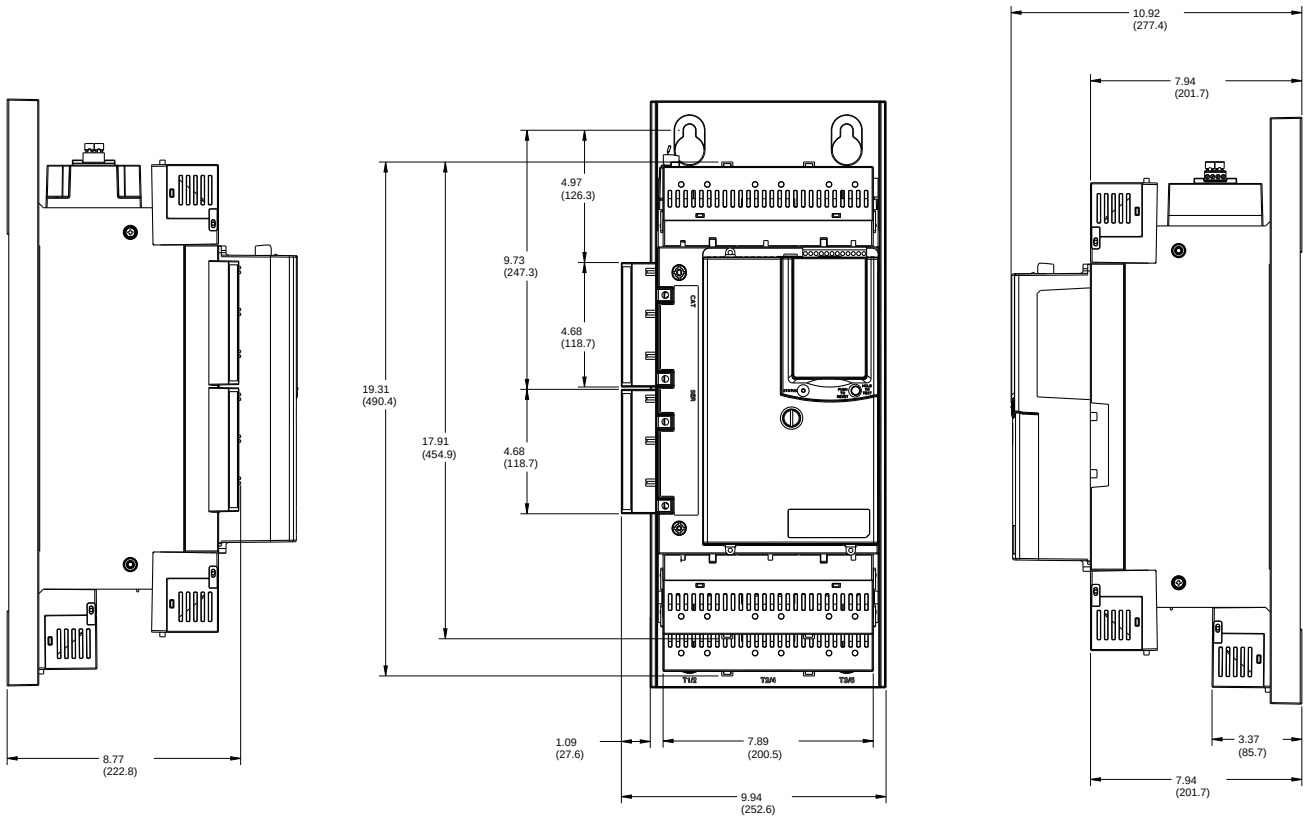
Figure 25 - 201/251 A Controller with Internal Bypass: Without Terminal Covers



Cat. No.	Weight
150-S201	30.8 kg (68.0 lbs.)
150-S251	

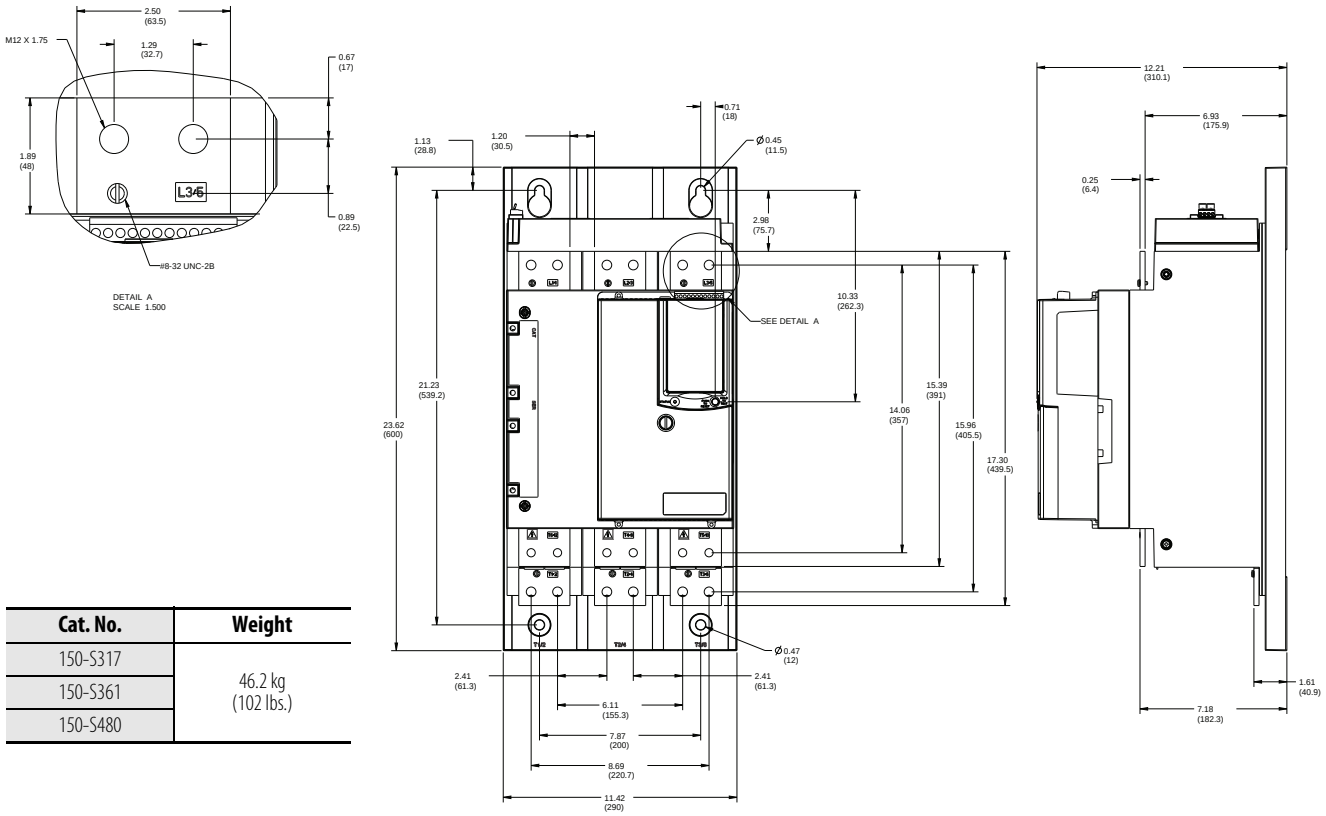
- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

Figure 26 - 201/251 A Controller with Internal Bypass: With Terminal Covers and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

Figure 27 - 317/361/480 A Controller with Internal Bypass: Without Terminal Covers



Cat. No.	Weight
150-S317	46.2 kg (102 lbs.)
150-S361	
150-S480	

- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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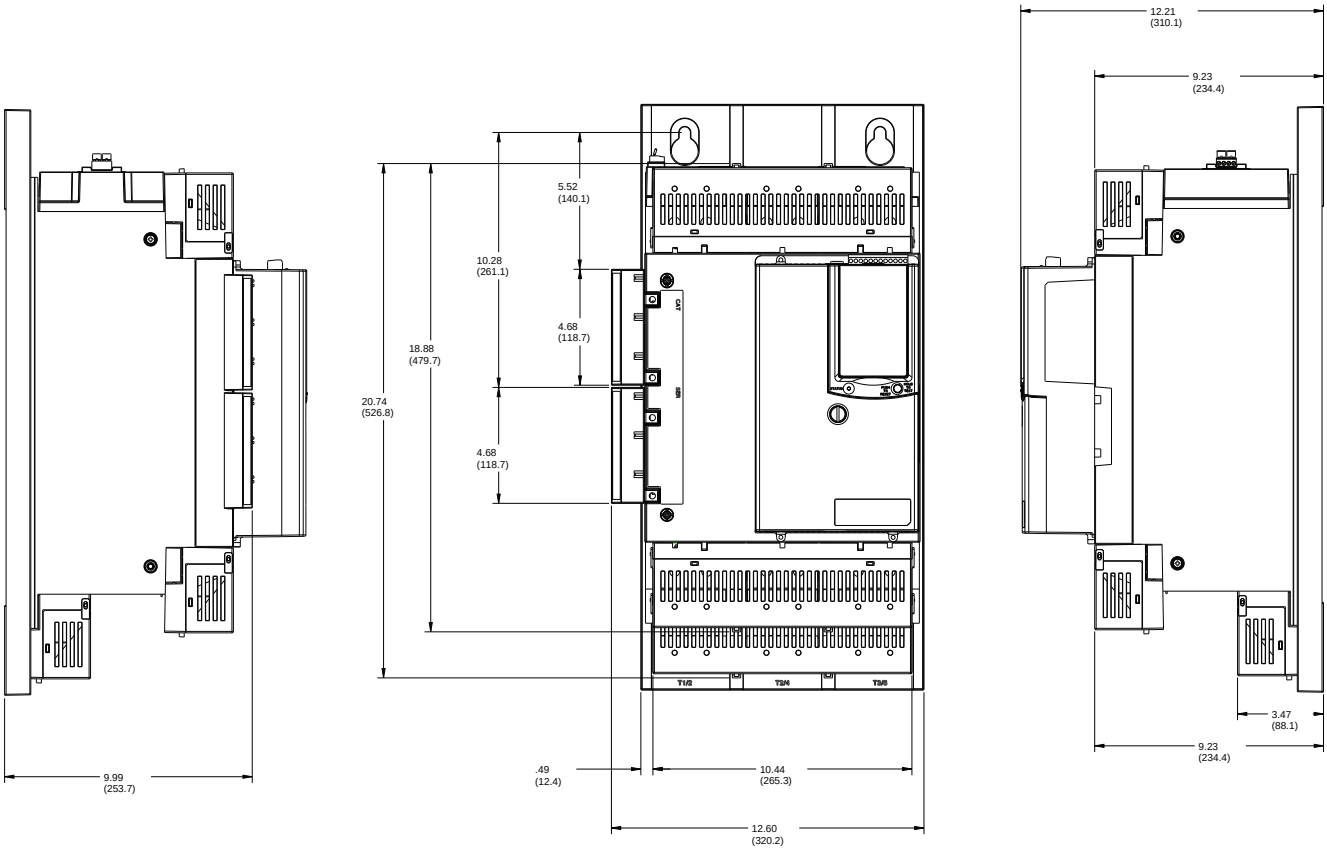
Figure 28 - 317/361/480 A Controller with Internal Bypass: With Terminal Covers and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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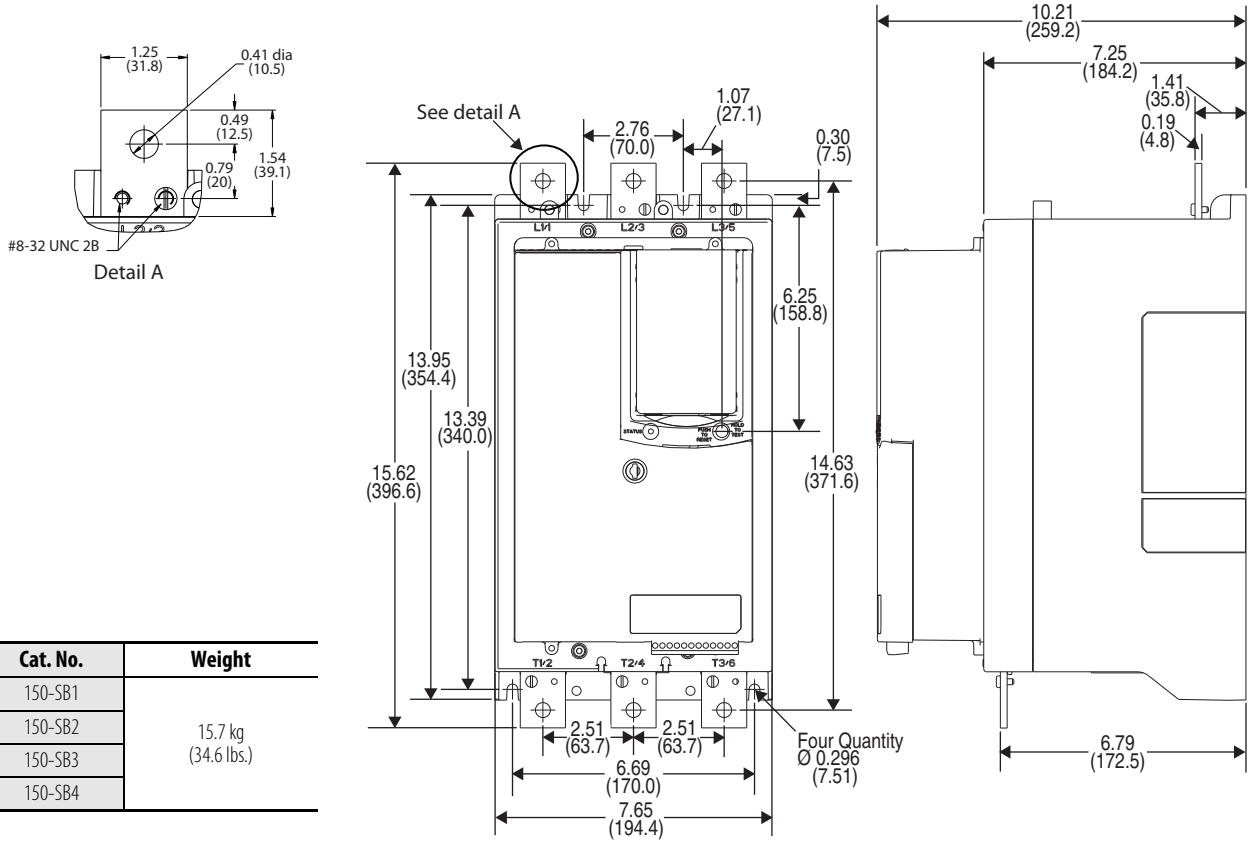
Solid-state Controllers

Figure 29 - Cat. Nos. 150-SB1…SB4 Solid-state Controller: Without Terminal Covers



Cat. No.	Weight
150-SB1	15.7 kg (34.6 lbs.)
150-SB2	
150-SB3	
150-SB4	

- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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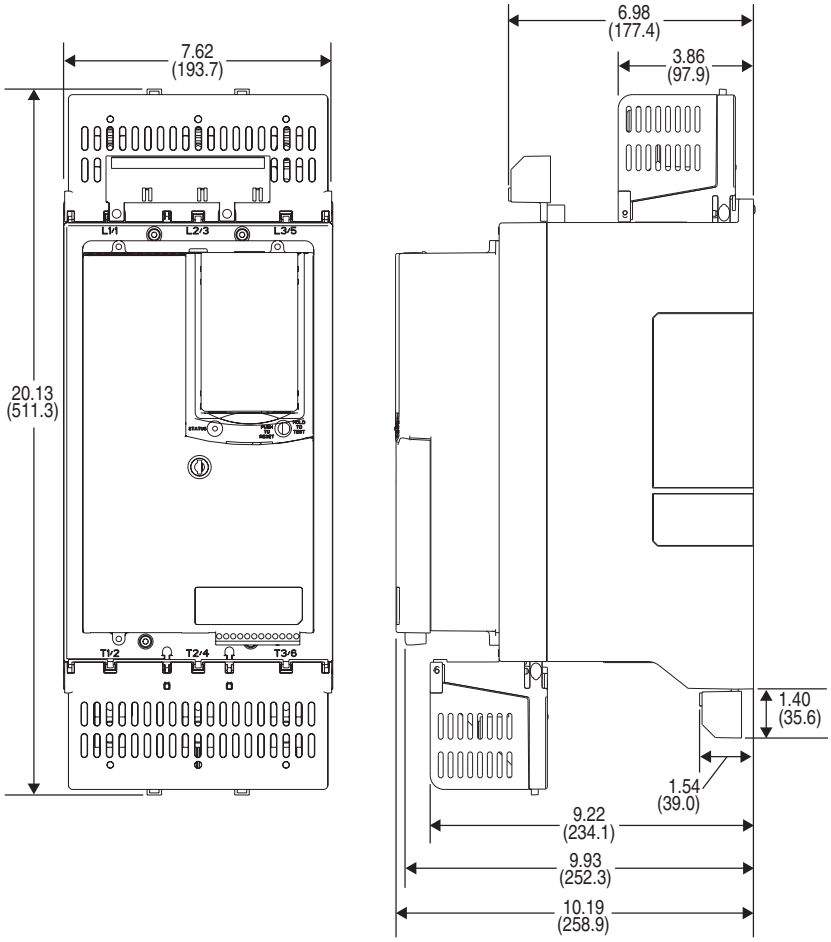
Figure 30 - Cat. Nos. 150-SB1…SB4 Solid-state Controller: With Terminal Covers and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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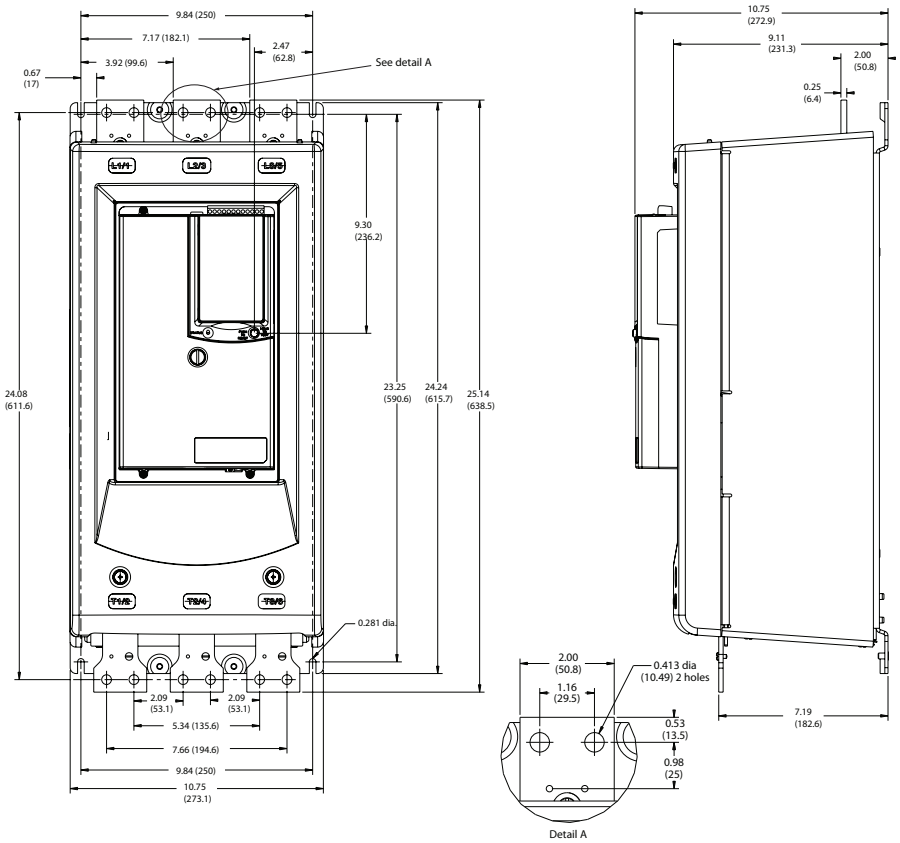
Figure 31 - Cat. Nos. 150-SC1…SC3 Solid-state Controller



Cat. No.	Weight
150-SC1	47.6 kg (105 lbs.)
150-SC2	
150-SC3	

- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

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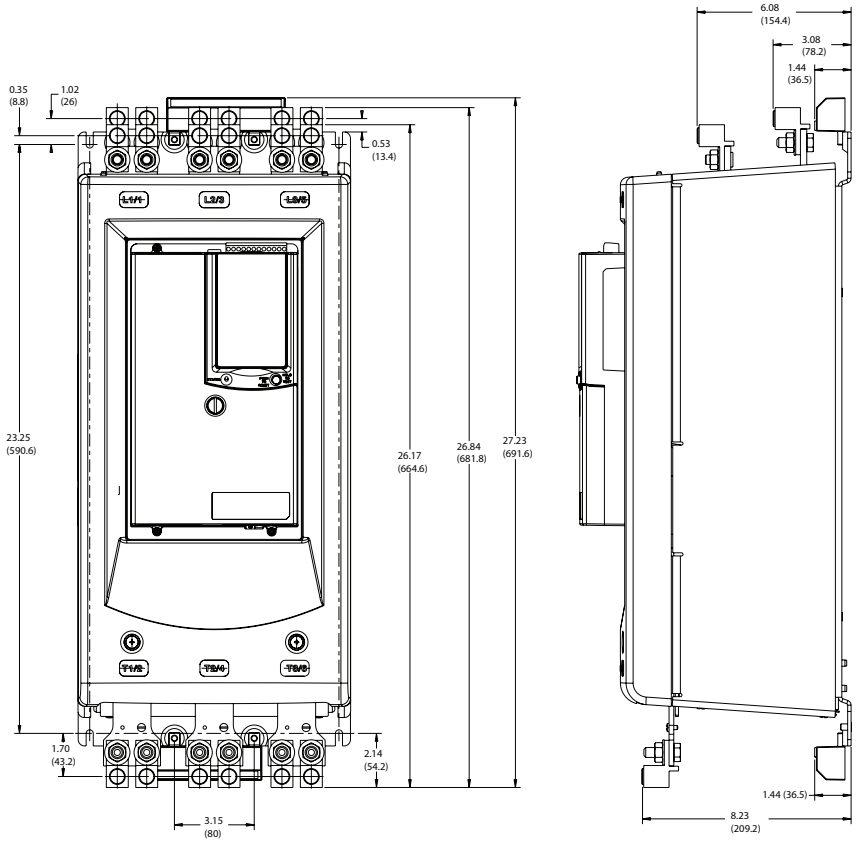
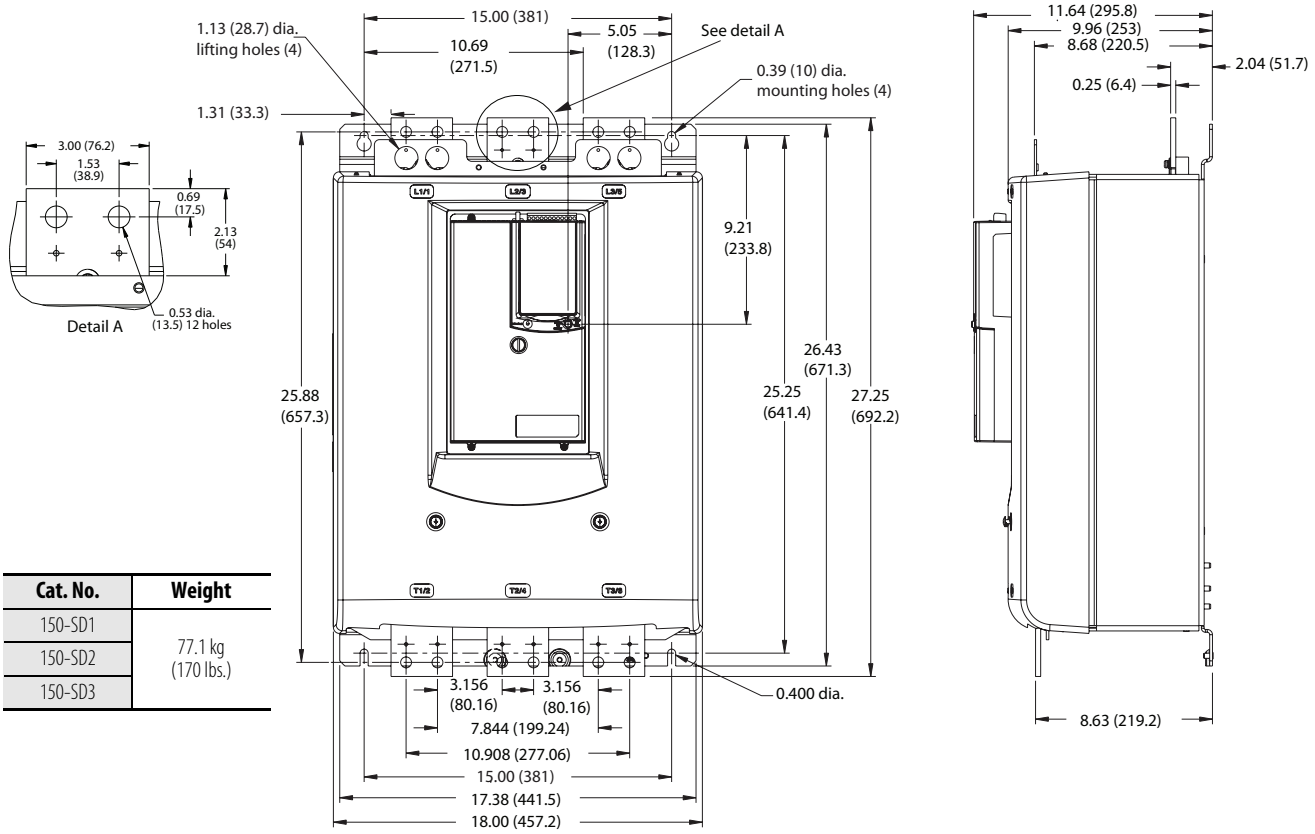
Figure 32 - Cat. Nos. 150-SC1…SC3 Solid-state Controller: With Lugs, Bypass Kit, and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

Figure 33 - Cat. Nos. 150-SD1…SD3 Solid-state Controller

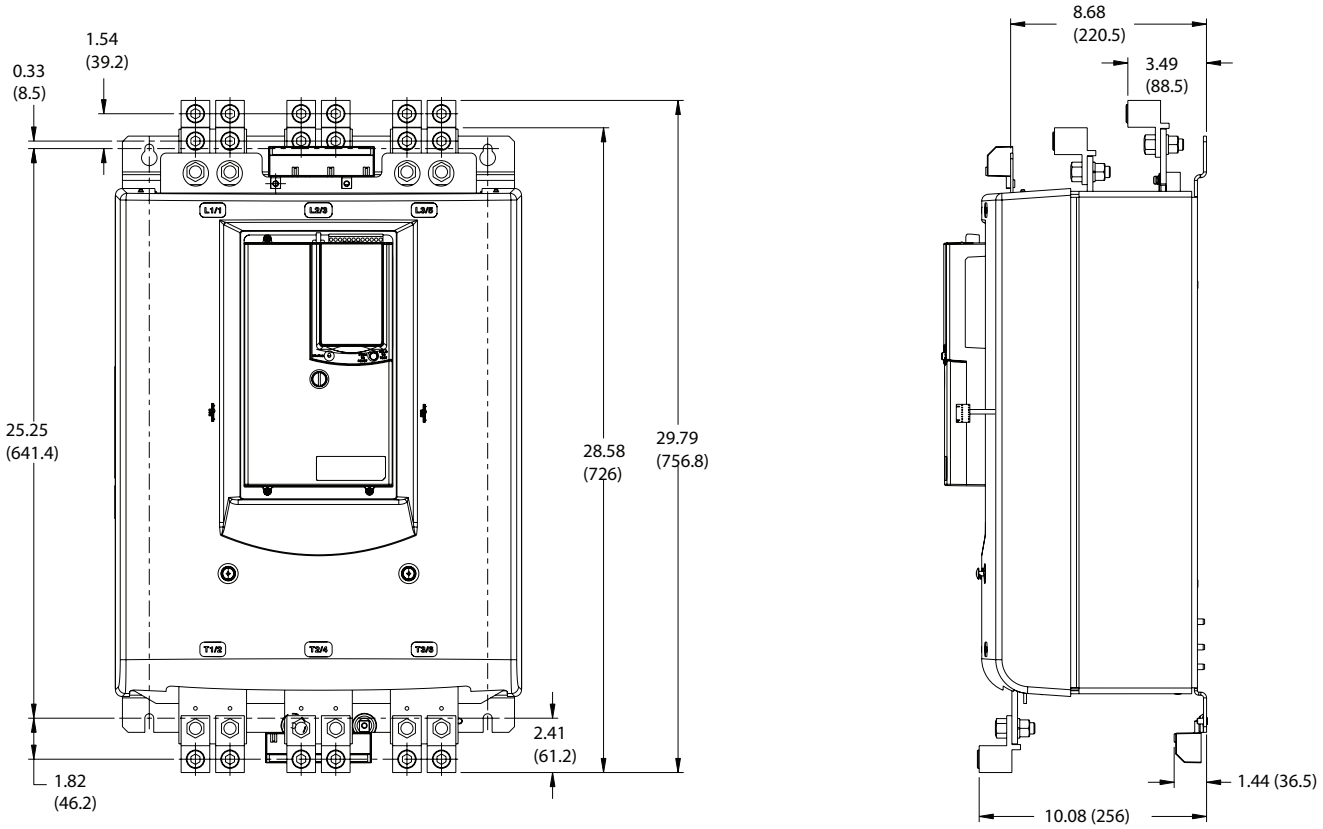


Cat. No.	Weight
150-SD1	77.1 kg (170 lbs.)
150-SD2	
150-SD3	

- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

ALLEN BRADLEY SMC FLEX

Figure 34 - Cat. Nos. 150-SD1…SD3 Solid-state Controller: With Lugs, Bypass Kit, and MOV Options



- Note: When mounted in an enclosure, maintain a minimum of 6.0 inches (152.4 mm) clearance above and below the SMC-50 controller. Side-to-side clearance is not required.

ALLEN BRADLEY SMC FLEX

Application Profiles

This section describes several of the myriad applications for SMC controllers. It also details the basis for selecting a control method. Illustrations are included to help identify the application. Motor ratings are specified, but the ratings may vary in other typical applications.

Applications and starting methods that are ideal for the SMC controllers include the following.

- Fans
  - Soft start
  - Linear acceleration
- Pumps
  - Soft start
  - Pump control
  - Linear acceleration
  - Pump cavitation
- Conveyors
  - Soft start
  - Linear acceleration
- Centrifuges
  - Smart motor braking
  - Current limit
- Shock loads
  - Rock crushers
  - Hammer Mills
  - Bark Hogs
- High-inertia loads
  - Hammer mill with current limit
  - Shredder with soft start
  - Bandsaw with soft start
  - Ball mill with current limit
- Smart Motor Braking
  - Bandsaw
  - Centrifuge
  - Hammermill
  - Ball mill
- Compressors
  - Soft start
- Tumblers
  - Linear acceleration
  - Soft start
- Short-term slow speed
- Resistive loads

ALLEN BRADLEY SMC FLEX

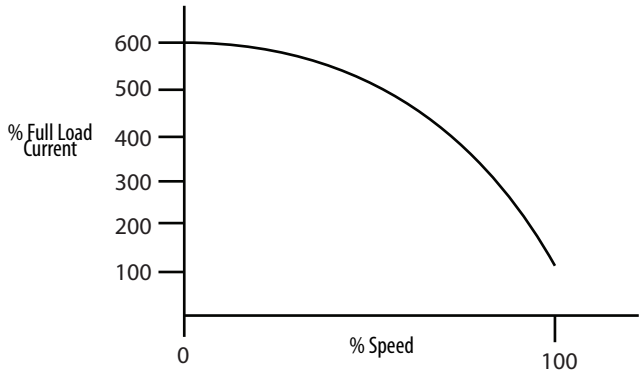
Reduced Voltage Starting

There are two primary reasons for using reduced voltage when starting a motor:

- Limit line disturbances
- Reduce excessive torque to the driven equipment

When starting a motor at full voltage, the current drawn from the power line is typically 600% of normal full load current. This high current flows until the motor is almost up to speed and then decreases, as shown in Figure 35. This could cause line voltage dips and brown-outs.

Figure 35 - Full-load Current vs. Speed



In addition to high starting currents, the motor also produces starting torques that are higher than full-load torque. The magnitude of the starting torque depends on the motor design. NEMA publishes standards for torques and currents for motor manufacturers to follow. Typically, a NEMA Design B motor has a locked rotor or starting torque that is approximately180% of full-load torque.

In many applications, this starting torque can cause excessive mechanical damage such as belt, chain, or coupling breakage.

All forms of reduced voltage starting affect the motor current and torque characteristics. When you apply a reduced voltage to a motor at rest, the current drawn by the motor is reduced. The torque produced by the motor is a factor of approximately the square of the percentage of voltage applied.

For example, if 50% voltage is applied to the motor, a starting torque of approximately 25% of the normal starting torque is produced. In the previous full voltage example, the NEMA Design B motor had a starting torque of 180% of full load torque. With only 50% voltage applied, this equates to approximately 45% of full load torque. Table 92 shows the typical relationship of voltage, current, and torque for a NEMA Design B motor.

ALLEN BRADLEY SMC FLEX

Table 92 - Typical Voltage, Current and Torque Characteristics for NEMA Design B Motors

Starting Method	% Voltage at Motor Terminals	Motor Starting Current as a % of:		Line Current as a % of:		Motor Starting Torque as a % of:	
		Locked Rotor Current	Full Load Current	Locked Rotor Current	Full Load Current	Locked Rotor Torque	Full Load Torque
Full Voltage	100	100	600	100	600	100	180
Autotransformer							
80% tap	80	80	480	64	384	64	115
65% tap	65	65	390	42	252	42	76
50% tap	50	50	300	25	150	25	45
Part Winding	100	65	390	65	390	50	90
Wye-Delta	100	33	198	33	198	33	60
Solid-state	0…100	0…100	0…100	0…100	0…100	0…100	0…100

With the wide range of torque characteristics for the various starting methods, selecting an electromechanical reduced voltage starter becomes more application dependent. In many instances, available torque becomes the key factor in the selection processes.

Solid-state Starters with SCRs

In solid-state starters, silicon-controlled rectifiers (SCRs) (see Figure 36) are used to control the voltage output to the motor. An SCR allows current to flow in one direction only. The amount of conduction of an SCR is controlled by the pulses received at the gate of the SCR. When two SCRs are connected back to back (see Figure 37), the AC power to a load can be controlled by changing the firing angle of the line voltage (see Figure 38) during each half cycle. By changing the angle, it is possible to increase or decrease the voltage and current to the motor. The SMC-50 controller incorporates a microprocessor to control the firing of the SCRs. Six SCRs are used in the power section to provide full cycle control of the voltage and current. The voltage and current can be slowly and steplessly increased to the motor.

Figure 36 - Silicon-controlled Rectifier

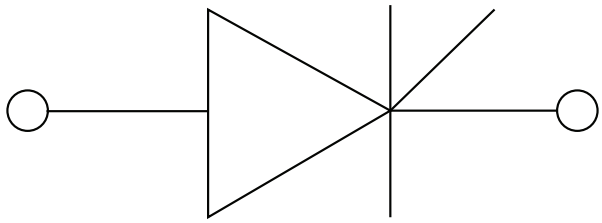
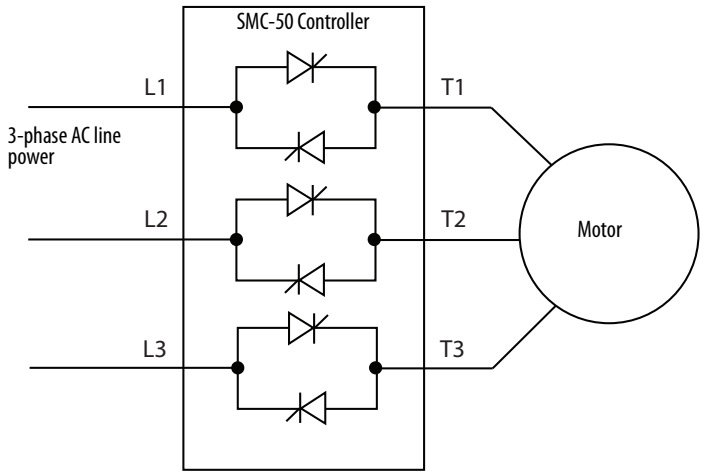
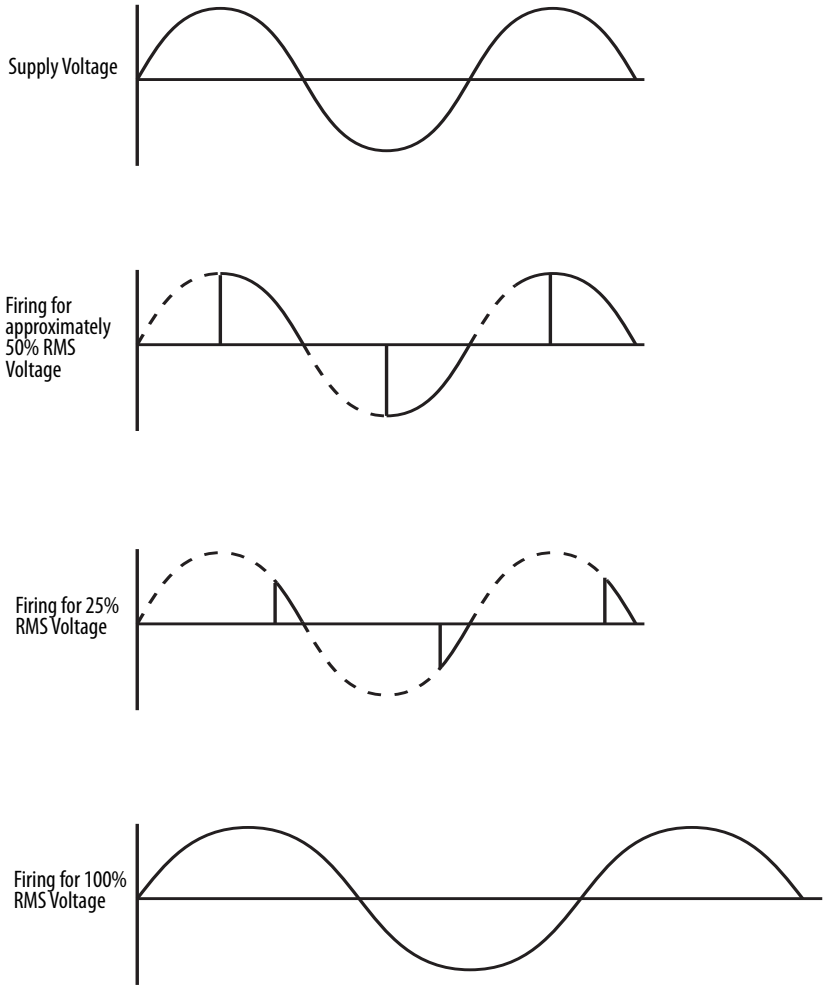


Figure 37 - Typical Wiring Diagram for SCRs



ALLEN BRADLEY SMC FLEX

Figure 38 - Different Firing Angles (Single-phase Simplification)



Industry Applications Matrix

Use this section to identify possible SMC controller applications. This section contains an application matrix that identifies starting characteristics and typical stopping features that may be used in various applications.

Table 93 - Mining and Metals(1)

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Roller Mills	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Hammermills	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Roller Conveyors	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Fans	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Tumbler	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Rock Crusher	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Dust Collector	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Chillers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Compressor	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Wire Draw Machine	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Belt Conveyors	X	X	X	X	X	X	X	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Shredder	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Grinder	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Slicer	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Overload Conveyor	—	X	X	—	—	—	—	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	—	X

Table 94 - Food Processing(1)

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Palletizers	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Mixers	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Agitators	—	X	X				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Centrifuges	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Conveyors	X	X	X	X	X	X	X	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Fans	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Bottle Washers	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Compressors	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Hammermill	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Separators	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Dryers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Slicers	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X

(1) Table Legend: 3= SMC-3 controller; F = SMC Flex controller; 50 = SMC-50 controller

ALLEN BRADLEY SMC FLEX

Table 95 - Pulp and Paper(1)

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Compressors	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Conveyors	X	X	X	X	X	X	X	X	X	X	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Trolleys	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Dryers	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Agitators	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Mixers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X(1)	—	—	X
Fans	X	X	X	X	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Re-Pulper	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Shredder	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	X

(1) Unloaded

Table 96 - Petrochemical(1)

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Extruders	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Screw Conveyors	—	X	X	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Mixers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Agitators	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Compressors	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Fans	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Ball Mills	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Centrifuge	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X

Table 97 - Transportation and Machine Tool(1)

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Material Handling Conveyors	X	X	X	X	X	X	X	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Ball Mills	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Grinders	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Trolleys	—	X	X				—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Presses	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Fans	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Palletizers	—	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Compressors	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Roller Mill	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Die Charger	—	X	X				—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Rotary Table	—	X	X				—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X

(1) Table Legend: 3= SMC-3 controller; F = SMC Flex controller; 50 = SMC-50 controller

ALLEN BRADLEY SMC FLEX

Table 98 - OEM Specialty Machine[1]

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Centrifugal Pumps	X	X	X	X	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Washers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Conveyors	X	X	X	X	X	X	X	X	X	X	X	X	—	—	—	—	X	X	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Power Walks	—	X	X	—	X	X	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Fans	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Twisting/ Spinning Machine	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X

Table 99 - Lumber and Wood Products[1]

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Chipper	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Circular Saw	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Bandsaw	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Edger	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Conveyors	X	X	X	X	X	X	X	X	X	X	X	X	—	—	—	—	X	X	—	—	—	—	X	X	—	—	—	—	—	X	—	—	X
Centrifugal Pumps	—	X	X	—	X	X	—	—	—	—	—	—	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Compressors	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Fans	X	X	X	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Planers	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Sander	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	X	X	—	X	X	—	X	X	—	X	X	—	—	X	—	—	X
Debarker	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X

Table 100 - Water/Wastewater Treatment and Municipalities[1]

Application	Soft Start			Current Limit			Kickstart			Soft Stop			Pump Control			Accu- Stop			Smart Motor Brake			Preset Slow Speed			Slow Speed with Brake			Linear Speed Acceleration			Torque Control Start		
	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50	3	F	50
Centrifugal Pumps	X	X	X	X	X	X	—	—	—	X	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Centrifuge, heavy	—	X	X	—	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	—	—	—	—	X	X	—	—	X	—	—	X
Fans	X	X	X	X	X	X	—	—	—	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X
Compressors	X	X	X	X	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	—	—	X

(1) Table Legend: 3= SMC-3 controller; F = SMC Flex controller; 50 = SMC-50 controller

ALLEN BRADLEY SMC FLEX

Fans

Soft starters are commonly used to start fans. Fans are typically variable torque type loads. The amount of torque that is required increases with the starting speed of the fan.

The best way to start a fan load is with the dampers closed to reduce the amount of resistance to airflow. Figure 39 and Figure 40 illustrate methods the SMC-50 uses for successful fan starting. Note the smooth start of the sensorless linear acceleration, keeping smooth control of the motor current.

Figure 39 - Sensorless Linear Acceleration and Sensorless Linear Deceleration

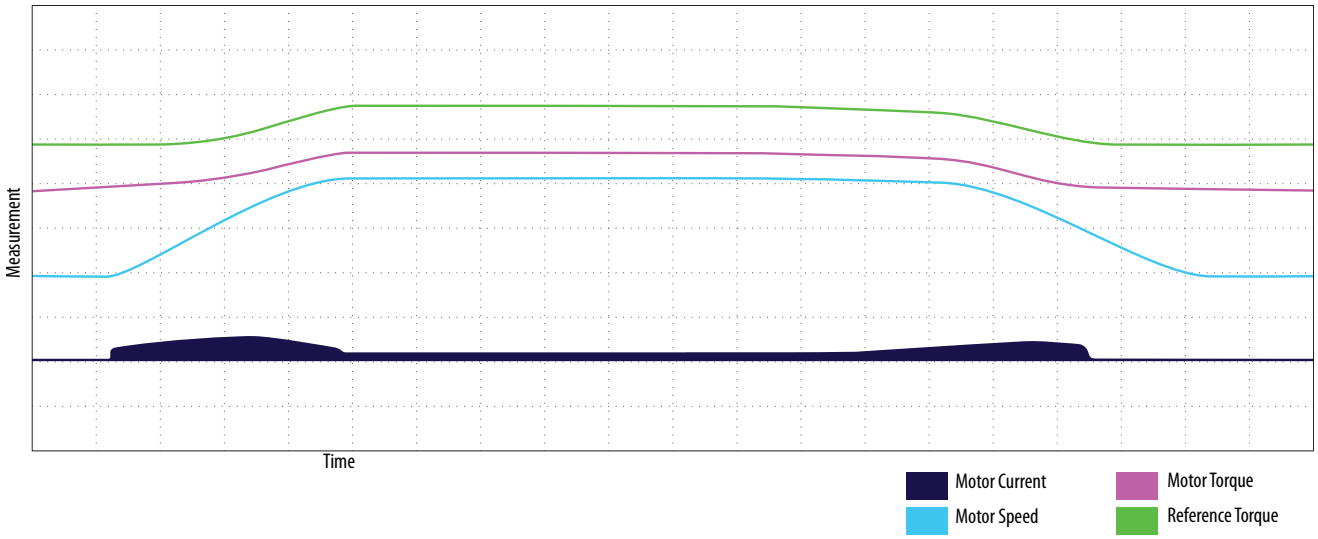
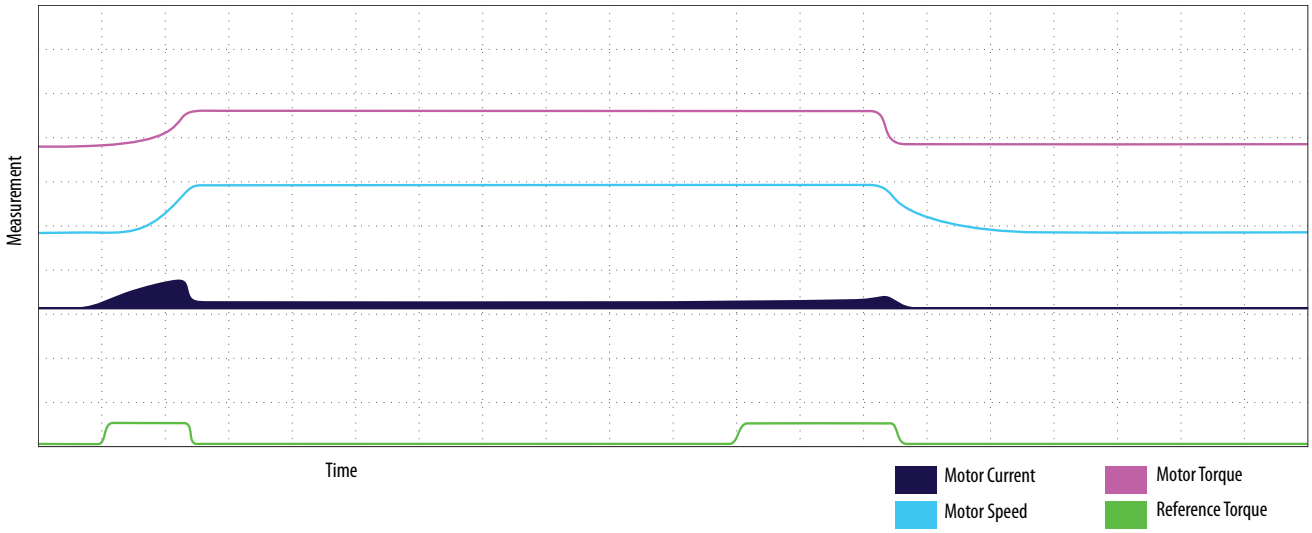


Figure 40 - Soft Start and Soft Stop

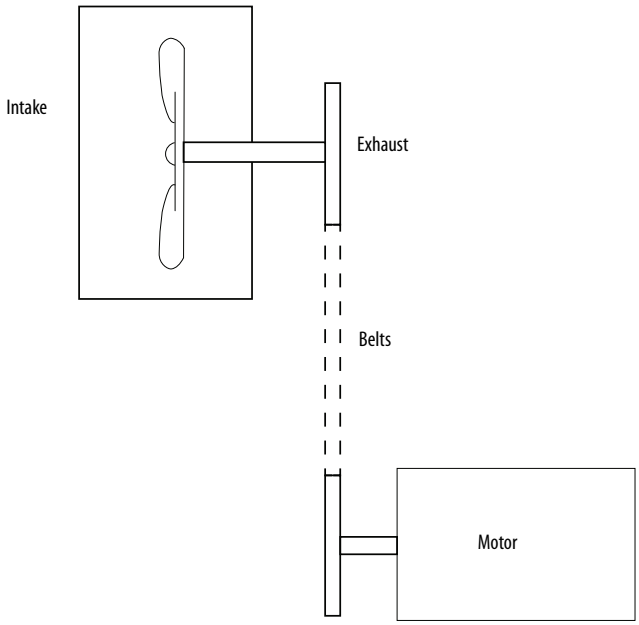


Exhaust Fan with Soft Start

Problem

The belts on an exhaust fan frequently break, which causes maintenance problems. In addition to the high cost of the belts, the fan belt guard is cumbersome to remove. The high starting torque from the motor is a major contributor to the belt wear. The customer wants to remotely stop and start the fan from a PLC. Panel space is limited, which requires a compact device. Figure 41 illustrates this scenario.

Figure 41 - Exhaust Fan with Soft Start



Solution

The SMC-50 controller is installed as a retrofit to the existing starter. The ramp time is set for 28 seconds, which facilitates a smooth acceleration while reducing the starting torque of the motor and minimizing the mechanical shock to the belts. The SMC-50 controller has optional communication capabilities, allowing it to be controlled remotely via a PLC. It also has built-in overload protection, which saves panel space by not requiring a separate overload protection device.

SMC Flex controllers also have the flexibility of setting the ramp time and the adjustability required for this application.

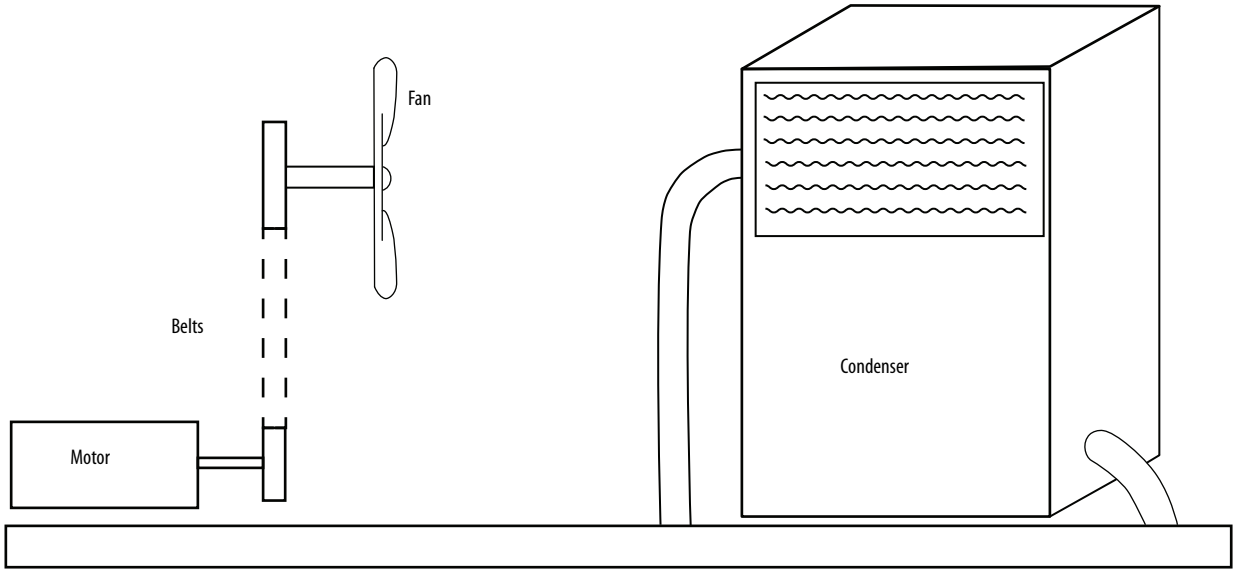
SMC-3 controllers have fixed selectable ramp times and selectable starting torques.

Chiller with Soft Start

Problem

A belt-driven fan on a chiller frequently breaks the belt because of high starting torque. The customer incurs excessive downtime because the housing has to be removed to replace the belt. A combination across-the-line starter is used to control the motor. Control panel space is limited. A device that uses same control and line voltage is required because there is no room in the panel for a control circuit transformer. Figure 42 illustrates this scenario.

Figure 42 - Chiller with Soft Start



Solution

The SMC-50 controller is installed as a retrofit to the chiller. It is set for an 18-second soft start to reduce the snap to the belts as a result of the high starting torque. It also reduces belt "squealing" that had been occurring at startup. Because the SMC-50 controller can operate with 240V control voltage and line voltage, a control circuit transformer is not required. The built-in overload protection on the SMC-50 controller further reduces the required panel space. The customer is able to retrofit the controller into the existing panel space.

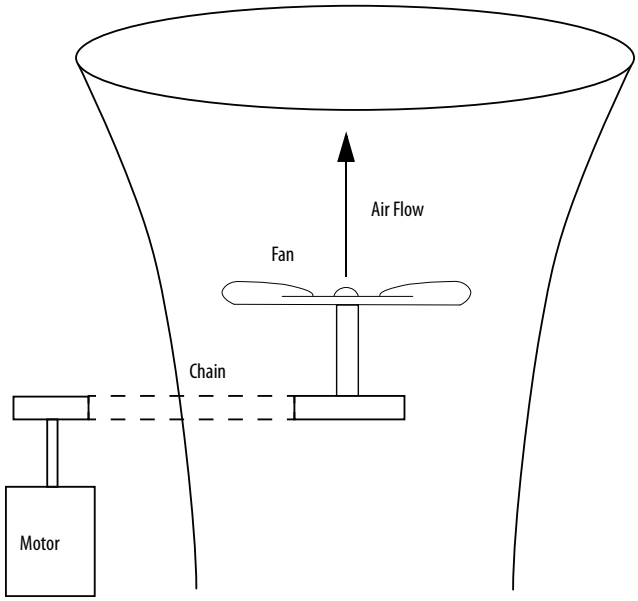
Both the SMC Flex and the SMC-3 controllers can operate at 240 control and line voltage, removing the requirement for a control circuit transformer.

Cooling Tower Fan with Linear Acceleration

Problem

A chain-driven fan that moderates the temperature of water in a chemical process is started across-the-line. The system requires frequent inspection and maintenance because of problems with the chain drive. Ice forms on the blades in winter. The air density is affected by seasonal temperature variations, which affects the starting time. The application requires a controlled start. Figure 43 illustrates this scenario.

Figure 43 - Cooling Tower Fan with Linear Acceleration



Solution

The SMC-50 controller is installed to provide a controlled acceleration to minimize the mechanical shock that is encountered during an across-the-line start. Maintenance inspection is also reduced. In the winter, when a longer start is required, linear acceleration is used to start the motor in the same time frame.

The SMC Flex controller offers soft start mode and linear acceleration with the use of an external tachometer.

The SMC-3 controller only offers soft start or current limit mode for this application.

ALLEN BRADLEY SMC FLEX

Pumps

System dynamics play a big part in pumping applications. The motor, valving, elbows, head (static and dynamic) pressure and power source of the system are all factors. Each system requires different ways to start and stop the pump to reduce water hammer. The two main pumping systems are positive displacement and centrifugal.

SMC controllers work best when they start lightly loaded centrifugal pumps. These pumps increase pressure from the impellers, which creates the pumping action. Motor torque increases during the starting process.

In contrast, positive displacement pumps have a constant torque characteristic and need more-specific calculations to correctly estimate requirements. One tool to use is the SMC controller estimation wizard. The issue is the potential for high torque demand while starting this type of pump. The SMC controller requires full voltage at start to provide full torque.

Because each system is different, the SMC-50 controller offers multiple ways to control the pump, simply by changing parameters.

You can use soft start, pump start, and linear acceleration starting methods. Stopping methods for pump applications include soft stop, pump stop, and linear deceleration.

Figure 44 through Figure 46 compare starting methods using a 10-second start time, 0% initial torque, and 65% load on a centrifugal pump.

Figure 44 - Soft Start and Soft Stop in Pump Application

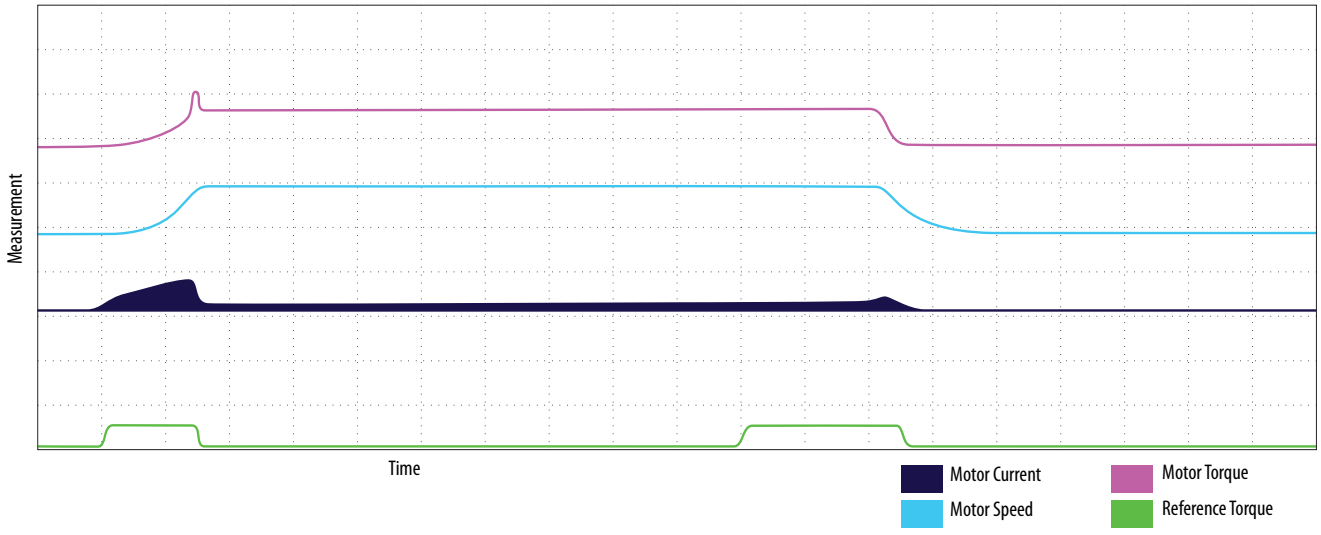


Figure 45 - Pump Control in Pump Application

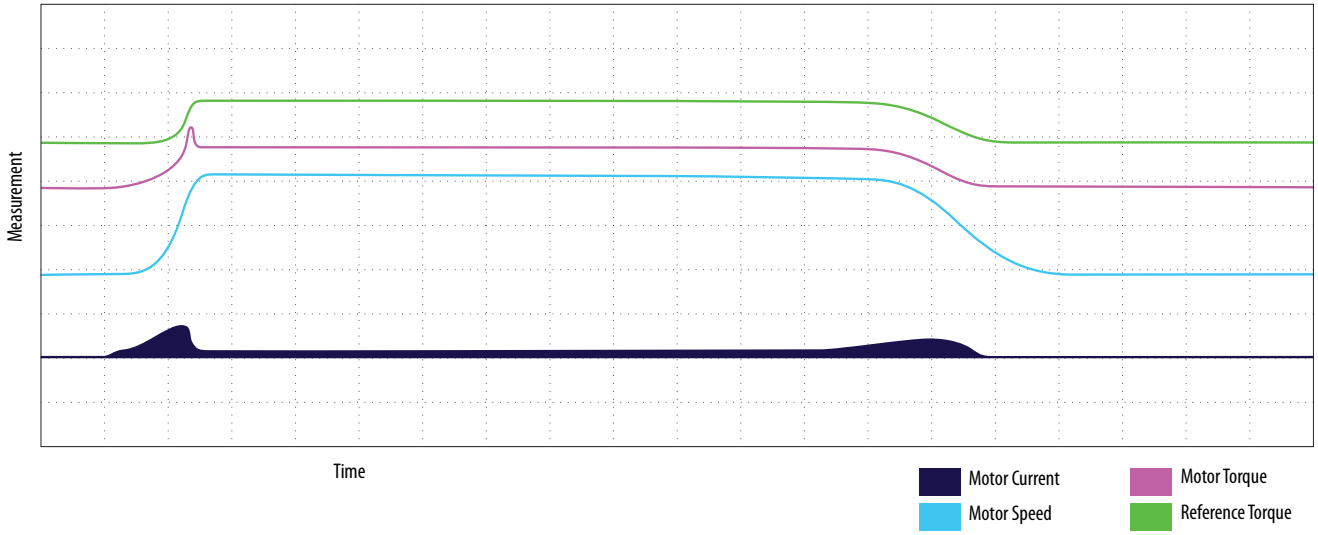
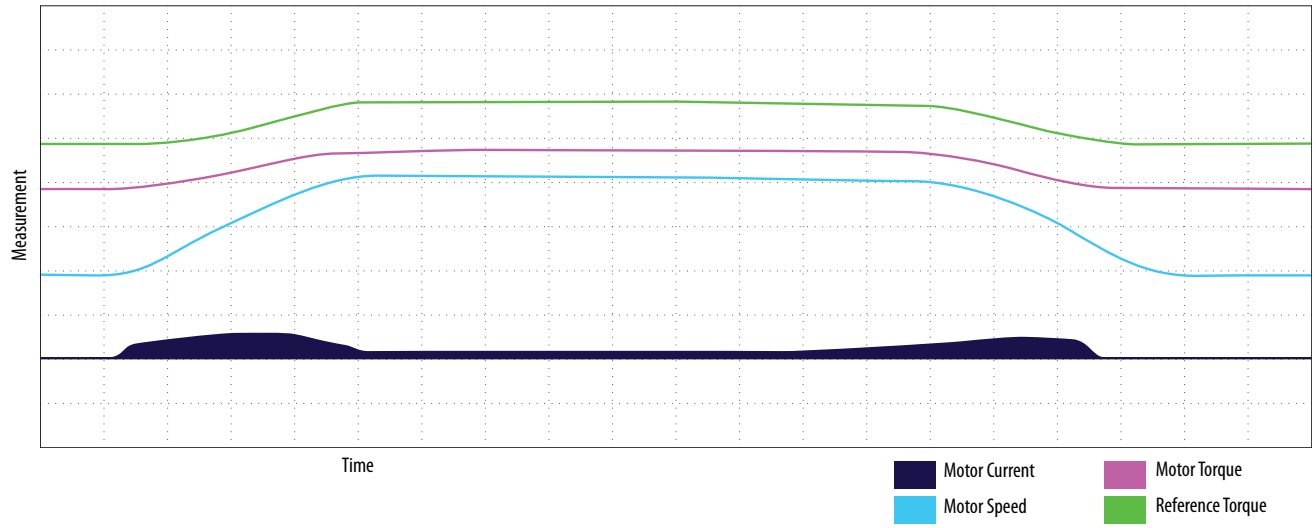


Figure 46 - Linear Acceleration and Linear Deceleration in Pump Application



Notice the lower current consumption that is used by using the linear acceleration mode on startup. This mode is not as load dependent as the other two methods. In addition to the starting and stopping methods offered by the SMC-50 controller, it also offers the ability to monitor and control pumping applications that are not available in other soft starters

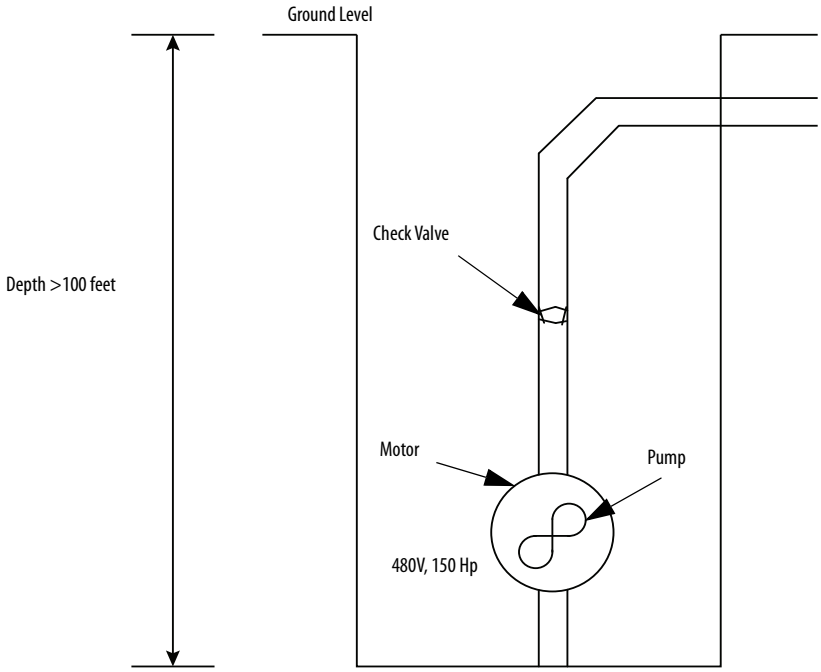
ALLEN BRADLEY SMC FLEX

Pump with Soft Start

Problem

A municipal water company is experiencing problems with damaged pump impellers. The damage occurs during frequent motor starting while the load below the check valve drains from the system. A timing relay is installed to help prevent restart under load, but it needs to be adjusted frequently. The pumping station motor is over 100 feet below ground, which makes repair costly. For maintenance scheduling purposes, an elapsed time meter that measures motor running time needs to be installed in the enclosure. Figure 47 illustrates this scenario.

Figure 47 - Pump with Soft Start



Solution

The SMC-50 controller is installed, and it provides a controlled motor acceleration. It can reduce the shock to the impeller by decreasing the torque during startup. The SMC-50 controller backspin timer feature can be implemented to help prevent the motor from starting while it turns in a reverse direction. By using the built-in elapsed time meter, panel space is saved. The SMC-50 controller line diagnostics protect the motor by detecting faults such as a shorted SCR condition at pre-start and shuts off the motor, protecting it against damage. Soft start is a good method to use with soft power sources to reduce current spikes.

The SMC Flex controller can also perform control with the backspin timer feature only with the pump control module.

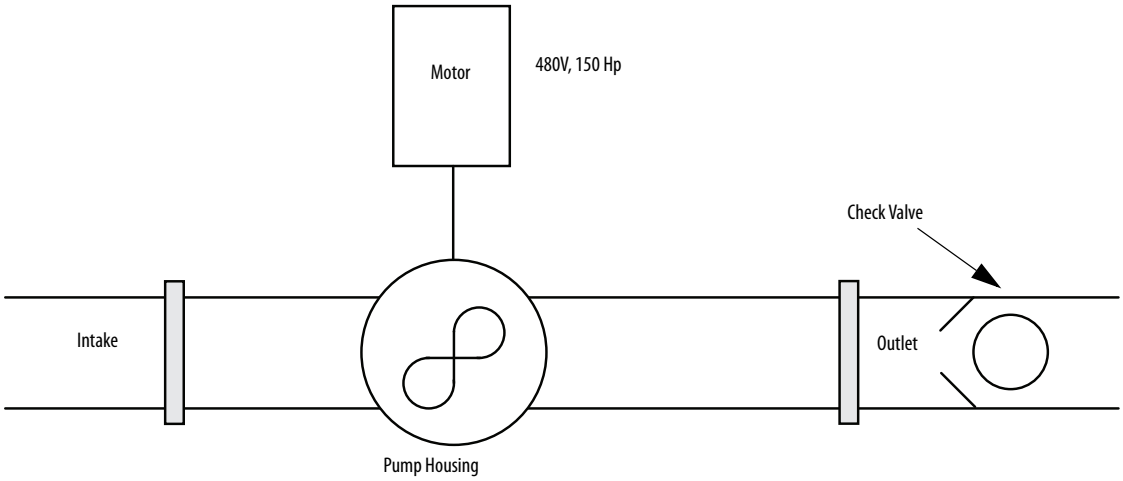
The SMC-3 controller offers soft start control but not a backspin timer.

Pump with Pump Control

Problem

A municipal pump uses a soft start controller with soft stop to control the pump motor. The soft stop controls the motor in an open-loop fashion by reducing the voltage to the motor. Because there is not enough motor torque to drive the load, the motor quickly reaches its stall point. Severe surges cause pipe vibration and breakage during the stop mode. Figure 48 illustrates this scenario.

Figure 48 - Pump with Pump Control



Solution

The SMC-50 controller is installed and configured to the Pump Control setting. The Pump Control option removes the surges by controlling the speed of the motor during starting and stopping. The microprocessor inside the SMC-50 controller analyzes the motor variables and generates control commands to reduce the surges in the system.

You could also use the pump control option on the on the SMC Flex controller.

The SMC-3 controller does not offer pure pump control option.

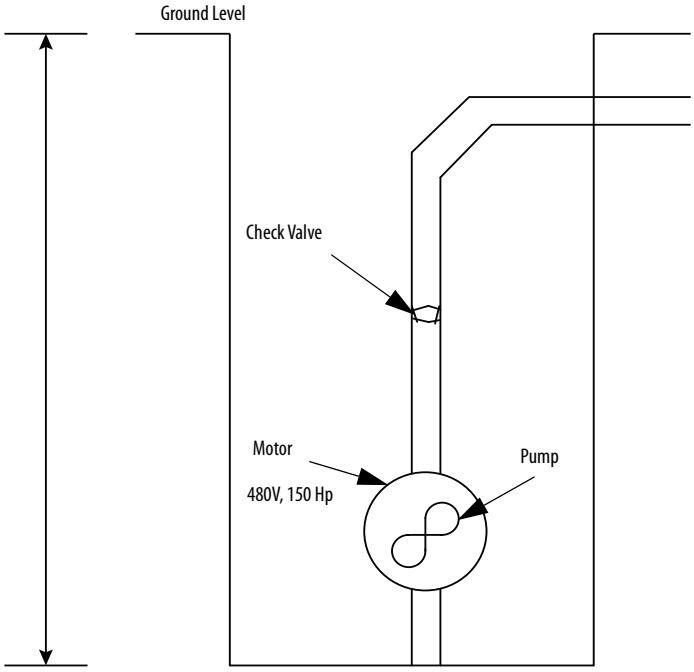
ALLEN BRADLEY SMC FLEX

Pump Control with Sensorless Linear Acceleration and Deceleration

Problem

A municipality has a pumping station where there is water hammer taking place even when using pump stop. The water hammer causes vibration alarms to go off at a bank several miles away. Fire and police are automatically notified and called to the bank. Once the source of the issue is identified, the municipality needs to adjust the stopping procedure. The pump stop profile of the SMC Flex controller is verified with an oscilloscope, but does not solve the issue. Figure 49 illustrates this scenario.

Figure 49 - Pump Control with Sensorless Linear Acceleration and Deceleration



Solution

Linear deceleration using the patented sensorless linear deceleration is the answer. The SMC-50 controller is connected to the SMC Flex power structure using the proper upgrade kit for the 108...251 A units. This method controls the SMC-50, but removes the need to remove the entire SMC Flex controller. This lets the personnel leave the 3-phase power wiring connected. (Three-phase power is turned off when the controllers are swapped.) Once the addition of the SMC-50 control module is complete, using the linear deceleration instead of pump stop removes the water hammer and provides a smooth closing of the valves.

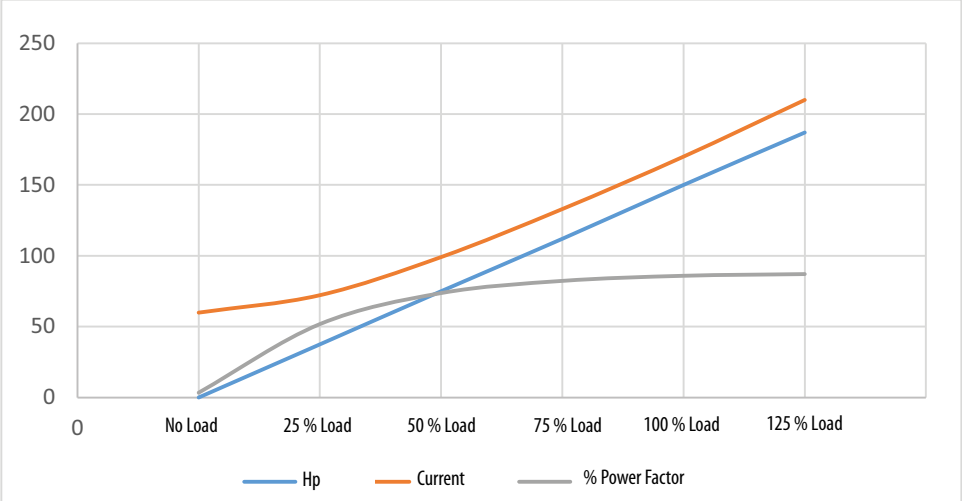
You cannot place the SMC-3 controller on an SMC Flex power structure, and the SMC-3 controller does not have linear acceleration or deceleration capabilities.

Pump Cavitation and Blockage

Problem

A customer is unable to detect pump cavitation quickly enough to help prevent damage to the system, including the pump impellers and valves. The traditional way to detect pump cavitation is to use a current-monitoring device to detect an issue. These devices are added separately from the starter. However, even at no load, there is still magnetizing current. Figure 50 illustrates this scenario.

Figure 50 - Pump Cavitation and Blockage (for 150 Hp Motor)



Solution

In addition to starting and stopping the motor for the pumping application, the SMC-50 controller can also monitor and trigger alarms or faults based on current, real power, and power factor. At no load, power factor is at a near zero value, real power is at zero value, and motor current is at another value due to the magnetizing current of the motor. The combination of the three values can help determine whether pump cavitation is taking place. For example, if real power decreases, this could indicate a clogged suction line, which can result in the pump running dry. It could also be an indication of pump cavitation. If real power increases, this can indicate overload or a rupture in the discharge line. You can set real power fault and alarm functions with a time delay and select for both under and over values.

The SMC Flex controller can monitor real power and power factor, but it does not have the ability to enunciate an alarm or fault based only on those values.

The SMC-3 controller does not have real power enunciation capability.

ALLEN BRADLEY SMC FLEX

Conveyors

Conveyors are one of the easiest systems to control using the SMC-50 controller. The SMC-50 controller offers linear acceleration and soft start for controlling a smooth start and stop of conveyors. The primary use of the soft starter in this application is to reduce mechanical stress and dynamic shifts in product.

Soft start is the typical way of starting a conveyor that is lightly loaded. If you need to restart the conveyor with a heavier load, linear acceleration may be a more effective option. Linear acceleration is not as load-dependent as soft start is, so it is more flexible under varying load conditions. It is also more flexible than soft starting when it must function in varying thermal conditions, such as running a cold motor in the morning, and a hotter motor as the day progresses.

Figure 51 and Figure 52 illustrate plots of starting and stopping constant loads, such as conveyors.

Figure 51 - Soft Start and Soft Stop on Conveyor

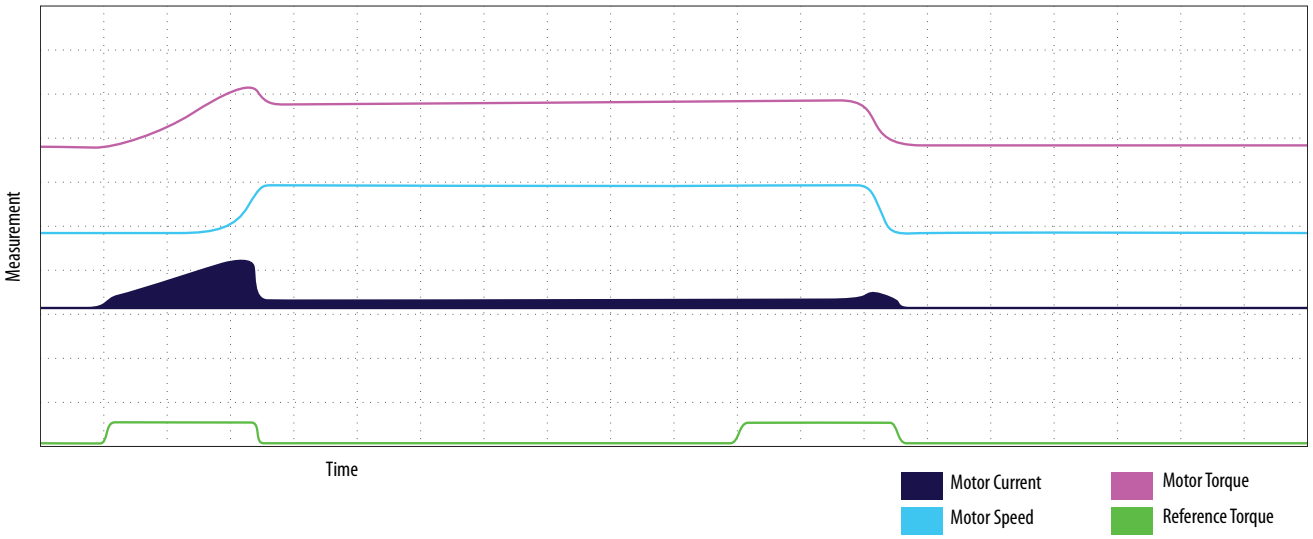
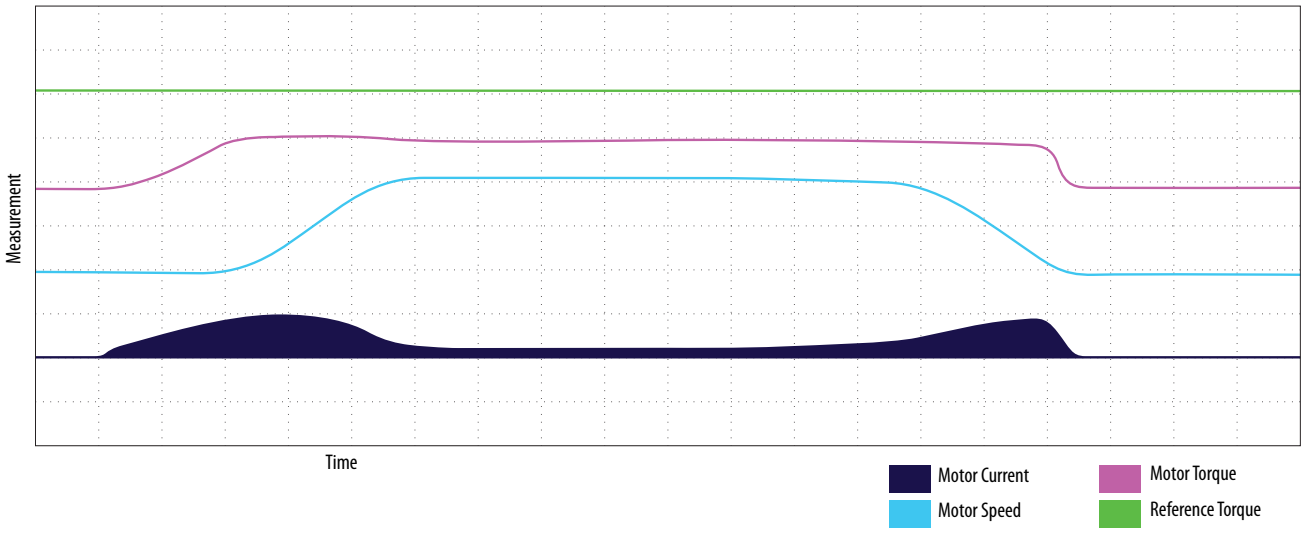


Figure 52 - Linear Acceleration and Linear Deceleration on Conveyor



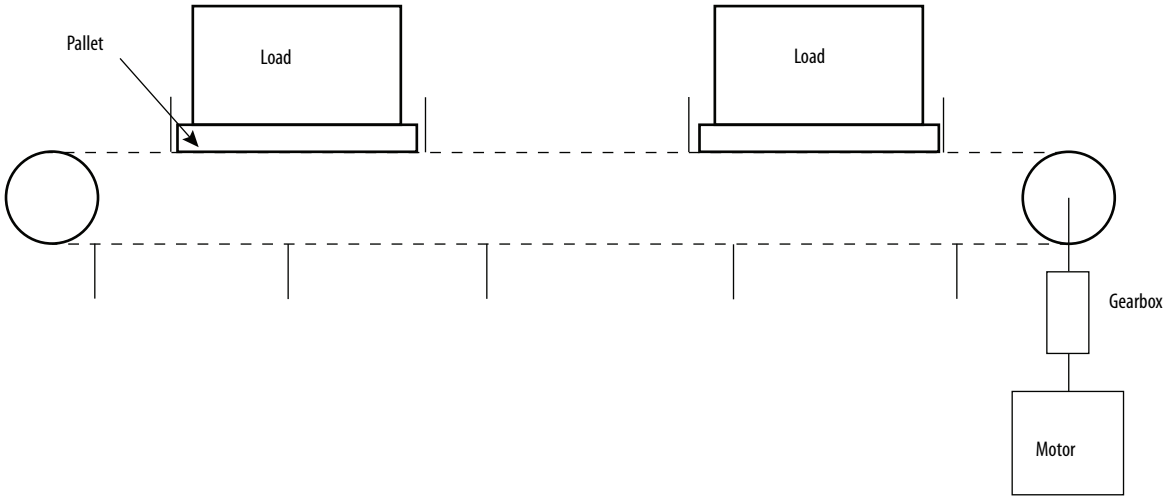
These two scenarios use identical motors and starting parameters. Note the difference between the two starts. The sensorless linear acceleration provides smoother motor torque over the soft starting method. Unlike soft start, which is load dependent, linear acceleration can produce a more accurate starting time. Sensorless linear acceleration also produces a smoother motor current, torque, and speed.

Towline Conveyor with Soft Start and Soft Stop Options

Problem

A towline conveyor at the end of a production line has frequent damage to the gearbox caused by the starting torque from across-the-line motor starting. There are also frequent spills during starting and stopping. The conveyor occasionally needs to be started under heavy load. This towline application has a variety of starting requirements that other soft starters could not satisfy. Investing in a variable speed drive was not cost effective. Figure 53 illustrates this scenario.

Figure 53 - Towline Conveyor with Soft Start and Stop



Solution

The SMC-50 controller with the Soft Stop option is installed as a retrofit to the existing across the-line starter. The starting and stopping times are programmed for 13 seconds. The reduced starting torque decreases the shock to the gearbox and keeps the load from shifting on startup. The Soft Stop option protects against loads shifting while stopping. The kickstart feature is used to provide a pulse of current to break the load away when higher starting torque is required. The SMC-50 controller meets the starting requirements and is a cost-effective solution.

SMC Flex controllers also have a full range of adjusting the initial torque value for starting the soft starting application, including full voltage if needed.

SMC-3 controllers have limited adjustability on initial torque value. They offer soft stop and kickstart options.

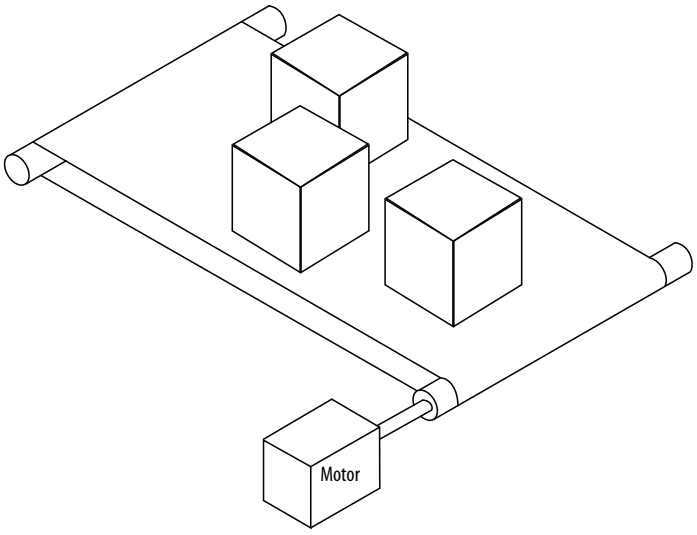
ALLEN BRADLEY SMC FLEX

Palletizer with Sensorless Linear Acceleration

Problem

A palletizer moves boxes of product through a packaging process to a shrink wrap machine. Across-the-line starting causes unwanted product spillage, and an interruption of production due to the uncontrolled torque from the motor on startup. Because several types of product, in different size boxes, are produced on the same line, the system needs the ability to match the acceleration ramp to the product. Figure 54 illustrates this scenario.

Figure 54 - Palletizer with Sensorless Linear Acceleration



Solution

The SMC-50 controller was installed. It is now able to furnish a controlled acceleration, reduce the shock to the load, and eliminate product spillage. The Linear Acceleration feature allows the controller to be programmed to more closely match the motor acceleration with the product produced.

You could also use an SMC Flex controller in soft start mode. With an external tachometer attached, you could also use linear acceleration.

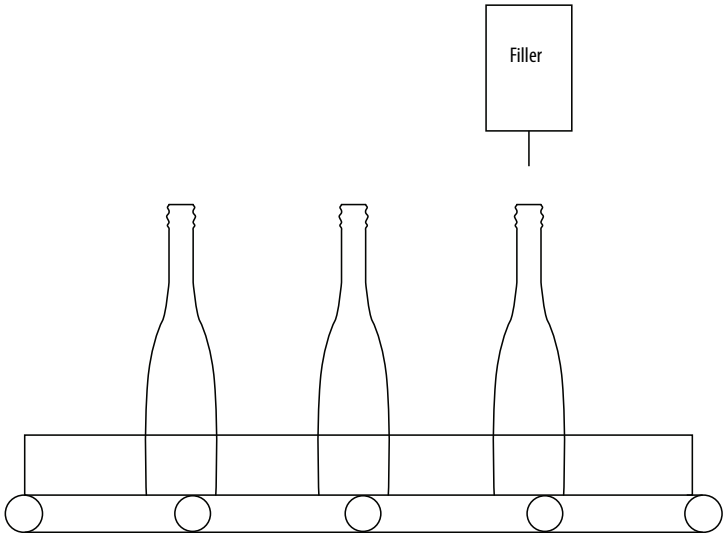
In this application, you could use the SMC-3 controller in soft start mode.

Bottle Filler with Soft Start and Soft Stop

Problem

A bottle filler line has product spillage during starting and stopping. An across-the-line starter is used to start the motor. The application also requires an auxiliary contact that energizes when the motor is up to speed. Figure 55 illustrates this scenario.

Figure 55 - Bottle Filler with Soft Start and Soft Stop



Solution

The SMC-50 controller is installed and programmed for a 13-second soft start with an 18-second soft stop. The controlled start reduces the starting torque and the product spillage. The soft stop option extends the stopping time and smooths load shift while stopping. The auxiliary contacts are configured to change state when the motor is up to speed.

You could also use either the SMC Flex or SMC-3 controllers for this application.

ALLEN BRADLEY SMC FLEX

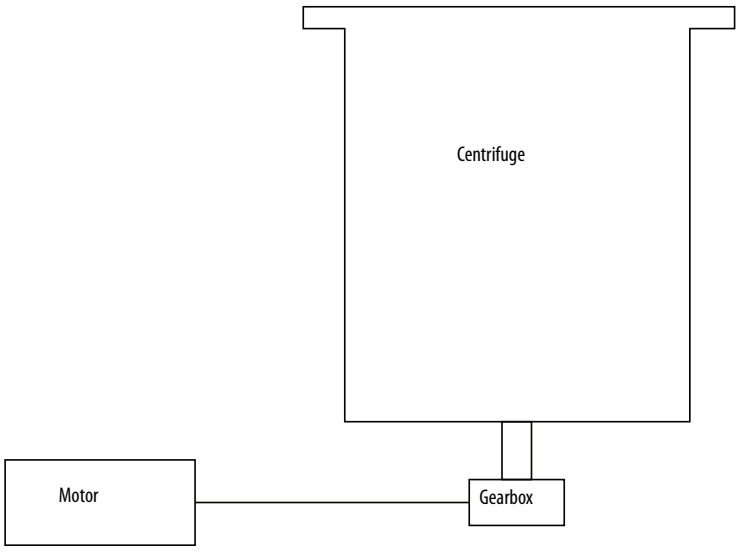
Centrifuge

Centrifuge with Current Limit Start and SMB Smart Motor Braking

Problem

A centrifuge requires a reduced voltage start because of power company restrictions. The high torque during starting damages the gearbox. The customer wants a shorter stop time than the present 15-minute coast-to-rest. The long stop time causes delays in the production process. A Wye-Delta starter with a mechanical brake is currently in use. A zero-speed switch is used to release the brake. The mechanical brake requires frequent maintenance and replacement, which is costly and time consuming. Both the mechanical brake and zero speed switches are worn out and require replacement. Figure 56 illustrates this scenario.

Figure 56 - Centrifuge with Current Limit Start and SMB Smart Motor Braking



Solution

The SMC-50 controller using the SMB option is installed. The controller is set for a 28-second, 340% current limit start, which meets the power company requirements and reduces the starting torque stress to the gearbox. The SMB option allows the centrifuge to stop in approximately one minute. The SMC-50 controller with SMB option does not require additional mounting space or panel wiring. The controller is mounted in a panel that is much smaller than the previous controller. Additionally, the new controller does not require frequent maintenance and can sense zero speed without a feedback device.

You can also use the SMC Flex controller with SMB in this application.

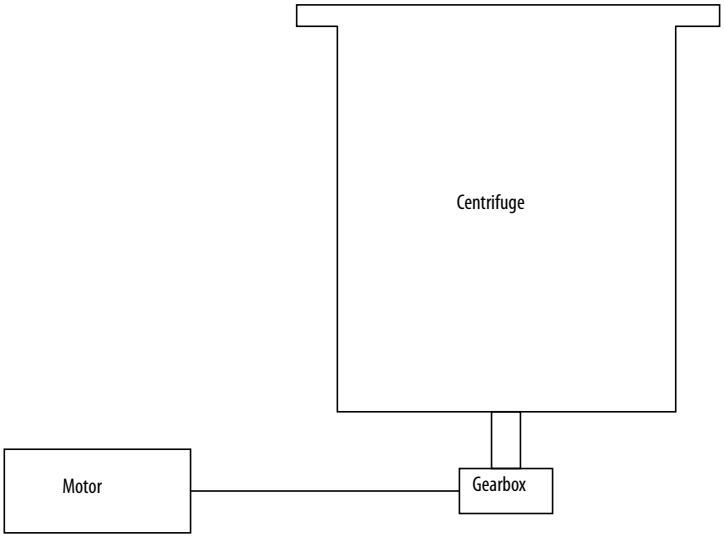
You should not use an SMC-3 controller in this instance because it does not have the braking option.

Centrifuge with Current Limit Start

Problem

High starting torque damages the gearbox to a centrifuge. A reduced-voltage starter is desired because this motor is near the end of the distribution line. In addition, the incoming power is unbalanced. The application needs a controller with a circuit breaker combination enclosure. When the enclosure door is open, the controller's circuit boards can not be exposed. Figure 57 illustrates this scenario.

Figure 57 - Centrifuge with Current Limit Start



Solution

The SMC-50 controller is installed. It is programmed for a 27-second, 300% current limit start, which limits the starting torque of the motor and the shock to the gearbox on startup. The Energy Saver feature reduces the voltage to the motor when it runs under a light load. The SMC-50 controller is ordered as a combination controller with a circuit breaker. The SMC-50 controller has no exposed circuit boards, which fulfills the packaging requirements.

The SMC Flex controller could also be used, but it does not offer energy saver mode.

The SMC-3 controller could be used, but it is not recommended because starting methods may need to take longer and this controller has limited adjustability.

Shock Loads

A load that quickly accelerates or decelerates is called a shock load. Shock loads are typically associated with a lot of vibration, dust, and current spikes because product (such as rock) gets stuck in the hopper. The SMC-50 controller electrically monitors what happens when running; there are current spikes from the application during acceleration and deceleration.

The SMC-50 controller is available in two versions, one version with solid-state control, and the other with an integrated bypass. You will need to apply these versions differently in some applications, including shock load.

For Controllers with Integrated Bypass Power Structures

The SCRs and the integrated bypass are not fully rated and need more awareness in this type of application. The internal bypass contactor is used after the SCRs of the soft starter have brought the motor up to speed. The algorithm of the soft starter determines when the motor is up to speed and then transitions from SCR control to the bypass contactor. The SMC-3 and the SMC Flex controllers are both hybrid soft starters; they have the power structure of a solid-state starter and an internal bypass contactor. The SMC-50 controller is available with an internal bypass contactor or as a purely solid-state version with no internal bypass contactor.

Attributes of an internal bypass contactor allow the soft starter to operate at a lower temperature with the motor at speed than a fully solid-state starter. A hybrid soft starter is typically smaller than that of fully rated SCRs with no bypass. This is because smaller components are used to start and carry the load current. The SCRs are rated for intermittent duty (AC-53b). The internal bypass contactors are not fully rated (AC-3), because they are not designed to make or break load current.

With an internal bypass soft starter, you only need power and control wiring. You do not need to purchase any additional devices. Internal bypass on a soft starter is appropriate for conveyors, fans, pumps and other applications in which the current and speed do not change while at running speed.

In a rock crushing application, there is a high chance of jamming material in a hopper, causing spikes in current. A soft starter with an internal bypass contactor monitors current and typically drops out of bypass around 120% over the SMC frame rating to protect the contactor and return to SCR control. Once the current returns to normal, the bypass contactor is pulled back in. This cycling on and off could shorten the life of the internal electromechanical contactor.

Not having all protective features of the soft starter during the run mode may be a benefit to keep an application like rock crushing working. In that application, using an external bypass contactor that is fully rated to handle the current surges keeps the contactor pulled in until a stop command is given or an overload is tripped. External overloads may be needed to protect the motor because some soft starters may not be able to read motor data while in external bypass mode.

An external bypass contactor can also be used on a AC-53a-rated fully solid-state SMC-50 controller. Depending on both the soft starter and the mounting and wiring of the bypass contactor, you might not need external overload devices. The mounting features from the soft start to the bypass contactor dictate whether the soft starter will be able to read data (current and voltage readings) while in bypass mode.

In UL/CSA regulated regions, size the bypass contactor according to the motor Hp and FLA. In IEC regulated regions, size the bypass conductor according to the AC-1 rated bypass contactor rating.

The Hp ratings of the AC-3 rated bypass contactor must match the Hp ratings of the SMC soft starter. The short-circuit ratings of the bypass contactor must be similar to those of the SMC soft starter. This is particularly important for the AC-1 rated bypass contactor selection.

For Controllers with Fully Solid-state Power Structures

The SMC-50 fully solid-state version of the controller lets you keep the machine running when current spikes. The SCRs are fully rated to handle the shock of the current spikes. Fully rated means they have the AC-53a rating, indicating the ability to operate at full duty. Overload and other protection of the motor and the SMC controller still applies.

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Fully solid-state devices are advantageous in harsh applications when there is a lot of vibration, dust, and dirt. Conformal coated circuit boards on the SMC-50 controller help protect component damage from conductive or corrosive dust in those types of environments. Vibration is not a concern as it would be for an electromechanical bypass contactor, where it could potentially cause contact bounce.

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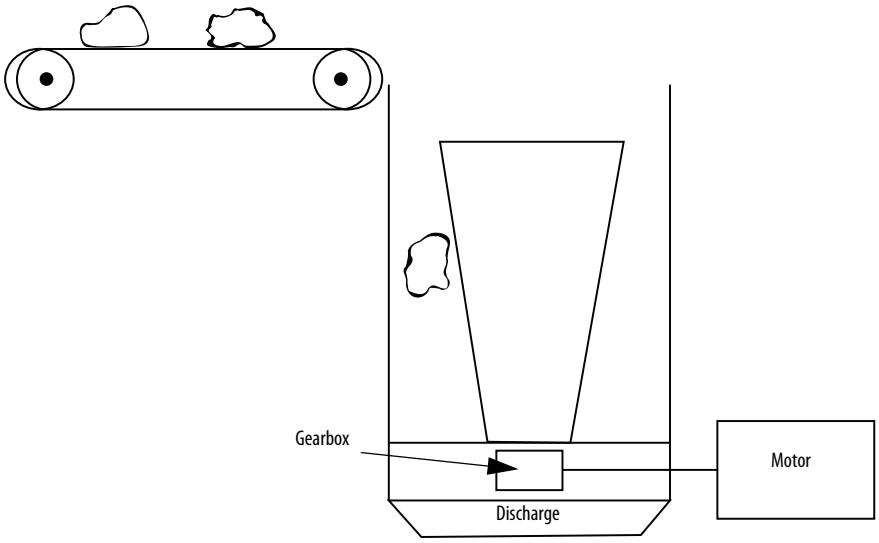
Rock Crusher with Current Limit and External Bypass Kit

Problem

Because of the remote location of a rock quarry, the utility power is weak and requires the use of current limit to start the crusher. The 350 Hp motor that drives the crusher has used hybrid soft starters in the past, but had to replace power structures too often because of the current spikes when product is stuck in the hopper. Figure 58 illustrates this scenario.

Figure 58 - Rock Crusher with Current Limit and External Bypass Kit



Solution

The solid-state SMC-50 controller is installed with an external bypass by using the bypass kit. The bypass kit allows the SMC-50 controller to still provide protection to the motor, including current overload, without the need for external protection to the externally connected bypass. When rock spikes the current, the system still runs because the fully AC-3 rated contactor does not drop out unless there is an overload condition that is based on the thermal curve and trip class that is set. The conformal coating of the SMC-50 controller circuit board keeps any dust from interfering with the operation of the soft starter. If the SMC-50 solid-state unit is used, the unit will continue to run until the thermal overload, or other parameter is exceeded. The SMC-50 controller can operate in solid-state mode without an optional external bypass by changing one parameter.

The SMC Flex controller can also perform current limit with the external bypass by setting the bypass parameter to external.

The SMC-3 controller can not run an external bypass.

High-inertia Loads

Loads that take longer than 30 seconds to start are typically considered to be high-inertia loads. In these applications, the inertia of the load is typically a significant factor in how long the motor will take to start without damaging the equipment. Heat generation is a byproduct of these long starting times. Too much heat can damage the motor, wiring, and other system components.

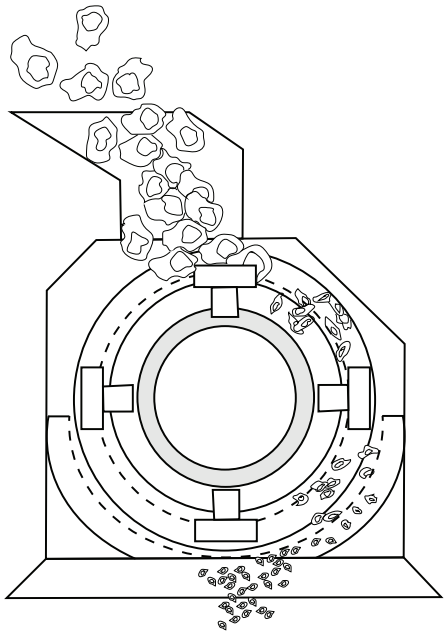
It is important to estimate how long it will take to start the motor for a given process that takes over 30 seconds to start. The SMC estimation tool can assist with this. See page 162.

Hammer Mill with Current Limit Start

Problem

A hammer mill with a high inertia load requires a reduced-voltage start because of power company restrictions. High torque on startup causes belt wear. Panel space is very limited. Traditional reduced voltage starters do not fit in the available space. Figure 59 illustrates this scenario.

Figure 59 - Hammer Mill with Current Limit Start



Solution

The SMC-50 controller is installed. It is set for a 23-second, 425% current limit start, which meets the power company's requirement for a reduced-voltage start. A current limit start is selected to quickly break away the high-inertia load and still provide a reduced-voltage start. The belt life is extended because the lower starting torque causes less wear. The Energy Saver feature is used when the mill is running lightly loaded. The compact size of the SMC-50 controller, along with the built-in overload feature, lets the controller fit into the available panel space.

The SMC Flex controller is also a good candidate for this application because it can adjust the start time and current limit. The SMC Flex controller does not have energy saver mode.

The SMC-3 is not appropriate for this application.

Bark Hogs

Challenges with bark hogs are very similar to those associated with hammer mill applications.

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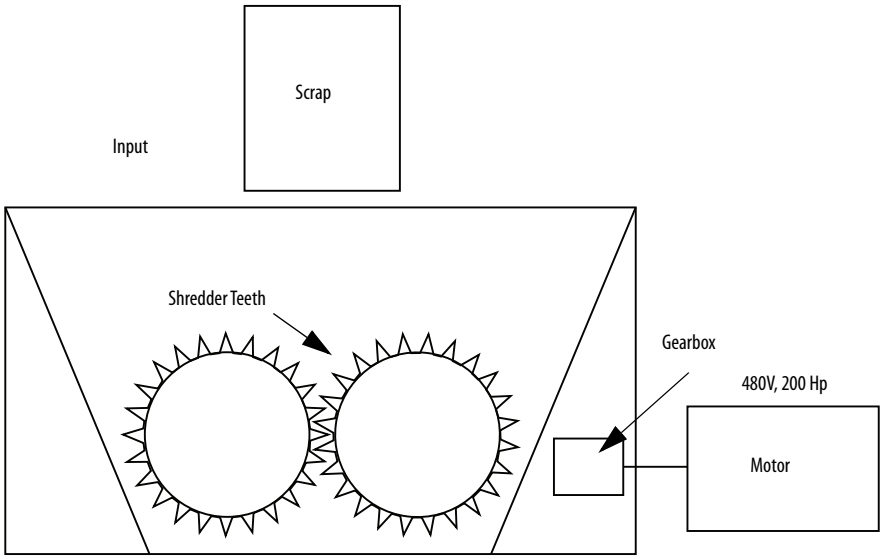
Shredder with Soft Start

Problem

Because of power company restrictions, a metal shredder requires a reduced-voltage start. Occasionally, a jam occurs during the shredding process. Additionally, the equipment runs unloaded for long periods. An autotransformer-type starter was used previously. Figure 60 illustrates this scenario.

Figure 60 - Shredder with Soft Start



Solution

The SMC-50 controller is installed, facilitating a reduced-voltage start. The controller also provides jam detection, which helps protect against excessive motor heating when a jam condition occurs. The Energy Saver feature of the SMC-50 controller reduces the voltage to the motor when the motor is running lightly loaded. The built-in overload feature of the controller saves panel space. A jam alarm is also set. This allows the operator to use the slow speed in reverse feature to try and unjam the product without needing to send someone out to clear the jam. Once the jam is cleared, the process continues normally.

The SMC Flex controller is also a good candidate for this application because it has current limit functions. The SMC Flex controller does not have energy saver mode.

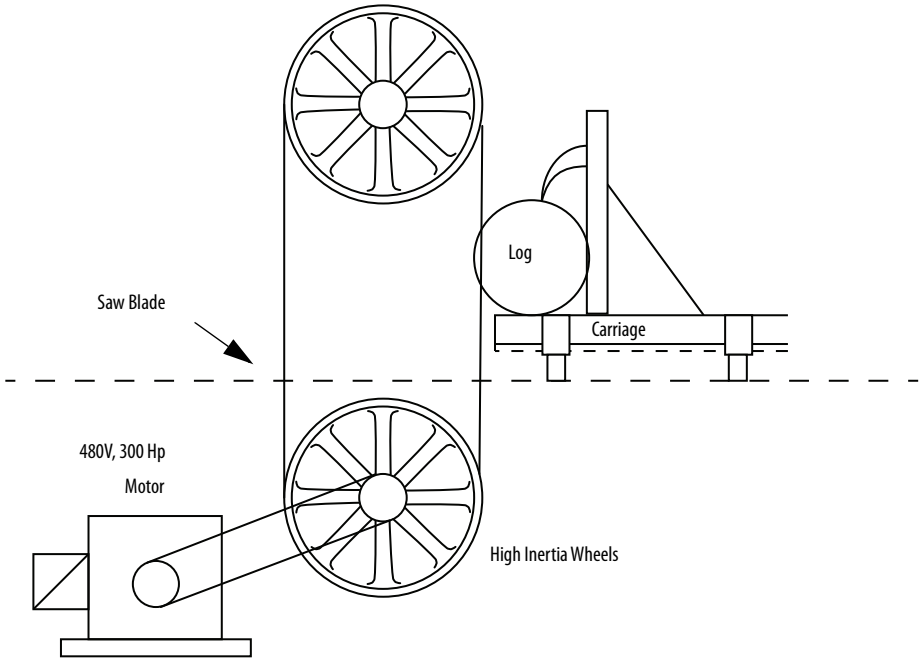
The SMC-3 is not appropriate for this application.

Bandsaw with Soft Start

Problem

Because of the remote location of the facility and power distribution limitations, a reduced voltage starter is needed on a bandsaw application. The saw is turned off only during shift changes. When the saw blade becomes dull, the motor draws more current. Therefore, an ammeter is required to meter the application for jam conditions. Single phasing of the motor is also a problem because of distribution limitations. Figure 61 illustrates this scenario.

Figure 61 - Bandsaw with Soft Start



Solution

The SMC-50 controller is installed to provide a reduced-voltage start, which minimizes the starting torque shock to the system. The Energy Saver feature activates whenever the bandsaw runs lightly loaded. The current monitoring and jam detection features of the SMC-50 controller are implemented, saving panel space and the cost of purchasing dedicated monitoring devices. The controller's built-in programmable overload protection eliminates the need for separate overload protection. The SMC-50 controller's diagnostic capabilities can help to detect single phasing and use current imbalance data to shut the motor off accordingly.

The SMC Flex controller does not have energy saver mode but has some alarm and fault imbalance capabilities.

The SMC-3 is not appropriate for this application.

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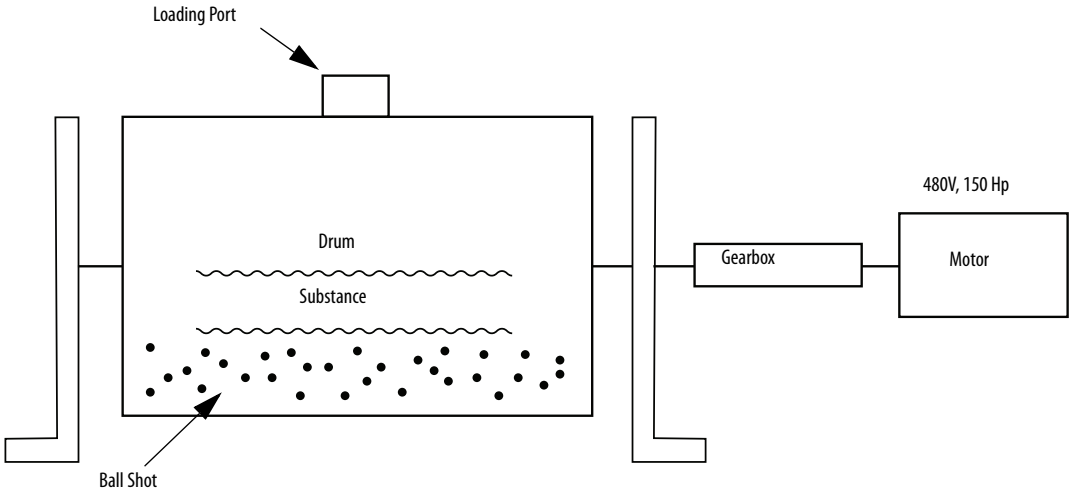
Ball Mill with Current Limit Start

Problem

An across-the-line starter starts the motor in a ball mill application. The uncontrolled start damages the gearbox, resulting in maintenance downtime, and the potential for the loss of the product (paint) being mixed. Line failures are a frequent problem. The application requires prestart and running protection and an elapsed time meter to monitor the process time. Communication capability is desired, and panel space is limited. Figure 62 illustrates this scenario.

Figure 62 - Ball Mill with Current Limit Start



Solution

The SMC-50 controller is installed. It is programmed for a 26-second current limit start, which reduces the starting torque and the damage to the gearbox. The metering feature of the SMC-50 controller contains an elapsed-time meter, which could monitor the process time of the ball mill. The optional communications capabilities of the controller allow it to communicate the process time to the PLC, which could remotely stop the ball mill. The line diagnostics required in the application are standard in the SMC-50 controller, and the built-in overload protection saves panel space.

The SMC Flex controller would also do well in this application.

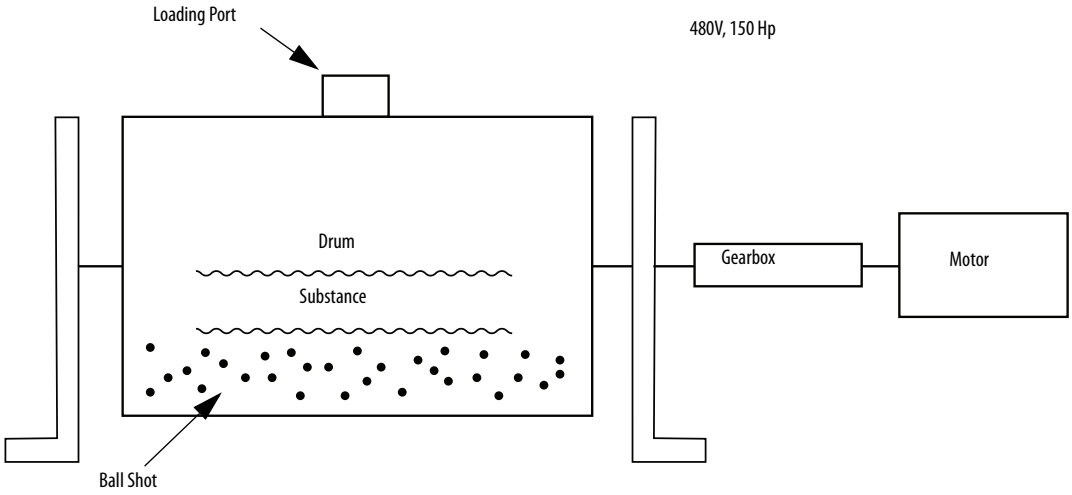
The SMC-3 controller is not appropriate for this application because of its limited diagnostics and lack of communication capability.

Ball Mill Soft Start with Accu-Stop

Problem

An across-the-line starter is used in a ball mill application. An electronic braking package stops the mill. The mill has to be jogged excessively to position the port for loading. The starting torque surges are causing gearbox problems. The application requires a cost-effective method to position the mill and control the stopping. Figure 63 illustrates this scenario.

Figure 63 - Ball Mill with Accu-Stop



Solution

The SMC-50 controller is installed on the mill. The Accu-Stop feature allows the drum to brake down to 15% slow speed and rotate the loading port into position before stopping. The SMC-50 requires less space and power wiring than the across-the-line starter and braking package.

The SMC Flex controller has fixed slow speed capabilities along with the ability to use Accu-Stop.

The SMC-3 controller does not have slow speed capabilities and is therefore not appropriate for this application.

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Smart Motor Braking

The forest products industry is one of the most dangerous industrial environments. Very sharp and fast-turning saw blades and moving products are common. Many of these saw blades are large and have a lot of mass. It is not uncommon for it to take 15 to 30 minutes or longer for the blade to coast to a complete stop.

Smart Motor Braking (SMB) is an effective way to stop a motor much faster than coast-to-rest methods. The average time to stop using SMB is 1.5...4 times the motor starting time. Stopping a large mass faster than coast uses more some energy, so you will need to consider the following points.

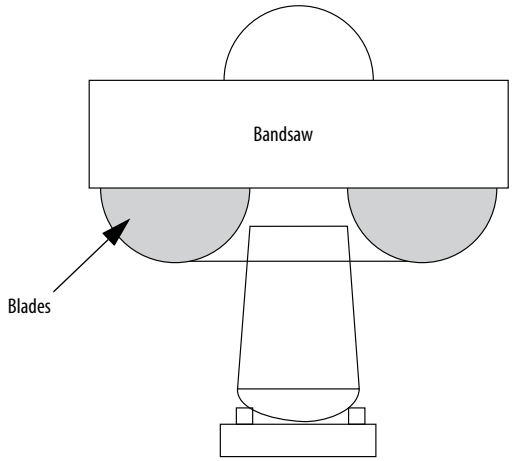
1. Braking is hard on the motor windings because more current is used to stop a load that generally takes many minutes to stop on its own.
2. You can hear noise, such as moans and groans of all kinds, during the braking process.
3. SMB produces some harmonic distortion during stopping, but the levels are somewhat insignificant as compared to the fundamental (typically < 10%) frequency.
4. SMB is not intended to be used as an emergency stop. Many factors go into using a safety function. The purpose of SMB is for routine use of stopping a mass for maintenance or other similar application.
5. Braking is hard on motors, but cannot create more energy than the motor demands.
6. Settings above 300% FLA can play havoc with power systems and cause nuisance overload trips or other issues.
7. A solid power supply is critical for consistent braking. Generators should be sized for minimum 3x motor FLA to work effectively in braking.

Bandsaw with Soft Start and SMB Option

Problem

A bandsaw application requires a reduced-voltage start because of power company restrictions. A brake package is required to reduce the stopping time of the saw. An autotransformer was previously used to start the saw. The saw is now stopped by sawing down. Sawing down is a process of running logs through the saw after the motor has been de-energized, which results in large amount of scrap lumber. Other stopping methods using dedicated braking devices have been investigated, but were unacceptable because of overly complex installation. Other stopping methods require panel space for the brake module, brake contactors and timers, and they offer no zero-speed detection. Figure 64 illustrates this scenario.

Figure 64 - Bandsaw with Soft Start and SMB Option



Solution

The SMC-50 controller installed and it is configured to use the SMB option. The controller provides the reduced-voltage start needed to meet the power company restrictions. The SMB operation does not require DC braking contactors. The starting and stopping control is furnished in a single modular design, providing ease of installation.

The SMC Flex controller using the SMB option control module is also a possible solution.

The SMC-3 controller is not appropriate for this application.

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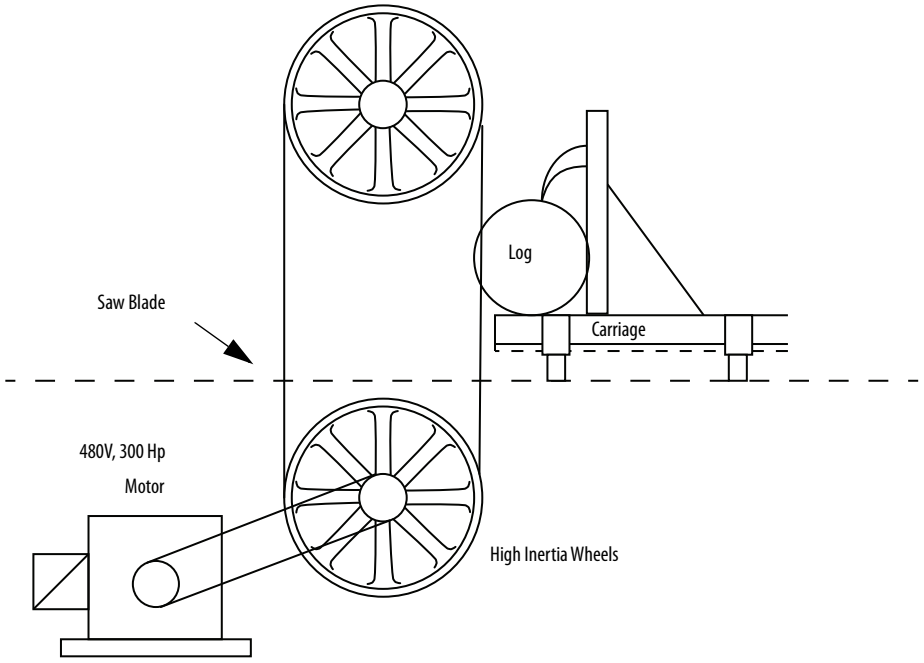
Bandsaw with Soft Start and Slow Speed with SMB

Problem

To change the saw blade, a bandsaw requires 25 minutes to coast to a stop. It requires a braking package to reduce the stopping time. Other methods using dedicated braking devices were investigated but were unacceptable because of overly complex installation. These methods require additional panel space for the brake module, brake contactors, and timers. Because of potential alignment problems, it is dangerous to bring the saw up to full speed after installing a new blade. Figure 65 illustrates this scenario.

Figure 65 - Bandsaw with Soft Start and slow speed with SMB



Solution

The SMC-50 controller, which has a selectable slow speed with braking option as standard, is installed. It provides a user-selected slow speed, allowing the user to inspect the saw blade tracking before the motor is brought to full speed. The braking option of the SMC-50 controller does not require additional panel space or DC braking contactors. Starting and stopping control is furnished in a single modular unit, providing ease of installation.

The SMC Flex controller using the SMB option control module is also a possible solution, but with fixed slow speed operation.

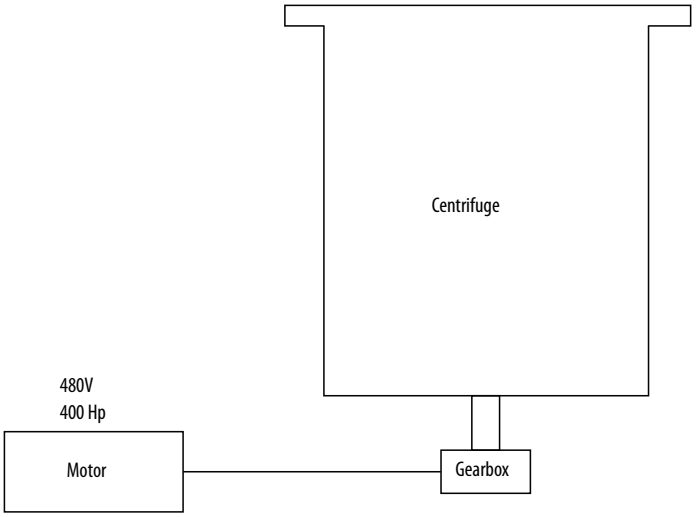
The SMC-3 controller is not appropriate for this application.

Centrifuge with Current Limit Start and SMB

Problem

A centrifuge requires a reduced-voltage start because of power company restrictions. The high torque during starting is damaging the gearbox. A shorter stopping time than the present 15 minute coast-to rest is desired. The long stop time causes delays in the production process. A Wye-Delta starter with a mechanical brake is currently in use. A zero-speed switch is used to release the brake. The mechanical brake requires frequent maintenance and replacement, which is costly and time consuming. Both the mechanical brake and zero-speed switches are worn out and require replacement. Figure 66 illustrates this scenario.

Figure 66 - Centrifuge with Current Limit Start and SMB



Solution

The SMC-50 controller is installed and wired inside-the-delta to the wye-delta motor and programmed to smart motor braking. The controller is set for a 28-second, 340% current limit start, meeting the power company requirements and reducing the starting torque stress to the gearbox. SMB allows the centrifuge to stop in approximately 1 minute. The SMC-50 controller with SMB programmed does not require additional mounting space or panel wiring. The controller is mounted in a panel that is considerably smaller than the previous controller. As an added benefit, the controller does not require frequent maintenance and can sense zero speed without using a feedback device.

The SMC Flex controller is also a good fit for this application.

The SMC-3 controller is not appropriate for this application because of the extended ramp time and its lack of SMB capability.

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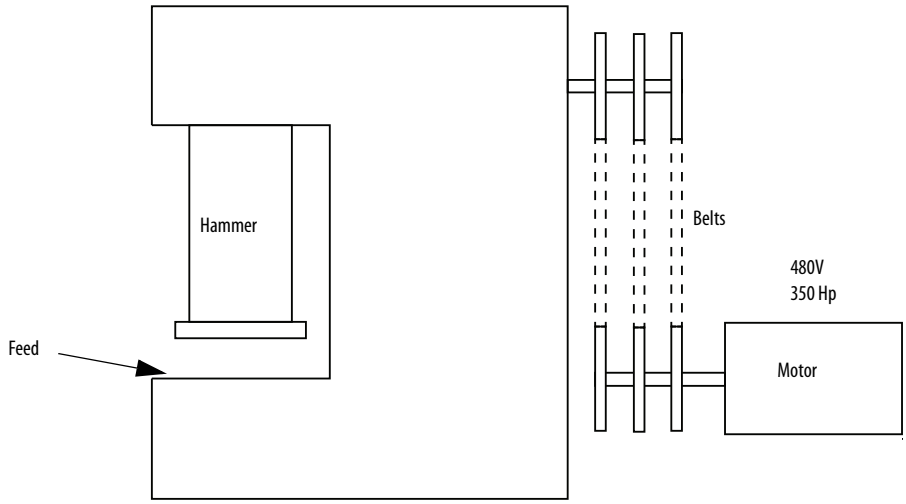
Hammermill with Current Limit Start and SMB

Problem

A hammermill requires a reduced-voltage start because of power company restrictions. A stopping time less than the present 5 minute coast-to-rest is desired. To save panel space, the customer wants to incorporate both starting and stopping control in the same device. Figure 67 illustrates this scenario.

Figure 67 - Hammermill with Current Limit Start and SMB



Solution

The SMC-50 controller configured with SMB is installed. A 23-second, 450% current limit acceleration is programmed, meeting the power company requirements and reducing the mechanical stress on the belts during startup. The braking function is accomplished without additional power wiring, panel space, or contactors. The controller detects zero speed without additional sensors or timers. The current limit start, braking, and overload protection are all contained in the same modular package.

The SMC Flex controller is also a good fit for this application.

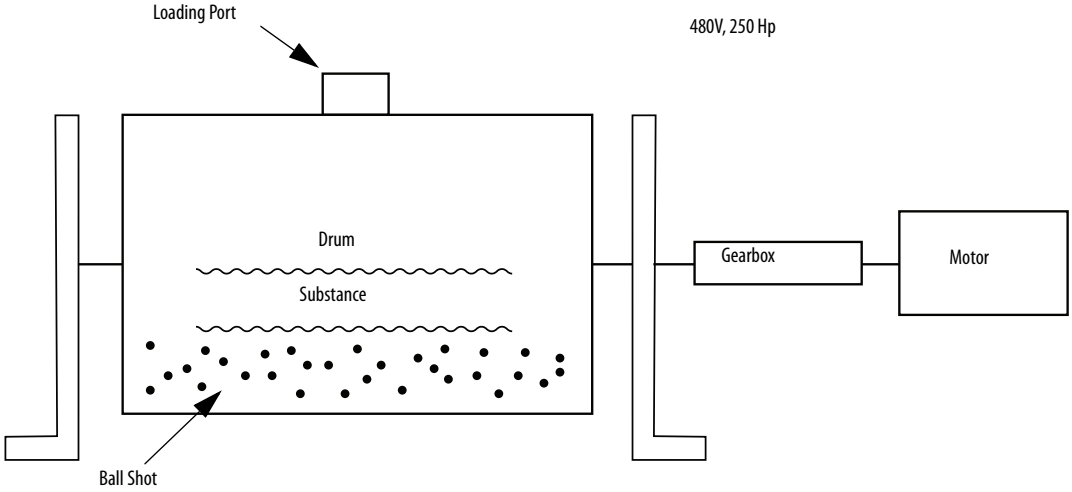
The SMC-3 controller is not appropriate for this application because of its lack of SMB capability.

Ball Mill with Soft Start and SMB

Problem

Across-the-line starts are damaging the gearbox on a ball mill, resulting in extra maintenance time to keep the mill operating. Due to the high inertia of the load, the coast-to-stop time is approximately five minutes. The application requires a soft start and braking package in a single controller because panel space is at a premium. Figure 68 illustrates this scenario.

Figure 68 - Ball Mill with Soft Start and SMB



Solution

The SMC-50 controller is installed on the ball mill and set to use the SMB setting. The soft start reduces the shock to the gearbox on startup. The SMB option reduces the stopping time and increases the productivity of the mill. The SMC-50 controller is installed in the same space in which the previous contactor had been mounted. No additional power wiring is required.

The SMC Flex controller is also a good fit for this application.

The SMC-3 controller is not appropriate for this application because of its lack of SMB capability.

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Compressor

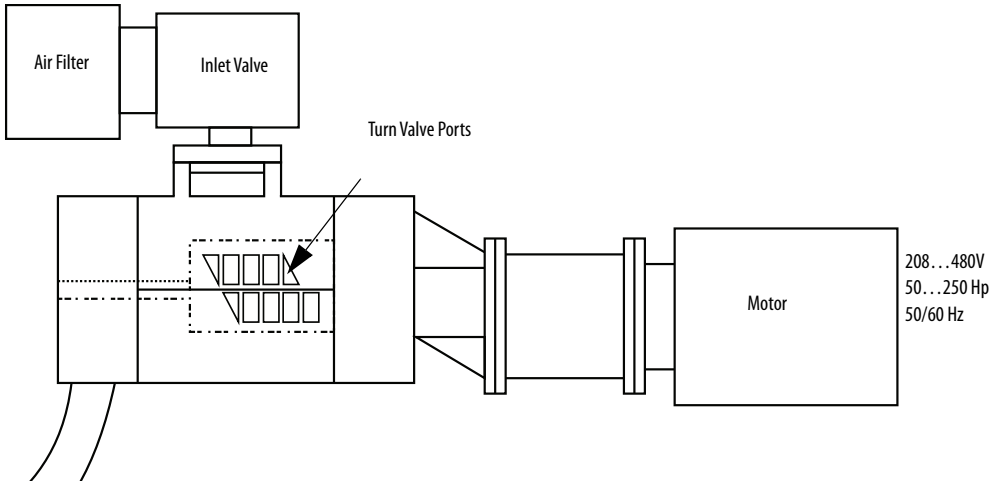
Compressor applications vary depending on the types of motors and loading when starting. Air and ammonia compressors are examples of good fits for a soft starter that runs efficiently at 100% voltage while using a voltage ramp, such as soft start or linear acceleration mode, during the starting process.

Compressor with Soft Start

Problem

A compressor OEM exports its equipment into foreign markets. Based on the final destination of the product, the compressors have to be able to meet many different voltage and frequency requirements. Due to power company requirements and mechanical stress on the compressor, reduced voltage starting is required. This makes ordering and stocking spare parts difficult. Customers want to save energy because this is typically one of the larger motors in the plant and it frequently runs lightly loaded. Because of the size of the motor, the incoming line voltage unbalance causes excessive heating in the motor. Figure 69 illustrates this scenario.

Figure 69 - Compressor with Soft Start



Solution

The SMC-50 controller is installed and set for an 18-second Soft Start, which reduces the voltage to the motor during starting and meets the power company requirements. Reducing the voltage reduces the starting torque, minimizing the shock to the compressor. Panel space is saved because the SMC-50 controller has a built-in overload feature. The Phase Rebalance feature automatically adjusts the voltage output to balance the three-phase currents drawn by the motor. The Energy Saver feature optimizes the voltage to the motor while it is running unloaded.

Neither the SMC-Flex or the SMC-3 controller have phase rebalance or have energy saver, and are therefore not suitable for this application.

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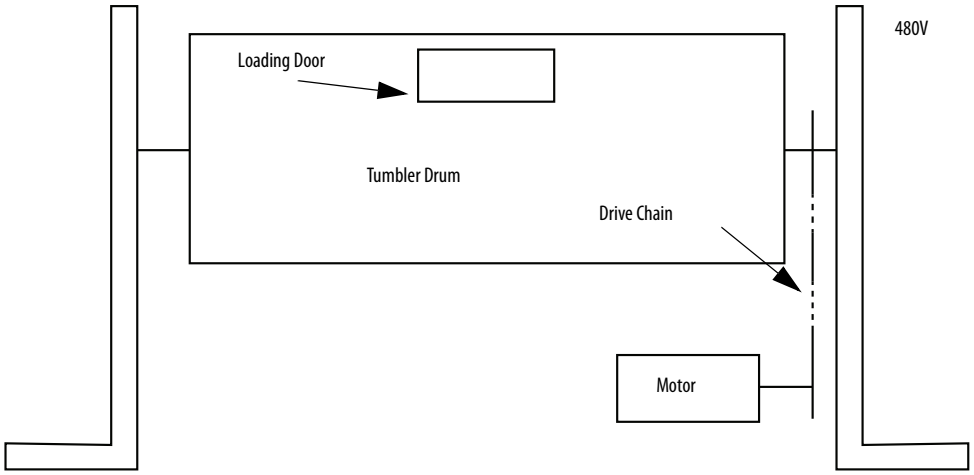
Tumbler

Tumbler with Linear Acceleration and Slow Speed

Problem

A tumbler used in a nail finishing process breaks the drive chain because of uncontrolled acceleration from the across-the-line starting. A reversing starter is needed to position the drum to the top position for loading the product. Because of the lack of controlled acceleration, numerous jogs are used to position the drum. Stopping time is not a concern in this application. When in maintenance mode, the tumble starts unloaded, reaching full speed very quickly. A second starting ramp, for unloaded conditions, is desired. Single phasing of the motor that causes premature motor failure is a frequent problem. Figure 70 illustrates this scenario.

Figure 70 - Tumbler with Linear Acceleration and Slow Speed



Solution

The SMC-50 is installed and linear acceleration is used to provide a controlled start when the tumbler runs both loaded and unloaded. Because the linear acceleration is not as load dependent as other starting methods, there is no need to have two different start profiles. The implementation of the slow speed function enables forward and reverse ±15% full speed. This function enables the drum to move forward and reverse directions at slow speed without using reversing contactors. Along with the starting, stopping, and slow speed features, the SMC-50 controller also has fault indicators for a 'line fault' that helps prevent the motor from restarting if it is detected.

The SMC Flex controller has fixed slow speed but does not have energy saver mode.

The SMC-3 controller is not appropriate for this application.

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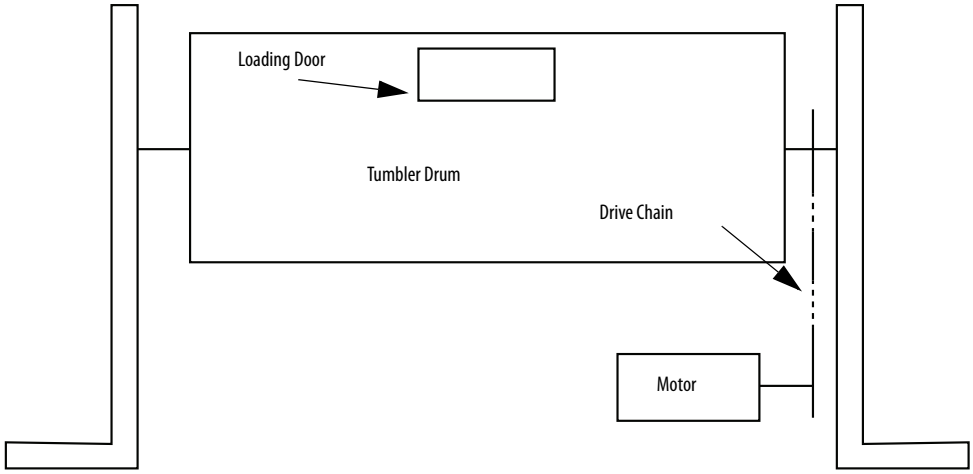
Tumbler with Soft Start and SMB

Problem

A tumbler used in the de-burring process breaks the drive chain because of uncontrolled acceleration from the across-the-line starting. To increase production on the drum, the coasting time on stop must be reduced. Previous solutions used a separate soft start package plus a motor brake, which required additional panel space and power wiring. The new solution needs a small enclosure size and simplified power wiring to reduce the cost of the controls. Because a PLC is controlling several other processes in the facility, communication capabilities are desired. Figure 71 illustrates this scenario.

Figure 71 - Tumbler with Soft Start and SMB



Solution

The SMC-50 controller is installed and set to use the SMB setting. The Soft Start feature provides a smooth acceleration of the drive chain, which reduces downtime. The controlled acceleration simplifies positioning for loading/unloading. The SMB feature allows the operators to stop the system quickly, improving productivity. The SMB feature does not require additional panel space or wiring. The built-in overload protection on the SMC-50 controller eliminates the need to mount an external overload relay in the enclosure, saving more panel space. The communication option of the SMC-50 controller allows remote starting and stopping of the process from a PLC using multiple communication protocols.

You can also use the SMC Flex controller with the SMB control module for this application. A communication module can also be mounted on board.

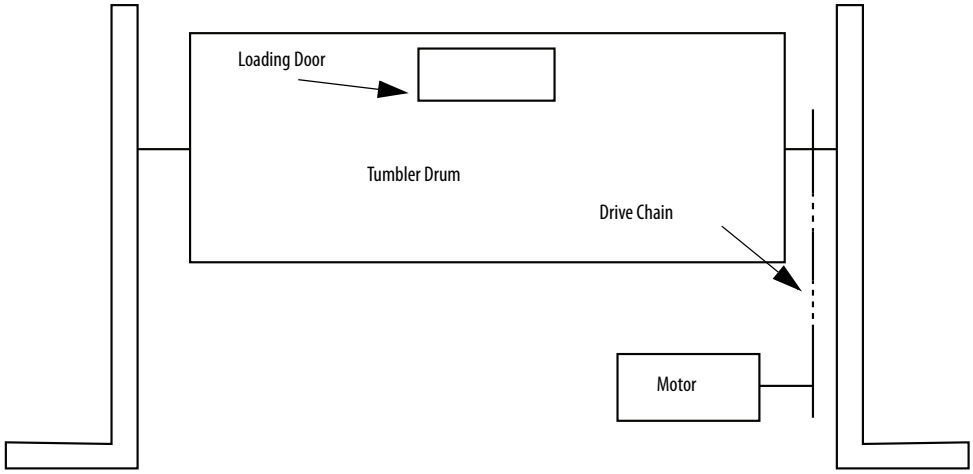
The SMC-3 controller is not appropriate for this application because it lacks communication capabilities and SMB functionality.

Tumbler with Accu-Stop Function

Problem

A tumbler drum used in a hide processing plant requires a controlled acceleration to help prevent the drive chain from breaking. The customer also wants to minimize the loading and unloading time. The drum coasts for a long period of time before stopping for unloading. A soft starter with electronic brake is currently being used. This method requires excessive jogging for loading and unloading, which results in extended production times. It also requires additional panel space and wiring for the brake. Consequently, higher installation costs are incurred. Figure 72 illustrates this scenario.

Figure 72 - Tumbler with Accu-Stop Function



Solution

The SMC-50 controller using the Accu-Stop feature is installed. This allows the drum to be positioned for loading using the Preset Slow Speed. For unloading, the drum is rotated at programmed Slow Speed and then accurately stopped. This increases the productivity of the loading/unloading cycle. The SMC-50 controller requires no additional panel space or power wiring, facilitating a smooth retrofit and reducing the installation costs.

The SMC Flex controller also uses the Accu-Stop function with fixed slow speed settings and can be applied in this scenario.

The SMC-3 controller is not appropriate for this application.

ALLEN BRADLEY SMC FLEX

Slow Speed

The SMC Flex controller uses cycle skipping, which is typical of many soft starts where the current pulses are controlled by the silicon-controlled rectifier (SCR) and fired for portions of every few line cycles, allowing for slow speed control. Torque during slow speed with this method is limited.

Another way to control slow speed is by using an SMC-50 soft starter. The SMC-50 soft starter has an adjustable forward and reverse capability from 1...15% of full speed. In other words, if the motor is running at full speed at 1800 rpm, the SMC-50 soft starter can be selected to run from -270...+270 rpm.

Instead of skipping cycles and then firing the thyristors (SCRs), the magnitude and duration of the current pulse is controlled approximately every cycle. The produced pseudo sine wave provides more stable control and programmable slow speed. A patented algorithm allows torque to be more controlled and developed in this method than in the cycle skipping method.

Unlike the typical soft starting methods in which percent resultant torque is approximately the square of the voltage that is applied, the torque at slow speed is higher. The slow speed resultant torque is higher due to firing approximately every cycle. This method provides a stable method of slowly rotating a motor shaft forward or in reverse without using a reversing contactor. The firing consistency translates to less wear and tear on windings.

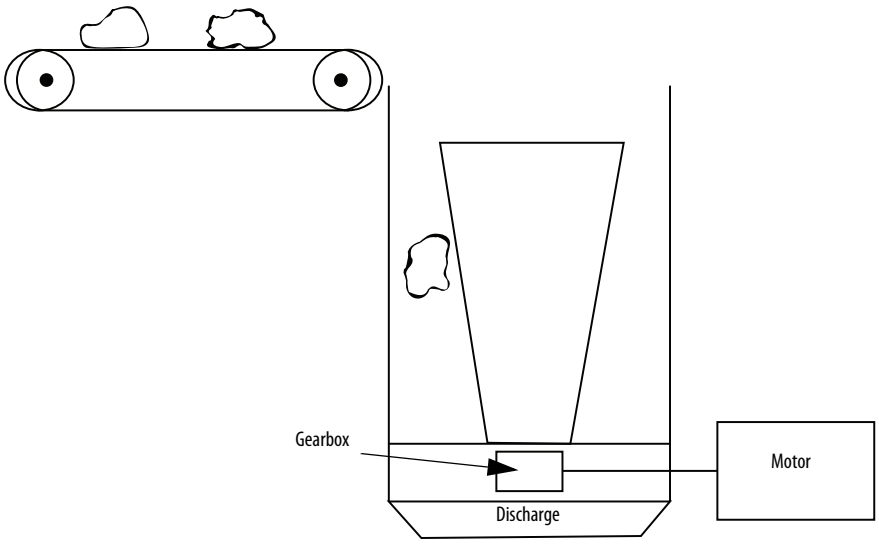
Typically, for soft starters, the longer the time in slow speed, the more current is being drawn from the motor, and the hotter the SCRs get. Running slow speed on soft starters can only be done for short periods of time due to heat buildup in the motor and the SCRs.

Rock Crusher with Soft Start and Reverse Slow Speed

Problem

Because of the remote location of a rock quarry, the power company requires a reduced-voltage start on all motors over 150 Hp. The starting current on these large motors causes severe voltage dips when it strains the capacity of the power system. When the rock crusher is overloaded, the current draw by the Wye-Delta-connected motor increases, which requires current monitoring capabilities within the starter. Because the conveyor that feeds the rock crusher is controlled by a PLC, communication between the starter and a PLC is necessary. When the rock crusher runs, it occasionally stalls or jams. Figure 73 illustrates this scenario.

Figure 73 - Rock Crusher with Soft Start and Reverse Slow Speed



Solution

The solid-state SMC-50 controller is installed, meeting the power company requirements for a reduced-voltage start. The motor is wired inside-the-delta, which saves panel space and lets you use the same wires to the motor. The metering capabilities of the SMC-50 controller allow the motor current draw to be monitored. With the optional communication capabilities, the motor current is communicated to the PLC. When the motor current reaches a specified limit, the conveyor that feeds the rock crusher can be slowed by configured alarms on the SMC-50 controller. By slowing the conveyor, a jam condition in the rock crusher is avoided. The stall and jam detection capabilities of the SMC-50 controller shut off the motor when a stall or jam condition occurs. By using the jam alarm, reverse slow speed is also used to change the rotation direction to unplug the jam in the crusher.

The SMC Flex controller can also be used inside the delta and uses one of two fixed slow speeds forward, or two in reverse.

The SMC-3 controller does not have slow speed capabilities.

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Resistive Loads

Solid- state contactors have been used for a long time, typically at zero cross, meaning that they turn on and off at zero cross for resistive load applications. You need an external control method to control the solid-state contactors, in order to control the resistive heating. Zero cross typically cycles on and off for so many cycles to achieve the desired temperature.The SMC-50 controller can directly control three-phase connected resistive loads by using SCR phase angle firing, which uses a PLC via communication, analog input, or DeviceLogix. By using a reference source, the controller can have the output remain on from 1...100% full voltage until commanded off. You can change the value of the reference source while the SMC-50 controller is in a run state. The output voltage varies in response to the reference source (Output V Ref, Analog Input or DeviceLogix™).

Note: You cannot use the resistive load feature on motor loads.

In resistive control mode, the tuning process still takes place, but is different than that of being connected to a motor. Current limit levels are still active.

When you use the resistive load feature, the output voltage to the resistive load is similar to the Full Voltage starting mode when using Output V Ref. Any type of ramping created is accomplished by using logic code, analog signal, or DeviceLogix.

Because there is a wide variety of possible resistive loads, the most universal control method is phase angle control, which is the method used by the SMC-50 controller. High hot-to-cold ratios of heaters are well suited for phase angle firing. You can use the SMC-50 controller to dry out heating resistors before full working voltage is applied, helping to prevent damage to the element.

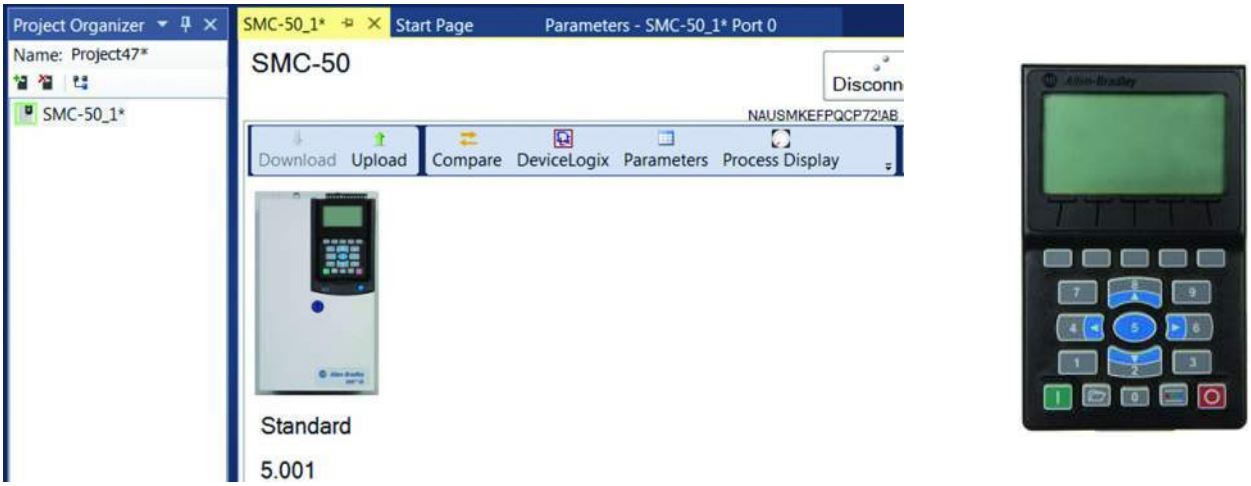
When you use the SMC-50 controller on heater loads, it provides all of the running protections that are available with induction motors. Unlike using a standard solid-state contactor that needs external overload and protection, protection is built into the SMC-50 controller in a compact package.

Note: Using this mode with the integrated bypass version is not recommended as unit will quickly trip on an SCR overtemperature fault.

Programming

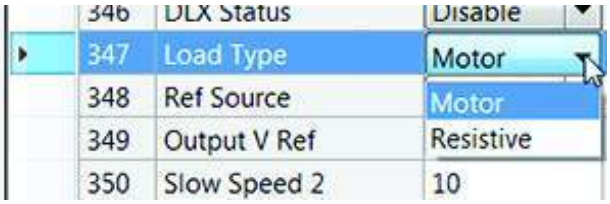
You can have direct control from most analog signals via the 150-SM3 optional analog card. You can control the SMC-50 controller with or without the aid of a programmable logic controller (PLC). For example, you can use the free Connected Components Workbench™ Software or a 20-HIM-A6 module.

Figure 74 - Connected Components Workbench Software and 20-HIM-A6 Interface Module

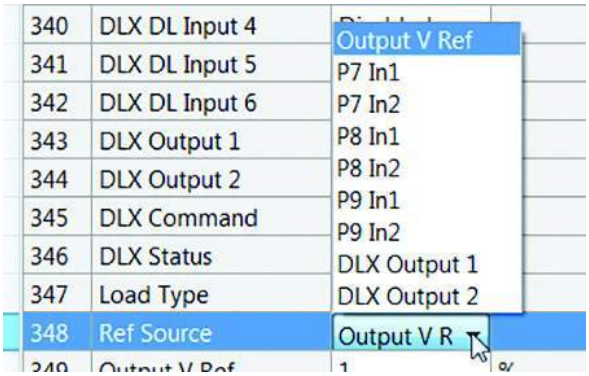


You are required to set the following parameters.

- Parameter 46, Line Voltage
  - Set this value to the actual voltage of the line, not in general terms. For example, if the voltage measures 460V, enter 460V, not 480V. The accuracy of the voltage output (parameter 349) depends on the value that you enter.
- Parameter 53, Current Limit
  - This parameter limits the current to a percentage of the value of parameter 78. For example, if parameter 78 is set to 150 A, and parameter 53 is set to 100%, the output (parameter 349) of the SMC-50 controller is limited to 150 A.
- Parameter 78, Motor FLC
  - Set this value to line current
- Parameter 347, Load Type
  - Set this value to resistive load



- Parameter 348 Reference Source
  - Use this parameter to select the reference source: Output V Ref, Analog Input (Port 7 – 9, Input 1 or 2), or DeviceLogix Output 1 and 2.



- Parameter 349 Output Voltage Reference
  - This parameter allows direct control of output if the output is controlled via communication.
- Parameter 148 Logic Mask
  - Logic Mask enables control (start – stop function) via communication port or HIM to control the SMC-50 controller.

Parameter		Bit Number	DPI Assignment	Access	Units [default]
Number	Name				
148	Logic Mask	0 - NA 1 2 3 4 5 - 15 NA	Port 0 - NA Port 1 Port 2 Port 3 Port 4 Port 5 - 15 NA	R/W	Bit = 0 [disabled] Bit = 1 enabled
149	Logic Mask Act			R	Bit = 0 [disabled] Bit = 1 enabled [Follows Logic Mask]

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Resistive Control Via Communication

You can have direct control from a PLC to the SMC-50 controller via communication such as Ethernet, by setting parameter 348, Reference Source, to Output V Ref and parameter 349 to the value that you want (1...100%). Whatever is sent from the PLC program to the SMC-50 controller will be put on the output of the SMC. You need to select the logic mask for DPI port 4 for control.

Example:

- Parameter 46: line voltage
- Parameter 78: motor FLC set to line current
- Parameter 148: logic mask set to port 4 (**bit 4**)
- Parameter 347: load type set to **RESISTIVE**
- Parameter 348: reference source set to **OUTPUT V REF**
- Parameter 349: output voltage reference programmed to **50%**

347	Load Type	Resistive		1	Motor	0	1
348	Ref Source	Output ...		0	Output V Ref	0	8
349	Output V Ref	50	%	50	1	1	100

- The output of the SMC-50 controller is 50% voltage (entered in parameter 46) until you change it or turn it off.

In this scenario, a PLC command on parameter 349 dictates the controller output. In the PLC rack, a thermocouple or RTD card feeds data to the PLC processor, which scales that information to the SMC-50 controller. Using a PID loop in the PLC controller program allows you to control temperature changes. The output is 1...100% output for this application. The PLC can also use the data from the PLC and directly control the output parameter 349, replicating the result you get from using a 150-SM3 analog card.

Table 101 lists the communication protocols and corresponding option cards that are available.

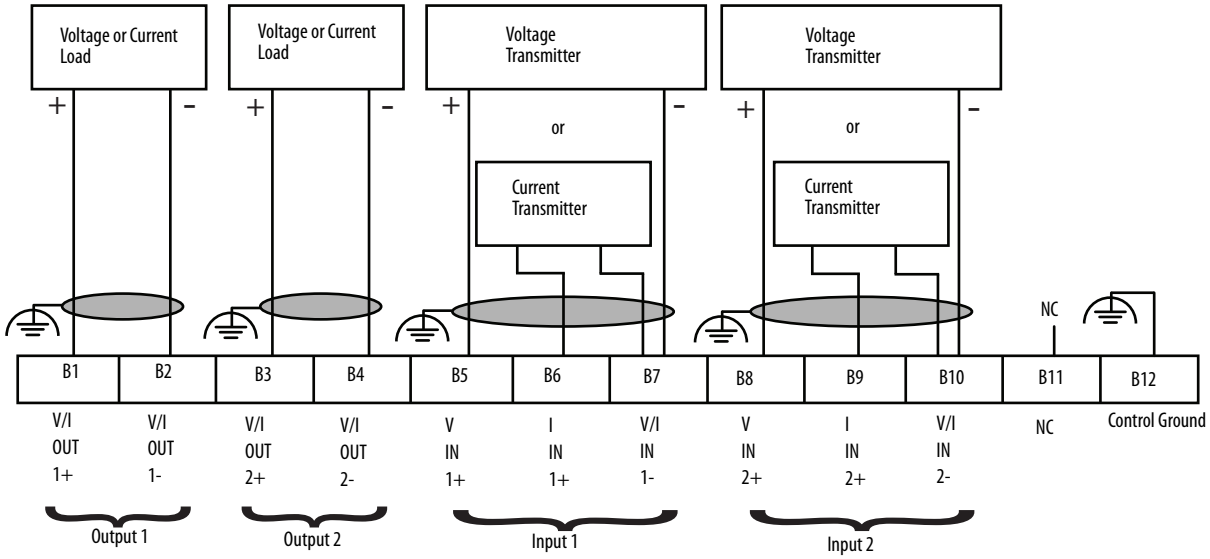
Table 101 - Communication Card Selection by Protocol Type

Protocol Type	Cat. No.
DeviceNet	20-COMM-D
ControlNet	20-COMM-C
Profibus®	20-COMM-P
RS-485	20-COMM-S
InterBus	20-COMM-I
EtherNet/IP	20-COMM-E
Dual Port EtherNet/IP	20-COMM-ER
RS485 HVAC	20-COMM-H
ControlNet (Fiber)	20-COMM-Q
CANopen	20-COMM-K

Analog Control

You can have direct analog control when you use the optional 150-SM3 analog card. The 150-SM3 card offers selectability of ±10V, 0...10 V, 0...5 V, 0...20 mA, and 4...20 mA. Once you have programmed the controller, it can produce the range of 1...100% output. You can place the analog card in one of three ports (7, 8 or 9) on the SMC-50 controller. Figure 75 illustrates the analog input wiring.

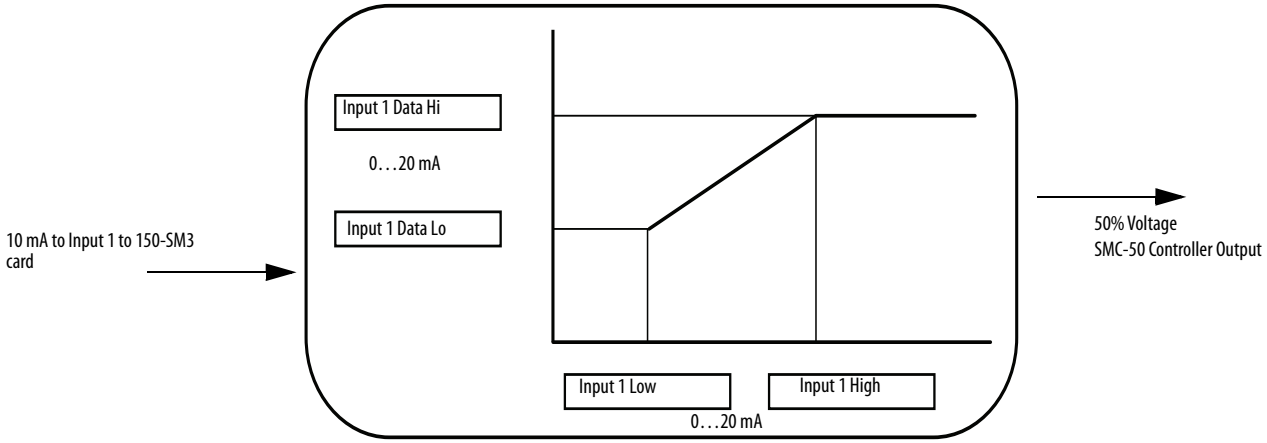
Figure 75 - Analog Input Wiring



Example:

- Parameter 347: load type set to **RESISTIVE**
- Parameter 348: reference source set to **P7 In1** (Port 7, input 1)
- Program the 150-SM3 card.
- Select X(Port).7 input range to 0...20 mA
- The 150-SM3 card reads 10 mA
- The output of the SMC-50 controller is 50% voltage (entered in parameter 46) until you change it or turn it off.

Figure 76 - Analog Input Scaling



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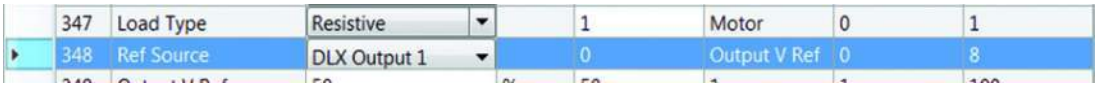
DeviceLogix

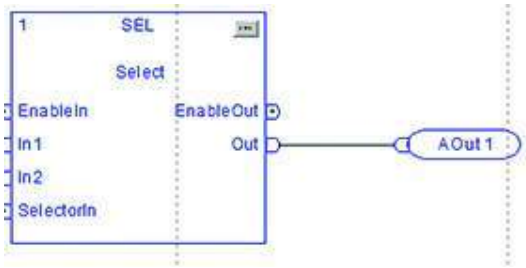
You can also use DeviceLogix with the SMC-50 controller on resistive loads. You can use one of two outputs on the DeviceLogix communication card to control the output of the SMC-50 controller. You can only program the DeviceLogix communication card on the SMC-50 controller within the free Connected Components Workbench Software. Resistive load functionality is only available on FRN 5.001 and later.

Example:

- Parameter 347: load type set to **RESISTIVE**
- Parameter 348: reference source set to **DLX Output 1**



- Create the DeviceLogix program with A Out 1 (DeviceLogix Analog Out 1)



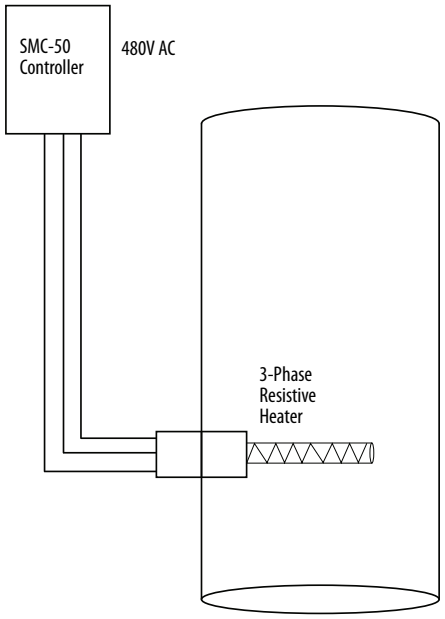
- The output of the SMC-50 controller is set from 1...100% of the value of A Out 1.

Tank Heater with Resistive Load

Problem

A customer is burning up standard contactors while cycling power on and off to achieve heater control for a tank of water that will be used to mix with chemicals at a certain temperature. Solid-state contactors are the best fit for high duty cycle. However the customer also wants to have communication and overload protection. The customer is planning to use a controller reading thermocouples and feeding information to an analog card on a ControlLogix rack. That signal will be used to turn on and off contactors through PLC outputs. This process leaves unaddressed concerns about duty cycle and overshoot (hysteresis), and so it requires more programming. The application also requires that no excessive current is applied to the cabling. Figure 77 illustrates this scenario.

Figure 77 - Tank Heater with Resistive Load



Solution

The SMC-50 replaces all standard and solid-state contactors in the application. The SMC-50 controller takes the feedback that the thermocouples send to the signal conditioner and sends it to the 150-SM3 analog card. This method allows direct control of the SMC-50 controller output to the resistive heaters by simply programming the reference source. By utilizing the current limit feature, the current is not allowed to exceed the level that is prescribed by the customer. The SMC-50 controller output increases or decreases depending on the input signal, without the need to turn the signal on and off.

Sizing and Selection Tools

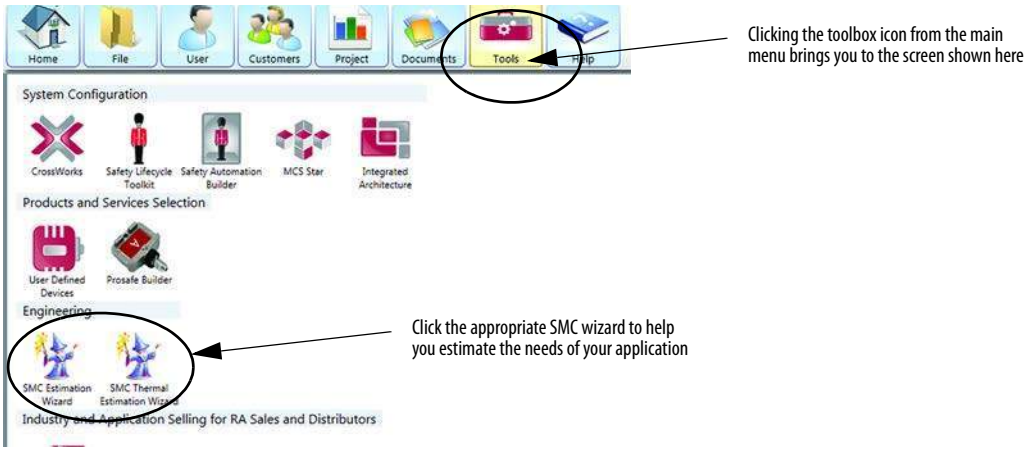
Properly sizing an SMC controller provides the best chance of starting a motor in the smoothest and most efficient way possible. Both thermal and estimation wizards are available to help assist you with this process.

Several types of applications need closer scrutiny to confirm that you have sized your controller properly.

- Starts longer than 30 seconds
- High inertia loads
- Frequent starts in a short period of time (high duty cycle)
- Predicting start and stop times of an application
- Elevation above 2000 meters
- High ambient temperature

You can access the SMC Estimation Wizard and SMC Thermal Estimation Wizard at ab.rockwellautomation.com. You can also access these wizards from within ProposalWorks software by clicking the toolbox icon, as shown in Figure 78. ProposalWorks is available from http://www.rockwellautomation.com/global/e-tools/overview.page.

Figure 78 -



Thermal Wizard

The thermal wizard is designed to help you to estimate the thermal capacity of the SCRs on the SMC controller for the estimated start, stop, and off time. Together, these times comprise the duty cycle.

The SMC Thermal Wizard is intended to provide an estimation of the applicability of the SMC products to a given set of operating requirements. The results of this tool are intended to be used as reference only.

To find out whether an SMC controller can perform the task from a thermal perspective, or if you need the next size up, you must set the following tool parameters.

- Unit Rating
  - The rating refers to the maximum current rating for the device, connected as a line controller. For example a 150-F85NBD is capable of 85 A.
- Starting Current
  - This determines the level of current that is allowed during starting. You can use a nominal value of 300 % or 350 % for modeling purposes for most applications.
- Starting Time
  - The starting time represents how long it takes for the motor to reach full speed. This is not always the same as the start time, because the motor getting to full speed is heavily dependent on the load.
- Motor Full Load Amps (FLA)
  - The value in this field is the motor's full load current. You can find this value on the motor nameplate.
- Typical Running Time
  - This represents the actual running time (time the motor runs at full speed without starting or stopping). If normal operation requires many starts and stops, set this time to represent the worst-case condition (shortest time).
- Typical Off Time
  - This represents the actual off time for the application. If normal operation requires many starts and stops, this time represents the worst-case condition (shortest time). In some cases where there is a high duty cycle, you can set this time to 1 second.
- Ambient Temperature
  - The standard maximum temperature is 50 °C for SMC-3 and SMC Flex controllers, and 40 °C for SMC-50 controllers. The thermal wizard can estimate derating up to 60 °C for the SMC-3 and SMC Flex controllers and up to 65 °C for the SMC-50 controller.
- Altitude
  - The value that is used in this field is the altitude in meters. The standard maximum for all SMC controllers is 2000m. The tool provides derating information for altitudes up to 7000 m.

The thermal wizard does not consider system dynamics; it only shows the thermal capacity of the SMC-50 controller. To look at the application itself, including the load and motor data, use the estimation wizard.

Estimation Wizard

Use the estimation wizard to determine how long the motor will take to start using different starting methods, such a current limit and soft start. The tool also calculates the estimated stopping time using smart motor braking. Using the tool helps to determine whether the size SMC controller that you selected is appropriate for the given application. Unlike the thermal wizard, this wizard considers the inertia of the motor and the load.

You need to supply values for the following parameters to use the estimation wizard.

- Motor Type
  - This parameter defines the characteristic of the motor torque speed curve; you can usually find the motor type on the motor nameplate. The most common types are NEMA B and IEC N. You can enter a custom curve by selecting the custom type and entering data in the next section
- Rated Motor Power
  - This represents the nominal Hp or kW rating of the motor
- Motor Rated Speed
  - This value represents the motor's nominal speed, not its rated speed. Nominal speed factors in % slip speed. For example, a motor that is rated 1800 rpm typically runs at a slightly lower speed, typically around 1750 rpm. This is the nominal speed. You can usually find this value on the motor nameplate
- Load Type
  - Select the load type that best fits the application that you wish to model. The high-inertia profile uses all the available input parameters. When selecting the other loads, only the % load factor, load inertia, and motor inertia parameters are used.
- Load Inertia
  - This value represents the actual total inertia of the load. Under most conditions, it can be difficult to approximate or obtain the true inertia of the system. In some cases, you may need to get this information from the machine or system designer. In these cases, you need to make some assumptions. The model is a good approximation but should not be considered absolute.
- Load Speed
  - The load speed is the actual running speed of the end mover. For instance, the load speed for a typical bandsaw (bandmill) is the actual speed of the blade (or wheels), which is typically between 500 and 700 rpm. With the load speed entered, the tool automatically calculates the gearing ratio and uses it in other calculations. Variations in the load speed have a large impact on reflected inertia, because it involves a square function. For applications with direct coupling or no change in speed, use the rated speed of the motor.

- Load Factor %
  - This factor represents the ratio of the load torque demand to the capabilities of the motor (for example, a load requires 525 kW, motor is rated 630 kW, load factor is 83.3%). This variable provides the ability to compensate for applications where the motor has been oversized for the load when running at rated speed. For instance, a value of 50% means that the motor has twice as much torque as required while at speed. Common values range from 50% to 90%.
- Motor Inertia
  - This value represents the inertia of the motor. In most high-inertia applications, this value is insignificant. However, it can play an important role in the overall calculation of the total system inertia for large motors. You can usually get this value from the nameplate or motor data sheet.
- % Inefficiency
  - This value equals the dynamic friction factor of the system. Dynamic friction is the amount of energy that is consumed by system components, such as bearings and windage, that helps prevent the load from running forever. This value is only active for high-inertia loads and plays a more important role in estimating braking times. It is often impossible to determine the exact value. However, you can try to determine the coast down time. By setting the braking model for "coast" and then dialing in the % load efficiency so that the stopping time is approximately the time predicted, it will give you a good estimate of the value. If you are unable to estimate this value, use a value of 100%, which represents a worst case condition.
- Starting Type
  - This represents the desired starting mode. This program allows you to select soft start, current limit, and, in some cases, full voltage. The soft start allows the voltage to increase over the start time, while the current limit holds the voltage constant during the start time. Most traditional electro-mechanical methods (that is, Star Delta) are variations of current limit. If you are unsure where to start, choose the default setting of most SMC controllers, which is Soft Start with an initial torque setting of 65 or 70%.
- Torque/Current %
  - Initial current %: this represents the level of current that is allowed during the start. This is only active when you have selected a current limit mode and it is programmable as allowed by the product selected. Because most designs are based in historical references, the best place to start an analysis is with 350% current limit. This produces a torque equivalent to a star-delta type reduced voltage starting method.
  - Initial Torque %: this represents the initial level of torque that will be applied to the motor at zero speed. This value will increase as the voltage is ramped during the start time. This value is only active when a soft start mode is selected and is programmable as allowed by the product selected. A default setting of around 70% is a good place to start with the estimation.
- Braking Type
  - This selection only becomes active when you select a stopping estimation. The selection includes coast to rest or SMB. At this time pump stop and soft stop are not modeled. When you select SMB, you can estimate how long it will take to stop the motor using a specified braking current level.
- Braking Current %
  - This value indicates the level of current that will be applied during SMB. The typical value is between 150% and 300%. It is generally not practical to use more than 300% braking current unless the system and motor have been properly designed to handle the potential impact of increased heating and electrical distribution demands.

The results of this tool do not change the ratings of the device or imply that you can use a device outside of its designed ratings as defined by all applicable electrical codes and standards. The tool is not a substitute for a formal determination by the SMC product engineering staff, nor should it be solely relied on for critical or safety-related applications. It is not designed to replace the engineering responsibility associated with the design or manufacturing of a machine or any of the components.

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Wizard Hints

While getting the load information might be impossible to obtain, it may be possible to model the motor characteristics by using the motor's across the line starting characteristics. This is also true for braking when taking the information on how long it takes to coast. You can then adjust settings to match the time of the starting and stopping method; this creates the start/stop profile using the SMC Wizard methods.

You can get most motor data from the motor nameplate. Common rotor inertia values are listed in Table 102 and Table 103.

Table 102 - Rotor Line Inertia—NEMA Ratings

Rated Hp	TEFC				OPD			
	2-Pole	4-Pole	6-Pole	8-Pole	2-Pole	4-Pole	6-Pole	8-Pole
	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]	[lb/ft^2]
0.5	0.015	0.017	0.017	0.04	0.018	0.17	0.18	0.18
0.75	0.03	0.05	0.04	0.06	0.035	0.21	0.21	0.21
1	0.05	0.05	0.19	0.13	0.15	0.21	0.21	0.55
1.5	0.06	0.07	0.22	0.18	0.21	0.23	0.55	0.62
2	0.08	0.1	0.52	0.37	0.21	0.25	0.6	0.76
3	0.1	0.47	0.65	0.51	0.23	0.62	0.76	0.91
5	0.16	0.57	0.76	1.3	0.25	0.7	0.91	1.8
7.5	0.41	0.68	2.3	1.6	0.62	0.84	1.8	2.1
10	0.46	2.2	2.8	2.6	0.7	0.99	2.1	3.6
15	0.93	2.2	3.9	3.8	0.84	1.9	3.6	4.4
20	1.2	3	4.5	5	0.99	2.3	4.4	7.3
25	2	4	11	6.4	1.9	3.6	7.3	9
30	2.3	4.5	12.5	11	2.3	4.4	9	17
40	3.3	9	20	14	3.6	6.3	13	20
50	4.2	10	23.5	24	4.4	7.6	15	22
60	4.9	14.5	35	28	6.3	11	24	25
75	6.1	17	40.5	39	7.6	13	27	28
100	12	27	61.5	51	11	16	45	47
125	20	33	57.5	62	13	20	56	59
150	24	44.5	85	68	16	33	56	68
200	31	56	111	85	20	39	68	85
250	40	74.5	136	82	33	43	85	106
300	40	86	136	86	39	54	98	129
350	44.5	95		92	43	60	112	158
400	56	109		101	54	82	130	181
500	74.5	114		101	60	122	149	200

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Table 103 - Rotor Line Inertia—IEC Ratings

Rated kW	2-Pole	4-Pole	6-Pole	8-Pole
	[kg/m^2]	[kg/m^2]	[kg/m^2]	[kg/m^2]
0.37	0.00035	0.0008	0.0015	0.0025
0.55	0.00045	0.0015	0.0018	0.0035
0.75	0.00085	0.0018	0.0028	0.0053
1.1	0.0011	0.0028	0.0035	0.007
1.5	0.0015	0.0035	0.0063	0.013
2.2	0.002	0.0048	0.011	0.025
3	0.0038	0.0058	0.02	0.033
4	0.0055	0.011	0.028	0.05
5.5	0.014	0.023	0.035	0.065
7.5	0.019	0.028	0.055	0.088
11	0.033	0.05	0.08	0.21
15	0.04	0.07	0.2	0.37
18.5	0.05	0.13	0.29	0.58
22	0.077	0.15	0.33	0.66
30	0.14	0.24	0.57	1.1
37	0.16	0.44	0.89	1.4
45	0.24	0.52	1.3	1.6
55	0.45	0.79	1.5	2.3
75	0.79	1.4	2.4	3
90	0.92	1.6	2.9	3.6
110	1.3	2.2	3.5	4.4
132	1.5	2.7	4.3	6.2
150	1.65	3.09	5.2	6.4
160	1.8	3.2	6	7.5
200	2.3	4.2	7.5	9.3
225	2.8	5.2	7.9	13.9
250	3.3	6	9.1	16
280	3.9	6.8	12.4	20
315	4	7.4	17	24
355	6.2	12	24	30
373	7.5	12.44	30	36

For motor type selection, entering in the data points of a speed torque curve on the custom motor is more accurate than taking the normal curve of a NEMA or IEC standard provided by the tool. While standards have a criteria to meet for the motors, there is still a window of variance. Motors vary in the speed torque curve even within the same type. The wizard uses the average range. Table 104, reproduced from NEMA publication NEMA MG 10-2013, shows the variance within the chart.

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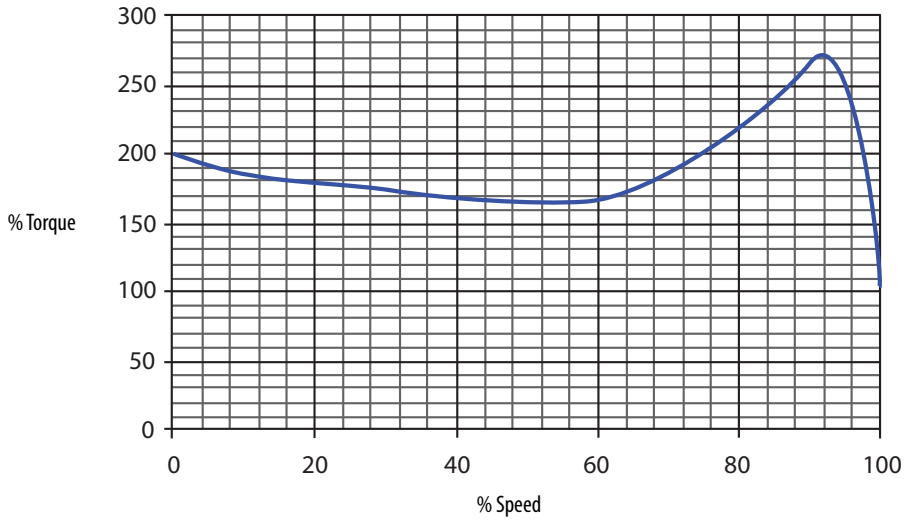
Table 104 - Typical Characteristics and Applications of Fixed Frequency Medium AC Squirrel-cage Induction Motors

Polyphase Characteristics(1)	Torque [% Rated Load Torque]			Locked Rotor Current [% Rated Load Current]	Slip	Typical Applications	Relative Efficiency
	Locked Rotor Torque	Pull-up Torque	Breakdown Torque				
Design A • Normal locked rotor torque and high locked rotor current	70…275(2)	65…190(2)	175…300(2)	Not Defined	0.5…5 %	Fans, blowers, centrifugal pumps and compressors, motor-generator sets, etc., where starting torque requirements are relatively low.	Medium or high
Design B • Normal locked rotor torque and normal locked rotor current	70…275(2)	65…190(2)	175…300(2)	600…800	0.5…5 %	Fans, blowers, centrifugal pumps and compressors, motor-generator sets, etc., where starting torque requirements are relatively low.	Medium or high
Design C • High locked rotor torque and high locked rotor current	200…285(2)	140…195(2)	190…225(2)	600…800	1…5 %	Conveyors, crushers, stirring machines, agitators, reciprocating pumps and compressors, etc., where starting under load is required.	Medium
Design D • High locked rotor torque and high slip	275	Not Defined	275	600…800	≥5 %	High peak loads with or without flywheels such as punch presses, shears, elevators, extractors, winches, hoists, oil-well pumping and wire-drawing machines.	Medium
IEC Design H • High locked rotor torque and high locked rotor current	200…285(2)	140…195(2)	190…225(2)	800…1000	1…5 %	Conveyors, crushers, stirring machines, agitators, reciprocating pumps and compressors, etc., where starting under load is required.	Medium
IEC Design N • Normal locked rotor torque and high locked rotor current	75…190(2)	60…140(2)	160…200(2)	800…1000	0.5…3 %	Fans, blowers, centrifugal pumps and compressors, motor-generator sets, etc., where starting torque requirements are relatively low.	Medium or high

(1) These characteristics represent common usage of the motors—for further details, consult the specific performance standards for the complete requirements.
(2) Higher values are for motors having lower horsepower ratings.

Figure 79 shows an example of a customer-supplied speed torque curve and the entries into the custom motor data.

Figure 79 - Custom Motor Speed vs. Torque Curve



Using the customer-supplied curve provides a much more accurate method of using the estimation wizard than using the NEMA design average.

A customer calls in and wants to know if they can use an SMC-50 with their motor to start a load in approximately 60 s. You are able to find out the following information:

The load is a flywheel for a large mill. The motor is 300 Hp NEMA Type B motor with a rated speed of 1785 rpm (information from the motor nameplate). The load speed is about 1200 rpm according to the customer. The load inertia was provided by the machine OEM as approximately 10,000 lb-ft^2. There is a 50% load factor (which means the motor is twice the size needed for the actual load). The customer does not know the system inefficiency. They would like to use an SMC-50 with a current limit start. Motor is a 3 lead

motor type with a 345 A FLA. Running time is 30 minutes and off time is 10 minutes. Ambient temperature can get up to 95 °F (35 °C) during the summer. Motor inertia is 100 lb-ft^2 according to the motor specification sheet.

With this scenario, and using the custom motor speed torque from Figure 79, the results look like this.

Custom Motor Type

% Speed	% Torque
0	200
10	185
20	180
30	175
40	170
50	168
60	165
70	180
80	215
90	268
92	275
94	280
96	272
98	271
100	100

Results:

Estimated Start Time: 59.794 seconds
Estimated Stop Time: Not Selected
Estimated Percent Thermal Capacity: 81%

User Input:

Motor Type:	Custom
Rated Power:	300 HP
Rated Speed:	1785
Load Type:	High Inertia
Load Inertia:	10000 lb ft^2
Load Speed:	1200
% Load Factor:	50 %
Motor Inertia:	100 lb ft^2
% Inefficiency:	100 %
Product:	SMC 50
Starting Type:	Current Limit
Initial Current %:	400
Initial Torque %:	Not Entered
Braking Type:	Not Entered
Braking Current %:	Not Entered
Unit Rating:	520 (with fan)
Motor FLA:	345 (Line)
Typical Run Time:	30 minutes
Typical Off Time:	10 minutes
Ambient Temperature:	95°F

Results

Start Time:
59.794

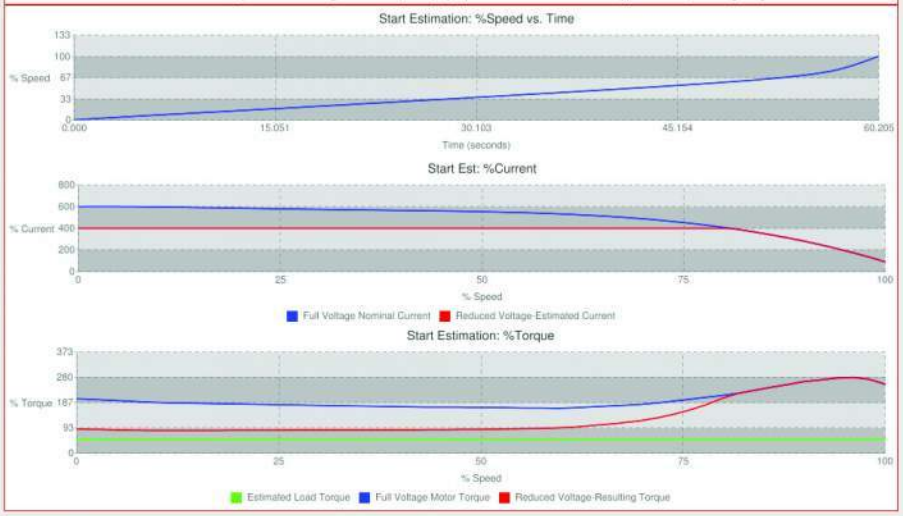
Stop Time:
Not Selected

Thermal Results

Using the information entered above, 81% of the thermal capacity for the SMC 50 - 520 would be reached.

Use of this product appears to be within the normal operating limits for this device.

*Motor FLA must fall within specified current range for unit to operate properly. Ensure that device selected is applicable to HP/kW rating being used.



ALLEN BRADLEY SMC FLEX

Remember, the tool is an estimation and is not a guarantee.

Table 105 shows the torque capabilities of the SMC-50 controller when it uses reduced voltage or current limit starting. Notice that using an SMC controller at 350% current limit produces approximately the same amount of torque as an electro-mechanical starter. The % applied voltage of the two starting methods is the same.

Table 105 - Motor Torque Capabilities with SMC-50 Controller Options

Starting Type	% Voltage Applied During Start	% Full Load Starting Torque	% Full Load Rated Current
Full Voltage	100	100	600
Wye-Delta	58	33	200
Soft Start with current limit			
150 %	25	6	150
200 %	33	11	200
250 %	42	18	250
300 %	50	25	300
350 %	58	34	350
400 %	67	49	400

ALLEN BRADLEY SMC FLEX

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
SMC-50 User Manual, publication 150-UM011	Provides complete user information for SMC-50 controllers.
SMC Flex User Manual, publication 150-UM008	Provides complete user information for SMC Flex controllers.
SMC-3 Installation Instructions, publication 150-IN004	Provides installation instructions for SMC-3 controllers.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page.

ALLEN BRADLEY SMC FLEX

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

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CUTLER HAMMER FAZ CIRCUIT BREAKERS

Miniature Circuit Breakers FAZ, FAZ-PN, FAZ-HS

SG55812

FAZ

- High-quality miniature circuit breakers for industrial applications and residential applications
- Contact position indicator red - green
- Guide for secure terminal connection
- 3-position DIN rail clip, permits removal from existing busbar system
- Comprehensive range of accessories suitable for subsequent installation
- Rated currents up to 63 A
- Tripping characteristics B, C, D, K, S, Z
- Rated breaking capacity up to 15 kA according to IEC/EN 60947-2

FAZ-PN

- Tripping characteristic B
- Rated breaking capacity up to 6 kA according to IEC/EN 60898-1
- Module width 1MU (1+N-poles)

FAZ-HS

- Tripping characteristic B
- Rated breaking capacity up to 10 kA according to IEC/EN 60898-1
- 1- and 2-poles available

FAZ Miniature Circuit Breakers (MCBs)
Characteristic B

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
1	240/415	15	277	10	FAZ-B1/1	182114	12
1.5	240/415	15	277	10	FAZ-B1,5/1	182115	12
1.6	240/415	15	277	10	FAZ-B1,6/1	182116	12
2	240/415	15	277	10	FAZ-B2/1	182117	12
3	240/415	15	277	10	FAZ-B3/1	182119	12
3.5	240/415	15	277	10	FAZ-B3,5/1	182120	12
4	240/415	15	277	10	FAZ-B4/1	182121	12
5	240/415	15	277	10	FAZ-B5/1	182122	12
6	240/415	15	277	10	FAZ-B6/1	182123	12
8	240/415	15	277	10	FAZ-B8/1	182124	12
10	240/415	15	277	10	FAZ-B10/1	182125	12
12	240/415	15	277	10	FAZ-B12/1	182126	12
13	240/415	15	277	10	FAZ-B13/1	182127	12
15	240/415	15	277	10	FAZ-B15/1	182128	12
16	240/415	15	277	10	FAZ-B16/1	182129	12
20	240/415	15	277	10	FAZ-B20/1	182130	12
25	240/415	15	277	10	FAZ-B25/1	182131	12
32	240/415	15	277	10	FAZ-B32/1	182132	12
40	240/415	15	277	5	FAZ-B40/1	182133	12
50	240/415	15	277	5	FAZ-B50/1	182134	12
63	240/415	15	277	5	FAZ-B63/1	182135	12

SG55612

1+N-pole

1	240	15	277	10	FAZ-B1/1N	182136	6
1.5	240	15	277	10	FAZ-B1,5/1N	182137	6
1.6	240	15	277	10	FAZ-B1,6/1N	182138	6
2	240	15	277	10	FAZ-B2/1N	182139	6
2.5	240	15	277	10	FAZ-B2,5/1N	182140	6
3	240	15	277	10	FAZ-B3/1N	182141	6
3.5	240	15	277	10	FAZ-B3,5/1N	182142	6
4	240	15	277	10	FAZ-B4/1N	182143	6
5	240	15	277	10	FAZ-B5/1N	182144	6
6	240	15	277	10	FAZ-B6/1N	182145	6
8	240	15	277	10	FAZ-B8/1N	182146	6
10	240	15	277	10	FAZ-B10/1N	182147	6
12	240	15	277	10	FAZ-B12/1N	182148	6
13	240	15	277	10	FAZ-B13/1N	182149	6
15	240	15	277	10	FAZ-B15/1N	182150	6
16	240	15	277	10	FAZ-B16/1N	182151	6
20	240	15	277	10	FAZ-B20/1N	182152	6
25	240	15	277	10	FAZ-B25/1N	182153	6
32	240	15	277	10	FAZ-B32/1N	182154	6
40	240	15	277	5	FAZ-B40/1N	182155	6
50	240	15	277	5	FAZ-B50/1N	182156	6
63	240	15	277	5	FAZ-B63/1N	182157	6

Miniature Circuit Breakers

SG55112

2-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
1	415	15	480Y/277	10	FAZ-B1/2	182158	6
1.5	415	15	480Y/277	10	FAZ-B1,5/2	182159	6
1.6	415	15	480Y/277	10	FAZ-B1,6/2	182160	6
2	415	15	480Y/277	10	FAZ-B2/2	182161	6
2.5	415	15	480Y/277	10	FAZ-B2,5/2	182162	6
3	415	15	480Y/277	10	FAZ-B3/2	182112	6
3.5	415	15	480Y/277	10	FAZ-B3,5/2	182113	6
4	415	15	480Y/277	10	FAZ-B4/2	182175	6
5	415	15	480Y/277	10	FAZ-B5/2	182176	6
6	415	15	480Y/277	10	FAZ-B6/2	182177	6
7	415	15	480Y/277	10	FAZ-B7/2	182178	6
8	415	15	480Y/277	10	FAZ-B8/2	182179	6
10	415	15	480Y/277	10	FAZ-B10/2	182180	6
12	415	15	480Y/277	10	FAZ-B12/2	182181	6
13	415	15	480Y/277	10	FAZ-B13/2	182182	6
15	415	15	480Y/277	10	FAZ-B15/2	182183	6
16	415	15	480Y/277	10	FAZ-B16/2	182184	6
20	415	15	480Y/277	10	FAZ-B20/2	182185	6
25	415	15	480Y/277	10	FAZ-B25/2	182186	6
32	415	15	480Y/277	10	FAZ-B32/2	182188	6
40	415	15	480Y/277	5	FAZ-B40/2	182189	6
50	415	15	480Y/277	5	FAZ-B50/2	182190	6
63	415	15	480Y/277	5	FAZ-B63/2	182191	6

SG53412

3-pole

1	415	15	480Y/277	10	FAZ-B1/3	182192	4
1.5	415	15	480Y/277	10	FAZ-B1,5/3	182193	4
1.6	415	15	480Y/277	10	FAZ-B1,6/3	182194	4
2	415	15	480Y/277	10	FAZ-B2/3	182195	4
2.5	415	15	480Y/277	10	FAZ-B2,5/3	182196	4
3	415	15	480Y/277	10	FAZ-B3/3	182197	4
3.5	415	15	480Y/277	10	FAZ-B3,5/3	182198	4
4	415	15	480Y/277	10	FAZ-B4/3	182199	4
5	415	15	480Y/277	10	FAZ-B5/3	182200	4
6	415	15	480Y/277	10	FAZ-B6/3	182201	4
7	415	15	480Y/277	10	FAZ-B7/3	182202	4
8	415	15	480Y/277	10	FAZ-B8/3	182203	4
10	415	15	480Y/277	10	FAZ-B10/3	182204	4
12	415	15	480Y/277	10	FAZ-B12/3	182205	4
13	415	15	480Y/277	10	FAZ-B13/3	182206	4
15	415	15	480Y/277	10	FAZ-B15/3	182207	4
16	415	15	480Y/277	10	FAZ-B16/3	182208	4
20	415	15	480Y/277	10	FAZ-B20/3	182209	4
25	415	15	480Y/277	10	FAZ-B25/3	182210	4
32	415	15	480Y/277	10	FAZ-B32/3	182212	4
40	415	15	480Y/277	5	FAZ-B40/3	182213	4
50	415	15	480Y/277	5	FAZ-B50/3	182214	4
63	415	15	480Y/277	5	FAZ-B63/3	182215	4

SG55712

3+N-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
1	415	15	480Y/277	10	FAZ-B1/3N	182216	3
1.5	415	15	480Y/277	10	FAZ-B1,5/3N	182217	3
1.6	415	15	480Y/277	10	FAZ-B1,6/3N	182218	3
2	415	15	480Y/277	10	FAZ-B2/3N	182219	3
2.5	415	15	480Y/277	10	FAZ-B2,5/3N	182220	3
3	415	15	480Y/277	10	FAZ-B3/3N	182221	3
3.5	415	15	480Y/277	10	FAZ-B3,5/3N	182222	3
4	415	15	480Y/277	10	FAZ-B4/3N	182223	3
5	415	15	480Y/277	10	FAZ-B5/3N	182224	3
6	415	15	480Y/277	10	FAZ-B6/3N	182225	3
8	415	15	480Y/277	10	FAZ-B8/3N	182226	3
10	415	15	480Y/277	10	FAZ-B10/3N	182227	3
12	415	15	480Y/277	10	FAZ-B12/3N	182228	3
13	415	15	480Y/277	10	FAZ-B13/3N	182229	3
15	415	15	480Y/277	10	FAZ-B15/3N	182230	3
16	415	15	480Y/277	10	FAZ-B16/3N	182231	3
20	415	15	480Y/277	10	FAZ-B20/3N	182232	3
25	415	15	480Y/277	10	FAZ-B25/3N	182233	3
32	415	15	480Y/277	10	FAZ-B32/3N	182234	3
40	415	15	480Y/277	5	FAZ-B40/3N	182235	3
50	415	15	480Y/277	5	FAZ-B50/3N	182236	3
63	415	15	480Y/277	5	FAZ-B63/3N	182237	3

SG55812

4-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
1	415	15	480Y/277	10	FAZ-B1/4	182238	3
1.5	415	15	480Y/277	10	FAZ-B1,5/4	182239	3
1.6	415	15	480Y/277	10	FAZ-B1,6/4	182240	3
2	415	15	480Y/277	10	FAZ-B2/4	182241	3
2.5	415	15	480Y/277	10	FAZ-B2,5/4	182242	3
3	415	15	480Y/277	10	FAZ-B3/4	182243	3
3.5	415	15	480Y/277	10	FAZ-B3,5/4	182244	3
4	415	15	480Y/277	10	FAZ-B4/4	182245	3
5	415	15	480Y/277	10	FAZ-B5/4	182246	3
6	415	15	480Y/277	10	FAZ-B6/4	182247	3
7	415	15	480Y/277	10	FAZ-B7/4	182248	3
8	415	15	480Y/277	10	FAZ-B8/4	182249	3
10	415	15	480Y/277	10	FAZ-B10/4	182250	3
12	415	15	480Y/277	10	FAZ-B12/4	182251	3
13	415	15	480Y/277	10	FAZ-B13/4	182252	3
15	415	15	480Y/277	10	FAZ-B15/4	182253	3
16	415	15	480Y/277	10	FAZ-B16/4	182254	3
20	415	15	480Y/277	10	FAZ-B20/4	182255	3
25	415	15	480Y/277	10	FAZ-B25/4	182256	3
32	415	15	480Y/277	10	FAZ-B32/4	182257	3
40	415	15	480Y/277	5	FAZ-B40/4	182258	3
50	415	15	480Y/277	5	FAZ-B50/4	182259	3
63	415	15	480Y/277	5	FAZ-B63/4	182260	3

FAZ Miniature Circuit Breakers (MCBs)
Characteristic C

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.16	240/415	15	277	5	FAZ-C0,16/1	182261	12
0.25	240/415	15	277	5	FAZ-C0,25/1	182262	12
0.5	240/415	15	277	10	FAZ-C0,5/1	182263	12
0.75	240/415	15	277	10	FAZ-C0,75/1	182264	12
1	240/415	15	277	10	FAZ-C1/1	182265	12
1.5	240/415	15	277	10	FAZ-C1,5/1	182266	12
1.6	240/415	15	277	10	FAZ-C1,6/1	182267	12
2	240/415	15	277	10	FAZ-C2/1	182268	12
2.5	240/415	15	277	10	FAZ-C2,5/1	182269	12
3	240/415	15	277	10	FAZ-C3/1	182270	12
3.5	240/415	15	277	10	FAZ-C3,5/1	182271	12
4	240/415	15	277	10	FAZ-C4/1	182272	12
5	240/415	15	277	10	FAZ-C5/1	182273	12
6	240/415	15	277	10	FAZ-C6/1	182274	12
8	240/415	15	277	10	FAZ-C8/1	182275	12
10	240/415	15	277	10	FAZ-C10/1	182276	12
12	240/415	15	277	10	FAZ-C12/1	182277	12
13	240/415	15	277	10	FAZ-C13/1	182278	12
15	240/415	15	277	10	FAZ-C15/1	182279	12
16	240/415	15	277	10	FAZ-C16/1	182280	12
20	240/415	15	277	10	FAZ-C20/1	182281	12
25	240/415	15	277	10	FAZ-C25/1	182282	12
32	240/415	15	277	10	FAZ-C32/1	182283	12
40	240/415	15	277	5	FAZ-C40/1	182284	12
50	240/415	15	277	5	FAZ-C50/1	182285	12
63	240/415	15	277	5	FAZ-C63/1	182286	12

SG55612

1+N-pole

0.16	240	15	277	5	FAZ-C0,16/1N	182287	6
0.25	240	15	277	5	FAZ-C0,25/1N	182288	6
0.5	240	15	277	10	FAZ-C0,5/1N	182289	6
0.75	240	15	277	10	FAZ-C0,75/1N	182290	6
1	240	15	277	10	FAZ-C1/1N	182291	6
1.5	240	15	277	10	FAZ-C1,5/1N	182292	6
1.6	240	15	277	10	FAZ-C1,6/1N	182293	6
2	240	15	277	10	FAZ-C2/1N	182294	6
2.5	240	15	277	10	FAZ-C2,5/1N	182295	6
3	240	15	277	10	FAZ-C3/1N	182296	6
3.5	240	15	277	10	FAZ-C3,5/1N	182297	6
4	240	15	277	10	FAZ-C4/1N	182298	6
5	240	15	277	10	FAZ-C5/1N	182299	6
6	240	15	277	10	FAZ-C6/1N	182300	6
8	240	15	277	10	FAZ-C8/1N	182301	6
10	240	15	277	10	FAZ-C10/1N	182302	6
12	240	15	277	10	FAZ-C12/1N	182303	6
13	240	15	277	10	FAZ-C13/1N	182304	6
15	240	15	277	10	FAZ-C15/1N	182305	6
16	240	15	277	10	FAZ-C16/1N	182306	6
20	240	15	277	10	FAZ-C20/1N	182307	6
25	240	15	277	10	FAZ-C25/1N	182308	6
32	240	15	277	10	FAZ-C32/1N	182309	6
40	240	15	277	5	FAZ-C40/1N	182310	6
50	240	15	277	5	FAZ-C50/1N	182311	6
63	240	15	277	5	FAZ-C63/1N	182312	6

SG55112

2-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.16	415	15	480Y/277	5	FAZ-C0,16/2	182313	6
0.25	415	15	480Y/277	5	FAZ-C0,25/2	182314	6
0.5	415	15	480Y/277	10	FAZ-C0,5/2	182315	6
0.75	415	15	480Y/277	10	FAZ-C0,75/2	182316	6
1	415	15	480Y/277	10	FAZ-C1/2	182317	6
1.5	415	15	480Y/277	10	FAZ-C1,5/2	182318	6
1.6	415	15	480Y/277	10	FAZ-C1,6/2	182319	6
2	415	15	480Y/277	10	FAZ-C2/2	182320	6
2.5	415	15	480Y/277	10	FAZ-C2,5/2	182321	6
3	415	15	480Y/277	10	FAZ-C3/2	182322	6
3.5	415	15	480Y/277	10	FAZ-C3,5/2	182323	6
4	415	15	480Y/277	10	FAZ-C4/2	182324	6
5	415	15	480Y/277	10	FAZ-C5/2	182325	6
6	415	15	480Y/277	10	FAZ-C6/2	182326	6
7	415	15	480Y/277	10	FAZ-C7/2	182327	6
8	415	15	480Y/277	10	FAZ-C8/2	182328	6
10	415	15	480Y/277	10	FAZ-C10/2	182329	6
12	415	15	480Y/277	10	FAZ-C12/2	182330	6
13	415	15	480Y/277	10	FAZ-C13/2	182331	6
15	415	15	480Y/277	10	FAZ-C15/2	182332	6
16	415	15	480Y/277	10	FAZ-C16/2	182333	6
20	415	15	480Y/277	10	FAZ-C20/2	182334	6
25	415	15	480Y/277	10	FAZ-C25/2	182335	6
30	415	15	480Y/277	10	FAZ-C30/2	182336	6
32	415	15	480Y/277	10	FAZ-C32/2	182337	6
40	415	15	480Y/277	5	FAZ-C40/2	182338	6
50	415	15	480Y/277	5	FAZ-C50/2	182339	6
63	415	15	480Y/277	5	FAZ-C63/2	182340	6

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3-pole

0.16	415	15	480Y/277	5	FAZ-C0,16/3	182341	4
0.25	415	15	480Y/277	5	FAZ-C0,25/3	182342	4
0.5	415	15	480Y/277	10	FAZ-C0,5/3	182163	4
0.75	415	15	480Y/277	10	FAZ-C0,75/3	182164	4
1	415	15	480Y/277	10	FAZ-C1/3	182165	4
1.5	415	15	480Y/277	10	FAZ-C1,5/3	182166	4
1.6	415	15	480Y/277	10	FAZ-C1,6/3	182167	4
2	415	15	480Y/277	10	FAZ-C2/3	182168	4
2.5	415	15	480Y/277	10	FAZ-C2,5/3	182169	4
3	415	15	480Y/277	10	FAZ-C3/3	182170	4
3.5	415	15	480Y/277	10	FAZ-C3,5/3	182171	4
4	415	15	480Y/277	10	FAZ-C4/3	182172	4
5	415	15	480Y/277	10	FAZ-C5/3	182173	4
6	415	15	480Y/277	10	FAZ-C6/3	182174	4
7	415	15	480Y/277	10	FAZ-C7/3	181651	4
8	415	15	480Y/277	10	FAZ-C8/3	181652	4
10	415	15	480Y/277	10	FAZ-C10/3	181653	4
12	415	15	480Y/277	10	FAZ-C12/3	181654	4
13	415	15	480Y/277	10	FAZ-C13/3	181655	4
15	415	15	480Y/277	10	FAZ-C15/3	181656	4
16	415	15	480Y/277	10	FAZ-C16/3	181657	4
20	415	15	480Y/277	10	FAZ-C20/3	181658	4
25	415	15	480Y/277	10	FAZ-C25/3	181659	4
30	415	15	480Y/277	10	FAZ-C30/3	181660	4
32	415	15	480Y/277	10	FAZ-C32/3	181661	4
40	415	15	480Y/277	5	FAZ-C40/3	181662	4
50	415	15	480Y/277	5	FAZ-C50/3	181663	4
63	415	15	480Y/277	5	FAZ-C63/3	181664	4

SG55712

3+N-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.16	415	15	480Y/277	5	FAZ-C0,16/3N	181665	3
0.25	415	15	480Y/277	5	FAZ-C0,25/3N	181666	3
0.5	415	15	480Y/277	10	FAZ-C0,5/3N	181667	3
0.75	415	15	480Y/277	10	FAZ-C0,75/3N	181668	3
1	415	15	480Y/277	10	FAZ-C1/3N	181669	3
1.5	415	15	480Y/277	10	FAZ-C1,5/3N	181670	3
1.6	415	15	480Y/277	10	FAZ-C1,6/3N	181671	3
2	415	15	480Y/277	10	FAZ-C2/3N	181672	3
2.5	415	15	480Y/277	10	FAZ-C2,5/3N	181673	3
3	415	15	480Y/277	10	FAZ-C3/3N	181674	3
3.5	415	15	480Y/277	10	FAZ-C3,5/3N	181675	3
4	415	15	480Y/277	10	FAZ-C4/3N	181676	3
5	415	15	480Y/277	10	FAZ-C5/3N	181677	3
6	415	15	480Y/277	10	FAZ-C6/3N	181678	3
8	415	15	480Y/277	10	FAZ-C8/3N	181679	3
10	415	15	480Y/277	10	FAZ-C10/3N	181680	3
12	415	15	480Y/277	10	FAZ-C12/3N	181681	3
13	415	15	480Y/277	10	FAZ-C13/3N	181682	3
15	415	15	480Y/277	10	FAZ-C15/3N	181683	3
16	415	15	480Y/277	10	FAZ-C16/3N	181684	3
20	415	15	480Y/277	10	FAZ-C20/3N	181685	3
25	415	15	480Y/277	10	FAZ-C25/3N	181686	3
32	415	15	480Y/277	10	FAZ-C32/3N	181687	3
40	415	15	480Y/277	5	FAZ-C40/3N	181688	3
50	415	15	480Y/277	5	FAZ-C50/3N	181689	3
63	415	15	480Y/277	5	FAZ-C63/3N	181690	3

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4-pole

0.16	415	15	480Y/277	5	FAZ-C0,16/4	181691	3
0.25	415	15	480Y/277	5	FAZ-C0,25/4	181692	3
0.5	415	15	480Y/277	10	FAZ-C0,5/4	181693	3
0.75	415	15	480Y/277	10	FAZ-C0,75/4	181694	3
1	415	15	480Y/277	10	FAZ-C1/4	181695	3
1.5	415	15	480Y/277	10	FAZ-C1,5/4	181696	3
1.6	415	15	480Y/277	10	FAZ-C1,6/4	181697	3
2	415	15	480Y/277	10	FAZ-C2/4	181698	3
2.5	415	15	480Y/277	10	FAZ-C2,5/4	181699	3
3	415	15	480Y/277	10	FAZ-C3/4	181700	3
3.5	415	15	480Y/277	10	FAZ-C3,5/4	181701	3
4	415	15	480Y/277	10	FAZ-C4/4	181702	3
5	415	15	480Y/277	10	FAZ-C5/4	181703	3
6	415	15	480Y/277	10	FAZ-C6/4	181704	3
7	415	15	480Y/277	10	FAZ-C7/4	181705	3
8	415	15	480Y/277	10	FAZ-C8/4	181706	3
10	415	15	480Y/277	10	FAZ-C10/4	181707	3
12	415	15	480Y/277	10	FAZ-C12/4	181708	3
13	415	15	480Y/277	10	FAZ-C13/4	181709	3
15	415	15	480Y/277	10	FAZ-C15/4	181710	3
16	415	15	480Y/277	10	FAZ-C16/4	181711	3
20	415	15	480Y/277	10	FAZ-C20/4	181712	3
25	415	15	480Y/277	10	FAZ-C25/4	181713	3
32	415	15	480Y/277	10	FAZ-C32/4	181714	3
40	415	15	480Y/277	5	FAZ-C40/4	181715	3
50	415	15	480Y/277	5	FAZ-C50/4	181716	3
63	415	15	480Y/277	5	FAZ-C63/4	181717	3

FAZ Miniature Circuit Breakers (MCBs)
Characteristic D

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	240/415	15	277	5	FAZ-D0,5/1	181718	12
1	240/415	15	277	5	FAZ-D1/1	181719	12
1.5	240/415	15	277	5	FAZ-D1,5/1	181720	12
1.6	240/415	15	277	5	FAZ-D1,6/1	181721	12
2	240/415	15	277	5	FAZ-D2/1	181722	12
2.5	240/415	15	277	5	FAZ-D2,5/1	181723	12
3	240/415	15	277	5	FAZ-D3/1	181724	12
3.5	240/415	15	277	5	FAZ-D3,5/1	181725	12
4	240/415	15	277	5	FAZ-D4/1	181726	12
5	240/415	15	277	5	FAZ-D5/1	181727	12
6	240/415	15	277	5	FAZ-D6/1	181728	12
8	240/415	15	277	5	FAZ-D8/1	181729	12
10	240/415	15	277	5	FAZ-D10/1	181730	12
12	240/415	15	277	5	FAZ-D12/1	181731	12
13	240/415	15	277	5	FAZ-D13/1	181732	12
15	240/415	15	277	5	FAZ-D15/1	181733	12
16	240/415	15	277	5	FAZ-D16/1	181734	12
20	240/415	15	277	5	FAZ-D20/1	181735	12
25	240/415	15	277	5	FAZ-D25/1	181736	12
32	240/415	15	277	5	FAZ-D32/1	181737	12
40	240/415	15	277	5	FAZ-D40/1	181738	12
50	240/415	10	-	-	FAZ-D50/1	181739	12
63	240/415	10	-	-	FAZ-D63/1	181740	12

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1+N-pole

0.5	240	15	277	5	FAZ-D0,5/1N	181741	6
1	240	15	277	5	FAZ-D1/1N	181742	6
1.5	240	15	277	5	FAZ-D1,5/1N	181743	6
1.6	240	15	277	5	FAZ-D1,6/1N	181744	6
2	240	15	277	5	FAZ-D2/1N	181745	6
2.5	240	15	277	5	FAZ-D2,5/1N	181746	6
3	240	15	277	5	FAZ-D3/1N	181747	6
3.5	240	15	277	5	FAZ-D3,5/1N	181748	6
4	240	15	277	5	FAZ-D4/1N	181749	6
5	240	15	277	5	FAZ-D5/1N	181750	6
6	240	15	277	5	FAZ-D6/1N	181751	6
8	240	15	277	5	FAZ-D8/1N	181752	6
10	240	15	277	5	FAZ-D10/1N	181753	6
12	240	15	277	5	FAZ-D12/1N	181754	6
13	240	15	277	5	FAZ-D13/1N	181755	6
15	240	15	277	5	FAZ-D15/1N	181756	6
16	240	15	277	5	FAZ-D16/1N	181757	6
20	240	15	277	5	FAZ-D20/1N	181758	6
25	240	15	277	5	FAZ-D25/1N	181759	6
32	240	15	277	5	FAZ-D32/1N	181760	6
40	240	15	277	5	FAZ-D40/1N	181761	6
50	240	10	-	-	FAZ-D50/1N	181762	6
63	240	10	-	-	FAZ-D63/1N	181763	6

SG55112

2-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-D0,5/2	181764	6
1	415	15	480Y/277	5	FAZ-D1/2	181765	6
1.5	415	15	480Y/277	5	FAZ-D1,5/2	181766	6
1.6	415	15	480Y/277	5	FAZ-D1,6/2	181767	6
2	415	15	480Y/277	5	FAZ-D2/2	181768	6
2.5	415	15	480Y/277	5	FAZ-D2,5/2	181769	6
3	415	15	480Y/277	5	FAZ-D3/2	181770	6
3.5	415	15	480Y/277	5	FAZ-D3,5/2	181771	6
4	415	15	480Y/277	5	FAZ-D4/2	181772	6
5	415	15	480Y/277	5	FAZ-D5/2	181773	6
6	415	15	480Y/277	5	FAZ-D6/2	181774	6
7	415	15	480Y/277	5	FAZ-D7/2	181775	6
8	415	15	480Y/277	5	FAZ-D8/2	181776	6
10	415	15	480Y/277	5	FAZ-D10/2	181777	6
12	415	15	480Y/277	5	FAZ-D12/2	181778	6
13	415	15	480Y/277	5	FAZ-D13/2	181779	6
15	415	15	480Y/277	5	FAZ-D15/2	181780	6
16	415	15	480Y/277	5	FAZ-D16/2	181781	6
20	415	15	480Y/277	5	FAZ-D20/2	181782	6
25	415	15	480Y/277	5	FAZ-D25/2	181783	6
32	415	15	480Y/277	5	FAZ-D32/2	181785	6
40	415	15	480Y/277	5	FAZ-D40/2	181786	6
50	415	10	-	-	FAZ-D50/2	181787	6
63	415	10	-	-	FAZ-D63/2	181788	6

SG53412

3-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-D0,5/3	181789	4
1	415	15	480Y/277	5	FAZ-D1/3	181790	4
1.5	415	15	480Y/277	5	FAZ-D1,5/3	181791	4
1.6	415	15	480Y/277	5	FAZ-D1,6/3	181792	4
2	415	15	480Y/277	5	FAZ-D2/3	181793	4
2.5	415	15	480Y/277	5	FAZ-D2,5/3	181794	4
3	415	15	480Y/277	5	FAZ-D3/3	181795	4
3.5	415	15	480Y/277	5	FAZ-D3,5/3	181796	4
4	415	15	480Y/277	5	FAZ-D4/3	181797	4
5	415	15	480Y/277	5	FAZ-D5/3	181798	4
6	415	15	480Y/277	5	FAZ-D6/3	181799	4
7	415	15	480Y/277	5	FAZ-D7/3	181800	4
8	415	15	480Y/277	5	FAZ-D8/3	181801	4
10	415	15	480Y/277	5	FAZ-D10/3	181802	4
12	415	15	480Y/277	5	FAZ-D12/3	181803	4
13	415	15	480Y/277	5	FAZ-D13/3	181804	4
15	415	15	480Y/277	5	FAZ-D15/3	181805	4
16	415	15	480Y/277	5	FAZ-D16/3	181806	4
20	415	15	480Y/277	5	FAZ-D20/3	181807	4
25	415	15	480Y/277	5	FAZ-D25/3	181808	4
30	415	15	480Y/277	5	FAZ-D30/3	181809	4
32	415	15	480Y/277	5	FAZ-D32/3	181810	4
40	415	10	480Y/277	5	FAZ-D40/3	181811	4
50	415	10	-	-	FAZ-D50/3	181812	4
63	415	10	-	-	FAZ-D63/3	181813	4

SG55712

3+N-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-D0,5/3N	181814	3
1	415	15	480Y/277	5	FAZ-D1/3N	181815	3
1.5	415	15	480Y/277	5	FAZ-D1,5/3N	181816	3
1.6	415	15	480Y/277	5	FAZ-D1,6/3N	181817	3
2	415	15	480Y/277	5	FAZ-D2/3N	181818	3
2.5	415	15	480Y/277	5	FAZ-D2,5/3N	181819	3
3	415	15	480Y/277	5	FAZ-D3/3N	181820	3
3.5	415	15	480Y/277	5	FAZ-D3,5/3N	181821	3
4	415	15	480Y/277	5	FAZ-D4/3N	181822	3
5	415	15	480Y/277	5	FAZ-D5/3N	181823	3
6	415	15	480Y/277	5	FAZ-D6/3N	181824	3
8	415	15	480Y/277	5	FAZ-D8/3N	181825	3
10	415	15	480Y/277	5	FAZ-D10/3N	181826	3
12	415	15	480Y/277	5	FAZ-D12/3N	181827	3
13	415	15	480Y/277	5	FAZ-D13/3N	181828	3
15	415	15	480Y/277	5	FAZ-D15/3N	181829	3
16	415	15	480Y/277	5	FAZ-D16/3N	181830	3
20	415	15	480Y/277	5	FAZ-D20/3N	181639	3
25	415	15	480Y/277	5	FAZ-D25/3N	181640	3
32	415	15	480Y/277	5	FAZ-D32/3N	181641	3
40	415	15	480Y/277	5	FAZ-D40/3N	181642	3
50	415	10	-	-	FAZ-D50/3N	181643	3
63	415	10	-	-	FAZ-D63/3N	181644	3

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4-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-D0,5/4	181645	3
1	415	15	480Y/277	5	FAZ-D1/4	181646	3
1.5	415	15	480Y/277	5	FAZ-D1,5/4	181647	3
1.6	415	15	480Y/277	5	FAZ-D1,6/4	181648	3
2	415	15	480Y/277	5	FAZ-D2/4	181649	3
2.5	415	15	480Y/277	5	FAZ-D2,5/4	181650	3
3	415	15	480Y/277	5	FAZ-D3/4	181843	3
3.5	415	15	480Y/277	5	FAZ-D3,5/4	181844	3
4	415	15	480Y/277	5	FAZ-D4/4	181845	3
5	415	15	480Y/277	5	FAZ-D5/4	181846	3
6	415	15	480Y/277	5	FAZ-D6/4	181847	3
7	415	15	480Y/277	5	FAZ-D7/4	181848	3
8	415	15	480Y/277	5	FAZ-D8/4	181849	3
10	415	15	480Y/277	5	FAZ-D10/4	181850	3
12	415	15	480Y/277	5	FAZ-D12/4	181851	3
13	415	15	480Y/277	5	FAZ-D13/4	181852	3
15	415	15	480Y/277	5	FAZ-D15/4	181853	3
16	415	15	480Y/277	5	FAZ-D16/4	181854	3
20	415	15	480Y/277	5	FAZ-D20/4	181855	3
25	415	15	480Y/277	5	FAZ-D25/4	181856	3
32	415	15	480Y/277	5	FAZ-D32/4	181857	3
40	415	10	480Y/277	5	FAZ-D40/4	181858	3
50	415	10	-	-	FAZ-D50/4	181859	3
63	415	10	-	-	FAZ-D63/4	181860	3

FAZ Miniature Circuit Breakers (MCBs)
Characteristic K

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	240/415	15	277	5	FAZ-K0,5/1	278589	12/120
1	240/415	15	277	5	FAZ-K1/1	278590	12/120
1.6	240/415	15	277	5	FAZ-K1,6/1	278591	12/120
2	240/415	15	277	5	FAZ-K2/1	278592	12/120
3	240/415	15	277	5	FAZ-K3/1	278593	12/120
4	240/415	15	277	5	FAZ-K4/1	278594	12/120
6	240/415	15	277	5	FAZ-K6/1	278595	12/120
8	240/415	15	277	5	FAZ-K8/1	278596	12/120
10	240/415	15	277	5	FAZ-K10/1	278597	12/120
13	240/415	15	277	5	FAZ-K13/1	278598	12/120
16	240/415	15	277	5	FAZ-K16/1	278599	12/120
20	240/415	15	277	5	FAZ-K20/1	278600	12/120
25	240/415	15	277	5	FAZ-K25/1	278601	12/120
32	240/415	15	277	5	FAZ-K32/1	278602	12/120
40	240/415	15	277	5	FAZ-K40/1	278603	12/120
50	240/415	15	277	5	FAZ-K50/1	278604	12/120
63	240/415	15	277	5	FAZ-K63/1	278605	12/120

SG55612

1+N-pole

0.5	240	15	277	5	FAZ-K0,5/1N	278702	1/60
1	240	15	277	5	FAZ-K1/1N	278703	1/60
1.6	240	15	277	5	FAZ-K1,6/1N	278704	1/60
2	240	15	277	5	FAZ-K2/1N	278705	1/60
3	240	15	277	5	FAZ-K3/1N	278706	1/60
4	240	15	277	5	FAZ-K4/1N	278707	1/60
6	240	15	277	5	FAZ-K6/1N	278708	1/60
8	240	15	277	5	FAZ-K8/1N	278709	1/60
10	240	15	277	5	FAZ-K10/1N	278710	1/60
13	240	15	277	5	FAZ-K13/1N	278711	1/60
16	240	15	277	5	FAZ-K16/1N	278712	1/60
20	240	15	277	5	FAZ-K20/1N	278713	1/60
25	240	15	277	5	FAZ-K25/1N	278714	1/60
32	240	15	277	5	FAZ-K32/1N	278715	1/60
40	240	15	277	5	FAZ-K40/1N	278716	1/60
50	240	15	277	5	FAZ-K50/1N	278717	1/60
63	240	15	277	5	FAZ-K63/1N	278718	1/60

SG55112

2-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-K0,5/2	278788	1/60
1	415	15	480Y/277	5	FAZ-K1/2	278789	1/60
1.6	415	15	480Y/277	5	FAZ-K1,6/2	278790	1/60
2	415	15	480Y/277	5	FAZ-K2/2	278791	1/60
3	415	15	480Y/277	5	FAZ-K3/2	278792	1/60
4	415	15	480Y/277	5	FAZ-K4/2	278793	1/60
6	415	15	480Y/277	5	FAZ-K6/2	278794	1/60
8	415	15	480Y/277	5	FAZ-K8/2	278795	1/60
10	415	15	480Y/277	5	FAZ-K10/2	278796	1/60
13	415	15	480Y/277	5	FAZ-K13/2	278797	1/60
16	415	15	480Y/277	5	FAZ-K16/2	278798	1/60
20	415	15	480Y/277	5	FAZ-K20/2	278799	1/60
25	415	15	480Y/277	5	FAZ-K25/2	278800	1/60
32	415	15	480Y/277	5	FAZ-K32/2	278801	1/60
40	415	15	480Y/277	5	FAZ-K40/2	278802	1/60
50	415	15	480Y/277	5	FAZ-K50/2	278803	1/60
63	415	15	480Y/277	5	FAZ-K63/2	278804	1/60

SG53412

3-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-K0,5/3	278901	1/40
1	415	15	480Y/277	5	FAZ-K1/3	278902	1/40
1.6	415	15	480Y/277	5	FAZ-K1,6/3	278903	1/40
2	415	15	480Y/277	5	FAZ-K2/3	278904	1/40
3	415	15	480Y/277	5	FAZ-K3/3	278905	1/40
4	415	15	480Y/277	5	FAZ-K4/3	278906	1/40
6	415	15	480Y/277	5	FAZ-K6/3	278907	1/40
8	415	15	480Y/277	5	FAZ-K8/3	278908	1/40
10	415	15	480Y/277	5	FAZ-K10/3	278909	1/40
13	415	15	480Y/277	5	FAZ-K13/3	278910	1/40
16	415	15	480Y/277	5	FAZ-K16/3	278911	1/40
20	415	15	480Y/277	5	FAZ-K20/3	278912	1/40
25	415	15	480Y/277	5	FAZ-K25/3	278913	1/40
32	415	15	480Y/277	5	FAZ-K32/3	278914	1/40
40	415	15	480Y/277	5	FAZ-K40/3	278915	1/40
50	415	15	480Y/277	5	FAZ-K50/3	278916	1/40
63	415	15	480Y/277	5	FAZ-K63/3	278917	1/40

SG55712

3+N-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-K0,5/3N	279003	1/30
1	415	15	480Y/277	5	FAZ-K1/3N	279004	1/30
1.6	415	15	480Y/277	5	FAZ-K1,6/3N	279005	1/30
2	415	15	480Y/277	5	FAZ-K2/3N	279006	1/30
3	415	15	480Y/277	5	FAZ-K3/3N	279007	1/30
4	415	15	480Y/277	5	FAZ-K4/3N	279008	1/30
6	415	15	480Y/277	5	FAZ-K6/3N	279009	1/30
8	415	15	480Y/277	5	FAZ-K8/3N	279010	1/30
10	415	15	480Y/277	5	FAZ-K10/3N	279011	1/30
13	415	15	480Y/277	5	FAZ-K13/3N	279012	1/30
16	415	15	480Y/277	5	FAZ-K16/3N	279013	1/30
20	415	15	480Y/277	5	FAZ-K20/3N	279014	1/30
25	415	15	480Y/277	5	FAZ-K25/3N	279015	1/30
32	415	15	480Y/277	5	FAZ-K32/3N	279016	1/30
40	415	15	480Y/277	5	FAZ-K40/3N	279017	1/30
50	415	15	480Y/277	5	FAZ-K50/3N	279018	1/30
63	415	15	480Y/277	5	FAZ-K63/3N	279019	1/30

SG55812

4-pole

0.5	415	15	480Y/277	5	FAZ-K0,5/4	279089	1/30
1	415	15	480Y/277	5	FAZ-K1/4	279090	1/30
1.6	415	15	480Y/277	5	FAZ-K1,6/4	279091	1/30
2	415	15	480Y/277	5	FAZ-K2/4	279092	1/30
3	415	15	480Y/277	5	FAZ-K3/4	279093	1/30
4	415	15	480Y/277	5	FAZ-K4/4	279094	1/30
6	415	15	480Y/277	5	FAZ-K6/4	279095	1/30
8	415	15	480Y/277	5	FAZ-K8/4	279096	1/30
10	415	15	480Y/277	5	FAZ-K10/4	279097	1/30
13	415	15	480Y/277	5	FAZ-K13/4	279098	1/30
16	415	15	480Y/277	5	FAZ-K16/4	279099	1/30
20	415	15	480Y/277	5	FAZ-K20/4	279100	1/30
25	415	15	480Y/277	5	FAZ-K25/4	279101	1/30
32	415	15	480Y/277	5	FAZ-K32/4	279102	1/30
40	415	15	480Y/277	5	FAZ-K40/4	279103	1/30
50	415	15	480Y/277	5	FAZ-K50/4	279104	1/30
63	415	15	480Y/277	5	FAZ-K63/4	279105	1/30

FAZ Miniature Circuit Breakers (MCBs)
Characteristic S

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
1	240/415	10	277	5	FAZ-S1/1	181861	12
2	240/415	10	277	5	FAZ-S2/1	181862	12
3	240/415	10	277	5	FAZ-S3/1	181863	12
4	240/415	10	277	5	FAZ-S4/1	181864	12
6	240/415	10	277	5	FAZ-S6/1	181865	12
10	240/415	10	277	5	FAZ-S10/1	181866	12
16	240/415	10	277	5	FAZ-S16/1	181867	12
20	240/415	10	277	5	FAZ-S20/1	181868	12
25	240/415	10	277	5	FAZ-S25/1	181869	12
32	240/415	10	277	5	FAZ-S32/1	181870	12
40	240/415	10	277	5	FAZ-S40/1	181871	12

SG55112

2-pole

1	415	10	480Y/277	5	FAZ-S1/2	181872	6
2	415	10	480Y/277	5	FAZ-S2/2	181873	6
3	415	10	480Y/277	5	FAZ-S3/2	181874	6
4	415	10	480Y/277	5	FAZ-S4/2	181875	6
6	415	10	480Y/277	5	FAZ-S6/2	181876	6
10	415	10	480Y/277	5	FAZ-S10/2	181877	6
16	415	10	480Y/277	5	FAZ-S16/2	181878	6
20	415	10	480Y/277	5	FAZ-S20/2	181879	6
25	415	10	480Y/277	5	FAZ-S25/2	181880	6
32	415	10	480Y/277	5	FAZ-S32/2	181881	6
40	415	10	480Y/277	5	FAZ-S40/2	181882	6

FAZ Miniature Circuit Breakers (MCBs)
Characteristic Z

SG53112

1-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0,5	240/415	15	277	5	FAZ-Z0,5/1	278617	12/120
1	240/415	15	277	5	FAZ-Z1/1	278618	12/120
1.6	240/415	15	277	5	FAZ-Z1,6/1	278619	12/120
2	240/415	15	277	5	FAZ-Z2/1	278620	12/120
3	240/415	15	277	5	FAZ-Z3/1	278621	12/120
4	240/415	15	277	5	FAZ-Z4/1	278622	12/120
6	240/415	15	277	5	FAZ-Z6/1	278623	12/120
8	240/415	15	277	5	FAZ-Z8/1	278624	12/120
10	240/415	15	277	5	FAZ-Z10/1	278625	12/120
13	240/415	15	277	5	FAZ-Z13/1	106020	12/120
16	240/415	15	277	5	FAZ-Z16/1	278626	12/120
20	240/415	15	277	5	FAZ-Z20/1	278627	12/120
25	240/415	15	277	5	FAZ-Z25/1	278628	12/120
32	240/415	15	277	5	FAZ-Z32/1	278629	12/120
40	240/415	15	277	5	FAZ-Z40/1	278630	12/120
50	240/415	15	277	5	FAZ-Z50/1	278631	12/120
63	240/415	15	277	5	FAZ-Z63/1	278632	12/120

SG55112

2-pole

0.5	415	15	480Y/277	5	FAZ-Z0,5/2	278816	1/60
1	415	15	480Y/277	5	FAZ-Z1/2	278817	1/60
1.6	415	15	480Y/277	5	FAZ-Z1,6/2	278818	1/60
2	415	15	480Y/277	5	FAZ-Z2/2	278819	1/60
3	415	15	480Y/277	5	FAZ-Z3/2	278820	1/60
4	415	15	480Y/277	5	FAZ-Z4/2	278821	1/60
6	415	15	480Y/277	5	FAZ-Z6/2	278822	1/60
8	415	15	480Y/277	5	FAZ-Z8/2	278823	1/60
10	415	15	480Y/277	5	FAZ-Z10/2	278824	1/60
13	415	15	480Y/277	5	FAZ-Z13/2	106021	1/60
16	415	15	480Y/277	5	FAZ-Z16/2	278825	1/60
20	415	15	480Y/277	5	FAZ-Z20/2	278826	1/60
25	415	15	480Y/277	5	FAZ-Z25/2	278827	1/60
32	415	15	480Y/277	5	FAZ-Z32/2	278828	1/60
40	415	15	480Y/277	5	FAZ-Z40/2	278829	1/60
50	415	15	480Y/277	5	FAZ-Z50/2	278830	1/60
63	415	15	480Y/277	5	FAZ-Z63/2	278831	1/60

SG53412

3-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-Z0,5/3	278918	1/40
1	415	15	480Y/277	5	FAZ-Z1/3	278919	1/40
1.6	415	15	480Y/277	5	FAZ-Z1,6/3	278920	1/40
2	415	15	480Y/277	5	FAZ-Z2/3	278921	1/40
3	415	15	480Y/277	5	FAZ-Z3/3	278922	1/40
4	415	15	480Y/277	5	FAZ-Z4/3	278923	1/40
6	415	15	480Y/277	5	FAZ-Z6/3	278924	1/40
8	415	15	480Y/277	5	FAZ-Z8/3	278925	1/40
10	415	15	480Y/277	5	FAZ-Z10/3	278926	1/40
13	415	15	480Y/277	5	FAZ-Z13/3	106022	1/40
16	415	15	480Y/277	5	FAZ-Z16/3	278927	1/40
20	415	15	480Y/277	5	FAZ-Z20/3	278928	1/40
25	415	15	480Y/277	5	FAZ-Z25/3	278929	1/40
32	415	15	480Y/277	5	FAZ-Z32/3	278930	1/40
40	415	15	480Y/277	5	FAZ-Z40/3	278931	1/40
50	415	15	480Y/277	5	FAZ-Z50/3	278932	1/40
63	415	15	480Y/277	5	FAZ-Z63/3	278933	1/40

SG55812

4-pole

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL1077 (V)	Breaking capacity acc. to UL1077 (kA)	Type Designation	Article No.	Units per package
0.5	415	15	480Y/277	5	FAZ-Z0,5/4	279106	1/60
1	415	15	480Y/277	5	FAZ-Z1/4	279107	1/60
1.6	415	15	480Y/277	5	FAZ-Z1,6/4	279108	1/60
2	415	15	480Y/277	5	FAZ-Z2/4	279109	1/60
3	415	15	480Y/277	5	FAZ-Z3/4	279110	1/60
4	415	15	480Y/277	5	FAZ-Z4/4	279111	1/60
6	415	15	480Y/277	5	FAZ-Z6/4	279112	1/60
8	415	15	480Y/277	5	FAZ-Z8/4	279113	1/60
10	415	15	480Y/277	5	FAZ-Z10/4	279114	1/60
13	415	15	480Y/277	5	FAZ-Z13/4	106023	1/60
16	415	15	480Y/277	5	FAZ-Z16/4	279115	1/60
20	415	15	480Y/277	5	FAZ-Z20/4	279116	1/60
25	415	15	480Y/277	5	FAZ-Z25/4	279117	1/60
32	415	15	480Y/277	5	FAZ-Z32/4	279118	1/60
40	415	15	480Y/277	5	FAZ-Z40/4	279119	1/60
50	415	15	480Y/277	5	FAZ-Z50/4	279120	1/60
63	415	15	480Y/277	5	FAZ-Z63/4	279121	1/60

FAZ-PN Miniature Circuit Breakers (MCBs)
Characteristic B

SG54212

1+N-pole (1MU)

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
6	240	6	10	FAZ-PN-B6/1N	279146	12/120
10	240	6	10	FAZ-PN-B10/1N	279147	12/120
13	240	6	10	FAZ-PN-B13/1N	279148	12/120
16	240	6	10	FAZ-PN-B16/1N	279149	12/120
20	240	6	10	FAZ-PN-B20/1N	279150	12/120
25	240	6	10	FAZ-PN-B25/1N	279151	12/120
32	240	6	10	FAZ-PN-B32/1N	279152	12/120
40	240	6	10	FAZ-PN-B40/1N	279153	12/120

FAZ-PN Miniature Circuit Breakers (MCBs)
Characteristic C

SG54212

1+N-pole (1MU)

Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
2	240	6	10	FAZ-PN-C2/1N	279154	12/120
4	240	6	10	FAZ-PN-C4/1N	279155	12/120
6	240	6	10	FAZ-PN-C6/1N	279156	12/120
10	240	6	10	FAZ-PN-C10/1N	279157	12/120
13	240	6	10	FAZ-PN-C13/1N	279158	12/120
16	240	6	10	FAZ-PN-C16/1N	279159	12/120
20	240	6	10	FAZ-PN-C20/1N	279160	12/120
25	240	6	10	FAZ-PN-C25/1N	279161	12/120
32	240	6	10	FAZ-PN-C32/1N	279162	12/120
40	240	6	10	FAZ-PN-C40/1N	279163	12/120

FAZ-...-HS Miniature Circuit Breakers (MCBs)
Characteristic B

	Rated current I_n (A)	Rated voltage (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Type Designation	Article No.	Units per package
wa_sg00114	**1-pole**					
	4	240	10	FAZ-B4/1-HS	279274	12/120
SG55512	**2-pole**					
	4	240	10	FAZ-B4/2-HS	279275	1/60

FAZ Miniature Circuit Breakers

Accessories:		
Auxiliary switch for subsequent installation	ZP-IHK	286052
Auxiliary switch for subsequent installation	ZP-WHK	286053
Tripping signal contact for subsequent installation	ZP-NHK	248437
Shunt trip release	ZP-ASA	248438, 248439
Undervoltage release	Z-USA	258288, 248289, 248290
	Z-USD	248292, 248291
Switching interlock	Z-IS/SPE-1TE	274418
Terminal cover		
1-pole	Z7-AK-1TE	750754200
2-pole	Z-CV/SD-2P	221954800
3-pole	Z-CV/SD-3P	221954900
4-pole	Z-CV/SD-4P	221953900

Specifications FAZ

Technical data

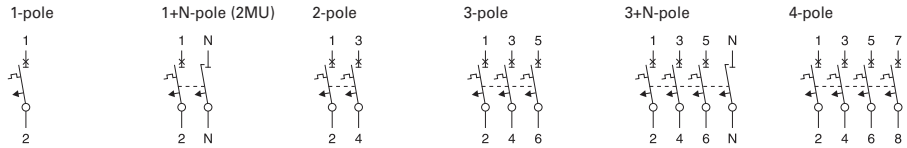
	B Curve	C Curve	D Curve
Electrical			
Approvals	UR (UL 1077), CSA (CSA 22.2 No. 235), CE, CB (Not for D50 and D63)		
Standards	IEC/EN 60947-2		
Short-circuit trip response	3–5 I_n	5–10 I_n	10–20 I_n
Supplementary Protectors—UL/CSA			
Current range	1–63A	0.5–63A	0.5–40A
Maximum voltage ratings—UL/CSA			
Single-pole	277 Vac	277 Vac	277 Vac
	48 Vdc	48 Vdc	48 Vdc
Two-, three-pole	480Y/277 Vac	480Y/277 Vac	480Y/277 Vac
Two poles in series	96 Vdc	96 Vdc	96 Vdc
Thermal tripping characteristics			
Single-pole	< 1 hour @ 1.35 x I_n @ 40°C	< 1 hour @ 1.35 x I_n @ 40°C	< 1 hour @ 1.35 x I_n @ 40°C
Multi-pole	< 1 hour @ 1.45 x I_n @ 40°C	< 1 hour @ 1.45 x I_n @ 40°C	< 1 hour @ 1.45 x I_n @ 40°C
Short-circuit ratings (at max. voltage)			
Single-pole	10 kA (5 kA for 40–63A device)	10 kA (5 kA for 40–63A device)	5 kA
Two-, three-pole	10 kA (5 kA for 40–63A device)	10 kA (5 kA for 40–63A device)	5 kA
Single-pole	10 kA @ 48 Vdc	10 kA @ 48 Vdc	10 kA @ 48 Vdc
Two poles in series	10 kA @ 96 Vdc	10 kA @ 96 Vdc	10 kA @ 96 Vdc
Miniature Circuit Breaker—IEC			
Current range	1–63A	0.5–63A	0.5–63A
Maximum voltage ratings—IEC 60947-2			
Single-pole	230 Vac	230 Vac	230 Vac
	60 Vdc	60 Vdc	60 Vdc
Two-, three-pole	230/400 Vac	230/400 Vac	230/400 Vac
Maximum Voltage Ratings—IEC 60898			
Single-pole	240 Vac	240 Vac	240 Vac
Two-, three-pole	240/415 Vac	240/415 Vac	240/415 Vac
Thermal tripping characteristics			
	> 1 hour @ 1.05 x I_n @ 40°C	> 1 hour @ 1.05 x I_n @ 40°C	> 1 hour @ 1.05 x I_n @ 40°C
	< 1 hour @ 1.3 x I_n @ 40°C	< 1 hour @ 1.3 x I_n @ 40°C	< 1 hour @ 1.3 x I_n @ 40°C
Interrupt ratings (at max. voltage)			
IEC 60947-2	15 kA	15 kA	15 kA (type D50 and D63: 10kA)
IEC 60898	10 kA	10 kA	10 kA (type D50 and D63: 6kA)
Operational switching capacity	7.5 kA	7.5 kA	7.5 kA (type D50 and D63: 6kA)
Max. back-up fuse [gL/gG]	125A	125A	125A
Rated impulse withstand—U_{imp}	4000 Vac	4000 Vac	4000 Vac
Rated insulation voltage—U_i	440 Vac	440 Vac	440 Vac
Environmental/General			
Selectivity class	3	3	3
Lifespan (operations)	> 10000 (1 operation = ON/OFF)	> 10000 (1 operation = ON/OFF)	> 10000 (1 operation = ON/OFF)
Shock (IEC 68-2-22)	10g–120 ms	10g–120 ms	10g–120 ms
Operating temperature range	-40 to +75°C	-40 to +75°C	-40 to +75°C
Mechanical			
Standard front dimension			
Device height	80 mm	80 mm	80 mm
Terminal protection	Finger and back-of-hand proof	Finger and back-of-hand proof	Finger and back-of-hand proof
Mounting width per pole	17.5 mm	17.5 mm	17.5 mm
Mounting	IEC/EN 60715 top-hat rail	IEC/EN 60715 top-hat rail	IEC/EN 60715 top-hat rail
Degree of protection	IP20	IP20	IP20
Terminals top and bottom	Twin-purpose terminals	Twin-purpose terminals	Twin-purpose terminals
Supply connection	Line or load side	Line or load side	Line or load side
Terminal capacity [mm^2]	1 x 25 / 2 x 10	1 x 25 / 2 x 10	1 x 25 / 2 x 10
Torque	2.4 Nm	2.4 Nm	2.4 Nm
Thickness of busbar material	0.8–2 mm	0.8–2 mm	0.8–2 mm
Mounting position	As required	As required	As required

Specifications FAZ

Technical Data (continued)

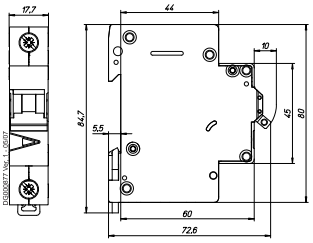
	K Curve	S Curve	Z Curve
Electrical			
Approvals	UR (UL 1077), CE	UR (UL 1077), CSA (CSA 22.2 No. 235) for 1-16 A, CE, CB	UR (UL 1077), CE
Standards	IEC/EN 60947-2		
Short-circuit trip response	8–12 I_n	13–17 I_n	2–3 I_n
Supplementary Protectors—UL/CSA			
Current range	0.5–63A	0.5–40A	1–63A
Maximum voltage ratings—UL/CSA			
Single-pole, single-pole + neutral	277 Vac 48 Vdc	277 Vac 48 Vdc	277 Vac 48 Vdc
Two-, three-, four-pole and three-pole + neutral	480Y/277 Vac	480Y/277 Vac	480Y/277 Vac
Two poles in series	96 Vdc	96 Vdc	96 Vdc
Thermal tripping characteristics			
Single-pole	< 1 hour @ 1.35 x I_n @ 40°C	< 1 hour @ 1.35 x I_n @ 40°C	< 1 hour @ 1.35 x I_n @ 40°C
Multi-pole	< 1 hour @ 1.45 x I_n @ 40°C	< 1 hour @ 1.45 x I_n @ 40°C	< 1 hour @ 1.45 x I_n @ 40°C
Short-circuit ratings (at max. voltage)			
Single-pole	5 kA @ 277 Vac	5 kA @ 277 Vac	5 kA @ 277 Vac
Single-pole + neutral	5 kA @ 277 Vac	5 kA @ 277 Vac	5 kA @ 277 Vac
Two-, three-, four-pole	5 kA @ 480Y/277 Vac	5 kA @ 480Y/277 Vac	5 kA @ 480Y/277 Vac
Miniature Circuit Breaker—IEC			
Current range	0.5–63A	0.5–40A	1–63A
Maximum voltage ratings—IEC 60947-2			
Single-pole, single-pole + neutral	240 Vac	240 Vac	240 Vac
Single-pole	60 Vdc	60 Vdc	60 Vdc
Two-, three-, four-pole, three-pole + neutral	240/415 Vac	240/415 Vac	240/415 Vac
Thermal tripping characteristics			
	> 1 hour @ 1.05 x I_n @ 30°C < 1 hour @ 1.3 x I_n @ 30°C	> 1 hour @ 1.05 x I_n @ 30°C < 1 hour @ 1.3 x I_n @ 30°C	> 1 hour @ 1.05 x I_n @ 30°C < 1 hour @ 1.3 x I_n @ 30°C
Interrupt ratings (at max. voltage)			
IEC 60947-2	15 kA	10 kA	10 kA
Operational switching capacity	7.5 kA	7.5 kA	7.5 kA
Max. back-up fuse [gL/gG]	125A	125A	125A
Rated impulse withstand—U_{imp}	4000 Vac	4000 Vac	4000 Vac
Rated insulation voltage—U_i	440 Vac	440 Vac	440 Vac
Environmental/General			
Selectivity class	3	3	3
Lifespan (operations)	> 10000 (1 operation = ON/OFF)	> 10000 (1 operation = ON/OFF)	> 10000 (1 operation = ON/OFF)
Shock (IEC 68-2-22)	10g–120 ms	10g–120 ms	10g–120 ms
Operating temperature range	-40°C to +75°C	-40°C to +75°C	-40°C to +75°C
Mechanical			
Standard front dimension			
Device height	80 mm	80 mm	80 mm
Terminal protection	Finger and back-of-hand proof	Finger and back-of-hand proof	Finger and back-of-hand proof
Mounting width per pole	17.5 mm	17.5 mm	17.5 mm
Mounting	IEC/EN 60715 top-hat rail	IEC/EN 60715 top-hat rail	IEC/EN 60715 top-hat rail
Degree of protection	IP20	IP20	IP20
Terminals top and bottom	Twin-purpose terminals	Twin-purpose terminals	Twin-purpose terminals
Supply connection	Line or load side	Line or load side	Line or load side
Terminal capacity [mm^2]	1 x 25 / 2 x 10	1 x 25 / 2 x 10	1 x 25 / 2 x 10
Torque	2.4 Nm	2.4 Nm	2.4 Nm
Thickness of busbar material	0.8–2 mm	0.8–2 mm	0.8–2 mm
Mounting position	As required	As required	As required

Connection diagram

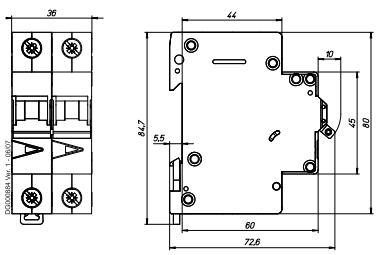


Dimensions (mm) FAZ

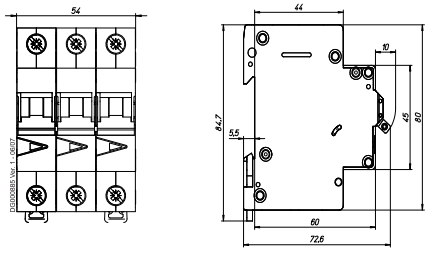
1-pole



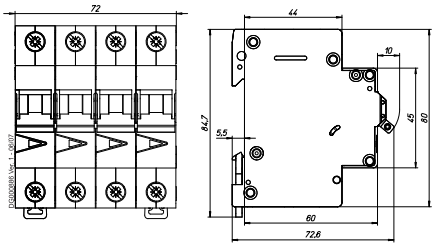
1+N-pole, 2-pole



3-pole

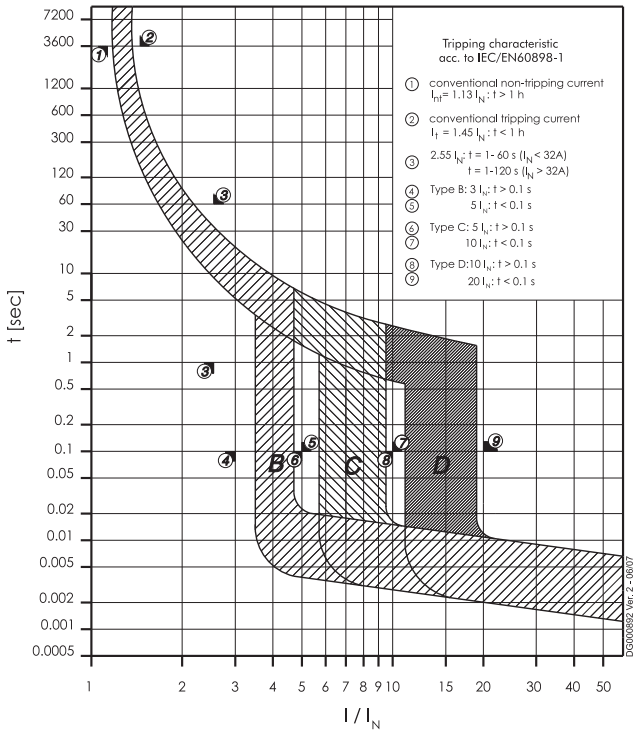


3+N-pole, 4-pole

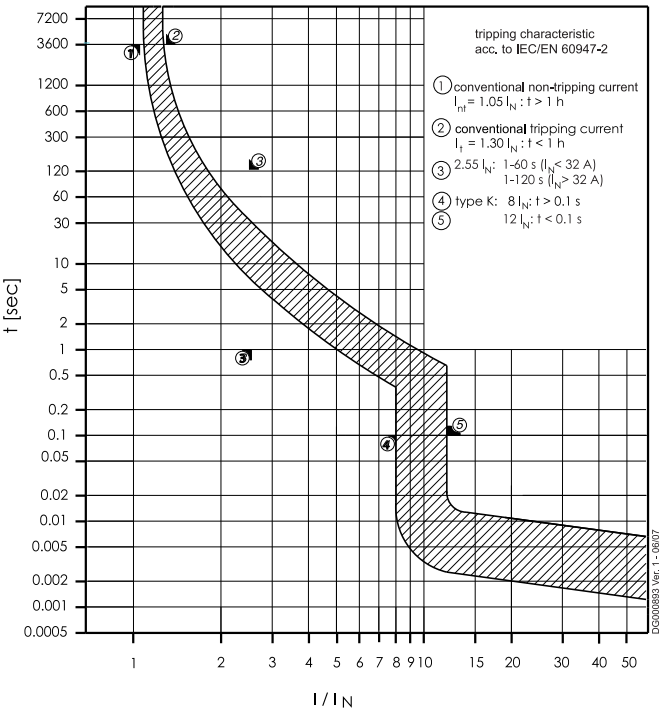


Tripping Characteristic FAZ

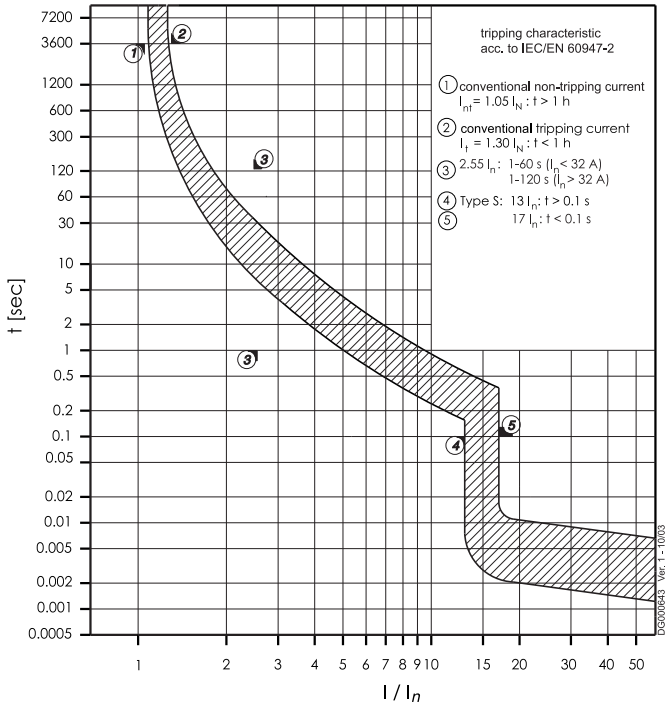
Characteristics B, C and D - IEC/EN60898-1



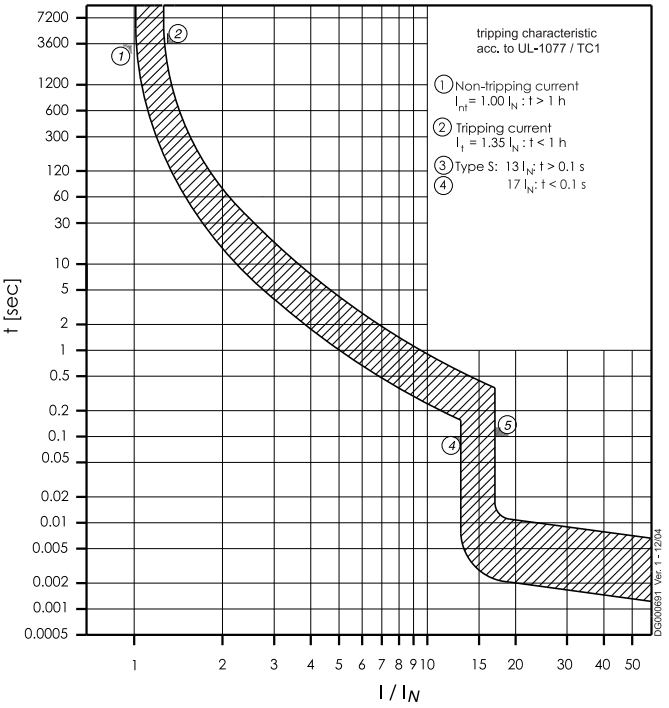
Characteristic K - IEC/EN 60947-2



Characteristic S - IEC/EN 60947-2

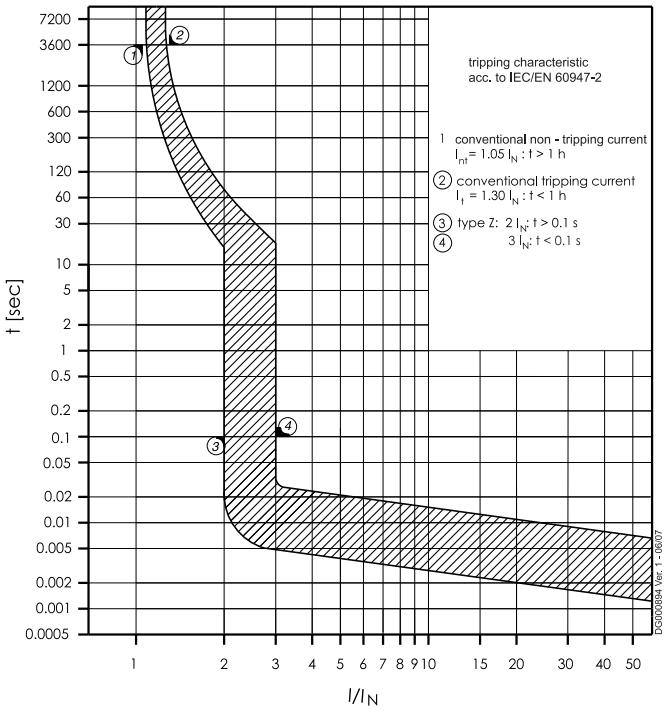


Characteristic S - UL1077

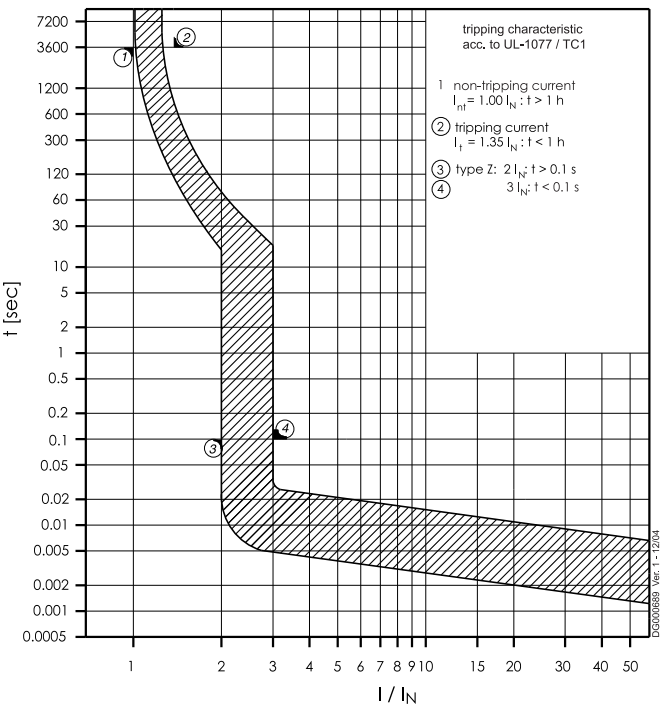


Tripping Characteristic FAZ

Characteristic Z - IEC/EN 60947-2



Characteristic Z - UL1077



Internal Resistance FAZ

Type B

At room temperature (single pole)

In [A]	Z* [mΩ]	R [mΩ]
1	1120	1102
1.5	922	912
1.6	922	912
2	335	333
2.5	234	230
3	211	208
3.5	184	180
4	87.7	87.2
5	73.5	72.8
6	46.8	46.3
8	30.5	30.4
10	17.5	17.4
12	16.9	16.8
13	13.4	13.3
15	8.0	7.9
16	8.0	7.9
20	7.2	7.1
25	5.0	4.9
32	3.7	3.7
40	2.6	2.5
50	2.1	2.1
63	2.0	2.0

* 50Hz

Type C

At room temperature (single pole)

In [A]	Z* [mΩ]	R [mΩ]
0.16	68500	68300
0.25	27500	27400
0.5	4680	4670
0.75	2280	2250
1	1120	1100
1.5	589	587
1.6	589	587
2	335	333
2.5	234	230
3	131	130
3.5	143	141
4	87.7	87.2
5	73.5	72.8
6	39.3	39.1
8	30.5	30.4
10	14.1	14.0
12	13.5	13.4
13	13.4	13.3
15	8.0	7.9
16	8.0	7.9
20	7.2	7.1
25	5.0	4.9
32	3.7	3.7
40	2.6	2.5
50	2.1	2.1
63	2.0	2.0

* 50Hz

Type D

At room temperature (single pole)

In [A]	Z* [mΩ]	R [mΩ]
0.5	4680	4670
1	772	770
1.5	512	508
1.6	512	508
2	250	249
2.5	153	153
3	131	130
3.5	143	141
4	87.7	87.2
5	65.4	65.1
6	39.3	39.1
8	19.5	19.5
10	14.1	14.0
12	11.3	11.2
13	10.1	10.1
15	8.0	7.9
16	8.0	7.9
20	4.9	4.9
25	3.9	3.8
32	3.5	3.4
40	2.7	2.6

* 50Hz

Fault Loop Impedance FAZ

Max. allowed value for the Fault Loop Impedance Z_S
(acc. to DIN VDE 0100, part 410)

U_0 = 230 V

	Type B		Type C		Type D	
Tripping time	0,4s	5s	0,4s	5s	0,4s	5s
I_n/A	Zs (Ω)	Zs (Ω)	Zs (Ω)	Zs (Ω)	Zs (Ω)	Zs (Ω)
1	40,4	40,4	24,3	40,4	12,4	40,4
1.5	26,9	26,9	16,2	26,9	8,3	26,9
2	20,2	20,2	12,2	20,2	6,2	20,2
2.5	16,1	16,1	9,7	16,1	5,0	16,1
3	13,5	13,5	8,1	13,5	4,1	13,5
3.5	11,5	11,5	7,0	11,5	3,6	11,5
4	10,1	10,1	6,1	10,1	3,1	10,1
5	8,1	8,1	4,9	8,1	2,5	8,1
6	6,7	6,7	4,1	6,7	2,1	6,7
8	5,0	5,0	3,0	5,0	1,6	5,0
10	4,0	4,0	2,4	4,0	1,2	4,0
12	3,4	3,4	2,0	3,4	1,0	3,4
13	3,1	3,1	1,9	3,1	1,0	3,1
15	2,7	2,7	1,6	2,7	0,8	2,7
16	2,5	2,5	1,5	2,5	0,8	2,5
20	2,0	2,0	1,2	2,0	0,6	2,0
25	1,6	1,6	1,0	1,6	0,5	1,6
32	1,3	1,3	0,8	1,3	0,4	1,3
40	1,0	1,0	0,6	1,0	0,3	1,0
50	0,8	0,8	0,5	0,8	0,2	0,8
63	0,6	0,6	0,4	0,6	0,2	0,6

$Z_s=R_{M.C.B.}+R_{Loop}$
Data/factors taken from the time-current characteristic FAZ

For other rated voltages U_0:
U_0 = 240 V: Z_s * 1,04 applies
U_0 = 127 V: Z_s * 0,55 applies

Power Loss at I_n FAZ

Type B

	1p	1pN	2p	3p	3pN*
In [A]	P [W]	P [W]	P [W]	P [W]	P [W]
1	1.6	1.7	3.1	4.7	4.8
1.5	2.3	2.5	4.6	6.9	7.2
1.6	2.5	2.7	4.9	7.4	7.6
2	1.4	1.5	2.8	4.1	4.3
2.5	1.5	1.7	3.1	4.6	4.7
3	2.5	2.7	5.0	7.6	7.8
3.5	2.5	2.8	5.1	7.8	8.0
4	1.4	1.6	2.9	4.4	4.5
5	1.9	2.1	3.8	5.8	6.0
6	1.8	2.0	3.6	5.5	5.6
8	2.1	2.3	4.1	6.3	6.5
10	1.9	2.1	3.9	5.9	6.1
12	2.8	3.2	5.9	8.7	9.0
13	2.5	2.9	5.3	7.8	8.1
15	2.1	2.4	4.4	6.5	6.7
16	2.2	2.6	4.7	6.9	7.2
20	3.2	3.6	6.6	9.8	10.1
25	3.0	3.5	6.4	9.4	9.7
32	3.7	4.4	8.1	12.1	12.5
40	3.4	4.1	7.5	11.2	11.5
50	4.5	5.4	9.9	14.9	15.3
63	5.2	6.3	11.5	17.2	17.7

*symmetrical load

Type C

	1p	1pN	2p	3p	3pN*
In [A]	P [W]	P [W]	P [W]	P [W]	P [W]
0.16	2.2	2.4	4.4	6.7	6.9
0.25	2.0	2.2	4.0	6.1	6.3
0.5	1.2	1.3	2.4	3.5	3.7
0.75	1.3	1.4	2.6	3.9	4.1
1	1.6	1.7	3.1	4.7	4.8
1.5	1.5	1.6	2.9	4.4	4.6
1.6	1.6	1.7	3.1	4.7	4.9
2	1.4	1.5	2.8	4.1	4.3
2.5	1.5	1.7	3.1	4.6	4.7
3	1.2	1.3	2.4	3.6	3.7
3.5	1.3	1.4	2.6	3.9	4.0
4	1.4	1.6	2.9	4.4	4.5
5	1.9	2.1	3.8	5.8	6.0
6	1.5	1.6	2.9	4.4	4.6
8	2.1	2.3	4.1	6.3	6.5
10	1.5	1.7	3.0	4.6	4.7
12	2.1	2.4	4.4	6.5	6.8
13	2.5	2.9	5.3	7.8	8.1
15	2.1	2.4	4.4	6.5	6.7
16	2.2	2.6	4.7	6.9	7.2
20	3.2	3.6	6.6	9.8	10.1
25	3.0	3.5	6.4	9.4	9.7
32	3.7	4.4	8.1	12.1	12.5
40	3.4	4.1	7.5	11.2	11.5
50	4.5	5.4	9.9	14.9	15.3
63	5.2	6.3	11.5	17.2	17.7

*symmetrical load

Type D

	1p	1pN	2p	3p	3pN*
In [A]	P [W]	P [W]	P [W]	P [W]	P [W]
0.5	1.2	1.3	2.4	3.5	3.7
1	0.8	0.9	1.6	2.4	2.5
1.5	1.2	1.3	2.3	3.5	3.6
1.6	1.3	1.4	2.5	3.8	3.9
2	1.0	1.1	2.0	3.0	3.1
2.5	1.0	1.1	1.9	2.9	3.0
3	1.2	1.3	2.4	3.6	3.7
3.5	1.3	1.4	2.6	3.9	4.0
4	1.4	1.6	2.9	4.4	4.5
5	1.7	1.8	3.3	5.1	5.3
6	1.5	1.6	2.9	4.4	4.6
8	1.3	1.5	2.6	4.0	4.2
10	1.5	1.7	3.0	4.6	4.7
12	1.7	2.0	3.6	5.3	5.4
13	1.9	2.2	4.0	5.9	6.1
15	2.1	2.4	4.4	6.5	6.7
16	2.2	2.6	4.7	6.9	7.2
20	2.0	2.2	4.1	6.1	6.2
25	2.5	2.9	5.2	7.7	7.9
32	3.4	4.0	7.4	11.1	11.4
40	3.2	3.8	7.0	10.4	10.7

*symmetrical load

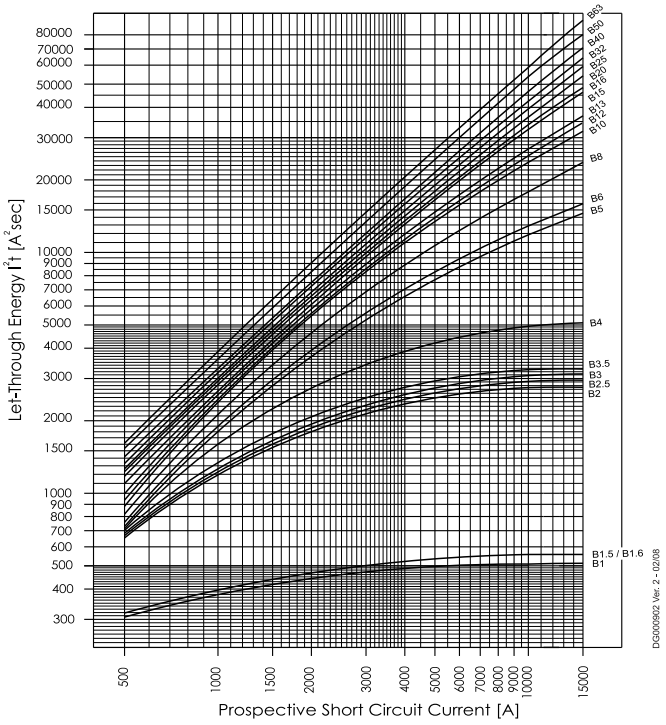
Influence of Ambient Temperature FAZ

On Load Carrying Capacity (temperature derating)

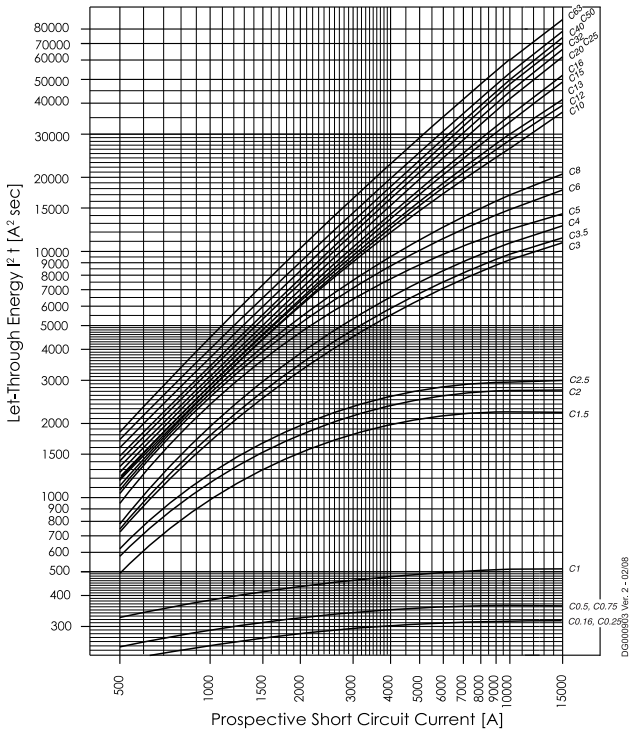
	Ambient temperature T [°C]																
I_N [A]	-40	-30	-20	-10	0	10	20	30	35	40	45	50	55	60	65	70	75
0.16	0.2	0.2	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13
0.25	0.32	0.31	0.3	0.29	0.28	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21
0.5	0.64	0.62	0.6	0.58	0.56	0.54	0.52	0.5	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.42	0.41
0.75	0.96	0.93	0.9	0.87	0.84	0.81	0.78	0.75	0.74	0.73	0.71	0.69	0.68	0.66	0.65	0.64	0.62
1	1.3	1.2	1.2	1.2	1.1	1.1	1	1	0.99	0.97	0.95	0.93	0.9	0.89	0.87	0.85	0.83
1.5	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2
1.6	2	2	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3
2	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2	2	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7
2.5	3.2	3.1	3	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1
3	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3	3	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.5
3.5	4.5	4.4	4.2	4.1	3.9	3.8	3.7	3.5	3.4	3.4	3.3	3.2	3.2	3.1	3	3	2.9
4	5.1	5	4.8	4.7	4.5	4.3	4.2	4	3.9	3.9	3.8	3.7	3.6	3.5	3.5	3.4	3.3
5	6.4	6.2	6	5.8	5.6	5.4	5.2	5	4.9	4.8	4.7	4.6	4.5	4.4	4.3	4.2	4.1
6	7.7	7.5	7.2	7	6.7	6.5	6.3	6	5.9	5.8	5.7	5.6	5.4	5.3	5.2	5.1	5
8	10.2	9.9	9.6	9.3	9	8.7	8.4	8	7.9	7.7	7.6	7.4	7.2	7.1	6.9	6.8	6.6
10	13	12	12	12	11	11	10	10	9.9	9.7	9.5	9.3	9	8.9	8.7	8.5	8.3
12	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10
13	17	16	16	15	15	14	14	13	13	13	12	12	12	12	11	11	11
15	19	19	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12
16	20	20	19	19	18	17	17	16	16	15	15	15	14	14	14	14	13
20	26	25	24	23	22	22	21	20	20	19	19	19	18	18	17	17	17
25	32	31	30	29	28	27	26	25	25	24	24	23	23	22	22	21	21
32	41	40	38	37	36	35	33	32	32	31	30	30	29	28	28	27	26
40	51	50	48	47	45	43	42	40	39	39	38	37	36	35	35	34	33
50	64	62	60	58	56	54	52	50	49	48	47	46	45	44	43	42	41
63	81	78	76	73	71	68	66	63	62	61	60	58	57	56	55	53	52

Maximum Let-Through Energy FAZ

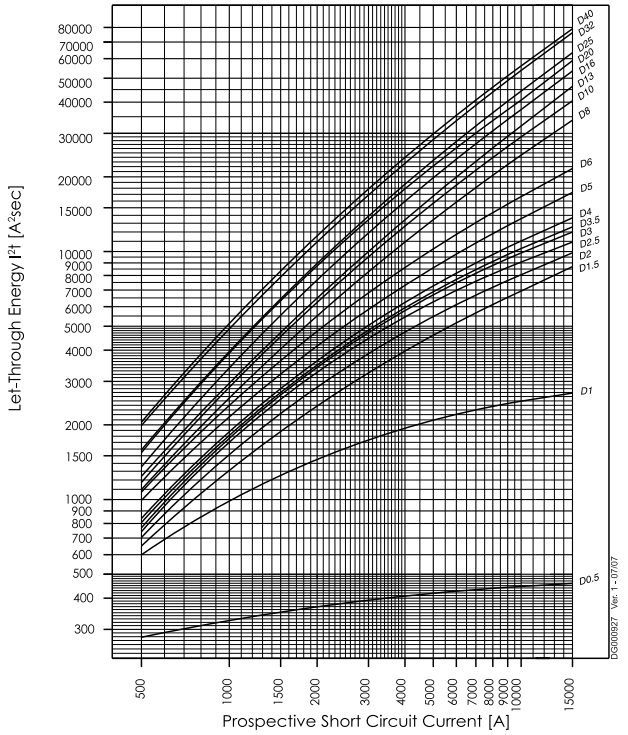
Type B (IEC/EN60947-2)



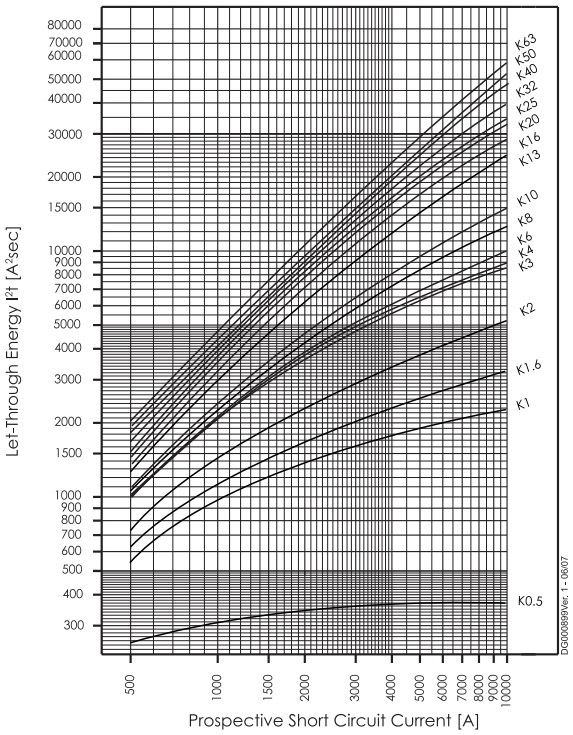
Type C (IEC/EN60947-2)



Type D (IEC/EN60947-2)

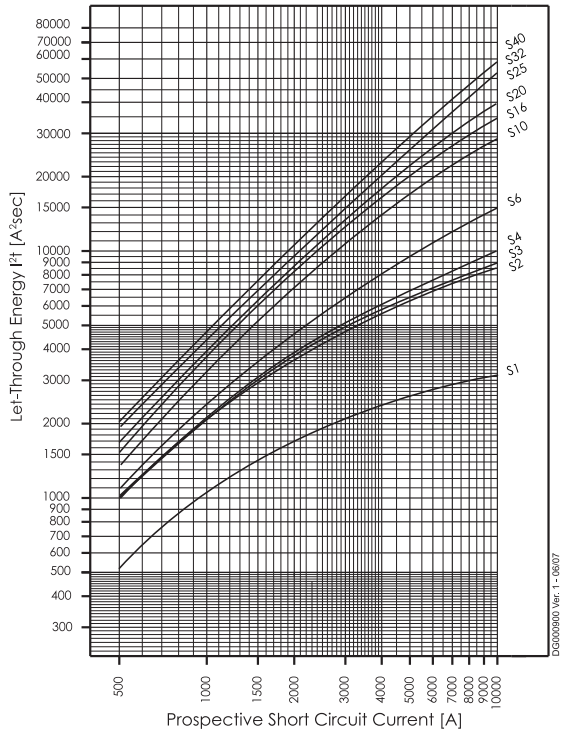


Type K

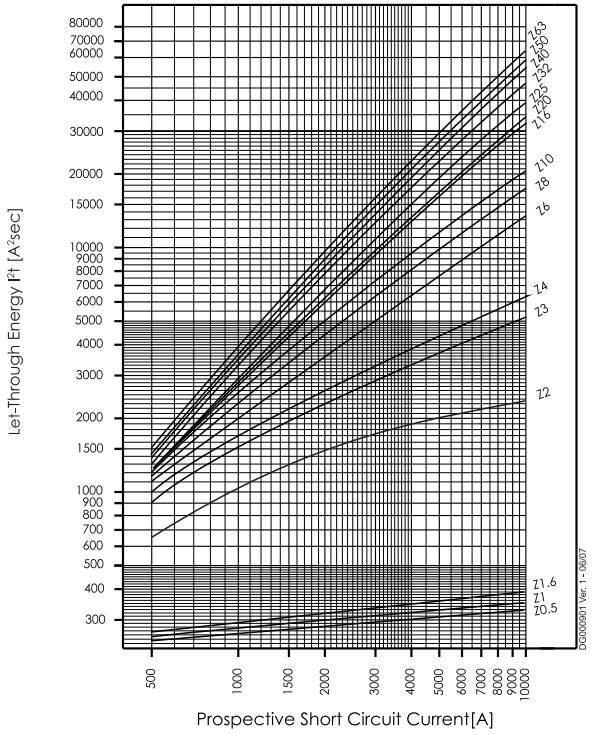


Maximum Let-Through Energy FAZ

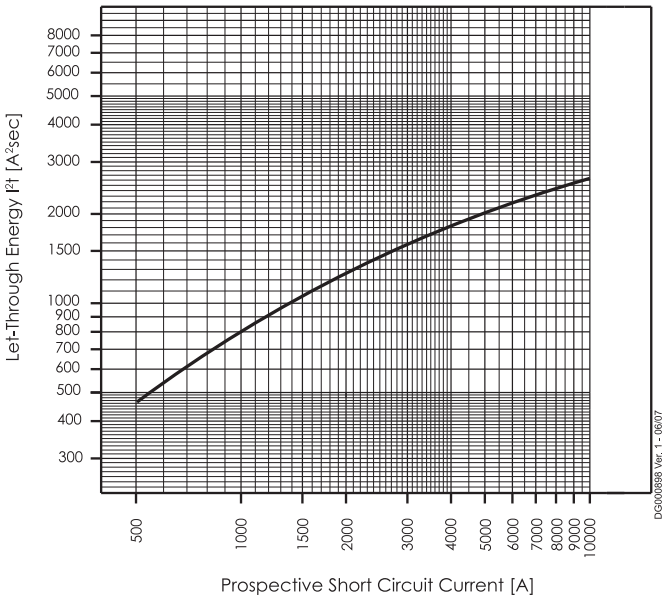
Type S



Type Z

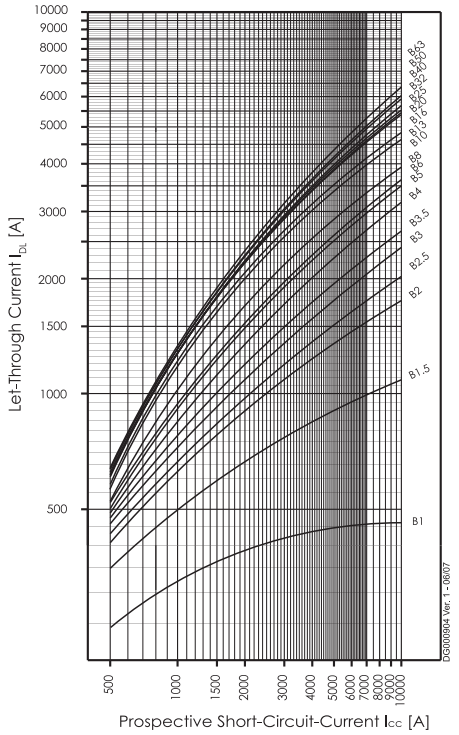


Type FAZ-...-HS

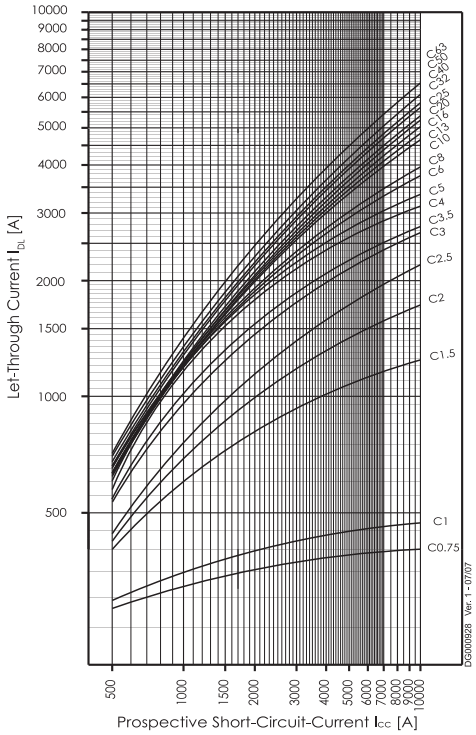


Maximum Let-Through Current FAZ

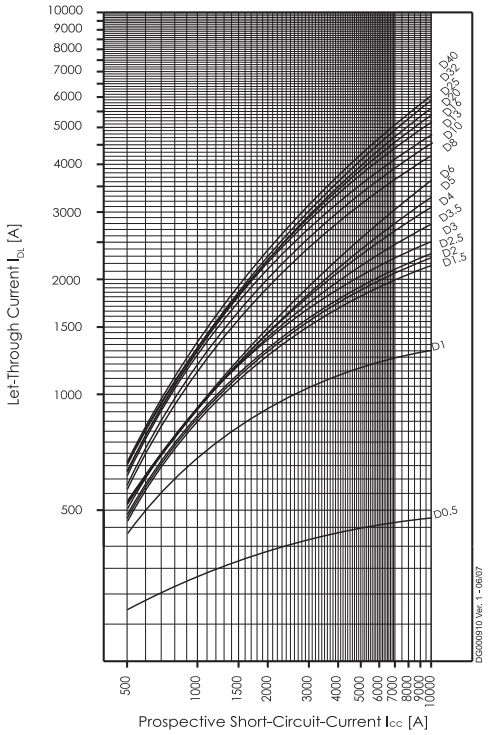
Type B (IEC/EN60898)



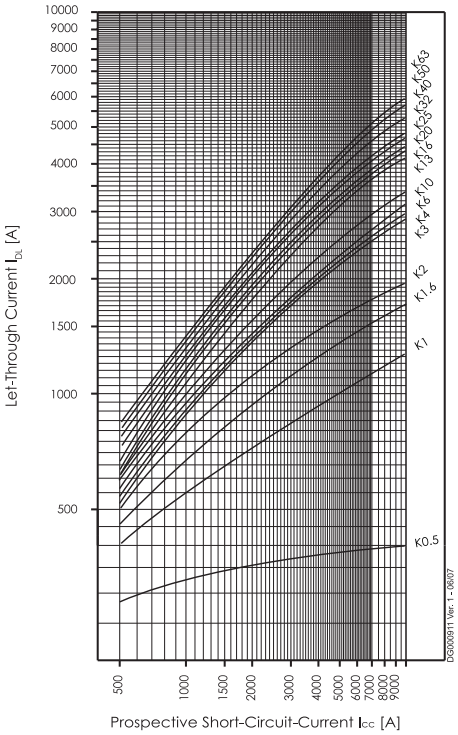
Type C (IEC/EN60898)



Type D (IEC/EN60898)

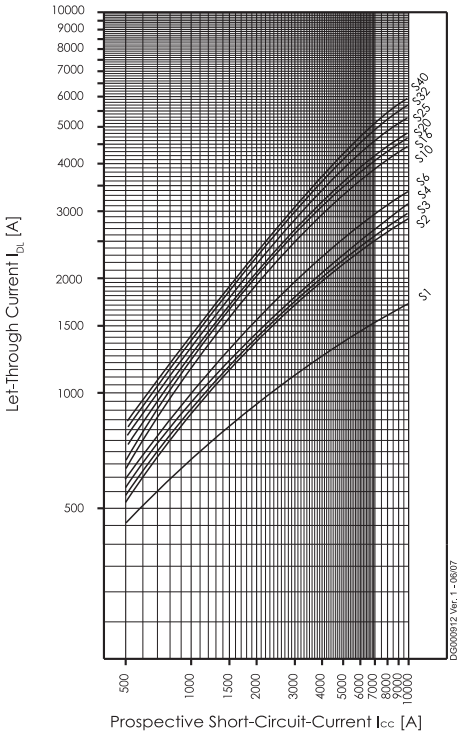


Type K

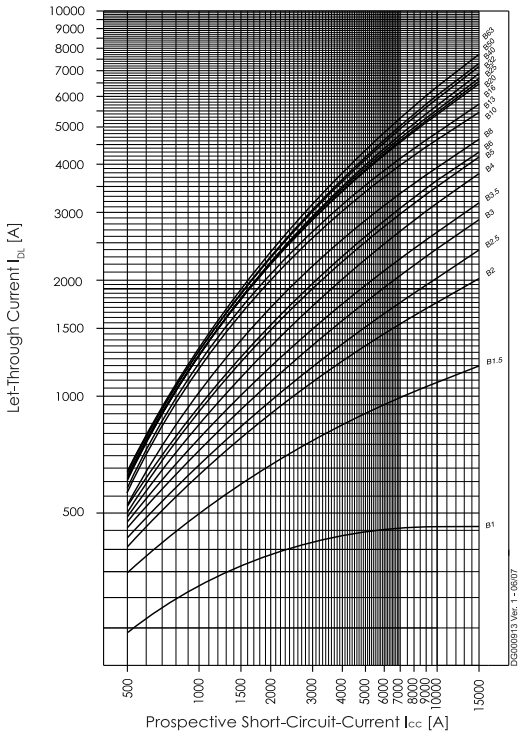


Maximum Let-Through Current FAZ

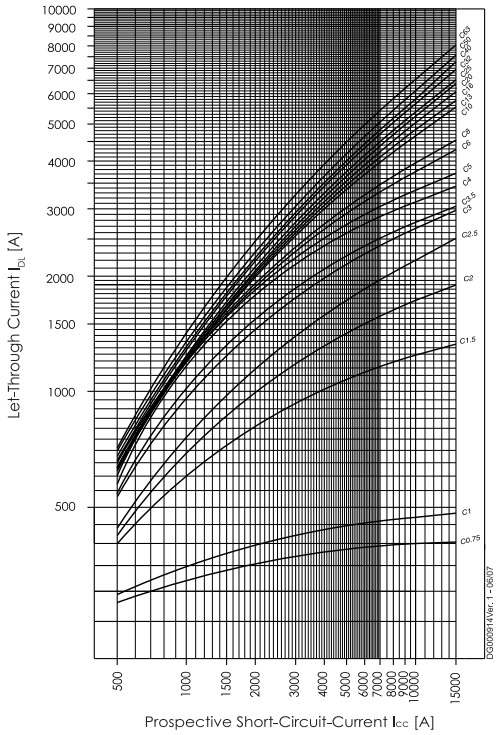
Type S



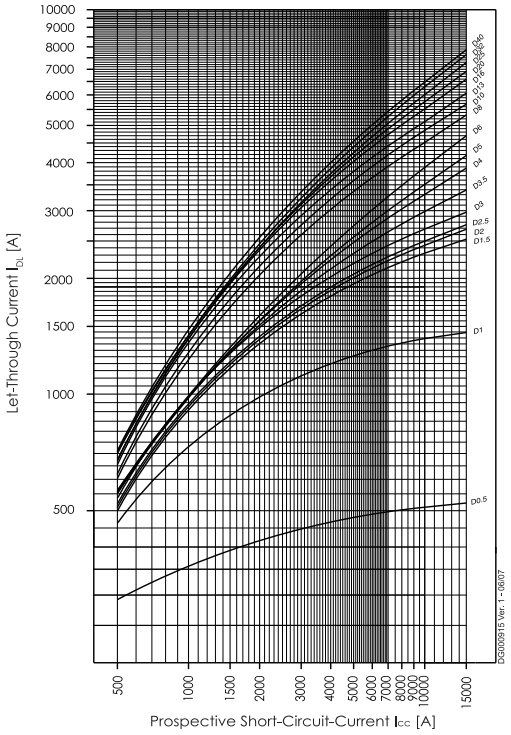
Type B (IEC/EN60947-2)



Type C (IEC/EN60947-2)



Type D (IEC/EN60947-2)



Short Circuit Selectivity FAZ

In case of short circuit, there is selectivity between the miniature circuit breakers FAZ and the upstream protection devices up to the specified values of the selectivity limit current I_s [kA] (i. e. in case of short-circuit currents I_{ks} under I_s, only the MCB will trip, in case of short circuit currents above this value both protective devices will respond).
*) basically in accordance with EN 60898-1 D.5.2.b

FAZ towards NH-00 Fuses

*Short circuit selectivity **characteristic B** towards fuse link **NH-00***)*

FAZ	NH-00 gL/gG											
I_n [A]	16	20	25	32	35	40	50	63	80	100	125	160
1.0	0.9	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	0.8	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	0.5	1.0	2.5	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	0.5	1.0	2.3	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	0.5	0.9	2.1	8.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	0.5	0.9	1.8	5.5	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.8	1.3	2.3	4.3	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
5	<0.5[1]	<0.5[1]	0.7	1.1	1.6	2.2	3.6	4.8	8.9	10.0[2]	10.0[2]	10.0[2]
6	<0.5[1]	<0.5[1]	0.7	1.1	1.5	2.0	3.3	4.3	7.6	10.0[2]	10.0[2]	10.0[2]
8	<0.5[1]	<0.5[1]	0.6	1.0	1.3	1.7	2.6	3.3	5.2	10.0[2]	10.0[2]	10.0[2]
10		<0.5[1]	0.6	0.9	1.2	1.5	2.2	2.7	4.0	9.0	10.0[2]	10.0[2]
13		<0.5[1]	0.6	0.8	1.1	1.4	2.1	2.6	3.8	7.9	10.0[2]	10.0[2]
16			0.5	0.7	1.0	1.3	1.9	2.4	3.4	6.4	9.3	10.0[2]
20				0.7	1.0	1.3	1.9	2.4	3.3	6.0	8.7	10.0[2]
25				0.7	1.0	1.3	1.8	2.3	3.2	5.7	8.0	10.0[2]
32					0.9	1.2	1.7	2.2	3.1	5.4	7.6	10.0[2]
40								2.1	3.0	5.1	7.2	10.0[2]
50								1.9	2.8	4.7	6.6	9.5
63										4.4	6.3	8.6

*Short circuit selectivity **characteristic C** towards fuse link **NH-00***)*

FAZ	NH-00 gL/gG											
I_n [A]	16	20	25	32	35	40	50	63	80	100	125	160
0.75	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	0.9	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	0.6	1.3	4.2	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	0.6	1.0	2.5	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	0.5	1.0	2.1	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.7	1.2	1.8	2.6	4.7	6.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.7	1.1	1.7	2.4	4.2	6.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.7	1.0	1.5	2.1	3.6	5.0	10.0	10.0[2]	10.0[2]	10.0[2]
5	<0.5[1]	<0.5[1]	0.6	0.8	1.2	1.7	2.8	3.8	8.7	10.0[2]	10.0[2]	10.0[2]
6	<0.5[1]	<0.5[1]	0.5	0.8	1.2	1.5	2.5	3.3	5.7	10.0[2]	10.0[2]	10.0[2]
8	<0.5[1]	<0.5[1]	0.5	0.8	1.1	1.5	2.3	2.9	4.9	10.0[2]	10.0[2]	10.0[2]
10			0.5	0.7	1.0	1.4	2.0	2.5	3.8	8.0	10.0[2]	10.0[2]
13					1.0	1.3	1.9	2.4	3.6	7.0	10.0[2]	10.0[2]
16					1.0	1.3	1.8	2.3	3.3	6.0	8.8	10.0[2]
20					1.0	1.2	1.7	2.2	3.2	5.5	7.7	10.0[2]
25							1.6	2.1	3.0	5.2	7.3	10.0[2]
32								2.1	2.9	5.0	7.0	10.0[2]
40									2.8	4.8	6.7	10.0
50										4.5	6.3	9.5
63											5.9	8.4

*Short circuit selectivity **characteristic D** towards fuse link **NH-00***)*

FAZ	NH-00 gL/gG											
I_n [A]	16	20	25	32	35	40	50	63	80	100	125	160
0.5	2.1	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	<0.5[1]	0,6	1.4	4.3	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	<0.5[1]	0.9	1.6	2.7	4.0	8.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.8	1.3	2.1	3.1	6.0	8.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.7	1.2	1.8	2.6	4.8	6.9	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.7	1.1	1.7	2.4	4.3	6.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.7	1.1	1.7	2.4	4.2	5.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.7	1.0	1.6	2.2	3.8	5.2	10.0	10.0[2]	10.0[2]	10.0[2]
5		<0.5[1]	0.6	0.9	1.4	1.9	3.2	4.1	7.1	10.0[2]	10.0[2]	10.0[2]
6		<0.5[1]	0.5	0.8	1.2	1.6	2.6	3.3	5.5	10.0[2]	10.0[2]	10.0[2]
8			0.5	0.8	1.1	1.5	2.2	2.7	4.1	8.7	10.0[2]	10.0[2]
10			0.5	0.7	1.0	1.3	1.9	2.5	3.6	7.2	10.0[2]	10.0[2]
13					1.0	1.3	1.9	2.3	3.4	6.5	9.5	10.0[2]
16						1.1	1.6	2.0	3.0	5.5	8.0	10.0[2]
20							1.4	1.8	2.8	5.0	7.5	10.0[2]
25								1.8	2.7	4.8	7.0	10.0[2]
32									2.4	4.1	6.2	9.3
40										4.0	6.0	9.0

[1] Selectivity limit current I_s under 0.5 kA
[2] Selectivity limit current I_s = rated breaking capacity I_{cn} of the MCB
Shaded fields: no selectivity

FAZ towards D01-D03 fuse link

*Short circuit selectivity **characteristic B** towards fuse link **D01-D03***)*

FAZ	D01-D03 gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
1.0	<0.5[1]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	4.1	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.6	1.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.6	1.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.5	1.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.5	0.9	7.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.5	0.9	2.5	10.0[2]	10.0[2]	10.0[2]	10.0[2]
5		<0.5[1]	0.5	0.8	1.7	4.0	7.0	10.0[2]	10.0[2]
6		<0.5[1]	0.5	0.8	1.6	3.6	6.0	10.0[2]	10.0[2]
8			0.5	0.8	1.4	2.8	4.3	8.2	10.0[2]
10			0.5	0.7	1.3	2.4	3.4	6.0	10.0[2]
13			<0.5[1]	0.7	1.2	2.3	3.2	5.3	10.0[2]
16				0.6	1.1	2.2	2.9	4.6	10.0
20					1.1	2.1	2.8	4.4	9.3
25					1.1	2.0	2.7	4.2	8.7
32						2.0	2.6	4.0	8.0
40							2.5	3.8	7.5
50							2.3	3.4	6.7
63									6.2

*Short circuit selectivity **characteristic C** towards fuse link **D01-D03***)*

FAZ	D01-D03 gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
0.75	<0.5[1]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	<0.5[1]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	0.5	0.6	0.9	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.5	0.7	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.5	0.7	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	<0.5[1]	0.6	1.9	5.2	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	<0.5[1]	0.6	1.8	4.7	9.5	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	<0.5[1]	0.6	1.6	4.0	7.6	10.0[2]	10.0[2]
5		<0.5[1]	<0.5[1]	0.5	1.3	3.1	5.7	10.0[2]	10.0[2]
6		<0.5[1]	<0.5[1]	<0.5[1]	1.2	2.7	4.5	10.0[2]	10.0[2]
8		<0.5[1]	<0.5[1]	<0.5[1]	1.2	2.5	4.0	8.6	10.0[2]
10			<0.5[1]	<0.5[1]	1.2	2.3	3.1	5.4	10.0[2]
13					1.1	2.2	3.0	4.9	10.0[2]
16					1.1	2.1	2.8	4.4	9.5
20					1.0	2.0	2.6	4.0	8.3
25						1.9	2.5	3.8	7.8
32							2.5	3.7	7.3
40								3.5	7.0
50									6.5
63									

*Short circuit selectivity **characteristic D** towards fuse link **D01-D03***)*

FAZ	D01-D03 gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
0.5	<0.5[1]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	<0.5[1]	<0.5[1]	0.7	1.3	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	<0.5[1]	0.6	0.9	2.8	9.0	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.6	0.8	2.2	6.7	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.5	0.7	1.9	5.4	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.5	0.7	1.8	4.8	9.3	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.5	0.7	1.7	4.7	8.6	10.0[2]	10.0[2]
4		<0.5[1]	0.5	0.7	1.7	4.6	7.7	10.0[2]	10.0[2]
5		<0.5[1]	<0.5[1]	0.6	1.5	3.5	5.8	10.0[2]	10.0[2]
6			<0.5[1]	0.5	1.3	2.9	4.5	9.0	10.0[2]
8			<0.5[1]	0.5	1.2	2.4	3.5	6.0	10.0[2]
10				0.5	1.1	2.2	3.0	5.0	10.0[2]
13					1.1	2.1	2.9	4.6	10.0[2]
16						1.9	2.6	3.9	9.0
20						1.7	2.3	3.5	8.0
25							2.2	3.4	7.5
32								2.9	6.0
40									5.7

[1] Selectivity limit current I_s under 0.5 kA
[2] Selectivity limit current I_s = rated breaking capacity I_{cn} of the MCB
Shaded fields: no selectivity

FAZ towards DII-DIV fuse link

*Short circuit selectivity **characteristic B** towards fuse link **DII-DIV***)*

FAZ	DII-DIV gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
1.0	<0.5[1]	1.2	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	1.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.8	1.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.8	1.5	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.8	1.4	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.7	1.3	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.6	1.0	3.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]
5	<0.5[1]	<0.5[1]	0.6	0.9	2.0	3.5	8.5	10.0[2]	10.0[2]
6		<0.5[1]	0.6	0.9	1.8	3.2	7.4	10.0[2]	10.0[2]
8		<0.5[1]	0.5	0.8	1.6	2.6	5.2	8.3	10.0[2]
10			0.5	0.8	1.4	2.2	3.9	6.0	10.0[2]
13			0.5	0.7	1.3	2.0	3.6	5.4	10.0[2]
16				0.6	1.2	1.9	3.2	4.6	8.4
20					1.2	1.8	3.1	4.4	7.8
25					1.2	1.8	3.0	4.2	7.3
32						1.7	2.8	3.9	6.8
40							2.7	3.8	6.5
50							2.5	3.5	5.7
63									5.3

*Short circuit selectivity **characteristic C** towards fuse link **DII-DIV***)*

FAZ	DII-DIV gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
0.75	1.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	<0.5[1]	1.2	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	<0.5[1]	1.0	2.2	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.8	1.6	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.8	1.4	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.8	0.9	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.6	0.9	2.2	4.5	10.0[2]	10.0[2]	10.0[2]
4	<0.5[1]	<0.5[1]	0.6	0.8	1.8	3.6	9.7	10.0[2]	10.0[2]
5	<0.5[1]	<0.5[1]	0.6	0.7	1.5	2.7	7.3	10.0[2]	10.0[2]
6		<0.5[1]	0.5	0.6	1.4	2.4	5.5	10.0[2]	10.0[2]
8		<0.5[1]	<0.5[1]	0.6	1.3	2.2	4.7	8.7	10.0[2]
10			<0.5[1]	0.6	1.3	2.0	3.6	5.4	10.0[2]
13					1.3	1.9	3.3	5.0	9.4
16					1.2	1.8	3.2	4.4	8.0
20					1.2	1.8	3.1	4.1	7.0
25						1.7	2.8	3.8	6.5
32							2.7	3.7	6.2
40								3.5	5.9
50									5.5
63									

*Short circuit selectivity **characteristic D** towards fuse link **DII-DIV***)*

FAZ	DII-DIV gL/gG								
I_n [A]	10	16	20	25	35	50	63	80	100
0.5	0.5	3.0	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.0	<0.5[1]	<0.5[1]	1.0	2.4	10.0[2]	10.0[2]	10.0[2]	10.0[2]	10.0[2]
1.5	<0.5[1]	<0.5[1]	0.7	1.2	3.5	7.7	10.0[2]	10.0[2]	10.0[2]
2.0	<0.5[1]	<0.5[1]	0.6	1.0	2.8	5.8	10.0[2]	10.0[2]	10.0[2]
2.5	<0.5[1]	<0.5[1]	0.6	1.4	2.3	4.6	10.0[2]	10.0[2]	10.0[2]
3.0	<0.5[1]	<0.5[1]	0.6	0.9	2.3	4.3	10.0[2]	10.0[2]	10.0[2]
3.5	<0.5[1]	<0.5[1]	0.6	0.9	2.1	4.0	10.0[2]	10.0[2]	10.0[2]
4		<0.5[1]	0.6	0.9	2.0	3.8	9.5	10.0[2]	10.0[2]
5		<0.5[1]	0.5	0.7	1.7	3.1	7.0	10.0[2]	10.0[2]
6			0.5	0.7	1.5	2.6	5.3	9.1	10.0[2]
8			<0.5[1]	0.7	1.4	2.2	3.9	6.0	10.0[2]
10				0.7	1.2	1.9	3.4	5.0	9.5
13					1.2	1.8	3.2	4.6	8.6
16						1.6	2.7	4.0	7.4
20						1.5	2.5	3.5	6.7
25							2.4	3.4	6.2
32								2.8	5.0
40									4.8

[1] Selectivity limit current I_s under 0.5 kA

[2] Selectivity limit current I_s = rated breaking capacity I_{cn} of the MCB

Shaded fields: no selectivity

FAZ-B and NZM 1/2

Selectivity-limit current I_s [kA] for selectivity between FAZ-B and NZM (overload and short-circuit release unit NZM at max. value).

	NZM...1-A...						**NZM...2-A...**								
I_n [A]	I_{cu} = 25 (50) kA						I_{cu} = 25 (50)(100)(150) kA								
FAZ-B	**40**	**50**	**63**	**80**	**100**	**125**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
1	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
2	2	15	15	15	15	15	3	15	15	15	15	15	15	15	15
3	1.2	2	3	3	10	15	1.5	1.5	3	5	15	15	15	15	15
4	1.2	2	3	3	8	15	1.2	1.5	3	4	15	15	15	15	15
6	1.2	2	2.5	3	5	10	1.2	1.5	2.5	3	15	15	15	15	15
10	1.2	1.5	2	2	4	10	1	1.5	2.5	3	10	10	10	10	10
13	1	1.5	2	2	4	10	1	1.2	2	3	10	10	10	10	10
16	1	1.2	1.5	2	3	8	1	1.2	1.5	2.5	10	10	10	10	10
20	0.8	1.2	1.5	1.5	3	8	1	1.2	1.5	1.5	10	10	10	10	10
25	0.7	1.2	1.5	1.5	3	7	0.8	1	1.5	2	10	10	10	10	10
32	-	1.2	1	1.5	2	6	-	1	1.5	2	8	8	8	8	10
40	-	-	1	1.5	2	5	-	-	1.2	1.5	7	7	7	7	10
50	-	-	-	1.2	1.5	4	-	-	-	1.5	6	6	6	6	10
63	-	-	-	-	1.5	3	-	-	-	-	6	6	6	6	10

FAZ-C and NZM 1/2

Selectivity-limit current I_s [kA] for selectivity between FAZ-C and NZM (overload and short-circuit release unit NZM at max. value).

	NZM...1-A...						**NZM...2-A...**								
I_n [A]	I_{cu} = 25 (50) kA						I_{cu} = 25 (50)(100)(150) kA								
FAZ-C	**40**	**50**	**63**	**80**	**100**	**125**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
0.5	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
2	2	15	15	15	15	15	3	15	15	15	15	15	15	15	15
3	1.2	2	3	3	10	15	1.5	1.5	3	5	15	15	15	15	15
4	1.2	2	3	3	8	15	1.2	1.5	3	4	15	15	15	15	15
6	1.2	2	2.5	3	5	10	1.2	1.5	2.5	3	15	15	15	15	15
10	1.2	1.5	2	2	4	10	1	1.5	2.5	3	10	10	10	10	10
13	1	1.5	2	2	4	10	1	1.2	2	3	10	10	10	10	10
16	1	1.2	1.5	2	3	8	1	1.2	1.5	2.5	10	10	10	10	10
20	0.8	1.2	1.5	1.5	3	8	1	1.2	1.5	1.5	10	10	10	10	10
25	0.7	1.2	1.5	1.5	3	7	0.8	1	1.5	2	10	10	10	10	10
32	-	1.2	1	1.5	2	6	-	1	1.5	2	8	8	8	8	10
40	-	-	1	1.5	2	5	-	-	1.2	1.5	7	7	7	7	10
50	-	-	-	1.2	1.5	4	-	-	-	1.5	6	6	6	6	10
63	-	-	-	-	1.5	3	-	-	-	-	6	6	6	6	10

FAZ-D and NZM 1/2

Selectivity-limit current I_s [kA] for selectivity between FAZ-D and NZM (overload and short-circuit release unit NZM at max. value).

	NZM...1-A...						**NZM...2-A...**								
I_n [A]	I_{cu} = 25 (50) kA						I_{cu} = 25 (50)(100)(150) kA								
FAZ-D	**40**	**50**	**63**	**80**	**100**	**125**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**
0.5	9	15	15	15	15	15	9	15	15	15	15	15	15	15	15
1	0.5	0.7	1.1	1.9	4.2	15	0.5	0.7	1.1	1.9	4.2	15	15	15	15
1.5	0.3	0.6	0.8	1.1	1.6	2.6	0.3	0.6	0.8	1.1	1.6	2.6	5	15	15
2	0.3	0.5	0.75	0.95	1.4	2.4	0.3	0.5	0.75	0.95	1.4	2.4	4.5	10	15
2.5	0.3	0.5	0.75	0.95	1.3	2.3	0.3	0.5	0.75	0.95	1.3	2.3	4.2	9	15
3	0.3	0.5	0.7	0.9	1.3	2.1	0.3	0.5	0.7	0.9	1.3	2.1	3.6	7	15
3.5	0.3	0.5	0.7	0.9	1.3	2	0.3	0.5	0.7	0.9	1.3	2	3.3	5.6	10
4	0.3	0.5	0.7	0.9	1.3	1.9	0.3	0.5	0.7	0.9	1.3	1.9	3	4.7	8
5	0.3	0.5	0.7	0.9	1.3	1.9	0.3	0.5	0.7	0.9	1.3	1.9	3	4.4	7
6	0.3	0.5	0.6	0.9	1.3	1.8	0.3	0.5	0.6	0.9	1.3	1.8	2.8	4	6
8	0.3	0.3	0.6	0.75	1	1.3	0.3	0.3	0.6	0.75	1	1.3	1.8	2.7	4
10	0.3	0.3	0.6	0.75	0.95	1.2	0.3	0.3	0.6	0.75	0.95	1.2	1.7	2.4	3.6
13	0.3	0.3	0.5	0.7	0.9	1.1	0.3	0.3	0.5	0.7	0.9	1.1	1.6	2.2	3.2
16	-	0.3	0.5	0.65	0.8	1.1	-	0.3	0.5	0.65	0.8	1.1	1.5	2.1	3
20	-	-	0.5	0.65	0.8	1.1	-	-	0.5	0.65	0.8	1.1	1.4	2.1	3
25	-	-	0.5	0.65	0.8	1.1	-	-	0.5	0.65	0.8	1.1	1.4	1.9	2.7
32	-	-	-	-	0.8	1.1	-	-	-	-	0.8	1.1	1.4	1.9	2.7
40	-	-	-	-	-	1	-	-	-	-	-	1	1.4	1.8	2.6

Back-up Protection FAZ

The up-stream protective devices will protect the down-stream FAZ up to the short-circuit current specified.

FAZ/C and AZ/C

	AZ/C								
I_n [A]	I_n [A]								
FAZ/C	**20**	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**
1	25	25	25	25	25	25	20	20	15 kA
2	25	25	25	25	25	25	20	20	15 kA
4	25	25	25	25	25	25	20	20	15 kA
6	25	25	25	25	25	25	20	20	15 kA
10	25	25	25	25	25	25	20	20	15 kA
13	25	25	25	25	25	25	20	20	15 kA
16	25	25	25	25	25	25	20	20	15 kA
20	1)	25	25	25	25	25	20	20	15 kA
25	1)	1)	25	25	25	25	20	20	15 kA
32	1)	1)	1)	25	25	25	20	20	-
40	1)	1)	1)	1)	25	25	20	20	-
50	1)	1)	1)	1)	1)	25	20	20	-
63	1)	1)	1)	1)	1)	1)	-	-	-

1) I_n (AZ) ≤ I_n (FAZ)

FAZ and CL-PKZ0

Back-up tests acc. to EN/IEC 60947-2, App. A: U = 1.05 U_e, (O - t - CO)

	FAZ-I_n/1(2,3,4)/B(C) + CL-PKZ0
I_n [A]	U_e = 230/400 V
0.16	65 kA
0.25	65 kA
0.5	65 kA
0.75	65 kA
1	65 kA
1.5	65 kA
2	65 kA
2.5	65 kA
3	65 kA
3.5	65 kA
4	65 kA
5	45 kA
6	45 kA
8	45 kA
10	45 kA
12	45 kA
13	45 kA
15	45 kA
16	45 kA
20	45 kA
25	45 kA
32	45 kA
40	25 kA
50	25 kA
63	25 kA

FAZ and NZM7

	FAZ-I_n/1(2,3,4)/B(C) + NZM7-40(...100)
I_n [A]	U_e = 230/400 V
0.16	25 kA
0.25	25 kA
0.5	25 kA
0.75	25 kA
1	25 kA
1.5	25 kA
2	25 kA
2.5	25 kA
3	25 kA
3.5	25 kA
4	25 kA
5	20 kA
6	20 kA
8	20 kA
10	20 kA
12	20 kA
13	20 kA
15	20 kA
16	20 kA
20	18 kA
25	18 kA
32	18 kA
40	18 kA
50	15 kA
63	15 kA

FAZ and NZMB1

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZMB1) = 25 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZMB1: I_r, I_{rm} at max. volumes)

	FAZ-I_n/1(2,3,4)/B(C) + NZMB1
I_n [A]	U_e = 230/400 V
0.16	25 kA
0.25	25 kA
0.5	25 kA
0.75	25 kA
1	25 kA
1.5	25 kA
2	25 kA
2.5	25 kA
3	25 kA
3.5	25 kA
4	25 kA
5	25 kA
6	25 kA
8	25 kA
10	25 kA
12	25 kA
13	25 kA
15	25 kA
16	25 kA
20	20 kA
25	20 kA
32	20 kA
40	20 kA
50	15 kA
63	15 kA

FAZ and NZMN1

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZMN1) = 25 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZM at max. values)

	FAZ-I_n/1(2,3,4)/B(C) + NZMN1
I_n [A]	U_e = 230/400 V
0.16	25 kA
0.25	25 kA
0.5	25 kA
0.75	25 kA
1	25 kA
1.5	25 kA
2	25 kA
2.5	25 kA
3	25 kA
3.5	25 kA
4	25 kA
5	25 kA
6	25 kA
8	25 kA
10	25 kA
12	25 kA
13	25 kA
15	25 kA
16	25 kA
20	20 kA
25	20 kA
32	20 kA
40	20 kA
50	15 kA
63	15 kA

FAZ and NZMB2

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZMB2) = 25 kA
U_e = 133/230 V: I_{cu} (FAZ) = 20 kA
U_e = 133/230 V: I_{cu} (NZMB2) = 30 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZM at max. values)

	FAZ-I_n/1(2,3,4)/B(C) + NZMB2	
I_n [A]	U_e = 230/400 V	U_e = 133/230 V
0.16	25 kA	30 kA
0.25	25 kA	30 kA
0.5	25 kA	30 kA
0.75	25 kA	30 kA
1	25 kA	30 kA
1.5	25 kA	30 kA
2	25 kA	30 kA
2.5	25 kA	30 kA
3	25 kA	30 kA
3.5	25 kA	30 kA
4	25 kA	30 kA
5	25 kA	25 kA
6	25 kA	25 kA
8	25 kA	25 kA
10	25 kA	25 kA
12	20 kA	25 kA
13	20 kA	25 kA
15	20 kA	25 kA
16	20 kA	25 kA
20	20 kA	25 kA
25	20 kA	25 kA
32	20 kA	25 kA
40	15 kA	20 kA
50	15 kA	20 kA
63	15 kA	20 kA

FAZ and NZMN2

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZMN2) = 50 kA
U_e = 133/230 V: I_{cu} (FAZ) = 20 kA
U_e = 133/230 V: I_{cu} (NZMN2) = 85 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZM at max. values)

	FAZ-I_n/1(2,3,4)/B(C) + NZMN2	
I_n [A]	U_e = 230/400 V	U_e = 133/230 V
0.16	50 kA	85 kA
0.25	50 kA	85 kA
0.5	50 kA	85 kA
0.75	50 kA	85 kA
1	50 kA	85 kA
1.5	50 kA	85 kA
2	50 kA	85 kA
2.5	50 kA	85 kA
3	50 kA	85 kA
3.5	50 kA	85 kA
4	50 kA	85 kA
5	50 kA	80 kA
6	50 kA	80 kA
8	50 kA	80 kA
10	50 kA	80 kA
12	30 kA	60 kA
13	30 kA	60 kA
15	30 kA	60 kA
16	30 kA	60 kA
20	30 kA	60 kA
25	30 kA	60 kA
32	30 kA	60 kA
40	20 kA	40 kA
50	20 kA	40 kA
63	20 kA	40 kA

FAZ and NZMH2

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZMH2) = 150 kA
U_e = 133/230 V: I_{cu} (FAZ) = 20 kA
U_e = 133/230 V: I_{cu} (NZMH2) = 150 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZM at max. values)

	FAZ-I_n/1(2,3,4)/B(C) + NZMH2	
I_n [A]	U_e = 230/400 V	U_e = 133/230 V
0.16	50 kA	85 kA
0.25	50 kA	85 kA
0.5	50 kA	85 kA
0.75	50 kA	85 kA
1	50 kA	85 kA
1.5	50 kA	85 kA
2	50 kA	85 kA
2.5	50 kA	85 kA
3	50 kA	85 kA
3.5	50 kA	85 kA
4	50 kA	85 kA
5	50 kA	80 kA
6	50 kA	80 kA
8	50 kA	80 kA
10	50 kA	80 kA
12	30 kA	60 kA
13	30 kA	60 kA
15	30 kA	60 kA
16	30 kA	60 kA
20	30 kA	60 kA
25	30 kA	60 kA
32	30 kA	60 kA
40	20 kA	40 kA
50	20 kA	40 kA
63	20 kA	40 kA

FAZ and NZML2

U_e = 230/400 V: I_{cu} (FAZ) = 15 kA
U_e = 230/400 V: I_{cu} (NZML2) = 150 kA
U_e = 133/230 V: I_{cu} (FAZ) = 20 kA
U_e = 133/230 V: I_{cu} (NZML2) = 150 kA
Back-up test acc. EN/IEC 60947-2, app. A: U = 1.05U_e, (O - t - CO)
(Settings NZM at max. values)

	FAZ-I_n/1(2,3,4)/B(C) + NZML2	
I_n [A]	U_e = 230/400 V	U_e = 133/230 V
0.16	50 kA	85 kA
0.25	50 kA	85 kA
0.5	50 kA	85 kA
0.75	50 kA	85 kA
1	50 kA	85 kA
1.5	50 kA	85 kA
2	50 kA	85 kA
2.5	50 kA	85 kA
3	50 kA	85 kA
3.5	50 kA	85 kA
4	50 kA	85 kA
5	50 kA	80 kA
6	50 kA	80 kA
8	50 kA	80 kA
10	50 kA	80 kA
12	30 kA	60 kA
13	30 kA	60 kA
15	30 kA	60 kA
16	30 kA	60 kA
20	30 kA	60 kA
25	30 kA	60 kA
32	30 kA	60 kA
40	20 kA	40 kA
50	20 kA	40 kA
63	20 kA	40 kA

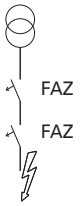
FAZ and NH

U_e = 230 V: I_{cu} (FAZ) = 15 (10) kA (acc. to IEC/EN 60947)
U_e = 500 V: I_{cu} (NH00 125 A gL / gG) = 120kA

	FAZ-I_n/B,(C),(D)... + NH00 125 A gL/gG
I_n [A]	IT-system U = 230 V
0.5	50 kA
1	50 kA
2	50 kA
3	50 kA
4	50 kA
6	50 kA
10	50 kA
13	50 kA
16	50 kA
20	50 kA
25	50 kA
32	50 kA
40	50 kA
50	50 kA
63	50 kA

Overload Selectivity FAZ

FAZ-B(C)(D) to FAZ-B



Upstream side FAZ, Characteristic B
Downstream side FAZ, Characteristic B, C, D

x ... Selectivity range (i.e. only the downstream switch drops in case I< I_s)

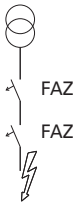
Upstream side →	**FAZ Characteristic B**												
Type B rated current I_n [A]	2	3	4	6	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]	7	10.5	14	21	35	45.5	56	70	87.5	112	140	175	220.5
Downstream side FAZ Characteristic B ↓													
2		x	x	x	x	x	x	x	x	x	x	x	x
3			x	x	x	x	x	x	x	x	x	x	x
4				x	x	x	x	x	x	x	x	x	x
6					x	x	x	x	x	x	x	x	x
10						x	x	x	x	x	x	x	x
13							x	x	x	x	x	x	x
16								x	x	x	x	x	x
20									x	x	x	x	x
25										x	x	x	x
32											x	x	x
40												x	x
50													x
63													

Upstream side →	**FAZ Characteristic B**												
Type B rated current I_n [A]	2	3	4	6	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]	7	10.5	14	21	35	45.5	56	70	87.5	112	140	175	220.5
Downstream side FAZ Characteristic C ↓													
0.5	x	x	x	x	x	x	x	x	x	x	x	x	x
1	x	x	x	x	x	x	x	x	x	x	x	x	x
2			x	x	x	x	x	x	x	x	x	x	x
3				x	x	x	x	x	x	x	x	x	x
4					x	x	x	x	x	x	x	x	x
6						x	x	x	x	x	x	x	x
8							x	x	x	x	x	x	x
10								x	x	x	x	x	x
13									x	x	x	x	x
16										x	x	x	x
20											x	x	x
25												x	x
32													x
40													
50													
63													

Upstream side →	**FAZ Characteristic B**												
Type B rated current I_n [A]	2	3	4	6	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]	7	10.5	14	21	35	45.5	56	70	87.5	112	140	175	220.5
Downstream side FAZ Characteristic D ↓													
2					x	x	x	x	x	x	x	x	x
4							x	x	x	x	x	x	x
6								x	x	x	x	x	x
10										x	x	x	x
13											x	x	x
16												x	x
20													x
25													
32													
40													

Overload Selectivity FAZ

FAZ-B(C)(D) to FAZ-C



Upstream side FAZ, Characteristic C
Downstream side FAZ, Characteristic B, C, D

x ... Selectivity range (i.e. only the downstream switch drops in case I< I_s)

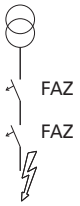
Upstream side →		**FAZ Characteristic C**															
Type B rated current I_n [A]		0.5	1	2	3	4	6	8	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]		2.85	5.7	11.4	17.1	22.8	34.2	45.6	57	74.1	91.2	114	142.5	182.4	228	285	359.1
Downstream side FAZ Characteristic B ↓	2				x	x	x	x	x	x	x	x	x	x	x	x	x
	3					x	x	x	x	x	x	x	x	x	x	x	x
	4						x	x	x	x	x	x	x	x	x	x	x
	6							x	x	x	x	x	x	x	x	x	x
	10									x	x	x	x	x	x	x	x
	13										x	x	x	x	x	x	x
	16											x	x	x	x	x	x
	20												x	x	x	x	x
	25													x	x	x	x
	32														x	x	x
	40															x	x
	50																x
	63																

Upstream side →		**FAZ Characteristic C**															
Type B rated current I_n [A]		0.5	1	2	3	4	6	8	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]		2.85	5.7	11.4	17.1	22.8	34.2	45.6	57	74.1	91.2	114	142.5	182.4	228	285	359.1
Downstream side FAZ Characteristic C ↓	0.5		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1			x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2				x	x	x	x	x	x	x	x	x	x	x	x	x
	3					x	x	x	x	x	x	x	x	x	x	x	x
	4						x	x	x	x	x	x	x	x	x	x	x
	6							x	x	x	x	x	x	x	x	x	x
	8								x	x	x	x	x	x	x	x	x
	10									x	x	x	x	x	x	x	x
	13										x	x	x	x	x	x	x
	16											x	x	x	x	x	x
	20												x	x	x	x	x
	25													x	x	x	x
	32														x	x	x
	40															x	x
	50																x
	63																

Upstream side →		**FAZ Characteristic C**															
Type B rated current I_n [A]		0.5	1	2	3	4	6	8	10	13	16	20	25	32	40	50	63
Selectivity limiting current I_s [A]		2.85	5.7	11.4	17.1	22.8	34.2	45.6	57	74.1	91.2	114	142.5	182.4	228	285	359.1
Downstream side FAZ Characteristic D ↓	2						x	x	x	x	x	x	x	x	x	x	x
	4							x	x	x	x	x	x	x	x	x	x
	6									x	x	x	x	x	x	x	x
	10											x	x	x	x	x	x
	13												x	x	x	x	x
	16													x	x	x	x
	20														x	x	x
	25															x	x
	32																
	40																

Overload Selectivity FAZ

FAZ-B(C)(D) to FAZ-D



Upstream side FAZ, Characteristic D
Downstream side FAZ, Characteristic B, C, D

x ... Selectivity range (i.e. only the downstream switch drops in case I< I_s)

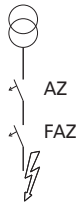
Upstream side →		**FAZ Characteristic D**									
Type B rated current I_n [A]		2	4	6	10	13	16	20	25	32	40
Selectivity limiting current I_s [A]		21	42	63	105	136.5	168	210	262.5	336	420
Downstream side FAZ Characteristic B ↓	2		x	x	x	x	x	x	x	x	x
	3		x	x	x	x	x	x	x	x	x
	4			x	x	x	x	x	x	x	x
	6				x	x	x	x	x	x	x
	10					x	x	x	x	x	x
	13						x	x	x	x	x
	16							x	x	x	x
	20								x	x	x
	25									x	x
	32										x
	40										
	50										
	63										

Upstream side →		**FAZ Characteristic D**									
Type B rated current I_n [A]		2	4	6	10	13	16	20	25	32	40
Selectivity limiting current I_s [A]		21	42	63	105	136.5	168	210	262.5	336	420
Downstream side FAZ Characteristic C ↓	0.5	x	x	x	x	x	x	x	x	x	x
	1	x	x	x	x	x	x	x	x	x	x
	2		x	x	x	x	x	x	x	x	x
	3		x	x	x	x	x	x	x	x	x
	4			x	x	x	x	x	x	x	x
	6				x	x	x	x	x	x	x
	8				x	x	x	x	x	x	x
	10					x	x	x	x	x	x
	13						x	x	x	x	x
	16							x	x	x	x
	20								x	x	x
	25									x	x
	32										x
	40										
	50										
	63										

Upstream side →		**FAZ Characteristic D**									
Type B rated current I_n [A]		2	4	6	10	13	16	20	25	32	40
Selectivity limiting current I_s [A]		21	42	63	105	136.5	168	210	262.5	336	420
Downstream side FAZ Characteristic D ↓	2		x	x	x	x	x	x	x	x	x
	4			x	x	x	x	x	x	x	x
	6				x	x	x	x	x	x	x
	10					x	x	x	x	x	x
	13						x	x	x	x	x
	16							x	x	x	x
	20								x	x	x
	25									x	x
	32										x
	40										

Overload Selectivity FAZ

FAZ-B(C)(D) to AZ-C



Upstream side AZ, Characteristic C
Downstream side FAZ, Characteristic B, C, D

x ... Selectivity range (i.e. only the downstream switch drops in case I< I_s)

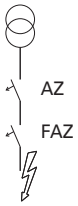
Upstream side →		**AZ Characteristic C**								
Type B rated current I_n [A]		20	25	32	40	50	63	80	100	125
Selectivity limiting current I_s [A]		130	163	208	260	325	410	520	650	813
Downstream side FAZ Characteristic B ↓	2	x	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x	x
	13	x	x	x	x	x	x	x	x	x
	16	x	x	x	x	x	x	x	x	x
	20		x	x	x	x	x	x	x	x
	25			x	x	x	x	x	x	x
	32				x	x	x	x	x	x
	40					x	x	x	x	x
	50						x	x	x	x
	63							x	x	x

Upstream side →		**AZ Characteristic C**								
Type B rated current I_n [A]		20	25	32	40	50	63	80	100	125
Selectivity limiting current I_s [A]		130	163	208	260	325	410	520	650	813
Downstream side FAZ Characteristic C ↓	0.5	x	x	x	x	x	x	x	x	x
	1	x	x	x	x	x	x	x	x	x
	2	x	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x	x
	8	x	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x	x
	13	x	x	x	x	x	x	x	x	x
	16	x	x	x	x	x	x	x	x	x
	20		x	x	x	x	x	x	x	x
	25			x	x	x	x	x	x	x
	32				x	x	x	x	x	x
	40					x	x	x	x	x
	50						x	x	x	x
	63							x	x	x

Upstream side →		**AZ Characteristic C**								
Type B rated current I_n [A]		20	25	32	40	50	63	80	100	125
Selectivity limiting current I_s [A]		130	163	208	260	325	410	520	650	813
Downstream side FAZ Characteristic D ↓	2	x	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x	x
	13		x	x	x	x	x	x	x	x
	16			x	x	x	x	x	x	x
	20				x	x	x	x	x	x
	25					x	x	x	x	x
	32						x	x	x	x
	40							x	x	x

Overload Selectivity FAZ

FAZ-B(C)(D) to AZ-D



Upstream side AZ, Characteristic D
Downstream side FAZ, Characteristic B, C, D

x ... Selectivity range (i.e. only the downstream switch drops in case I< I_s)

Upstream side →		**AZ Characteristic D**							
Type B rated current I_n [A]		20	25	32	40	50	63	80	100
Selectivity limiting current I_s [A]		230	285	365	450	550	680	850	1020
Downstream side FAZ Characteristic B ↓	2	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x
	13	x	x	x	x	x	x	x	x
	16	x	x	x	x	x	x	x	x
	20		x	x	x	x	x	x	x
	25			x	x	x	x	x	x
	32				x	x	x	x	x
	40					x	x	x	x
	50						x	x	x
	63							x	x

Upstream side →		**AZ Characteristic D**							
Type B rated current I_n [A]		20	25	32	40	50	63	80	100
Selectivity limiting current I_s [A]		230	285	365	450	550	680	850	1020
Downstream side FAZ Characteristic C ↓	0.5	x	x	x	x	x	x	x	x
	1	x	x	x	x	x	x	x	x
	2	x	x	x	x	x	x	x	x
	3	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x
	8	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x
	13	x	x	x	x	x	x	x	x
	16	x	x	x	x	x	x	x	x
	20		x	x	x	x	x	x	x
	25			x	x	x	x	x	x
	32				x	x	x	x	x
	40					x	x	x	x
	50						x	x	x
	63							x	x

Upstream side →		**AZ Characteristic D**							
Type B rated current I_n [A]		20	25	32	40	50	63	80	100
Selectivity limiting current I_s [A]		230	285	365	450	550	680	850	1020
Downstream side FAZ Characteristic D ↓	2	x	x	x	x	x	x	x	x
	4	x	x	x	x	x	x	x	x
	6	x	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x	x
	13	x	x	x	x	x	x	x	x
	16	x	x	x	x	x	x	x	x
	20		x	x	x	x	x	x	x
	25			x	x	x	x	x	x
	32				x	x	x	x	x
	40					x	x	x	x

Influence of the Line Frequency FAZ

On the Instantaneous Tripping Current I_{MA}

	Line Frequency f [Hz]						
	$16^2/_3$	50	60	100	200	300	400
$I_{MA}(f)/I_{MA}(50Hz)$ [%]	91	100	101	106	115	134	141

Miniature Circuit Breakers FAZ-T

SG56012

FAZ-T

- High-quality miniature circuit breakers for industrial and commercial applications
- Contact position indicator red - green
- Accessories suitable for subsequent installation
- Rated currents up to 40 A
- Tripping characteristics B, C, D
- Rated breaking capacity up to 25 kA according to EN 60947-2

FAZ-T Miniature Circuit Breakers (MCBs)
Characteristic B

SG53212

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	240/415	15	240	25	FAZT-B1/1	240770	12/120
2	240/415	15	240	25	FAZT-B2/1	240771	12/120
3	240/415	15	240	25	FAZT-B3/1	240772	12/120
4	240/415	15	240	25	FAZT-B4/1	240777	12/120
6	240/415	15	240	25	FAZT-B6/1	240782	12/120
10	240/415	15	240	25	FAZT-B10/1	240787	12/120
12	240/415	15	240	25	FAZT-B12/1	240792	12/120
13	240/415	15	240	25	FAZT-B13/1	240793	12/120
15	240/415	15	240	25	FAZT-B15/1	240794	12/120
16	240/415	15	240	25	FAZT-B16/1	240795	12/120
20	240/415	15	240	25	FAZT-B20/1	240796	12/120
25	240/415	15	240	25	FAZT-B25/1	240797	12/120
32	240/415	10	240	20	FAZT-B32/1	141907	12/120
40	240/415	10	240	20	FAZT-B40/1	141908	12/120

SG55412

1+N-pole

1	240	15	240	25	FAZT-B1/1N	240994	1/60
2	240	15	240	25	FAZT-B2/1N	240995	1/60
3	240	15	240	25	FAZT-B3/1N	240996	1/60
4	240	15	240	25	FAZT-B4/1N	240997	1/60
6	240	15	240	25	FAZT-B6/1N	240998	1/60
10	240	15	240	25	FAZT-B10/1N	240999	1/60
12	240	15	240	25	FAZT-B12/1N	241000	1/60
13	240	15	240	25	FAZT-B13/1N	241001	1/60
15	240	15	240	25	FAZT-B15/1N	241005	1/60
16	240	15	240	25	FAZT-B16/1N	241009	1/60
20	240	15	240	25	FAZT-B20/1N	241015	1/60
25	240	15	240	25	FAZT-B25/1N	241019	1/60
32	240	10	240	20	FAZT-B32/1N	142509	1/60
40	240	10	240	20	FAZT-B40/1N	142510	1/60

SG55212

2-pole

1	415	15	240/415	25	FAZT-B1/2	240820	1/60
2	415	15	240/415	25	FAZT-B2/2	240821	1/60
3	415	15	240/415	25	FAZT-B3/2	240822	1/60
4	415	15	240/415	25	FAZT-B4/2	240823	1/60
6	415	15	240/415	25	FAZT-B6/2	240824	1/60
10	415	15	240/415	25	FAZT-B10/2	240825	1/60
12	415	15	240/415	25	FAZT-B12/2	240826	1/60
13	415	15	240/415	25	FAZT-B13/2	240827	1/60
15	415	15	240/415	25	FAZT-B15/2	240828	1/60
16	415	15	240/415	25	FAZT-B16/2	240829	1/60
20	415	15	240/415	25	FAZT-B20/2	240830	1/60
25	415	15	240/415	25	FAZT-B25/2	240831	1/60
32	415	10	240/415	20	FAZT-B32/2	142485	1/60
40	415	10	240/415	20	FAZT-B40/2	142486	1/60

Miniature Circuit Breakers

SG53512

3-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	415	15	240/415	25	FAZT-B1/3	240874	1/40
2	415	15	240/415	25	FAZT-B2/3	240875	1/40
3	415	15	240/415	25	FAZT-B3/3	240876	1/40
4	415	15	240/415	25	FAZT-B4/3	240877	1/40
6	415	15	240/415	25	FAZT-B6/3	240878	1/40
10	415	15	240/415	25	FAZT-B10/3	240879	1/40
12	415	15	240/415	25	FAZT-B12/3	240880	1/40
13	415	15	240/415	25	FAZT-B13/3	240881	1/40
15	415	15	240/415	25	FAZT-B15/3	240882	1/40
16	415	15	240/415	25	FAZT-B16/3	240883	1/40
20	415	15	240/415	25	FAZT-B20/3	240884	1/40
25	415	15	240/415	25	FAZT-B25/3	240885	1/40
32	415	10	240/415	20	FAZT-B32/3	142493	1/40
40	415	10	240/415	20	FAZT-B40/3	142494	1/40

SG55912

3+N-pole

1	415	15	240/415	25	FAZT-B1/3N	241060	1/30
2	415	15	240/415	25	FAZT-B2/3N	241065	1/30
3	415	15	240/415	25	FAZT-B3/3N	241070	1/30
4	415	15	240/415	25	FAZT-B4/3N	241075	1/30
6	415	15	240/415	25	FAZT-B6/3N	241080	1/30
10	415	15	240/415	25	FAZT-B10/3N	241085	1/30
12	415	15	240/415	25	FAZT-B12/3N	241090	1/30
13	415	15	240/415	25	FAZT-B13/3N	241095	1/30
15	415	15	240/415	25	FAZT-B15/3N	241100	1/30
16	415	15	240/415	25	FAZT-B16/3N	241105	1/30
20	415	15	240/415	25	FAZT-B20/3N	241110	1/30
25	415	15	240/415	25	FAZT-B25/3N	241115	1/30
32	415	10	240/415	20	FAZT-B32/3N	142517	1/30
40	415	10	240/415	20	FAZT-B40/3N	142518	1/30

SG56012

4-pole

1	415	15	240/415	25	FAZT-B1/4	240922	1/30
2	415	15	240/415	25	FAZT-B2/4	240927	1/30
3	415	15	240/415	25	FAZT-B3/4	240930	1/30
4	415	15	240/415	25	FAZT-B4/4	240931	1/30
6	415	15	240/415	25	FAZT-B6/4	240932	1/30
10	415	15	240/415	25	FAZT-B10/4	240933	1/30
12	415	15	240/415	25	FAZT-B12/4	240934	1/30
13	415	15	240/415	25	FAZT-B13/4	240935	1/30
15	415	15	240/415	25	FAZT-B15/4	240936	1/30
16	415	15	240/415	25	FAZT-B16/4	240937	1/30
20	415	15	240/415	25	FAZT-B20/4	240938	1/30
25	415	15	240/415	25	FAZT-B25/4	240939	1/30
32	415	10	240/415	20	FAZT-B32/4	142501	1/30
40	415	10	240/415	20	FAZT-B40/4	142502	1/30

FAZ-T Miniature Circuit Breakers (MCBs)
Characteristic C

SG53212

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	240/415	15	240	25	FAZT-C1/1	240798	12/120
2	240/415	15	240	25	FAZT-C2/1	240799	12/120
3	240/415	15	240	25	FAZT-C3/1	240800	12/120
4	240/415	15	240	25	FAZT-C4/1	240801	12/120
6	240/415	15	240	25	FAZT-C6/1	240802	12/120
10	240/415	15	240	25	FAZT-C10/1	240803	12/120
12	240/415	15	240	25	FAZT-C12/1	240804	12/120
13	240/415	15	240	25	FAZT-C13/1	240805	12/120
15	240/415	15	240	25	FAZT-C15/1	240806	12/120
16	240/415	15	240	25	FAZT-C16/1	240807	12/120
20	240/415	15	240	25	FAZT-C20/1	240808	12/120
25	240/415	15	240	25	FAZT-C25/1	240809	12/120
32	240/415	10	240	20	FAZT-C32/1	141909	12/120
40	240/415	10	240	20	FAZT-C40/1	142480	12/120

SG55412

1+N-pole

1	240	15	240	25	FAZT-C1/1N	241022	1/60
2	240	15	240	25	FAZT-C2/1N	241023	1/60
3	240	15	240	25	FAZT-C3/1N	241024	1/60
4	240	15	240	25	FAZT-C4/1N	241025	1/60
6	240	15	240	25	FAZT-C6/1N	241026	1/60
10	240	15	240	25	FAZT-C10/1N	241027	1/60
12	240	15	240	25	FAZT-C12/1N	241028	1/60
13	240	15	240	25	FAZT-C13/1N	241029	1/60
15	240	15	240	25	FAZT-C15/1N	241030	1/60
16	240	15	240	25	FAZT-C16/1N	241034	1/60
20	240	15	240	25	FAZT-C20/1N	241038	1/60
25	240	15	240	25	FAZT-C25/1N	241044	1/60
32	240	10	240	20	FAZT-C32/1N	142511	1/60
40	240	10	240	20	FAZT-C40/1N	142512	1/60

SG55212

2-pole

1	415	15	240/415	25	FAZT-C1/2	240832	1/60
2	415	15	240/415	25	FAZT-C2/2	240833	1/60
3	415	15	240/415	25	FAZT-C3/2	240838	1/60
4	415	15	240/415	25	FAZT-C4/2	240843	1/60
6	415	15	240/415	25	FAZT-C6/2	240850	1/60
10	415	15	240/415	25	FAZT-C10/2	240855	1/60
12	415	15	240/415	25	FAZT-C12/2	240858	1/60
13	415	15	240/415	25	FAZT-C13/2	240859	1/60
15	415	15	240/415	25	FAZT-C15/2	240860	1/60
16	415	15	240/415	25	FAZT-C16/2	240861	1/60
20	415	15	240/415	25	FAZT-C20/2	240862	1/60
25	415	15	240/415	25	FAZT-C25/2	240863	1/60
32	415	10	240/415	20	FAZT-C32/2	142487	1/60
40	415	10	240/415	20	FAZT-C40/2	142488	1/60

Miniature Circuit Breakers

SG53512

3-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	415	15	240/415	25	FAZT-C1/3	240886	1/40
2	415	15	240/415	25	FAZT-C2/3	240887	1/40
3	415	15	240/415	25	FAZT-C3/3	240888	1/40
4	415	15	240/415	25	FAZT-C4/3	240889	1/40
6	415	15	240/415	25	FAZT-C6/3	240890	1/40
10	415	15	240/415	25	FAZT-C10/3	240891	1/40
12	415	15	240/415	25	FAZT-C12/3	240892	1/40
13	415	15	240/415	25	FAZT-C13/3	240893	1/40
15	415	15	240/415	25	FAZT-C15/3	240894	1/40
16	415	15	240/415	25	FAZT-C16/3	240895	1/40
20	415	15	240/415	25	FAZT-C20/3	240896	1/40
25	415	15	240/415	25	FAZT-C25/3	240897	1/40
32	415	10	240/415	20	FAZT-C32/3	142495	1/40
40	415	10	240/415	20	FAZT-C40/3	142496	1/40

SG55912

3+N-pole

1	415	15	240/415	25	FAZT-C1/3N	241120	1/30
2	415	15	240/415	25	FAZT-C2/3N	241125	1/30
3	415	15	240/415	25	FAZT-C3/3N	241130	1/30
4	415	15	240/415	25	FAZT-C4/3N	241135	1/30
6	415	15	240/415	25	FAZT-C6/3N	241140	1/30
10	415	15	240/415	25	FAZT-C10/3N	241145	1/30
12	415	15	240/415	25	FAZT-C12/3N	241150	1/30
13	415	15	240/415	25	FAZT-C13/3N	241155	1/30
15	415	15	240/415	25	FAZT-C15/3N	241160	1/30
16	415	15	240/415	25	FAZT-C16/3N	241165	1/30
20	415	15	240/415	25	FAZT-C20/3N	241170	1/30
25	415	15	240/415	25	FAZT-C25/3N	241175	1/30
32	415	10	240/415	20	FAZT-C32/3N	142519	1/30
40	415	10	240/415	20	FAZT-C40/3N	142520	1/30

SG56012

4-pole

1	415	15	240/415	25	FAZT-C1/4	240940	1/30
2	415	15	240/415	25	FAZT-C2/4	240941	1/30
3	415	15	240/415	25	FAZT-C3/4	240945	1/30
4	415	15	240/415	25	FAZT-C4/4	240949	1/30
6	415	15	240/415	25	FAZT-C6/4	240955	1/30
10	415	15	240/415	25	FAZT-C10/4	240959	1/30
12	415	15	240/415	25	FAZT-C12/4	240962	1/30
13	415	15	240/415	25	FAZT-C13/4	240963	1/30
15	415	15	240/415	25	FAZT-C15/4	240964	1/30
16	415	15	240/415	25	FAZT-C16/4	240965	1/30
20	415	15	240/415	25	FAZT-C20/4	240966	1/30
25	415	15	240/415	25	FAZT-C25/4	240967	1/30
32	415	10	240/415	20	FAZT-C32/4	142503	1/30
40	415	10	240/415	20	FAZT-C40/4	142504	1/30

FAZ-T Miniature Circuit Breakers (MCBs)
Characteristic D

SG53212

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	240/415	15	240	25	FAZT-D1/1	240810	12/120
2	240/415	15	240	25	FAZT-D2/1	240811	12/120
3	240/415	15	240	25	FAZT-D3/1	240812	12/120
4	240/415	15	240	25	FAZT-D4/1	240813	12/120
6	240/415	15	240	25	FAZT-D6/1	240814	12/120
10	240/415	15	240	25	FAZT-D10/1	240815	12/120
12	240/415	15	240	25	FAZT-D12/1	240816	12/120
13	240/415	15	240	25	FAZT-D13/1	240817	12/120
15	240/415	15	240	20	FAZT-D15/1	240818	12/120
16	240/415	15	240	20	FAZT-D16/1	240819	12/120
20	240/415	10	240	20	FAZT-D20/1	142481	12/120
25	240/415	10	240	15	FAZT-D25/1	142482	12/120
32	240/415	10	240	15	FAZT-D32/1	142483	12/120
40	240/415	10	240	15	FAZT-D40/1	142484	12/120

SG55412

1+N-pole

1	240	15	240	25	FAZT-D1/1N	241048	1/60
2	240	15	240	25	FAZT-D2/1N	241051	1/60
3	240	15	240	25	FAZT-D3/1N	241052	1/60
4	240	15	240	25	FAZT-D4/1N	241053	1/60
6	240	15	240	25	FAZT-D6/1N	241054	1/60
10	240	15	240	25	FAZT-D10/1N	241055	1/60
12	240	15	240	25	FAZT-D12/1N	241056	1/60
13	240	15	240	25	FAZT-D13/1N	241057	1/60
15	240	15	240	20	FAZT-D15/1N	241058	1/60
16	240	15	240	20	FAZT-D16/1N	241059	1/60
20	240	10	240	20	FAZT-D20/1N	142513	1/60
25	240	10	240	15	FAZT-D25/1N	142514	1/60
32	240	10	240	15	FAZT-D32/1N	142515	1/60
40	240	10	240	15	FAZT-D40/1N	142516	1/60

SG55212

2-pole

1	415	15	240/415	25	FAZT-D1/2	240864	1/60
2	415	15	240/415	25	FAZT-D2/2	240865	1/60
3	415	15	240/415	25	FAZT-D3/2	240866	1/60
4	415	15	240/415	25	FAZT-D4/2	240867	1/60
6	415	15	240/415	25	FAZT-D6/2	240868	1/60
10	415	15	240/415	25	FAZT-D10/2	240869	1/60
12	415	15	240/415	25	FAZT-D12/2	240870	1/60
13	415	15	240/415	25	FAZT-D13/2	240871	1/60
15	415	15	240/415	20	FAZT-D15/2	240872	1/60
16	415	15	240/415	20	FAZT-D16/2	240873	1/60
20	415	10	240/415	20	FAZT-D20/2	142489	1/60
25	415	10	240/415	15	FAZT-D25/2	142490	1/60
32	415	10	240/415	15	FAZT-D32/2	142491	1/60
40	415	10	240/415	15	FAZT-D40/2	142492	1/60

Miniature Circuit Breakers

SG53512

3-pole

Rated current I_n (A)	Rated voltage IEC/EN 60898-1 (V)	Breaking capacity acc. to IEC/EN 60898-1 (kA)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
1	415	15	240/415	25	FAZT-D1/3	240898	1/40
2	415	15	240/415	25	FAZT-D2/3	240899	1/40
3	415	15	240/415	25	FAZT-D3/3	240900	1/40
4	415	15	240/415	25	FAZT-D4/3	240901	1/40
6	415	15	240/415	25	FAZT-D6/3	240902	1/40
10	415	15	240/415	25	FAZT-D10/3	240903	1/40
12	415	15	240/415	25	FAZT-D12/3	240904	1/40
13	415	15	240/415	25	FAZT-D13/3	240905	1/40
15	415	15	240/415	25	FAZT-D15/3	240910	1/40
16	415	15	240/415	25	FAZT-D16/3	240915	1/40
20	415	10	240/415	20	FAZT-D20/3	142497	1/40
25	415	10	240/415	15	FAZT-D25/3	142498	1/40
32	415	10	240/415	15	FAZT-D32/3	142499	1/40
40	415	10	240/415	15	FAZT-D40/3	142500	1/40

SG55912

3+N-pole

1	415	15	240/415	25	FAZT-D1/3N	241180	1/30
2	415	15	240/415	25	FAZT-D2/3N	241181	1/30
3	415	15	240/415	25	FAZT-D3/3N	241182	1/30
4	415	15	240/415	25	FAZT-D4/3N	241183	1/30
6	415	15	240/415	25	FAZT-D6/3N	241184	1/30
10	415	15	240/415	25	FAZT-D10/3N	241185	1/30
12	415	15	240/415	25	FAZT-D12/3N	241186	1/30
13	415	15	240/415	25	FAZT-D13/3N	241187	1/30
15	415	15	240/415	25	FAZT-D15/3N	241188	1/30
16	415	15	240/415	25	FAZT-D16/3N	241189	1/30
20	415	10	240/415	20	FAZT-D20/3N	142521	1/30
25	415	10	240/415	15	FAZT-D25/3N	142522	1/30
32	415	10	240/415	15	FAZT-D32/3N	142523	1/30
40	415	10	240/415	15	FAZT-D40/3N	142524	1/30

SG56012

4-pole

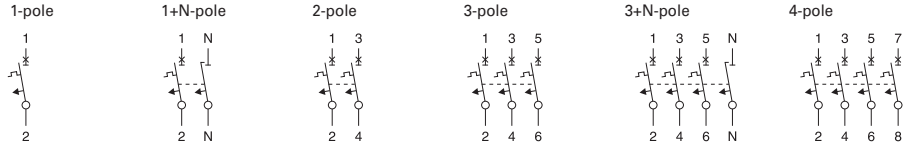
1	415	15	240/415	25	FAZT-D1/4	240968	1/30
2	415	15	240/415	25	FAZT-D2/4	240969	1/30
3	415	15	240/415	25	FAZT-D3/4	240970	1/30
4	415	15	240/415	25	FAZT-D4/4	240971	1/30
6	415	15	240/415	25	FAZT-D6/4	240975	1/30
10	415	15	240/415	25	FAZT-D10/4	240979	1/30
12	415	15	240/415	25	FAZT-D12/4	240985	1/30
13	415	15	240/415	25	FAZT-D13/4	240989	1/30
15	415	15	240/415	25	FAZT-D15/4	240992	1/30
16	415	15	240/415	25	FAZT-D16/4	240993	1/30
20	415	10	240/415	20	FAZT-D20/4	142505	1/30
25	415	10	240/415	15	FAZT-D25/4	142506	1/30
32	415	10	240/415	15	FAZT-D32/4	142507	1/30
40	415	10	240/415	15	FAZT-D40/4	142508	1/30

Specifications FAZ-T

Technical data

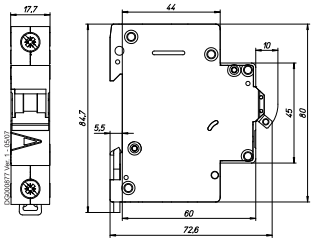
		FAZ-T
Productstandard		IEC/EN 60947-2 IEC/EN 60898-1
Number of poles		1, 1p+N, 2, 3, 3p+N, 4
Mechanical specifications		
Device width		17.7 mm (1p), 27 mm (1p+N), 36 mm (2p), 54 mm (3p), 72mm (3p+N), 72 mm (4p)
Frame size		45 mm
Socket size		80 mm
Device depth		60 mm
Terminals		lift terminal
Terminal capacity rigid solid/stranded wire		1-25 mm^2
Terminal screw		M5 (with slotted screw acc. to EN ISO 4757-Z2, PZ2)
Terminal torque		max. 2.4 Nm
Snap on fixing		tristable (on DIN rail acc. to EN 50022)
Finger proof		acc. to VBG4, ÖVE EN-6
Degree of Protection (DIN VDE 0470)		
Surface mounted		IP 20
Built-in behind panel		IP 40
Contact position indicator		red / green
Electrical specifications		
Rated voltage	U_n	240/415Vac 60Vdc per pole
Rated current	I_n	Type B, C, D: 1, 2, 3, 4, 6, 10, 12, 13, 15, 16, 20, 25, 32, 40 A
Rated insulation voltage	U_i	440 V
Rated impulse withstand voltage	U_{imp}	4 kV (1.2/50)µsec
Tripping characteristic		
Conventional non-tripping current		I_{nt}=1.13 I_n
Conventional tripping current		I_t=1.45 I_n
Reference temperature		30 °C
Temperature factor		0.4% /K
Instantaneous tripping current	I_{mt}	type B: 3 I_n < I_{mt} = 5 I_n:t (I_{mt}) < 0.1 sec type C: 5 I_n < I_{mt} = 10 I_n:t (I_{mt}) < 0.1 sec type D: 10 I_n < I_{mt} = 20 I_n:t (I_{mt}) < 0.1 sec
Rated ultimate short-circuit braking capacity	I_{cu} (IEC/EN 60947-2)	
	type B	1-25 A: 25 kA, 32-40 A: 20 kA
	type C	1-25 A: 25 kA, 32-40 A: 20 kA
	type D	1p/1p+N/2p - 1-13 A: 25 kA, 15-20 A: 20 kA, 25-40 A: 15 kA 3p/3p+N/4p - 1-16 A: 25 kA, 20 A: 20 kA, 25-40 A: 15 kA
Rated service short-circuit braking capacity	I_{cs} (IEC/EN 60947-2)	for I_{cu} = 25 kA --> I_{cs} = 12.5 kA for I_{cu} = 20 kA --> I_{cs} = 10 kA for I_{cu} = 15 kA --> I_{cs} = 7.5 kA
Rated short-circuit braking capacity	I_{cn} (IEC/EN 60898-1)	
	type B	1-25 A: 15 kA, 32-40 A: 10 kA
	type C	1-25 A: 15 kA, 32-40 A: 10 kA
	type D	1-16 A: 15 kA, 20-40 A: 10 kA
Selectivity class		3 (acc. to EN 60898)
Number of electrical operations		> 4000 (IEC/EN 60898)
Number of mechanical operations		> 10000 (IEC/EN 60947)
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Operating temperature range		-40°C to +75°C

Connection diagram

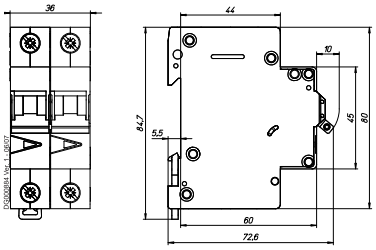


Dimensions (mm) FAZ-T

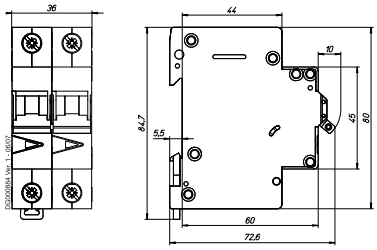
1-pole



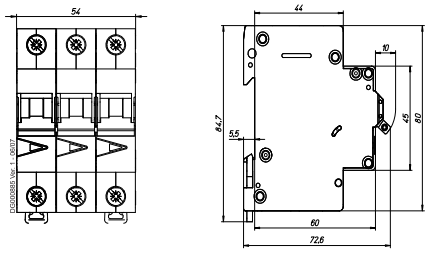
1+N-pole



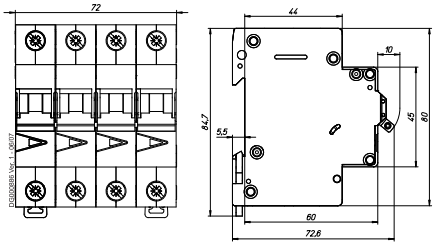
2-pole



3-pole

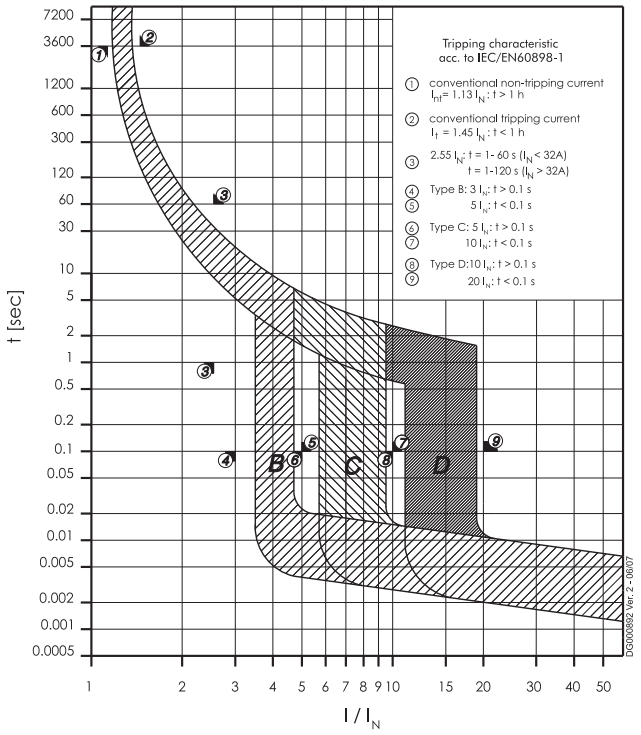


3+N-pole, 4-pole



Tripping Characteristic FAZ-T

Characteristics B, C and D - EN60898



Power Loss at I_n FAZ-T

Type B

In [A]	1p P [W]	1pN P [W]	2p P [W]	3p P [W	3pN* P [W]	4p P [W]
1	1.6	1.7	3.1	4.7	4.8	6.3
2	1.4	1.5	2.8	4.1	4.3	5.5
3	2.5	2.7	5.0	7.6	7.8	10.1
4	1.4	1.6	2.9	4.4	4.5	5.8
6	1.8	2.0	3.6	5.5	5.6	7.3
10	1.9	2.1	3.9	5.9	6.1	7.8
12	2.8	3.2	5.9	8.7	9.0	11.5
13	2.5	2.9	5.3	7.8	8.1	10.3
15	2.1	2.4	4.4	6.5	6.7	8.6
16	2.2	2.6	4.7	6.9	7.2	9.1
20	3.2	3.6	6.6	9.8	10.1	13.0
25	3.0	3.5	6.4	9.4	9.7	12.4
32	3.7	4.4	8.1	12.1	12.5	15.8
40	3.4	4.1	7.5	11.2	11.5	14.6

*symmetrical load

Type C

In [A]	1p P [W]	1pN P [W]	2p P [W]	3p P [W	3pN* P [W]	4p P [W]
1	1.6	1.7	3.1	4.7	4.8	6.3
2	1.4	1.5	2.8	4.1	4.3	5.5
3	1.2	1.3	2.4	3.6	3.7	4.8
4	1.4	1.6	2.9	4.4	4.5	5.8
6	1.5	1.6	2.9	4.4	4.6	5.9
10	1.5	1.7	3.0	4.6	4.7	6.1
12	2.1	2.4	4.4	6.5	6.8	8.6
13	2.5	2.9	5.3	7.8	8.1	10.3
15	2.1	2.4	4.4	6.5	6.7	8.6
16	2.2	2.6	4.7	6.9	7.2	9.1
20	3.2	3.6	6.6	9.8	10.1	13.0
25	3.0	3.5	6.4	9.4	9.7	12.4
32	3.7	4.4	8.1	12.1	12.5	15.8
40	3.4	4.1	7.5	11.2	11.5	14.6

*symmetrical load

Type D

In [A]	1p P [W]	1pN P [W]	2p P [W]	3p P [W	3pN* P [W]	4p P [W]
1	0.8	0.9	1.6	2.4	2.5	3.2
2	1.0	1.1	2.0	3.0	3.1	4.0
3	1.2	1.3	2.4	3.6	3.7	4.8
4	1.4	1.6	2.9	4.4	4.5	5.8
6	1.5	1.6	2.9	4.4	4.6	5.9
10	1.5	1.7	3.0	4.6	4.7	6.1
12	1.7	2.0	3.6	5.3	5.4	7.0
13	1.9	2.2	4.0	5.9	6.1	7.8
15	2.1	2.4	4.4	6.5	6.7	8.6
16	2.2	2.6	4.7	6.9	7.2	9.1
20	2.0	2.2	4.1	6.1	6.2	8.1
25	2.5	2.9	5.2	7.7	7.9	10.2
32	3.4	4.0	7.4	11.1	11.4	14.5
40	3.2	3.8	7.0	10.4	10.7	13.6

*symmetrical load

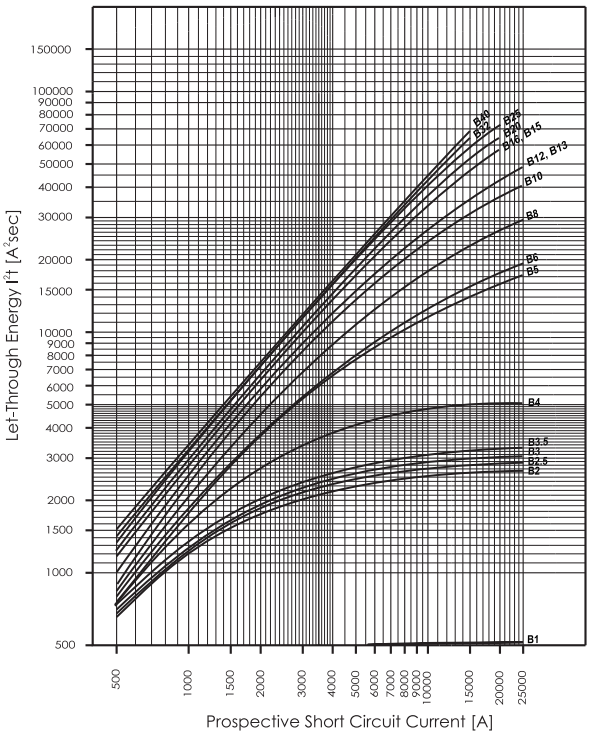
Influence of Ambient Temperature FAZ-T

On Load Carrying Capacity (temperature derating)

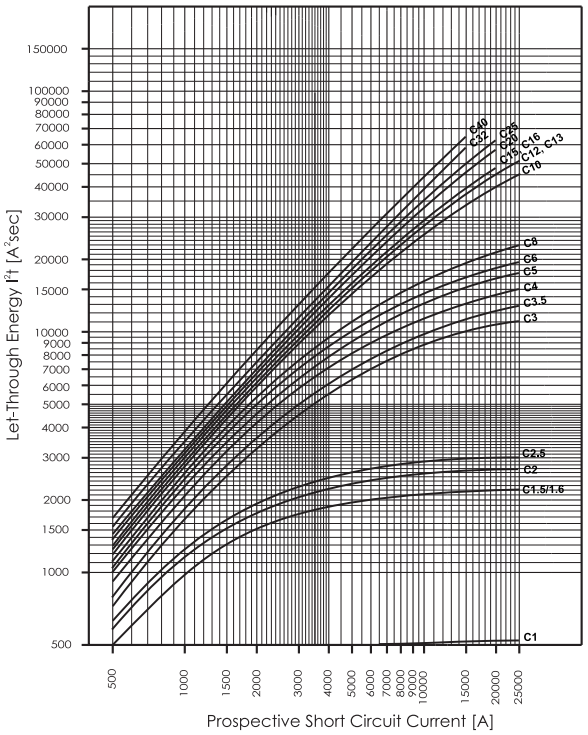
	Ambient temperature T [°C]																
I_N [A]	-40	-30	-20	-10	0	10	20	30	35	40	45	50	55	60	65	70	75
1	1.3	1.2	1.2	1.2	1.1	1.1	1	1	0.99	0.97	0.95	0.93	0.9	0.89	0.87	0.85	0.83
2	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2	2	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.7
3	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3	3	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.5
4	5.1	5	4.8	4.7	4.5	4.3	4.2	4	3.9	3.9	3.8	3.7	3.6	3.5	3.5	3.4	3.3
6	7.7	7.5	7.2	7	6.7	6.5	6.3	6	5.9	5.8	5.7	5.6	5.4	5.3	5.2	5.1	5
10	13	12	12	12	11	11	10	10	9.9	9.7	9.5	9.3	9	8.9	8.7	8.5	8.3
12	15	15	14	14	13	13	13	12	12	12	11	11	11	11	10	10	10
13	17	16	16	15	15	14	14	13	13	13	12	12	12	12	11	11	11
15	19	19	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12
16	20	20	19	19	18	17	17	16	16	15	15	15	14	14	14	14	13
20	26	25	24	23	22	22	21	20	20	19	19	19	18	18	17	17	17
25	32	31	30	29	28	27	26	25	25	24	24	23	23	22	22	21	21
32	41	40	38	37	36	35	33	32	32	31	30	30	29	28	28	27	26
40	51	50	48	47	45	43	42	40	39	39	38	37	36	35	35	34	33

Maximum Let-Through Energy FAZ-T

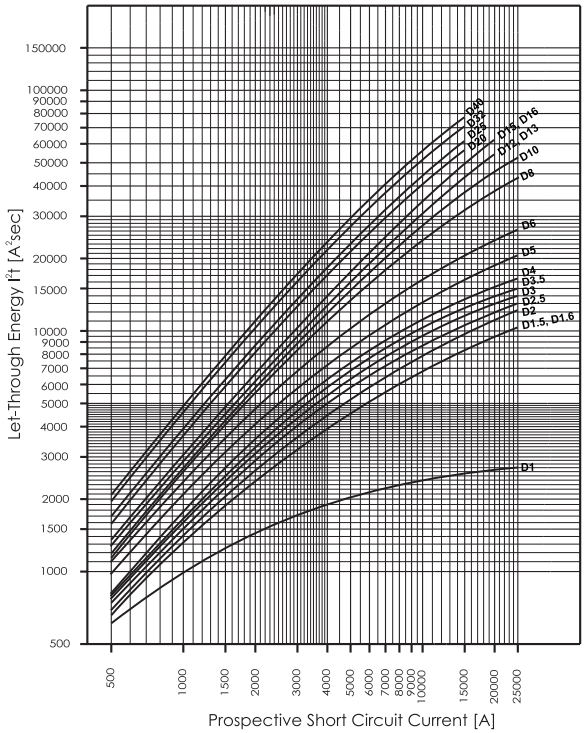
Type B



Type C

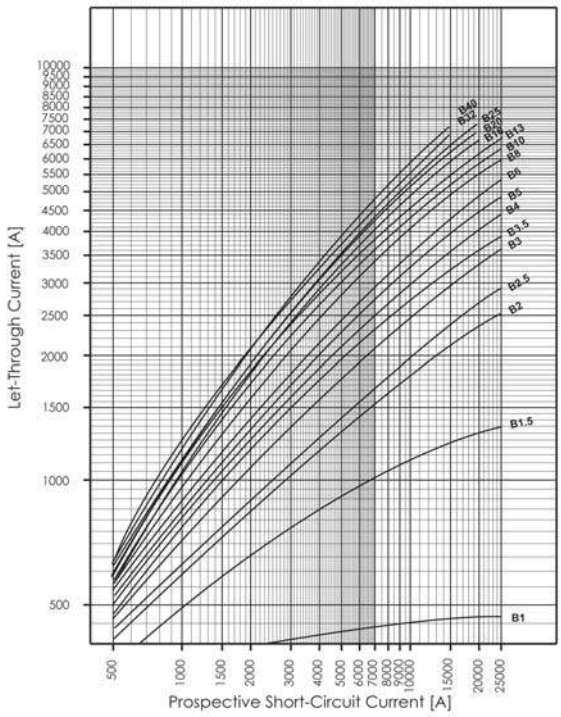


Type D

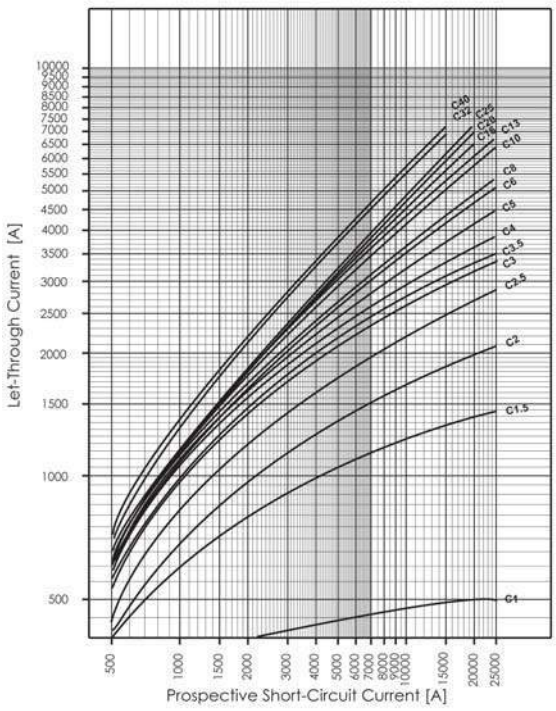


Maximum Let-Through Current FAZ-T

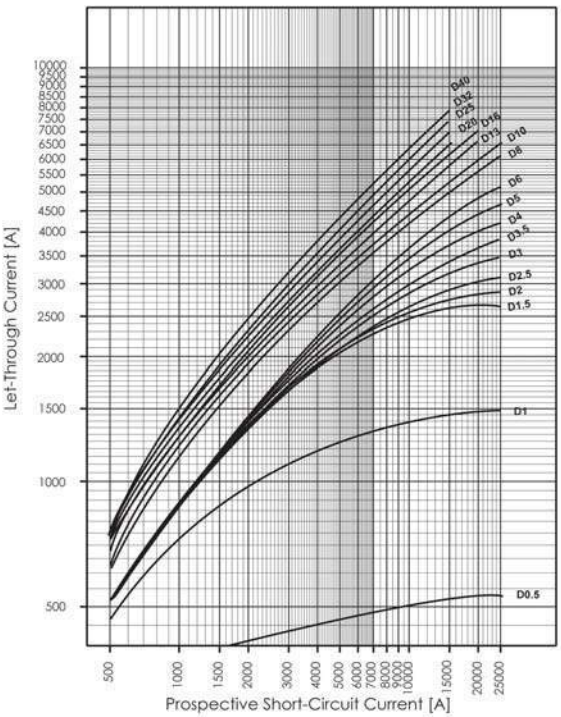
Type B



Type C



Type D

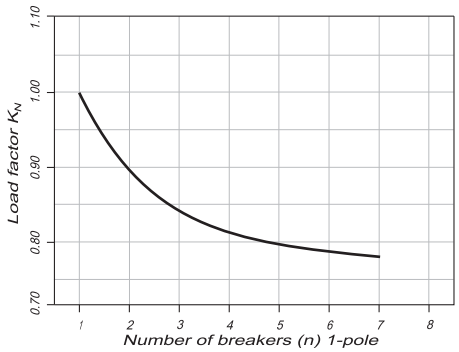


Influence of the Line Frequency FAZ-T

On the Instantaneous Tripping Current I_{MA}

	Line Frequency f [Hz]						
	$16^2/_3$	50	60	100	200	300	400
$I_{MA}(f)/I_{MA}(50Hz)$ [%]	91	100	101	106	115	134	141

Load rating in case of circuit breakers arranged one next to the other FAZ-T



Miniature Circuit Breakers FAZ-DC

SG53312

FAZ-DC

- High-quality miniature circuit breakers for DC-applications
- Contact position indicator red - green
- Guide for secure terminal connection (not for FAZ-NA)
- 3-position DIN rail clip, permits removal from existing busbar system
- Comprehensive range of accessories suitable for subsequent installation
- Rated currents up to 50 A
- Tripping characteristic C
- Rated breaking capacity 10 kA according to IEC/EN 60947-2
- Up to 250 V DC pro pole

FAZ-...-DC Miniature Circuit Breakers (MCBs)
Characteristic C

SG54512

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V DC)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Type Designation	Article No.	Units per package
2	220	10	FAZ-C2/1-DC	279122	12/120
3	250	10	FAZ-C3/1-DC	279123	12/120
4	250	10	FAZ-C4/1-DC	279124	12/120
6	250	10	FAZ-C6/1-DC	279125	12/120
10	250	10	FAZ-C10/1-DC	279126	12/120
13	250	10	FAZ-C13/1-DC	279127	12/120
16	250	10	FAZ-C16/1-DC	279128	12/120
20	250	10	FAZ-C20/1-DC	279129	12/120
25	250	10	FAZ-C25/1-DC	279130	12/120
32	250	10	FAZ-C32/1-DC	279131	12/120
40	250	10	FAZ-C40/1-DC	279132	12/120
50	250	10	FAZ-C50/1-DC	279133	12/120

SG53312

2-pole

2	440	10	FAZ-C2/2-DC	279134	1/60
3	500	10	FAZ-C3/2-DC	279135	1/60
4	500	10	FAZ-C4/2-DC	279136	1/60
6	500	10	FAZ-C6/2-DC	279137	1/60
10	500	10	FAZ-C10/2-DC	279138	1/60
13	500	10	FAZ-C13/2-DC	279139	1/60
16	500	10	FAZ-C16/2-DC	279140	1/60
20	500	10	FAZ-C20/2-DC	279141	1/60
25	500	10	FAZ-C25/2-DC	279142	1/60
32	500	10	FAZ-C32/2-DC	279143	1/60
40	500	10	FAZ-C40/2-DC	279144	1/60
50	500	10	FAZ-C50/2-DC	279145	1/60

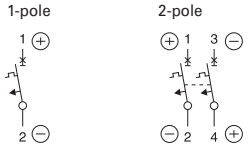
Specifications FAZ-DC

Technical data

		FAZ-DC *)
Productstandard		IEC/EN 60947-2
Number of poles		1, 2
Mechanical specifications		
Device width		17.7 mm (1p), 36 mm (2p)
Frame size		45 mm
Socket size		80 mm
Device depth		60 mm
Terminals		lift terminal
Terminal capacity rigid solid/stranded wire		1-25 mm^2
Terminal screw		M5 (with slotted screw acc. to EN ISO 4757-Z2, PZ2)
Terminal torque		max. 2.4 Nm
Snap on fixing		tristable (on DIN rail acc. to EN 50022)
Finger proof		acc. to VBG4, ÖVE EN-6
Degree of Protection (DIN VDE 0470)		
Surface mounted		IP 20
Built-in behind panel		IP 40
Contact position indicator		red / green
Electrical specifications		
Rated voltage DC	U_n	2 A type: 220V (per pole) 3-50 A types: 250V (per pole)
Rated current	I_n	Type C: 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50 A
Rated insulation voltage	U_i	440 V
Rated impulse withstand voltage	U_{imp}	4 kV (1.2/50)µsec
Tripping characteristic		
Conventional non-tripping current		I_{nt}=1.13 I_n
Conventional tripping current		I_t=1.45 I_n
Reference temperature		30 °C
Temperature factor		0.4% /K
Instantaneous tripping current	I_{mt}	type C: 7 I_n < I_{mt} = 15 I_n:t (I_{mt}) < 0.1 sec
Rated short-circuit braking capacity	I_{cu}	10 kA
Selectivity class		3
Number of electrical operations		> 4000
Number of mechanical operations		> 20000
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Operating temperature range		-40°C to +75°C

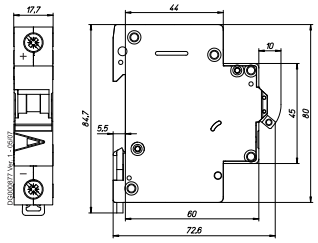
*) not for PV string protection!

Connection diagram

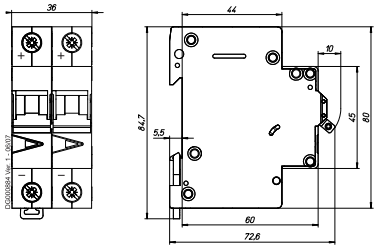


Dimensions (mm) FAZ-...-DC

1-pole

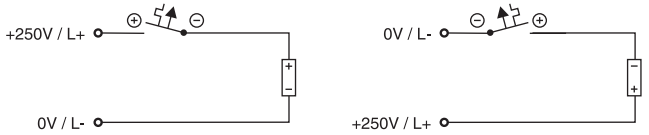


2-pole

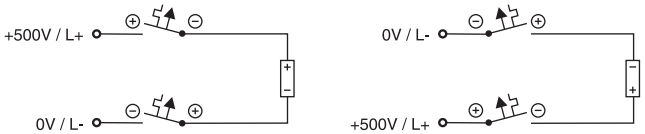


Connection examples FAZ-...-DC

Connection example at 250V=, 1-pole

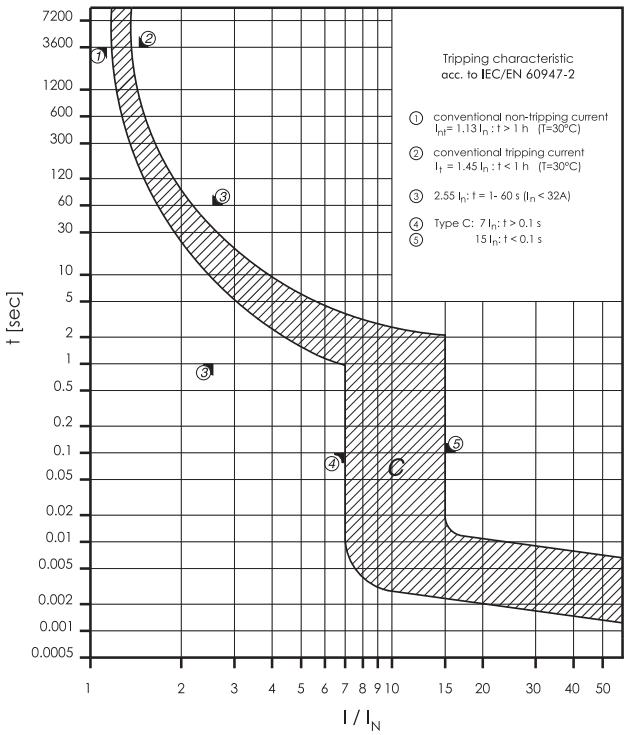


Connection example at 500V=, 2-pole



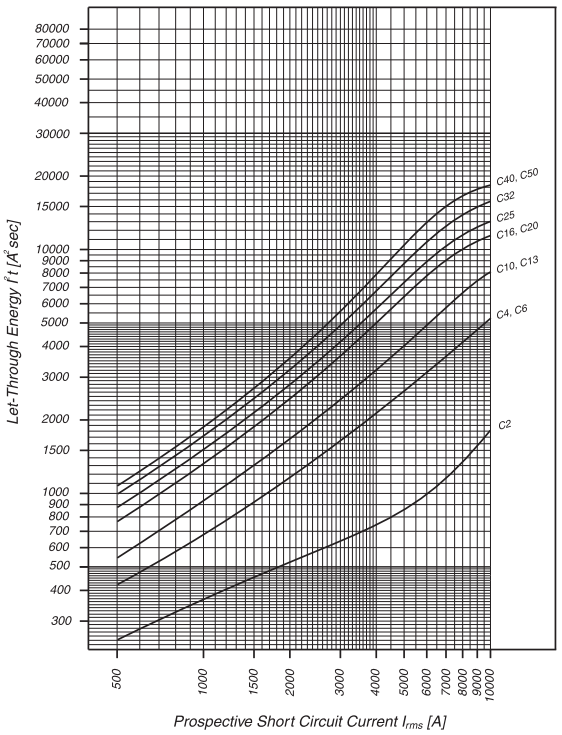
Tripping Characteristic FAZ-...-DC

Characteristics C - IEC/EN 60947-2



Maximum Let-Through Energy FAZ-...-DC

Type C



Miniature Circuit Breakers FAZ-NA, FAZ-RT, FAZ-DU

SG56912

FAZ-NA/-RT/-DU

- According to UL 489, CSA C22.2 No. 5 and also IEC 60947-2 standard
- For Applications, wich are permitted for UL 1077 or CSA C22.2 No. 235
- Auxiliary switch and voltage trips suitable for subsequent installation
- Serie with removable terminal screws (Type FAZ-..-RT/-DU), for use with ring cable lug
- Contact position indicator red - green
- Easy mounting at DIN-rail

FAZ-...-NA Miniature Circuit Breakers (MCBs)
Characteristic B

SG53012

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	Type Designation	Article No.	Units per package
1	240/415	15	277	10	SWD	AWG 18	FAZ-B1/1-NA	132414	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-B1,5/1-NA	132415	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-B2/1-NA	132416	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-B3/1-NA	132417	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-B4/1-NA	132418	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-B5/1-NA	132419	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-B6/1-NA	132680	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-B7/1-NA	132681	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-B8/1-NA	132682	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-B10/1-NA	132683	12/120
13	240/415	15	277	10	SWD		FAZ-B13/1-NA	132684	12/120
15	240/415	15	277	14	SWD		FAZ-B15/1-NA	132685	12/120
16	240/415	15	277	14	SWD		FAZ-B16/1-NA	132686	12/120
20	240/415	15	277	14	SWD		FAZ-B20/1-NA	132687	12/120
25	240/415	15	277	14			FAZ-B25/1-NA	132688	12/120
30	240/415	15	277	10			FAZ-B30/1-NA	132689	12/120
32	240/415	15	277	10			FAZ-B32/1-NA	132690	12/120
35	240/415	15	240	10			FAZ-B35/1-NA	132691	12/120
40	240/415	15	240	10			FAZ-B40/1-NA	132692	12/120

SG56812

2-pole

1	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1/2-NA	132693	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1,5/2-NA	132694	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-B2/2-NA	132695	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-B3/2-NA	132696	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-B4/2-NA	132697	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B5/2-NA	132698	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-B6/2-NA	132699	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-B7/2-NA	132700	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-B8/2-NA	132701	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-B10/2-NA	132702	1/60
13	415	15	480Y/277	10	SWD		FAZ-B13/2-NA	132703	1/60
15	415	15	480Y/277	14	SWD		FAZ-B15/2-NA	132704	1/60
16	415	15	480Y/277	14	SWD		FAZ-B16/2-NA	132705	1/60
20	415	15	480Y/277	14	SWD		FAZ-B20/2-NA	132706	1/60
25	415	15	480Y/277	14			FAZ-B25/2-NA	132707	1/60
30	415	15	480Y/277	10			FAZ-B30/2-NA	132708	1/60
32	415	15	480Y/277	10			FAZ-B32/2-NA	132709	1/60
35	415	15	240	10			FAZ-B35/2-NA	132710	1/60
40	415	15	240	10			FAZ-B40/2-NA	132711	1/60

SG56912

3-pole

1	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1/3-NA	132712	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1,5/3-NA	132713	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-B2/3-NA	132714	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-B3/3-NA	132715	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-B4/3-NA	132716	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B5/3-NA	132717	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-B6/3-NA	132718	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-B7/3-NA	132719	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-B8/3-NA	132720	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-B10/3-NA	132721	1/40
13	415	15	480Y/277	10	SWD		FAZ-B13/3-NA	132722	1/40
15	415	15	480Y/277	14	SWD		FAZ-B15/3-NA	132723	1/40
16	415	15	480Y/277	14	SWD		FAZ-B16/3-NA	132724	1/40
20	415	15	480Y/277	14	SWD		FAZ-B20/3-NA	132725	1/40
25	415	15	480Y/277	14			FAZ-B25/3-NA	132726	1/40
30	415	15	480Y/277	10			FAZ-B30/3-NA	132727	1/40
32	415	15	480Y/277	10			FAZ-B32/3-NA	132728	1/40
35	415	15	240	10			FAZ-B35/3-NA	132729	1/40
40	415	15	240	10			FAZ-B40/3-NA	132730	1/40

FAZ-...-NA Miniature Circuit Breakers (MCBs)
Characteristic C

SG53012

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	Type Designation	Article No.	Units per package
0.5	240/415	15	277	10	SWD	AWG 18	FAZ-C0,5/1-NA	181883	12/120
1	240/415	15	277	10	SWD	AWG 18	FAZ-C1/1-NA	181885	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-C1,5/1-NA	181887	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-C2/1-NA	181889	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-C3/1-NA	181891	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-C4/1-NA	181893	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-C5/1-NA	181895	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-C6/1-NA	181897	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-C7/1-NA	181899	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-C8/1-NA	181901	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-C10/1-NA	181903	12/120
13	240/415	15	277	10	SWD		FAZ-C13/1-NA	181905	12/120
15	240/415	15	277	14	SWD		FAZ-C15/1-NA	181907	12/120
16	240/415	15	277	14	SWD		FAZ-C16/1-NA	181909	12/120
20	240/415	15	277	14	SWD		FAZ-C20/1-NA	181911	12/120
25	240/415	15	277	14			FAZ-C25/1-NA	181913	12/120
30	240/415	15	277	10			FAZ-C30/1-NA	181915	12/120
32	240/415	15	277	10			FAZ-C32/1-NA	181917	12/120
35	240/415	15	240	10			FAZ-C35/1-NA	181919	12/120
40	240/415	15	240	10			FAZ-C40/1-NA	181921	12/120

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2-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C0,5/2-NA	181923	1/60
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1/2-NA	181925	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1,5/2-NA	181927	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-C2/2-NA	181929	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-C3/2-NA	181931	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-C4/2-NA	181933	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C5/2-NA	181935	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-C6/2-NA	181937	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-C7/2-NA	181939	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-C8/2-NA	181941	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-C10/2-NA	181943	1/60
13	415	15	480Y/277	10	SWD		FAZ-C13/2-NA	181945	1/60
15	415	15	480Y/277	14	SWD		FAZ-C15/2-NA	181947	1/60
16	415	15	480Y/277	14	SWD		FAZ-C16/2-NA	181949	1/60
20	415	15	480Y/277	14	SWD		FAZ-C20/2-NA	181951	1/60
25	415	15	480Y/277	14			FAZ-C25/2-NA	181953	1/60
30	415	15	480Y/277	10			FAZ-C30/2-NA	181955	1/60
32	415	15	480Y/277	10			FAZ-C32/2-NA	181957	1/60
35	415	15	240	10			FAZ-C35/2-NA	181959	1/60
40	415	15	240	10			FAZ-C40/2-NA	181961	1/60

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3-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C0,5/3-NA	181963	1/40
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1/3-NA	181965	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1,5/3-NA	181967	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-C2/3-NA	181969	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-C3/3-NA	181971	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-C4/3-NA	181973	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C5/3-NA	181975	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-C6/3-NA	181977	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-C7/3-NA	181979	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-C8/3-NA	181981	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-C10/3-NA	181983	1/40
13	415	15	480Y/277	10	SWD		FAZ-C13/3-NA	181985	1/40
15	415	15	480Y/277	14	SWD		FAZ-C15/3-NA	181987	1/40
16	415	15	480Y/277	14	SWD		FAZ-C16/3-NA	181989	1/40
20	415	15	480Y/277	14	SWD		FAZ-C20/3-NA	181991	1/40
25	415	15	480Y/277	14			FAZ-C25/3-NA	181993	1/40
30	415	15	480Y/277	10			FAZ-C30/3-NA	181995	1/40
32	415	15	480Y/277	10			FAZ-C32/3-NA	181997	1/40
35	415	15	240	10			FAZ-C35/3-NA	181999	1/40
40	415	15	240	10			FAZ-C40/3-NA	182001	1/40

FAZ-...-NA Miniature Circuit Breakers (MCBs)
Characteristic D

SG53012

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	Type Designation	Article No.	Units per package
0.5	240/415	15	277	10	SWD	AWG 18	FAZ-D0,5/1-NA	182003	12/120
1	240/415	15	277	10	SWD	AWG 18	FAZ-D1/1-NA	182005	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-D1,5/1-NA	182007	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-D2/1-NA	182009	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-D3/1-NA	182011	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-D4/1-NA	182013	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-D5/1-NA	182015	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-D6/1-NA	182017	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-D7/1-NA	182019	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-D8/1-NA	182021	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-D10/1-NA	181831	12/120
13	240/415	15	277	14	SWD		FAZ-D13/1-NA	181833	12/120
15	240/415	15	277	14	SWD		FAZ-D15/1-NA	181835	12/120
16	240/415	15	277	14	SWD		FAZ-D16/1-NA	181837	12/120
20	240/415	15	277	14	SWD		FAZ-D20/1-NA	181839	12/120
25	240/415	15	277	10			FAZ-D25/1-NA	181841	12/120
30	240/415	15	277	10			FAZ-D30/1-NA	182023	12/120
32	240/415	15	277	10			FAZ-D32/1-NA	182025	12/120
35	240/415	15	240	10			FAZ-D35/1-NA	182027	12/120
40	240/415	15	240	10			FAZ-D40/1-NA	182029	12/120

SG56812

2-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D0,5/2-NA	182031	1/60
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1/2-NA	182033	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1,5/2-NA	182035	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-D2/2-NA	182037	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-D3/2-NA	182039	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-D4/2-NA	182041	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D5/2-NA	182043	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-D6/2-NA	182045	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-D7/2-NA	182047	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-D8/2-NA	182049	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-D10/2-NA	182051	1/60
13	415	15	480Y/277	14	SWD		FAZ-D13/2-NA	182053	1/60
15	415	15	480Y/277	14	SWD		FAZ-D15/2-NA	182055	1/60
16	415	15	480Y/277	14	SWD		FAZ-D16/2-NA	182057	1/60
20	415	15	480Y/277	14	SWD		FAZ-D20/2-NA	182059	1/60
25	415	15	480Y/277	10			FAZ-D25/2-NA	182061	1/60
30	415	15	480Y/277	10			FAZ-D30/2-NA	182063	1/60
32	415	15	480Y/277	10			FAZ-D32/2-NA	182065	1/60
35	415	15	240	10			FAZ-D35/2-NA	182067	1/60
40	415	15	240	10			FAZ-D40/2-NA	182069	1/60

SG56912

3-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D0,5/3-NA	182071	1/40
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1/3-NA	182073	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1,5/3-NA	182075	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-D2/3-NA	182077	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-D3/3-NA	182079	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-D4/3-NA	182081	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D5/3-NA	182083	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-D6/3-NA	182085	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-D7/3-NA	182087	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-D8/3-NA	182089	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-D10/3-NA	182091	1/40
13	415	15	480Y/277	14	SWD		FAZ-D13/3-NA	182093	1/40
15	415	15	480Y/277	14	SWD		FAZ-D15/3-NA	182095	1/40
16	415	15	480Y/277	14	SWD		FAZ-D16/3-NA	182097	1/40
20	415	15	480Y/277	14	SWD		FAZ-D20/3-NA	182099	1/40
25	415	15	480Y/277	10			FAZ-D25/3-NA	182101	1/40
30	415	15	480Y/277	10			FAZ-D30/3-NA	182103	1/40
32	415	15	480Y/277	10			FAZ-D32/3-NA	182105	1/40
35	415	15	240	10			FAZ-D35/3-NA	182107	1/40
40	415	15	240	10			FAZ-D40/3-NA	182109	1/40

FAZ-...-RT/-DU Miniature Circuit Breakers (MCBs)
Characteristic B

SG56412

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	Type Designation	Article No.	Units per package
1	240/415	15	277	10	SWD	AWG 18	FAZ-B1/1-RT	132731	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-B1,5/1-RT	132732	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-B2/1-RT	132733	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-B3/1-RT	132734	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-B4/1-RT	132735	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-B5/1-RT	132736	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-B6/1-RT	132737	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-B7/1-RT	132738	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-B8/1-RT	132739	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-B10/1-RT	132740	12/120
13	240/415	15	277	10	SWD		FAZ-B13/1-RT	132741	12/120
15	240/415	15	277	14	SWD		FAZ-B15/1-RT	132742	12/120
16	240/415	15	277	14	SWD		FAZ-B16/1-RT	132743	12/120
20	240/415	15	277	14	SWD		FAZ-B20/1-RT	132744	12/120
25	240/415	15	277	14			FAZ-B25/1-RT	132745	12/120
30	240/415	15	277	10			FAZ-B30/1-RT	132746	12/120
32	240/415	15	277	10			FAZ-B32/1-RT	132747	12/120
35	240/415	15	240	10			FAZ-B35/1-RT	132748	12/120
40	240/415	15	240	10			FAZ-B40/1-RT	132749	12/120

SG56712

2-pole

1	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1/2-RT	132750	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1,5/2-RT	132751	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-B2/2-RT	132752	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-B3/2-RT	132753	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-B4/2-RT	132754	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B5/2-RT	132755	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-B6/2-RT	132756	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-B7/2-RT	132757	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-B8/2-RT	132758	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-B10/2-RT	132759	1/60
13	415	15	480Y/277	10	SWD		FAZ-B13/2-RT	132760	1/60
15	415	15	480Y/277	14	SWD		FAZ-B15/2-RT	132761	1/60
16	415	15	480Y/277	14	SWD		FAZ-B16/2-RT	132762	1/60
20	415	15	480Y/277	14	SWD		FAZ-B20/2-RT	132763	1/60
25	415	15	480Y/277	14			FAZ-B25/2-RT	132764	1/60
30	415	15	480Y/277	10			FAZ-B30/2-RT	132765	1/60
32	415	15	480Y/277	10			FAZ-B32/2-RT	132766	1/60
35	415	15	240	10			FAZ-B35/2-RT	132767	1/60
40	415	15	240	10			FAZ-B40/2-RT	132768	1/60

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3-pole

1	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1/3-RT	132769	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B1,5/3-RT	132770	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-B2/3-RT	132771	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-B3/3-RT	132772	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-B4/3-RT	132773	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-B5/3-RT	132774	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-B6/3-RT	132775	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-B7/3-RT	132776	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-B8/3-RT	132777	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-B10/3-RT	132778	1/40
13	415	15	480Y/277	10	SWD		FAZ-B13/3-RT	132779	1/40
15	415	15	480Y/277	14	SWD		FAZ-B15/3-RT	132780	1/40
16	415	15	480Y/277	14	SWD		FAZ-B16/3-RT	132781	1/40
20	415	15	480Y/277	14	SWD		FAZ-B20/3-RT	132782	1/40
25	415	15	480Y/277	14			FAZ-B25/3-RT	132783	1/40
30	415	15	480Y/277	10			FAZ-B30/3-RT	132784	1/40
32	415	15	480Y/277	10			FAZ-B32/3-RT	132785	1/40
35	415	15	240	10			FAZ-B35/3-RT	132786	1/40
40	415	15	240	10			FAZ-B40/3-RT	132787	1/40

FAZ-...-RT/-DU Miniature Circuit Breakers (MCBs)
Characteristic C

FAZ-RT has the plastic limiter at both terminals, as showed in red circle; While FAZ-DU doesn't have

SG56412

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	RT Type Designation	RT Article No.	DU Type Designation	DU Article No.	Units per package
0.5	240/415	15	277	10	SWD	AWG 18	FAZ-C0,5/1-RT	181884	FAZ-C0,5/1-DU	185095	12/120
1	240/415	15	277	10	SWD	AWG 18	FAZ-C1/1-RT	181886	FAZ-C1/1-DU	185096	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-C1,5/1-RT	181888	FAZ-C1,5/1-DU	185097	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-C2/1-RT	181890	FAZ-C2/1-DU	185098	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-C3/1-RT	181892	FAZ-C3/1-DU	185099	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-C4/1-RT	181894	FAZ-C4/1-DU	185100	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-C5/1-RT	181896	FAZ-C5/1-DU	185101	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-C6/1-RT	181898	FAZ-C6/1-DU	185102	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-C7/1-RT	181900	FAZ-C7/1-DU	185103	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-C8/1-RT	181902	FAZ-C8/1-DU	184990	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-C10/1-RT	181904	FAZ-C10/1-DU	184991	12/120
13	240/415	15	277	10	SWD		FAZ-C13/1-RT	181906	FAZ-C13/1-DU	184992	12/120
15	240/415	15	277	14	SWD		FAZ-C15/1-RT	181908	FAZ-C15/1-DU	184993	12/120
16	240/415	15	277	14	SWD		FAZ-C16/1-RT	181910	FAZ-C16/1-DU	184994	12/120
20	240/415	15	277	14	SWD		FAZ-C20/1-RT	181912	FAZ-C20/1-DU	184995	12/120
25	240/415	15	277	14			FAZ-C25/1-RT	181914	FAZ-C25/1-DU	184996	12/120
30	240/415	15	277	10			FAZ-C30/1-RT	181916	FAZ-C30/1-DU	184997	12/120
32	240/415	15	277	10			FAZ-C32/1-RT	181918	FAZ-C32/1-DU	184998	12/120
35	240/415	15	240	10			FAZ-C35/1-RT	181920	FAZ-C35/1-DU	184999	12/120
40	240/415	15	240	10			FAZ-C40/1-RT	181922	FAZ-C40/1-DU	185000	12/120

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2-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C0,5/2-RT	181924	FAZ-C0,5/2-DU	185021	1/60
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1/2-RT	181926	FAZ-C1/2-DU	185022	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1,5/2-RT	181928	FAZ-C1,5/2-DU	185023	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-C2/2-RT	181930	FAZ-C2/2-DU	185024	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-C3/2-RT	181932	FAZ-C3/2-DU	185025	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-C4/2-RT	181934	FAZ-C4/2-DU	185026	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C5/2-RT	181936	FAZ-C5/2-DU	185027	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-C6/2-RT	181938	FAZ-C6/2-DU	185028	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-C7/2-RT	181940	FAZ-C7/2-DU	185029	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-C8/2-RT	181942	FAZ-C8/2-DU	185030	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-C10/2-RT	181944	FAZ-C10/2-DU	185031	1/60
13	415	15	480Y/277	10	SWD		FAZ-C13/2-RT	181946	FAZ-C13/2-DU	185032	1/60
15	415	15	480Y/277	14	SWD		FAZ-C15/2-RT	181948	FAZ-C15/2-DU	185033	1/60
16	415	15	480Y/277	14	SWD		FAZ-C16/2-RT	181950	FAZ-C16/2-DU	185034	1/60
20	415	15	480Y/277	14	SWD		FAZ-C20/2-RT	181952	FAZ-C20/2-DU	185035	1/60
25	415	15	480Y/277	14			FAZ-C25/2-RT	181954	FAZ-C25/2-DU	185036	1/60
30	415	15	480Y/277	10			FAZ-C30/2-RT	181956	FAZ-C30/2-DU	185037	1/60
32	415	15	480Y/277	10			FAZ-C32/2-RT	181958	FAZ-C32/2-DU	185038	1/60
35	415	15	240	10			FAZ-C35/2-RT	181960	FAZ-C35/2-DU	185039	1/60
40	415	15	240	10			FAZ-C40/2-RT	181962	FAZ-C40/2-DU	185040	1/60

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3-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C0,5/3-RT	181964	FAZ-C0,5/3-DU	185061	1/40
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1/3-RT	181966	FAZ-C1/3-DU	185062	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C1,5/3-RT	181968	FAZ-C1,5/3-DU	185063	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-C2/3-RT	181970	FAZ-C2/3-DU	185064	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-C3/3-RT	181972	FAZ-C3/3-DU	185065	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-C4/3-RT	181974	FAZ-C4/3-DU	185066	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-C5/3-RT	181976	FAZ-C5/3-DU	185067	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-C6/3-RT	181978	FAZ-C6/3-DU	185068	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-C7/3-RT	181980	FAZ-C7/3-DU	185069	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-C8/3-RT	181982	FAZ-C8/3-DU	185070	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-C10/3-RT	181984	FAZ-C10/3-DU	185071	1/40
13	415	15	480Y/277	10	SWD		FAZ-C13/3-RT	181986	FAZ-C13/3-DU	185072	1/40
15	415	15	480Y/277	14	SWD		FAZ-C15/3-RT	181988	FAZ-C15/3-DU	185073	1/40
16	415	15	480Y/277	14	SWD		FAZ-C16/3-RT	181990	FAZ-C16/3-DU	185074	1/40
20	415	15	480Y/277	14	SWD		FAZ-C20/3-RT	181992	FAZ-C20/3-DU	185075	1/40
25	415	15	480Y/277	14			FAZ-C25/3-RT	181994	FAZ-C25/3-DU	185076	1/40
30	415	15	480Y/277	10			FAZ-C30/3-RT	181996	FAZ-C30/3-DU	185077	1/40
32	415	15	480Y/277	10			FAZ-C32/3-RT	181998	FAZ-C32/3-DU	185078	1/40
35	415	15	240	10			FAZ-C35/3-RT	182000	FAZ-C35/3-DU	185079	1/40
40	415	15	240	10			FAZ-C40/3-RT	182002	FAZ-C40/3-DU	185080	1/40

FAZ-...-RT/-DU Miniature Circuit Breakers (MCBs)
Characteristic D

SG56412

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	RT Type Designation	RT Article No.	DU Type Designation	DU Article No.	Units per package
0.5	240/415	15	277	10	SWD	AWG 18	FAZ-D0,5/1-RT	182004	FAZ-D0,5/1-DU	185001	12/120
1	240/415	15	277	10	SWD	AWG 18	FAZ-D1/1-RT	182006	FAZ-D1/1-DU	185002	12/120
1.5	240/415	15	277	10	SWD	AWG 18	FAZ-D1,5/1-RT	182008	FAZ-D1,5/1-DU	185003	12/120
2	240/415	15	277	10	SWD	AWG 18	FAZ-D2/1-RT	182010	FAZ-D2/1-DU	185004	12/120
3	240/415	15	277	10	SWD	AWG 18	FAZ-D3/1-RT	182012	FAZ-D3/1-DU	185005	12/120
4	240/415	15	277	10	SWD	AWG 18	FAZ-D4/1-RT	182014	FAZ-D4/1-DU	185006	12/120
5	240/415	15	277	10	SWD	AWG 18	FAZ-D5/1-RT	182016	FAZ-D5/1-DU	185007	12/120
6	240/415	15	277	10	SWD	AWG 18	FAZ-D6/1-RT	182018	FAZ-D6/1-DU	185008	12/120
7	240/415	15	277	10	SWD	AWG 18	FAZ-D7/1-RT	182020	FAZ-D7/1-DU	185009	12/120
8	240/415	15	277	10	SWD	AWG 16	FAZ-D8/1-RT	182022	FAZ-D8/1-DU	185010	12/120
10	240/415	15	277	10	SWD	AWG 16	FAZ-D10/1-RT	181832	FAZ-D10/1-DU	185011	12/120
13	240/415	15	277	14	SWD		FAZ-D13/1-RT	181834	FAZ-D13/1-DU	185012	12/120
15	240/415	15	277	14	SWD		FAZ-D15/1-RT	181836	FAZ-D15/1-DU	185013	12/120
16	240/415	15	277	14	SWD		FAZ-D16/1-RT	181838	FAZ-D16/1-DU	185014	12/120
20	240/415	15	277	14	SWD		FAZ-D20/1-RT	181840	FAZ-D20/1-DU	185015	12/120
25	240/415	15	277	10			FAZ-D25/1-RT	181842	FAZ-D25/1-DU	185016	12/120
30	240/415	15	277	10			FAZ-D30/1-RT	182024	FAZ-D30/1-DU	185017	12/120
32	240/415	15	277	10			FAZ-D32/1-RT	182026	FAZ-D32/1-DU	185018	12/120
35	240/415	15	240	10			FAZ-D35/1-RT	182028	FAZ-D35/1-DU	185019	12/120
40	240/415	15	240	10			FAZ-D40/1-RT	182030	FAZ-D40/1-DU	185020	12/120

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2-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D0,5/2-RT	182032	FAZ-D0,5/2-DU	185041	1/60
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1/2-RT	182034	FAZ-D1/2-DU	185042	1/60
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1,5/2-RT	182036	FAZ-D1,5/2-DU	185043	1/60
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-D2/2-RT	182038	FAZ-D2/2-DU	185044	1/60
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-D3/2-RT	182040	FAZ-D3/2-DU	185045	1/60
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-D4/2-RT	182042	FAZ-D4/2-DU	185046	1/60
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D5/2-RT	182044	FAZ-D5/2-DU	185047	1/60
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-D6/2-RT	182046	FAZ-D6/2-DU	185048	1/60
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-D7/2-RT	182048	FAZ-D7/2-DU	185049	1/60
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-D8/2-RT	182050	FAZ-D8/2-DU	185050	1/60
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-D10/2-RT	182052	FAZ-D10/2-DU	185051	1/60
13	415	15	480Y/277	14	SWD		FAZ-D13/2-RT	182054	FAZ-D13/2-DU	185052	1/60
15	415	15	480Y/277	14	SWD		FAZ-D15/2-RT	182056	FAZ-D15/2-DU	185053	1/60
16	415	15	480Y/277	14	SWD		FAZ-D16/2-RT	182058	FAZ-D16/2-DU	185054	1/60
20	415	15	480Y/277	14	SWD		FAZ-D20/2-RT	182060	FAZ-D20/2-DU	185055	1/60
25	415	15	480Y/277	10			FAZ-D25/2-RT	182062	FAZ-D25/2-DU	185056	1/60
30	415	15	480Y/277	10			FAZ-D30/2-RT	182064	FAZ-D30/2-DU	185057	1/60
32	415	15	480Y/277	10			FAZ-D32/2-RT	182066	FAZ-D32/2-DU	185058	1/60
35	415	15	240	10			FAZ-D35/2-RT	182068	FAZ-D35/2-DU	185059	1/60
40	415	15	240	10			FAZ-D40/2-RT	182070	FAZ-D40/2-DU	185060	1/60

SG57012

3-pole

0.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D0,5/3-RT	182072	FAZ-D0,5/3-DU	185081	1/40
1	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1/3-RT	182074	FAZ-D1/3-DU	185082	1/40
1.5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D1,5/3-RT	182076	FAZ-D1,5/3-DU	185083	1/40
2	415	15	480Y/277	10	SWD	AWG 18	FAZ-D2/3-RT	182078	FAZ-D2/3-DU	185084	1/40
3	415	15	480Y/277	10	SWD	AWG 18	FAZ-D3/3-RT	182080	FAZ-D3/3-DU	185085	1/40
4	415	15	480Y/277	10	SWD	AWG 18	FAZ-D4/3-RT	182082	FAZ-D4/3-DU	185086	1/40
5	415	15	480Y/277	10	SWD	AWG 18	FAZ-D5/3-RT	182084	FAZ-D5/3-DU	185087	1/40
6	415	15	480Y/277	10	SWD	AWG 18	FAZ-D6/3-RT	182086	FAZ-D6/3-DU	185088	1/40
7	415	15	480Y/277	10	SWD	AWG 18	FAZ-D7/3-RT	182088	FAZ-D7/3-DU	185089	1/40
8	415	15	480Y/277	10	SWD	AWG 16	FAZ-D8/3-RT	182090	FAZ-D8/3-DU	185090	1/40
10	415	15	480Y/277	10	SWD	AWG 16	FAZ-D10/3-RT	182092	FAZ-D10/3-DU	185091	1/40
13	415	15	480Y/277	14	SWD		FAZ-D13/3-RT	182094	FAZ-D13/3-DU	185092	1/40
15	415	15	480Y/277	14	SWD		FAZ-D15/3-RT	182096	FAZ-D15/3-DU	185093	1/40
16	415	15	480Y/277	14	SWD		FAZ-D16/3-RT	182098	FAZ-D16/3-DU	185094	1/40
20	415	15	480Y/277	14	SWD		FAZ-D20/3-RT	182100	FAZ-D20/3-DU	184984	1/40
25	415	15	480Y/277	10			FAZ-D25/3-RT	182102	FAZ-D25/3-DU	184985	1/40
30	415	15	480Y/277	10			FAZ-D30/3-RT	182104	FAZ-D30/3-DU	184986	1/40
32	415	15	480Y/277	10			FAZ-D32/3-RT	182106	FAZ-D32/3-DU	184987	1/40
35	415	15	240	10			FAZ-D35/3-RT	182108	FAZ-D35/3-DU	184988	1/40
40	415	15	240	10			FAZ-D40/3-RT	182110	FAZ-D40/3-DU	184989	1/40

FAZ-NA, -RT, -DU Miniature Circuit Breakers

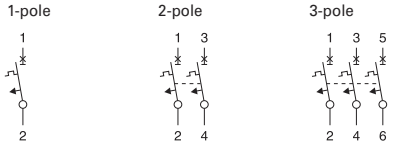
Accessories:		
Auxiliary switch for subsequent installation	Z-IHK-NA	113895
Tripping signal contact for subsequent installation	Z-NHK	248434
Shunt trip release	FAZ-XAA-NA12-110VAC	102037
	FAZ-XAA-NA110-415VAC	102036
Switching interlock	IS/SPE-1TE	101911
	Z-IS/SPE-1TE	274418

Specifications FAZ-NA, -RT, -DU

Technical data IEC/EN

		FAZ-...-NA, -RT, -DU
Productstandard		IEC/EN 60947-2
Number of poles		1, 2, 3
Mechanical specifications		
Device width		17.7mm (1-pole), 35.4 mm (2-poles), 53.1 mm (3-poles)
Frame size		45 mm
Socket size		105 mm
Device depth		60 mm
Terminals		lift terminal / ring-tongue
Terminal capacity rigid solid/stranded wire		1-25 mm^2
Terminal screw		M5 (with slotted screw Pozidriv PZ2)
Terminal torque		max. 2.4 Nm
Snap on fixing		tristable (on DIN Rail acc. to IEC/EN 60715)
Degree of Protection (DIN VDE 0470)		
Surface mounted		IP 20
Built-in behind panel		IP 40
Contact position indicator		red / green
Electrical specifications		
Rated voltage	U_n	240/415 V AC
Rated current	I_n	0.5, 1, 1.5, 2, 3, 4, 5, 6, 7, 8, 10, 13, 15, 16, 20, 25, 30, 32, 35, 40 A
Rated insulation voltage	U_i	440 V AC
Rated impulse withstand voltage	U_{imp}	4 kV (1.2/50)µsec
Tripping characteristic		
Conventional non-tripping current		I_{nt}=1.05 I_n
Conventional tripping current		I_t=1.30 I_n
Reference temperature		30 °C
Temperature factor		0.5% /K
Instantaneous tripping current	I_{mt}	type B: 3 I_n < I_{mt} = 5 I_n:t (I_{mt}) < 0.1 sec (IEC/EN 60898-1) type C: 5 I_n < I_{mt} = 10 I_n:t (I_{mt}) < 0.1 sec (IEC/EN 60898-1) type D: 10 I_n < I_{mt} = 20 I_n:t (I_{mt}) < 0.1 sec (IEC/EN 60898-1)
Rated short-circuit braking capacity	I_{cu}	15 kA
Service short circuit capacity	I_{cs}	7.5 kA
Selectivity class		3 (acc. to EN 60898)
Number of electrical operations		> 1500
Number of mechanical operations		> 10000
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Operating temperature range		-40°C to +75°C

Connection diagram

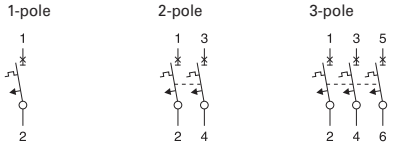


Specifications FAZ-NA, -RT, -DU

Technical data UL

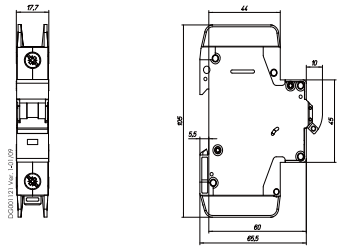
		FAZ-...-NA, -RT, -DU
Productstandard		UL 489 CSA C22.2 No. 5-02
Number of poles		1, 2, 3
Mechanical specifications		
Device width		0.697 in. (1-pole), 1.394 in. (2-poles), 2.090 in. (3-poles)
Frame size		1.772 in.
Socket size		4.134 in.
Device depth		2.362 in.
Terminals		lift terminal / ring-tongue
Terminal capacity		1 Wire: #18-6 AWG (Cu only) 2 Wires: #18-10 AWG (Cu only)
Terminal screw		M5 (with slotted screw Pozidriv PZ2)
Terminal torque		#18-12 AWG: 21 lb-in #10-8 AWG: 25 lb-in #6 AWG: 36 lb-in
Snap on fixing		tristable (on DIN Rail acc. to IEC/EN 60715)
Contact position indicator		red / green
Electrical specifications		
Rated voltage	U_n	0.5-32 A: 480Y/277 V AC, 35-40 A: 240 V AC
Rated current	I_n	0.5, 1, 1.5, 2, 3, 4, 5, 6, 7, 8, 10, 13, 15, 16, 20, 25, 30, 32, 35, 40 A
Tripping characteristic		
Conventional non-tripping current		I_{nt}=1.00 I_n
Conventional tripping current		I_t=1.35 I_n
Reference temperature		40 °C
Temperature factor		0.5% /K
Instantaneous tripping current	I_{mt}	type C: 5 I_n < I_{mt} = 10 I_n:t (I_{mt}) < 0.1 sec type D: 10 I_n < I_{mt} = 20 I_n:t (I_{mt}) < 0.1 sec
Current interrupting rating		10 kA, 14 kA (types D13, B/C/D15, 16, 20, B/C25 A)
Current-Limiting at 240 V / 10 kA		1p, 2p, 3p to I^2t = 43 kA^2s and I_{peak} = 6.2 kA
Current-Limiting at 480Y/277 V / 10 kA		1p, 2p, 3p to I^2t = 60 kA^2s and I_{peak} = 6.2 kA
Current-Limiting at 480Y/277 V / 14 kA		1p, 2p, 3p to I^2t = 65 kA^2s and I_{peak} = 7.5 kA
Selectivity class		3 (acc. to EN 60898)
Number of electrical operations		6000
Number of mechanical operations		10000
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Operating temperature range		-5°C to +40°C

Connection diagram

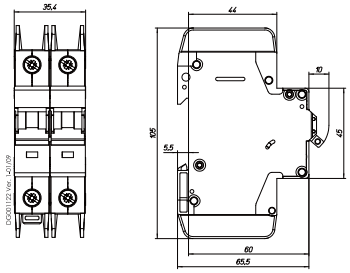


Dimensions (mm) FAZ-...-NA, -RT, -DU

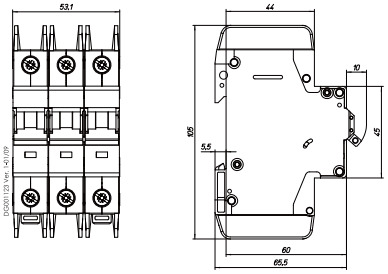
1-pole



2-pole

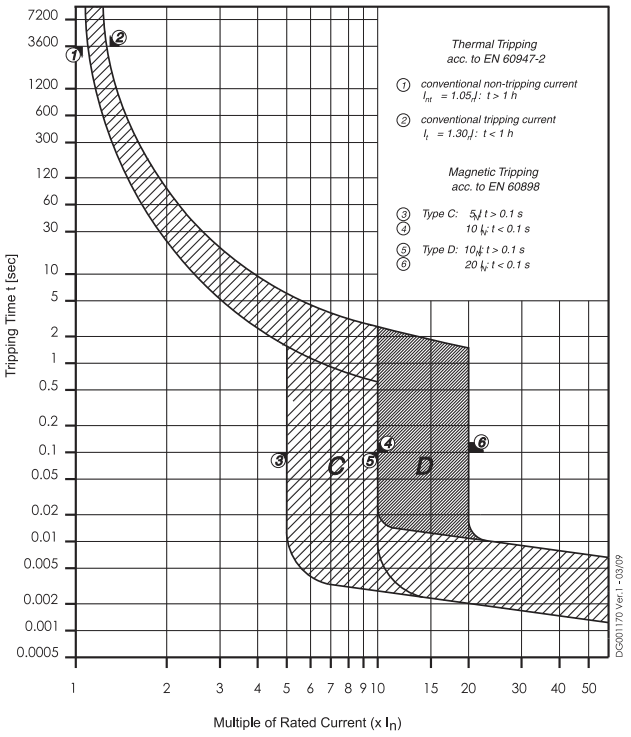


3-pole

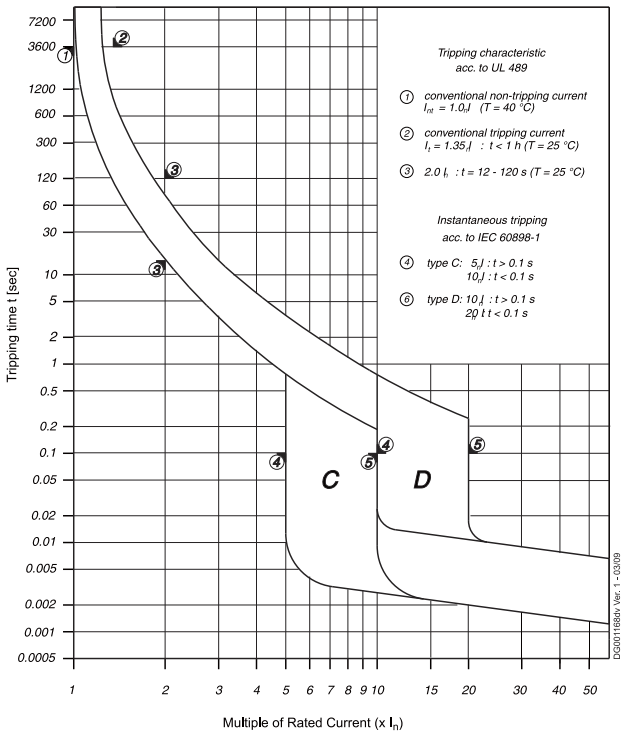


Tripping Characteristic FAZ-...-NA, -RT, -DU

Characteristics C and D - EN/IEC 60947-2



Characteristics C and D - UL 489



Internal Resistance FAZ-...-NA, -RT, -DU

Type C

At room temperature (single pole)

In [A]	Z* [m⌧]	R [m⌧]
0.5	6400	6300
1	1100	1080
1.5	560	550
2	340	330
3	132	130
4	86	85
5	70	69
6	31	30
7	28	27
8	20	19.6
10	15.8	15.5
13	12.3	12.1
15	7.1	7.0
16	7.1	7.0
20	6.0	5.9
25	4.1	4.0
30	2.8	2.7
32	2.8	2.7
35	2.5	2.5
40	2.1	2.1

* 50Hz

Type D

At room temperature (single pole)

In [A]	Z* [m⌧]	R [m⌧]
0.5	6400	6300
1	770	755
1.5	460	450
2	250	245
3	132	130
4	86	85
5	57	56
6	31	30
7	28	27
8	18	17.6
10	13.5	13.2
13	10.5	10.3
15	5.9	5.8
16	5.9	5.8
20	4.0	3.9
25	3.4	3.3
30	2.5	2.5
32	2.5	2.5
35	2.5	2.5
40	2.0	2.0

* 50Hz

Power Loss at I_n FAZ-...-NA, -RT, -DU

Type C

	1p	2p	3p
In [A]	P* [W]	P* [W]	P* [W
0.5	1.6	3.2	4.7
1	1.1	2.2	3.4
1.5	1.3	2.6	3.9
2	1.4	2.8	4.3
3	1.2	2.4	3.6
4	1.4	2.9	4.3
5	1.9	3.7	5.6
6	1.2	2.3	3.5
7	1.4	2.8	4.3
8	1.4	2.8	4.2
10	1.8	3.6	5.3
13	2.4	4.7	7.1
15	1.9	3.8	5.6
16	2.1	4.3	6.4
20	2.9	5.8	8.7
25	3.1	6.2	9.3
30	3.0	6.0	9.0
32	3.4	6.8	10.2
35	3.7	7.4	11.0
40	4.0	8.1	12.1

*50Hz

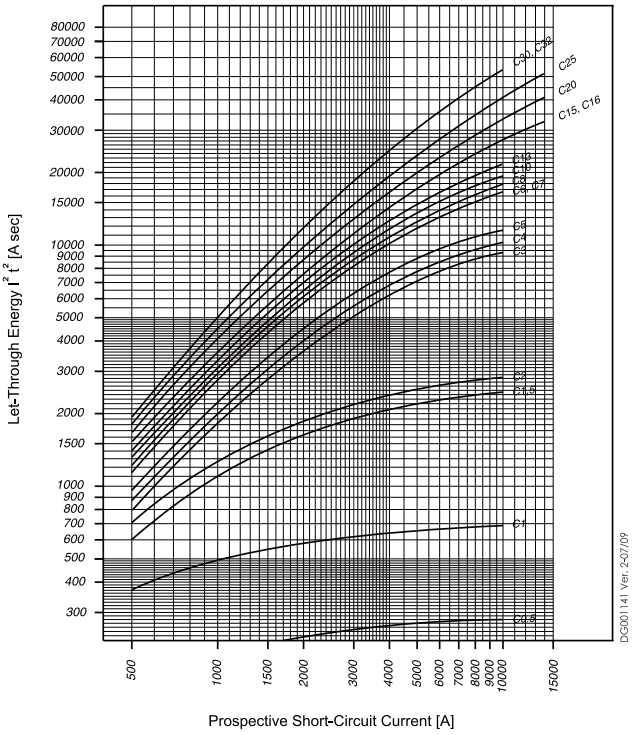
Type D

	1p	2p	3p
In [A]	P* [W]	P* [W]	P* [W
0.5	1.6	3.2	4.8
1	0.8	1.5	2.3
1.5	1.0	2.1	3.1
2	1.0	2.1	3.1
3	1.2	2.4	3.6
4	1.4	2.9	4.3
5	1.5	2.9	4.4
6	1.2	2.3	3.5
7	1.4	2.8	4.3
8	1.2	2.4	3.7
10	1.5	3.0	4.5
13	2.0	4.1	6.1
15	1.5	3.1	4.6
16	1.7	3.5	5.2
20	1.8	3.7	5.5
25	2.6	5.1	7.7
30	2.7	5.4	8.1
32	3.1	6.2	9.3
35	3.8	7.6	11.3
40	3.9	7.8	11.6

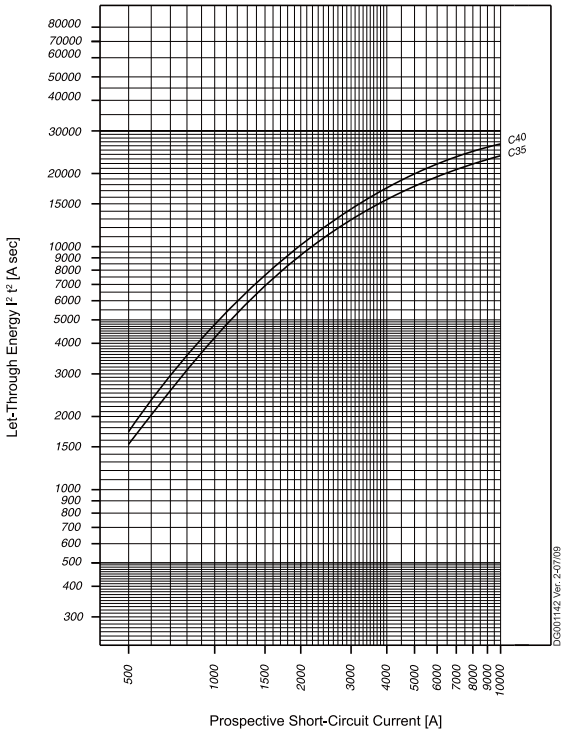
*50Hz

Maximum Let-Through Energy FAZ-...-NA, -RT, -DU

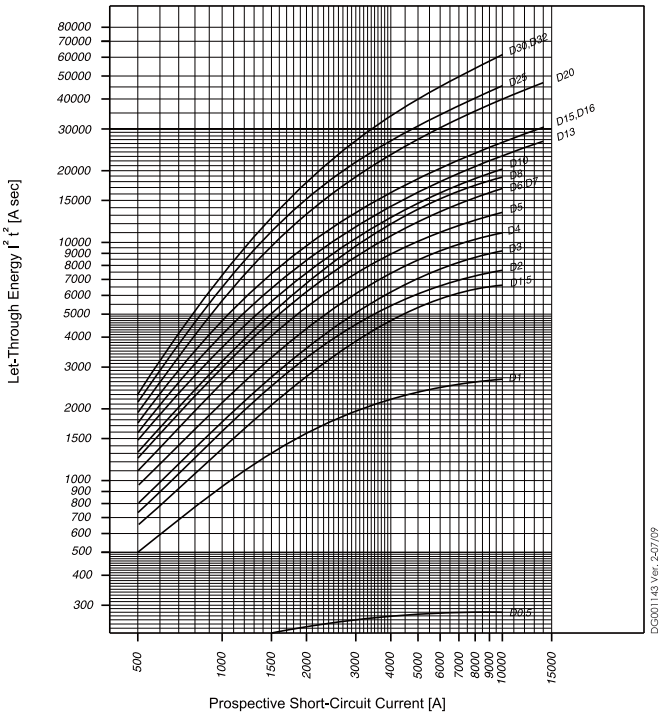
Type C (0.5 - 32 A), 277 V



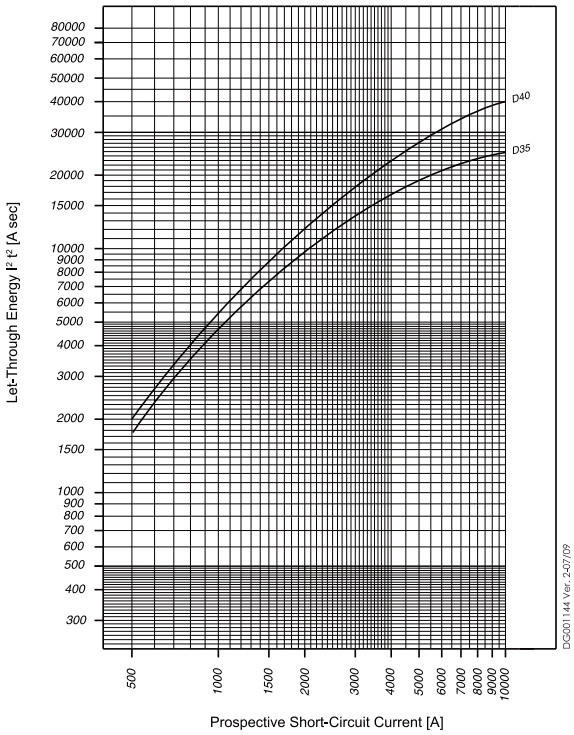
Type C (35 - 40 A), 240 V



Type D (0.5 - 32 A), 277 V

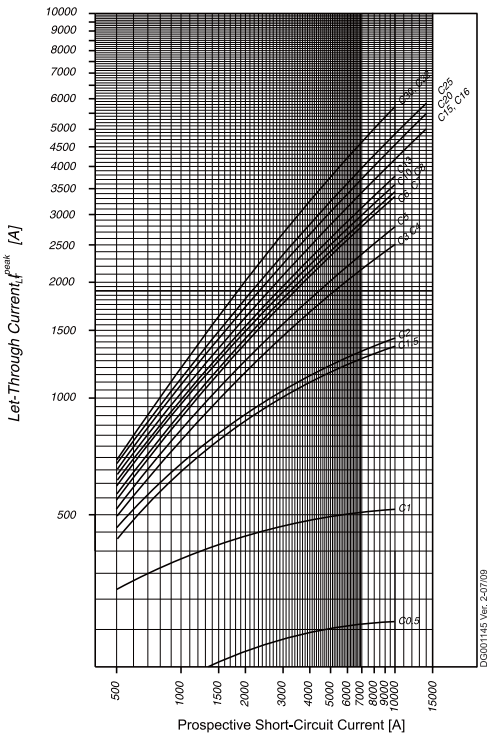


Type D (35 - 40 A), 240 V

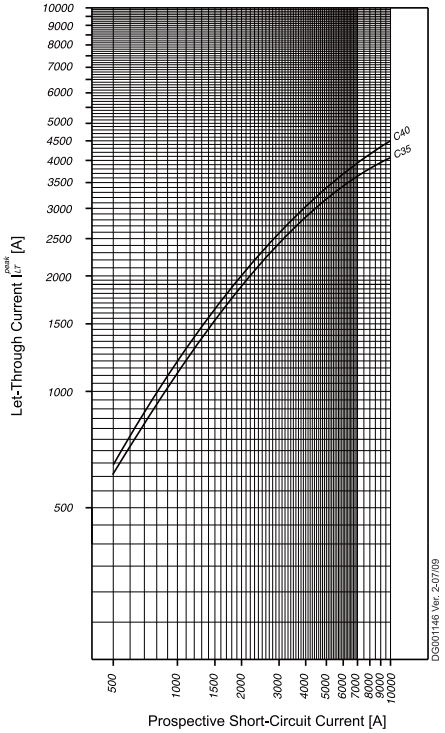


Maximum Let-Through Current FAZ-...-NA, -RT, -DU

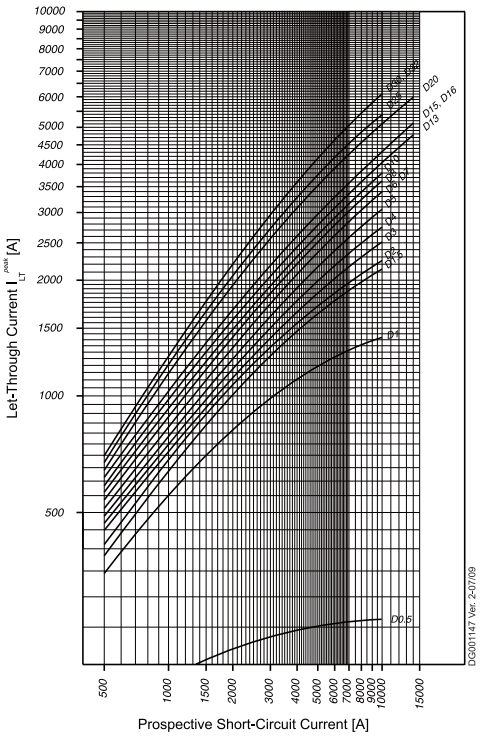
Type C (0.5 - 32 A), 277 V



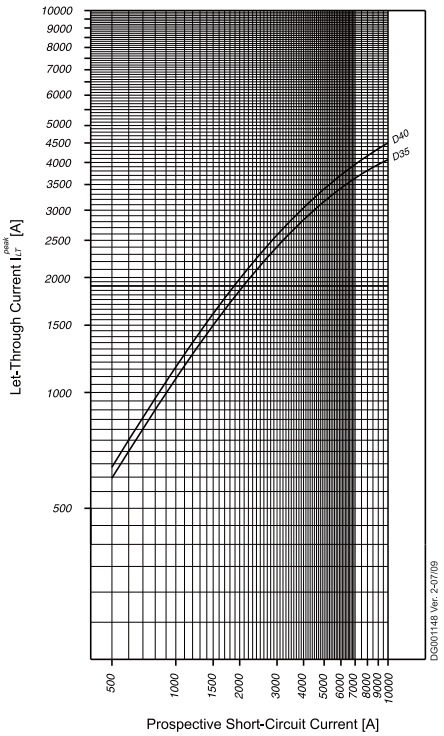
Type C (35 - 40 A), 240 V



Type D (0.5 - 32 A), 277 V



Type D (35 - 40 A), 240 V



Miniature Circuit Breakers FAZ-NA-DC

SG56612

FAZ-NA-DC

- High-quality miniature circuit breakers for DC-applications
- Contact position indicator red - green
- Guide for secure terminal connection (not for FAZ-NA)
- 3-position DIN rail clip, permits removal from existing busbar system
- Comprehensive range of accessories suitable for subsequent installation
- Rated currents up to 40 A
- Tripping characteristic C
- Rated breaking capacity 10 kA according to IEC/EN 60947-2
- Up to 125 V DC per pole

FAZ-...-NA-DC Miniature Circuit Breakers (MCBs)
Characteristic C

SG56512

1-pole

Rated current I_n (A)	Rated voltage IEC/EN 60947-2 (V DC)	Breaking capacity acc. to IEC/EN 60947-2 (kA)	Rated voltage UL489 (V)	Breaking capacity acc. to UL489 (kA)	SWD	NFPA 79	Type Designation	Article No.	Units per package
2	220	10	125	10			FAZ-C2/1-NA-DC	113752	12/120
3	250	10	125	10			FAZ-C3/1-NA-DC	113753	12/120
4	250	10	125	10			FAZ-C4/1-NA-DC	113754	12/120
5	250	10	125	10			FAZ-C5/1-NA-DC	113755	12/120
6	250	10	125	10			FAZ-C6/1-NA-DC	113756	12/120
7	250	10	125	10			FAZ-C7/1-NA-DC	113757	12/120
8	250	10	125	10			FAZ-C8/1-NA-DC	113758	12/120
10	250	10	125	10			FAZ-C10/1-NA-DC	113759	12/120
13	250	10	125	10			FAZ-C13/1-NA-DC	113760	12/120
15	250	10	125	10			FAZ-C15/1-NA-DC	113761	12/120
16	250	10	125	10			FAZ-C16/1-NA-DC	113762	12/120
20	250	10	125	10			FAZ-C20/1-NA-DC	113763	12/120
25	250	10	125	10			FAZ-C25/1-NA-DC	113764	12/120
30	250	10	125	10			FAZ-C30/1-NA-DC	113765	12/120
32	250	10	125	10			FAZ-C32/1-NA-DC	113766	12/120
35	250	10	125	10			FAZ-C35/1-NA-DC	113767	12/120
40	250	10	125	10			FAZ-C40/1-NA-DC	113768	12/120

SG56612

2-pole

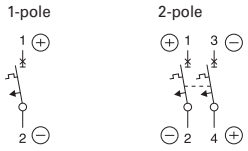
2	440	10	250	10			FAZ-C2/2-NA-DC	137239	1/60
3	500	10	250	10			FAZ-C3/2-NA-DC	137250	1/60
4	500	10	250	10			FAZ-C4/2-NA-DC	137251	1/60
5	500	10	250	10			FAZ-C5/2-NA-DC	137252	1/60
6	500	10	250	10			FAZ-C6/2-NA-DC	120638	1/60
7	500	10	250	10			FAZ-C7/2-NA-DC	120639	1/60
8	500	10	250	10			FAZ-C8/2-NA-DC	120640	1/60
10	500	10	250	10			FAZ-C10/2-NA-DC	120641	1/60
13	500	10	250	10			FAZ-C13/2-NA-DC	120642	1/60
15	500	10	250	10			FAZ-C15/2-NA-DC	120643	1/60
16	500	10	250	10			FAZ-C16/2-NA-DC	120644	1/60
20	500	10	250	10			FAZ-C20/2-NA-DC	120645	1/60
25	500	10	250	10			FAZ-C25/2-NA-DC	120646	1/60
30	500	10	250	10			FAZ-C30/2-NA-DC	120647	1/60
32	500	10	250	10			FAZ-C32/2-NA-DC	120648	1/60
35	500	10	250	10			FAZ-C35/2-NA-DC	120649	1/60
40	500	10	250	10			FAZ-C40/2-NA-DC	120650	1/60

Specifications FAZ-NA-DC

Technical data

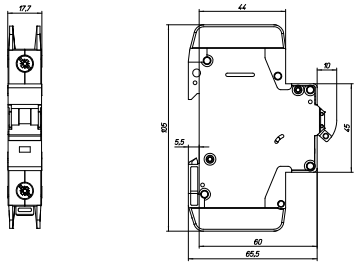
		FAZ-NA-DC
Productstandard		UL 489, CSA C22.2 No 5-02
Number of poles		1, 2
Mechanical specifications		
Device width		1 pole = 0.697 inch, 2 poles = 1.394 inch
Frame size		1.772 inch
Socket size		4.134 inch
Device depth		2.362 inch
Terminals		lift terminal / ring-tongue
Terminal capacity rigid solid/stranded wire		1 Wire: AWG 18-6 (Cu only) 2 Wires: AWG 18-10 (Cu only)
Terminal screw		M5 (with slotted screw Pozidriv PZ2)
Terminal torque		#18-12 AWG: 21 lb-in #10-8 AWG: 25 lb-in #6 AWG: 36 lb-in
Snap on fixing		tristable (on DIN Rail acc. to IEC/EN 60715)
Finger proof		acc.to VBG4, ÖVE EN-6
Contact position indicator		red / green
Electrical specifications		
Rated voltage DC	U_n	125 V d.c. (1p) 250 V d.c. (2p)
Rated current	I_n	2, 3, 4, 5, 6, 7, 8, 10, 13, 15, 16, 20, 25, 30, 32, 35, 40 A
Rated impulse withstand voltage	U_{imp}	4 kV (1.2/50)µsec
Tripping characteristic		
Conventional non-tripping current		I_{nt}=1.0 I_n
Conventional tripping current		I_t=1.35 I_n
Reference temperature		40 °C
Temperature factor		0.5% /K
Instantaneous tripping current	I_{mt}	7 I_n < I_{mt} = 15 I_n:t (I_{mt}) < 0.1 sec
Current interrupting rating		10 kA
Number of electrical operating cycles		6000
Number of mechanical operating cycles		10000
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Operating temperature range		-25°C to +55°C

Connection diagram

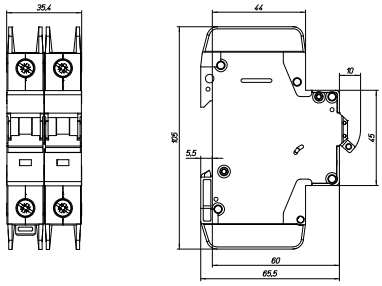


Dimensions (mm) FAZ-NA-DC

1-pole

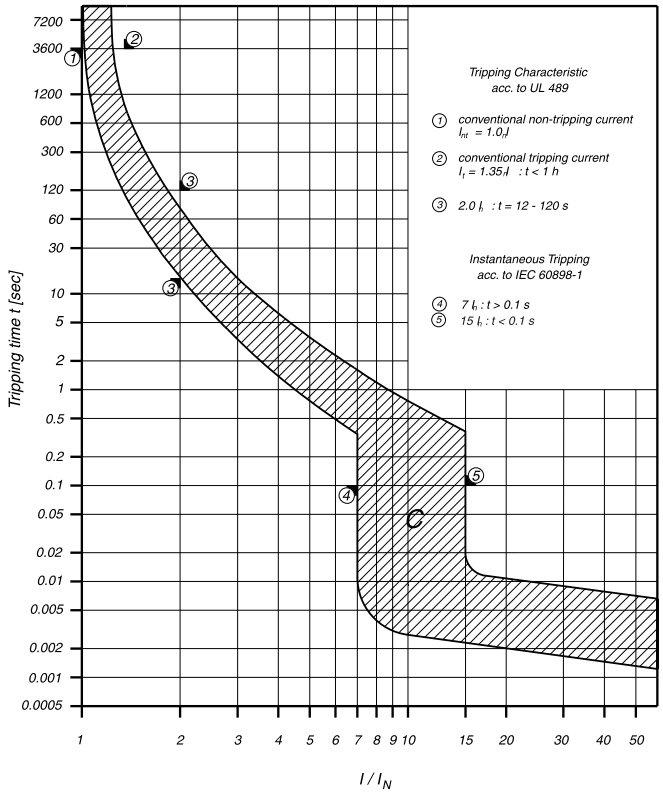


2-pole



Tripping Characteristic FAZ-NA-DC

Characteristics C - UL 489



Miniature Circuit Breakers AZ

SG51412

- High-quality miniature circuit breakers for commercial and industrial applications
- Contact position indicator red - green
- Accessories suitable for subsequent installation
- Rated currents up to 125 A
- Tripping characteristics C, D
- Rated breaking capacity up to 25 kA according to EN 60947-2

AZ Miniature Circuit Breakers (MCBs)
Characteristic C

SG51212

1-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
20	AZ-C20	211769	12
25	AZ-C25	211774	12
32	AZ-C32	211779	12
40	AZ-C40	211784	12
50	AZ-C50	211789	12
63	AZ-C63	211794	12
80	AZ-C80	211799	12
100	AZ-C100	211804	12
125	AZ-C125	211809	12

SG51312

2-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
20	AZ-2-C20	211770	2
25	AZ-2-C25	211775	2
32	AZ-2-C32	211780	2
40	AZ-2-C40	211785	2
50	AZ-2-C50	211790	2
63	AZ-2-C63	211795	2
80	AZ-2-C80	211800	2
100	AZ-2-C100	211805	2
125	AZ-2-C125	211810	2

wa_sg00314

3-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
20	AZ-3-C20	211771	1
25	AZ-3-C25	211776	1
32	AZ-3-C32	211781	1
40	AZ-3-C40	211786	1
50	AZ-3-C50	211791	1
63	AZ-3-C63	211796	1
80	AZ-3-C80	211801	1
100	AZ-3-C100	211806	1
125	AZ-3-C125	211811	1

wa_sg00214

3+N-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
20	AZ-3N-C20	211773	1
25	AZ-3N-C25	211778	1
32	AZ-3N-C32	211783	1
40	AZ-3N-C40	211788	1
50	AZ-3N-C50	211793	1
63	AZ-3N-C63	211798	1
80	AZ-3N-C80	211803	1
100	AZ-3N-C100	211808	1
125	AZ-3N-C125	211813	1

SG51412

4-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
20	AZ-4-C20	211772	1
25	AZ-4-C25	211777	1
32	AZ-4-C32	211782	1
40	AZ-4-C40	211787	1
50	AZ-4-C50	211792	1
63	AZ-4-C63	211797	1
80	AZ-4-C80	211802	1
100	AZ-4-C100	211807	1
125	AZ-4-C125	211812	1

AZ Miniature Circuit Breakers (MCBs)
Characteristic D

SG51212

1-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
50	AZ-D50	211814	12
63	AZ-D63	211818	12
80	AZ-D80	211822	12
100	AZ-D100	211826	12

SG51312

2-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
50	AZ-2-D50	211815	2
63	AZ-2-D63	211819	2
80	AZ-2-D80	211823	2
100	AZ-2-D100	211827	2

wa_sg00314

3-pole

Rated current I_n (A)	Type Designation	Article No.	Units per package
50	AZ-3-D50	211816	1
63	AZ-3-D63	211820	1
80	AZ-3-D80	211824	1
100	AZ-3-D100	211828	1

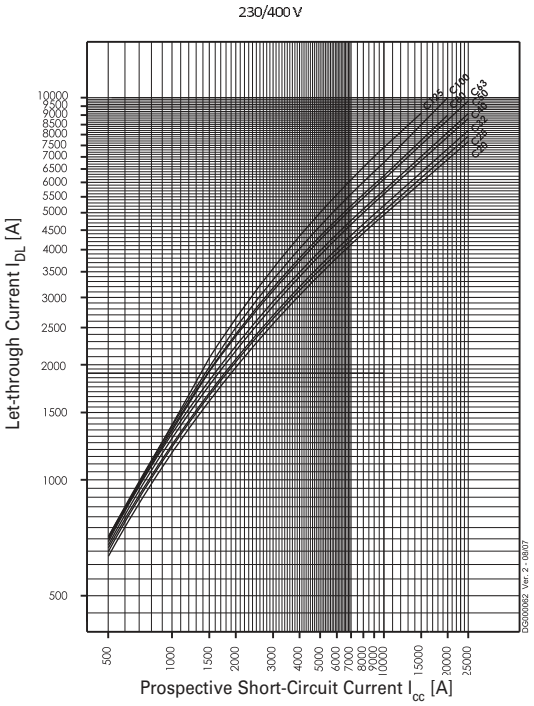
wa_sg00214

3+N-pole

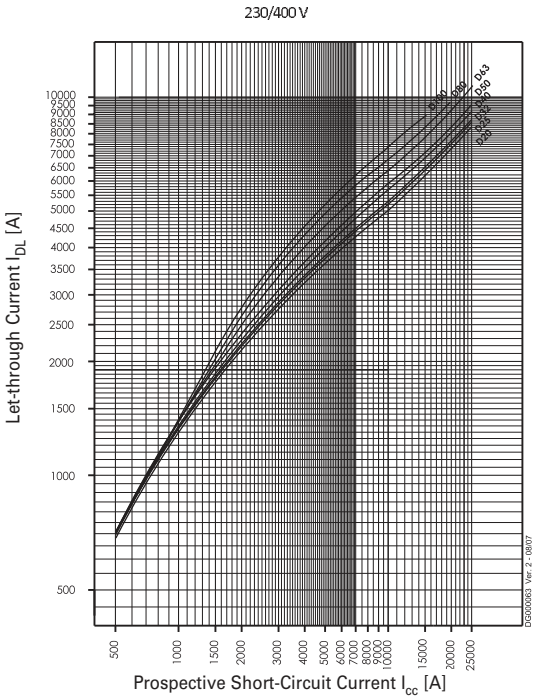
Rated current I_n (A)	Type Designation	Article No.	Units per package
50	AZ-3N-D50	211817	1
63	AZ-3N-D63	211821	1
80	AZ-3N-D80	211825	1
100	AZ-3N-D100	211829	1

Maximum Let-Through Current AZ

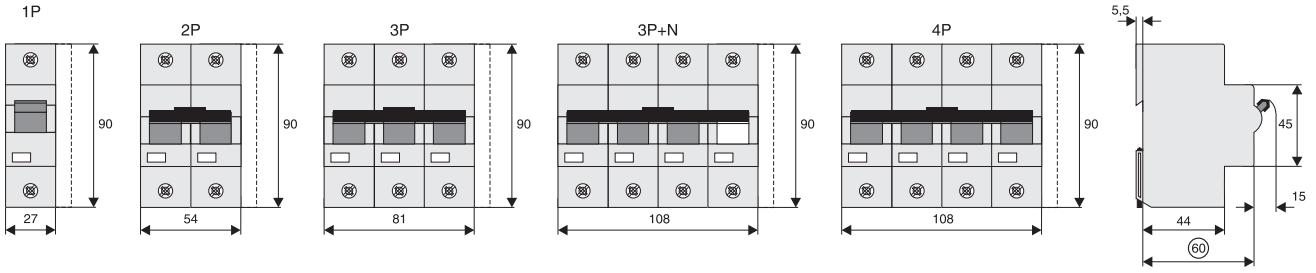
Type C



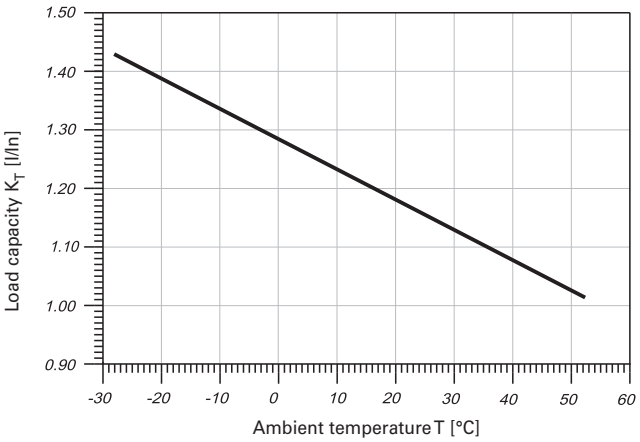
Type D



Dimensions (mm)



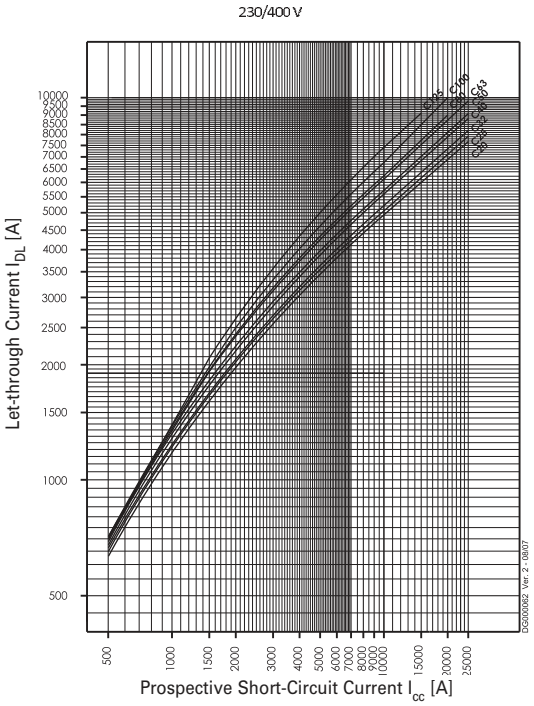
Effect of ambient temperature AZ



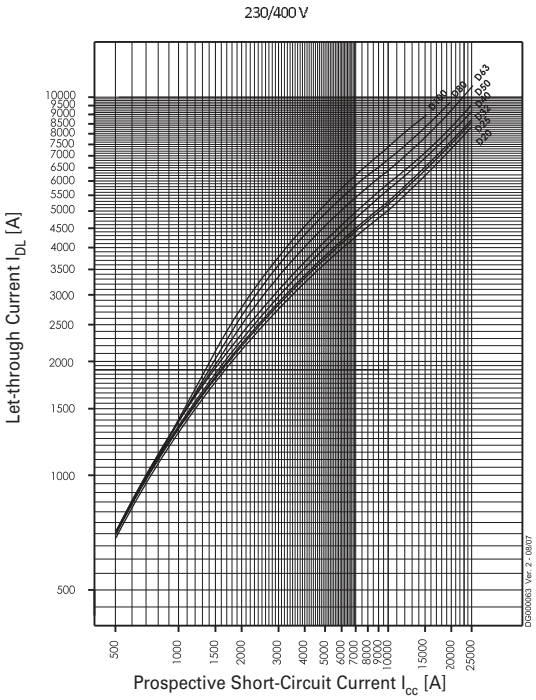
Permitted permanent load at ambient temperature T [°C] with n devices: $I_{DL} = I_n K_T(T) K_N(N)$.

Maximum Let-Through Current AZ

Type C



Type D



Short Circuit Selectivity AZ

In case of short circuit, there is selectivity between the miniature circuit breakers AZ and the upstream protection devices up to the specified values of the selectivity limit current I_s [kA] (i. e. in case of short-circuit currents I_{ks} under I_s, only the MCB will trip, in case of short circuit currents above this value both protective devices will respond).

AZ towards back-up fuses D01, D02, D03

Rated current I_n AZ in A		Rated current of the back-up fuse in A					
		25	**35**	**50**	**63**	**80**	**100**
C-Characteristic	**20**	0,5	1,0	2,0	2,9	3,9	7,6
	25		1,0	1,9	2,8	3,8	7,3
	32		1,0	1,8	2,7	3,6	7,0
	40			1,6	2,2	3,0	5,6
	50				2,1	2,8	5,2
	63					2,7	4,8
	80						4,3
	100						
	125						
D-Characteristic	**20**	0,5	0,9	1,7	2,5	3,4	6,7
	25		0,9	1,6	2,3	3,2	6,2
	32		0,9	1,5	2,3	3,0	6,0
	40			1,4	2,0	2,6	4,7
	50				1,8	2,3	4,3
	63					2,1	3,7
	80						3,1
	100						

AZ towards back-up fuses NH Gr. 00

Rated current I_n AZ in A		Rated current of the back-up fuse in A									
		25	**35**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
C-Characteristic	**20**	0,5	1,0	1,3	1,9	2,7	3,7	6,7	17,0	25,0	25,0
	25		0,9	1,3	1,8	2,6	3,5	6,5	17,0	25,0	25,0
	32		0,9	1,2	1,7	2,4	3,3	6,0	15,0	23,0	25,0
	40				1,4	2,1	2,9	4,8	12,0	18,0	25,0
	50					1,9	2,7	4,5	11,0	17,0	25,0
	63							4,2	10,0	15,0	25,0
	80							3,8	8,5	12,0	25,0
	100								7,0	10,0	25,0
	125									7,5	25,0
D-Characteristic	**20**	<0,5	0,8	1,1	1,5	2,3	3,1	5,6	16,0	25,0	25,0
	25		0,7	1,0	1,4	2,1	3,0	5,3	14,0	23,0	25,0
	32		0,7	1,0	1,3	2,1	2,9	5,0	13,0	22,0	25,0
	40				1,1	1,8	2,5	4,2	10,0	15,0	25,0
	50					1,6	2,3	3,8	8,5	13,0	22,0
	63						2,1	3,2	7,0	10,5	18,0
	80							2,8	5,5	8,4	15,0
	100								4,8	7,5	12,5

AZ towards NZM 1

*Short circuit selectivity **characteristic C** towards **NZM***)*

AZ	NZM...1-A gL/gG					
I_n [A]	40	50	63	80	100	125
20	0.3	0.4	0.5	0.75	0.9	1.25
25	0.3	0.4	0.5	0.7	0.9	1.2
32		0.4	0.5	0.7	0.85	1.2
40			0.5	0.6	0.85	1.1
50				0.6	0.85	1.1
63					0.8	1
80						1
100						
125						

*Short circuit selectivity **characteristic D** towards **NZM***)*

AZ	NZM...1-A gL/gG					
I_n [A]	40	50	63	80	100	125
50						
63						
80						
100						

no selectivity

AZ towards NZM 2

*Short circuit selectivity **characteristic C** towards **NZM***)*

AZ	NZM...2-A gL/gG								
I_n [A]	40	50	63	80	100	125	160	200	250
20	0.3	0.4	0.5	0.75	0.9	1.25	1.8	2.5	3.5
25	0.3	0.4	0.5	0.7	0.9	1.2	1.7	2.4	3.3
32		0.4	0.5	0.7	0.85	1.2	1.65	2.3	3.2
40			0.5	0.6	0.85	1.1	1.5	2.1	2.9
50				0.6	0.85	1.1	1.5	2	2.8
63					0.8	1	1.4	1.8	2.5
80						1	1.4	1.8	2.4
100							1.3	1.7	2.3
125								1.6	2.1

*Short circuit selectivity **characteristic D** towards **NZM***)*

AZ	NZM...2-A gL/gG								
I_n [A]	40	50	63	80	100	125	160	200	250
50							1	1.4	2.6
63							1	1.3	2.3
80									2.1
100									

no selectivity

Back-up Protection AZ

The up-stream protective devices will protect the down-stream AZ up to the short-circuit current specified.

AZ and NZM(B)(C)(N)(H)1

	AZ-I_n/1(2,3,4) / C(D) + NZMB1
I_n [A]	U_e = 230/400 V
20	25 kA
25	25 kA
32	25 kA
40	25 kA
50	25 kA
63	25 kA
80	25 kA
100	25 kA
125	25 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMC1
I_n [A]	U_e = 230/400 V
20	36 kA
25	36 kA
32	36 kA
40	36 kA
50	36 kA
63	36 kA
80	36 kA
100	36 kA
125	36 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMN1
I_n [A]	U_e = 230/400 V
20	50 kA
25	50 kA
32	50 kA
40	50 kA
50	50 kA
63	50 kA
80	50 kA
100	50 kA
125	50 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMH1
I_n [A]	U_e = 230/400 V
20	80 kA
25	80 kA
32	80 kA
40	80 kA
50	80 kA
63	80 kA
80	80 kA
100	80 kA
125	80 kA

AZ and NZM(B)(C)(N)(H)2

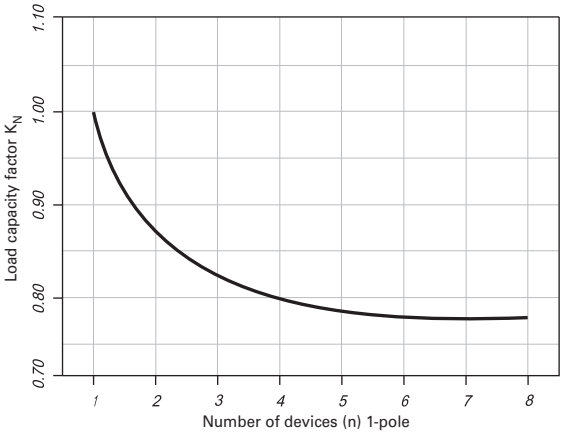
	AZ-I_n/1(2,3,4) / C(D) + NZMB2
I_n [A]	U_e = 230/400 V
20	25 kA
25	25 kA
32	25 kA
40	25 kA
50	25 kA
63	25 kA
80	25 kA
100	25 kA
125	25 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMC2
I_n [A]	U_e = 230/400 V
20	36 kA
25	36 kA
32	36 kA
40	36 kA
50	36 kA
63	36 kA
80	36 kA
100	36 kA
125	36 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMN2
I_n [A]	U_e = 230/400 V
20	50 kA
25	50 kA
32	50 kA
40	50 kA
50	50 kA
63	50 kA
80	50 kA
100	50 kA
125	50 kA

	AZ-I_n/1(2,3,4) / C(D) + NZMH2
I_n [A]	U_e = 230/400 V
20	65 kA
25	65 kA
32	65 kA
40	65 kA
50	65 kA
63	65 kA
80	65 kA
100	65 kA
125	65 kA

Load capacity in case of block installation AZ



Main Load Disconnector Switch (Isolator) IS

SG10911

- Load circuit breaker with isolating function
- Highly wear resistant contacts
- Quick make
- Terminal capacity 50 mm^2
- Compatible busbars
- 1-, 2-, 3-, 4-pole

CUTLER HAMMER FAZ CIRCUIT BREAKERS

Main Load Disconnector Switch (Isolator) IS

SG10611

SG10711

SG10811

SG10911

Rated Current (A)	Poles	Type Designation	Article No.	Units per package
16	1	IS-16/1	276254	12/120
16	2	IS-16/2	276255	1/60
16	3	IS-16/3	276256	1/40
16	4	IS-16/4	276257	1/30
20	1	IS-20/1	276258	12/120
20	2	IS-20/2	276259	1/60
20	3	IS-20/3	276260	1/40
20	4	IS-20/4	276261	1/30
25	1	IS-25/1	276262	12/120
25	2	IS-25/2	276263	1/60
25	3	IS-25/3	276264	1/40
25	4	IS-25/4	276265	1/30
32	1	IS-32/1	276266	12/120
32	2	IS-32/2	276267	1/60
32	3	IS-32/3	276268	1/40
32	4	IS-32/4	276269	1/30
40	1	IS-40/1	276270	12/120
40	2	IS-40/2	276271	1/60
40	3	IS-40/3	276272	1/40
40	4	IS-40/4	276273	1/30
63	1	IS-63/1	276274	12/120
63	2	IS-63/2	276275	1/60
63	3	IS-63/3	276276	1/40
63	4	IS-63/4	276277	1/30
80	1	IS-80/1	276278	12/120
80	2	IS-80/2	276279	1/60
80	3	IS-80/3	276280	1/40
80	4	IS-80/4	276281	1/30
100	1	IS-100/1	276282	12/120
100	2	IS-100/2	276283	1/60
100	3	IS-100/3	276284	1/40
100	4	IS-100/4	276285	1/30
125	1	IS-125/1	276286	12/120
125	2	IS-125/2	276287	1/60
125	3	IS-125/3	276288	1/40
125	4	IS-125/4	276289	1/30

Accessories

SG47812

Description	Type Designation	Article No.	Units per package
Switching interlock without lock for Isolators, RCDs, combined RCD/MCBs, ...	IS/SPE-1TE	101911	5/30
Terminal cover	Z-IS/AK-1TE	276290	10/600

Switching interlock IS/SPE-1TE

- Without lock
- Also suitable for PFIM, CFI6, PKNM, CKN6

Terminal Cover Caps Z-IS/AK-1TE

- Can be sealed with leads
- Modular design, width 1 MU

Main Load Disconnector Switch

Specifications | Main Load Disconnector Switch (Isolator) IS

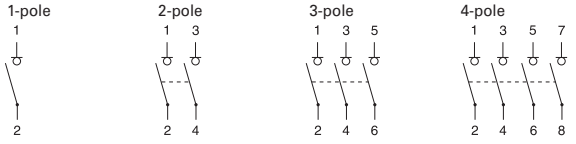
Description

- Load circuit breaker with isolating function
- Design according to IEC/EN 60947-3
- Highly wear resistant contacts
- Quick make, black toggle
- Terminal capacity 50 mm^2
- Compatible busbars with switchgear series Xpole by use of the mouth terminal in combination with standard fork busbar

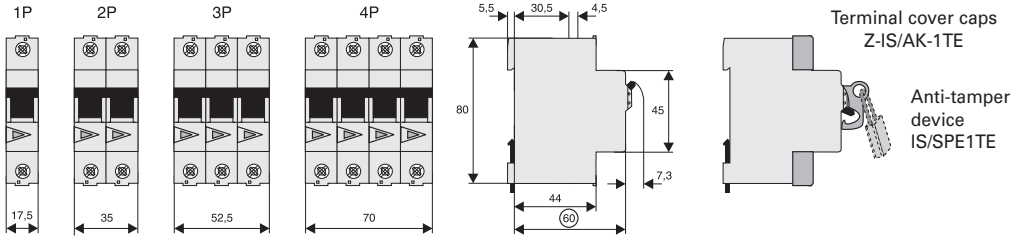
Technical Data

		IS-16	IS-20	IS-25	IS-32	IS-40	IS-63	IS-80	IS-100	IS-125
Electrical										
Design		according to IEC/EN 60947-3								
Rated voltage		240/415 V								
Frequency		50/60 Hz								
Rated insulation voltage	U_i	690 V~								
Rated peak withstand voltage	U_{imp}	6 kV								
Pollution degree		3								
Rated short-time withstand current	I_{cw}	2 kA								
Rated short-circuit making capacity	I_{cm}	2.8 kA								
Rated current										
240/415V, AC23A		16 A	20 A	25 A	32 A	40 A	63 A	80 A	100 A	125 A
Number of poles		1-, 2-, 3-, 4-pole								
Maximum back-up fuse		125 A gG								
Short circuit strength - with back-up fuse acc. to the applicable rules										
IEC/EN 60947-3		12.5 kA	12.5 kA	12.5 kA	12.5 kA	12.5 kA	12.5 kA	12.5 kA	10 kA	10 kA
Endurance										
electrical components operation cycles		≥3.000	≥3.000	≥ 3.000	≥3.000	≥3.000	≥3.000	≥3.000	≥3.000	≥2.000
mechanical components operation cycles		≥16.000	≥16.000	≥16.000	≥16.000	≥16.000	≥16.000	≥16.000	≥16.000	≥14.000
Mechanical										
Frame size		45 mm								
Device height		80 mm								
Device width		17.5mm/pole								
Mounting		quick fastening with 2 lock-in positions on DIN rail IEC/EN 60715								
Degree of protection, built-in		IP40								
Terminal protection		finger and hand touch safe according to BGV A3								
Terminals		open mouthed/lift terminals								
Terminal capacity		2.5 - 50 mm^2								
Busbar thickness		0.8 - 2 mm								
Fastening torque of terminal screws		2.5 - 5 Nm								
Function		irrespective of the position of installation								

Connection diagram

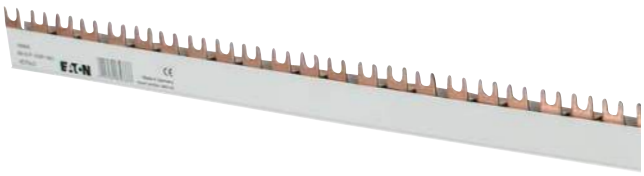


Dimensions (mm)



Busbar System xEffect BB-EV

SG13113



Busbar System xEffect is the modular design system for busbars. xEffect busbars are available as yard goods with 1, 2 or 3 poles. Now, there is a special feature: each bar can easily be extended by one-pole bar as you like. The additional pole can be added completely without tools by easy clamping technique. The lugs or forks in the xEffect bars - available in 10 and 16 mm^2 and all common distances - can be broken out at a predetermined breaking point. There is actually no more flexibility available.

Busbar System xEffect saves time and material

The yard good can be cut with a saw of course. However, there is no need neither for deburring nor for cutting the conductor. Just cut to the required dimension and close with the fitting end cap -ready! The end caps have also breakable edges, which enable further connecting of the Busbar System xEffect. By overlapping assembly, doubling the cross section can be achieved.

Busbar System xEffect in use

Busbar System xEffect is especially well suited for solving flexible busbar applications rack-mounted models in series. Fork-pin combinations for 1+N-applications can be realized by individual combinations - for this also the one-pole version with blue isolation is available besides the one with grey isolation. Even different cross sections can be combined in this case.

Accessories, such as feeder terminals and self adhesive phase marking labels will complete the comfortable total package. Existing contact prevention caps can be used.

Busbar System xEffect at a glance:

- Yard goods can be cut
- No cutting back of copper required
- No deburring required
- Almost no waste during cutting
- End capsavailable with 1- to 4-poles, end caps can be broken out for further extensions
- 4-pole end cap molded in pairs (leftand right)
- Overlapping rail extension possible
- Rails can be extended on demand by 1-pole rails (plug-in technology)
- All step distances
- 10 and 16 mm^2
- Fork and stud
- Lugs can be broken out at any predetermined breaking point
- Self adhesive phase indication labels available
- Contact preventing caps (ZV-BS-G) can be used
- Simple, flexible handling
- All assembly requirements can be covered by the Busbar System xEffect
- Low storage space requirements due to modular system
- Less time consuming (no deburring, no cutting back)
- Individual and self configurable
- Fork-pin combination for 1+N application possible, feeding through rail (terminal clamp) not possible.
- Protected technology

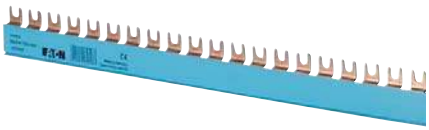
xEffect busbar 1m 10mm², 16mm² (Fork) BB-EVF

for MCBs, RCCBs, RCBOs, SPDs

- Delivered without end caps

SG13113

SG13413

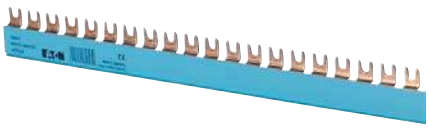


10 mm², Rated Current 63 A

Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package
1-phase	17.8	0.22	BB-EVF-10/1P-1MU	168826	10
	27	0.24	BB-EVF-10/1P-2MU	168830	10
	36	0.24	BB-EVF-10/1P-3MU	168834	10
2-phase	17.8	0.31	BB-EVF-10/2P-1MU	168838	10
	27	0.36	BB-EVF-10/2P-2MU	168840	10
3-phase	17.8	0.46	BB-EVF-10/3P-1MU	168842	10
	27	0.58	BB-EVF-10/3P-2MU	168844	10
	36	0.56	BB-EVF-10/3P-3MU	168850	10
3-phase + AUX	3x17.5+1x9	0.58	BB-EVF-10/3P-1MU/AUX	168846	10
	3x17.5+2x9	0.57	BB-EVF-10/3P-1MU2AUX	168848	10
Neutral	17.8	0.22	BB-EVF-10/N-1MU	168828	10
	27	0.24	BB-EVF-10/N-2MU	168832	10
	36	0.24	BB-EVF-10/N-3MU	168836	10

SG13213

SG13613



16 mm², Rated Current 80 A

1-phase	17.8	0.33	BB-EVF-16/1P-1MU	168827	10
	27	0.36	BB-EVF-16/1P-2MU	168831	10
	36	0.32	BB-EVF-16/1P-3MU	168835	10
2-phase	17.8	0.46	BB-EVF-16/2P-1MU	168839	10
	27	0.54	BB-EVF-16/2P-2MU	168841	10
3-phase	17.8	0.69	BB-EVF-16/3P-1MU	168843	10
	27	0.87	BB-EVF-16/3P-2MU	168845	10
	36	0.84	BB-EVF-16/3P-3MU	168851	10
3-phase + AUX	3x17.5+1x9	0.87	BB-EVF-16/3P-1MU/AUX	168847	10
	3x17.5+2x9	0.86	BB-EVF-16/3P-1MU2AUX	168849	10
Neutral	17.8	0.33	BB-EVF-16/N-1MU	168829	10
	27	0.36	BB-EVF-16/N-2MU	168833	10
	36	0.32	BB-EVF-16/N-3MU	168837	10

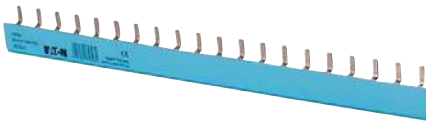
xEffect busbar 1m 10mm², 16mm² (Pin) BB-EVP

for MCBs, RCCBs, RCBOs, SPDs

- Delivered without end caps

SG13013

SG13513

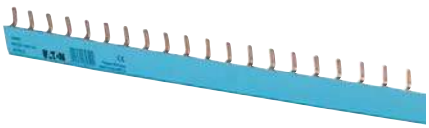


10 mm², Rated Current 63 A

Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package
1-phase	17.8	0.22	BB-EVP-10/1P-1MU	168852	10
	27	0.24	BB-EVP-10/1P-2MU	168856	10
	36	0.24	BB-EVP-10/1P-3MU	168860	10
2-phase	17.8	0.31	BB-EVP-10/2P-1MU	168864	10
	27	0.36	BB-EVP-10/2P-2MU	168866	10
3-phase	17.8	0.46	BB-EVP-10/3P-1MU	168868	10
	27	0.58	BB-EVP-10/3P-2MU	168870	10
	36	0.56	BB-EVP-10/3P-3MU	168876	10
3-phase + AUX	3x17.5+1x9	0.58	BB-EVP-10/3P-1MU/AUX	168872	10
	3x17.5+2x9	0.57	BB-EVP-10/3P-1MU2AUX	168874	10
Neutral	17.8	0.22	BB-EVP-10/N-1MU	168854	10
	27	0.24	BB-EVP-10/N-2MU	168858	10
	36	0.24	BB-EVP-10/N-3MU	168862	10

SG12913

SG13313



16 mm², Rated Current 80 A

Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package
1-phase	17.8	0.33	BB-EVP-16/1P-1MU	168853	10
	27	0.36	BB-EVP-16/1P-2MU	168857	10
	36	0.32	BB-EVP-16/1P-3MU	168861	10
2-phase	17.8	0.46	BB-EVP-16/2P-1MU	168865	10
	27	0.54	BB-EVP-16/2P-2MU	168867	10
3-phase	17.8	0.69	BB-EVP-16/3P-1MU	168869	10
	27	0.87	BB-EVP-16/3P-2MU	168871	10
	36	0.84	BB-EVP-16/3P-3MU	168877	10
3-phase + AUX	3x17.5+1x9	0.87	BB-EVP-16/3P-1MU/AUX	168873	10
	3x17.5+2x9	0.86	BB-EVP-16/3P-1MU2AUX	168875	10
Neutral	17.8	0.33	BB-EVP-16/N-1MU	168855	10
	27	0.36	BB-EVP-16/N-2MU	168859	10
	36	0.32	BB-EVP-16/N-3MU	168863	10

Accessories

End caps BB-EV-EC

wa_sg05612

Description	Cu-factor	Type Designation	Article No.	Units per package
1-phase	-	BB-EV-EC/1P	168878	40
2+3-phase	-	BB-EV-EC/2-3P	168823	40
4-phase	-	BB-EV-EC/4P	168824	20
Neutral	-	BB-EV-EC/N	168879	20

Terminal BB-EV-TE/35

wa_sg05312

Description	Cu-factor	Type Designation	Article No.	Units per package
	0.04	BB-EV-TE/35	168825	3

Sticker phase sequence

SG08713

Description	Cu-factor	Type Designation	Article No.	Units per package
	-	BB-S-PS	169831	5

Busbar Tag Shrouds ZV-BS-G

SG05705

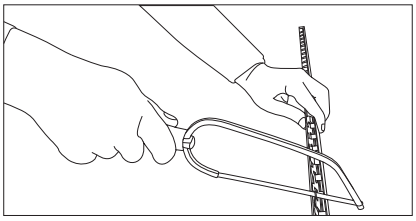
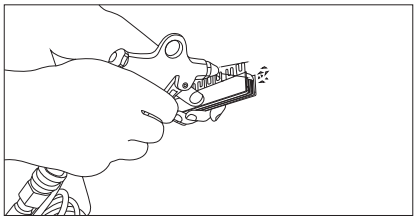
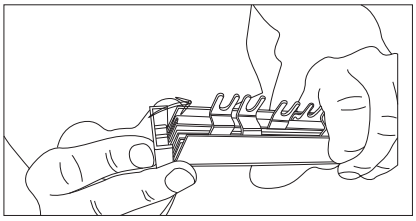
Description	Cu-factor	Type Designation	Article No.	Units per package
	-	ZV-BS-G	104903	10/600

Technical Data

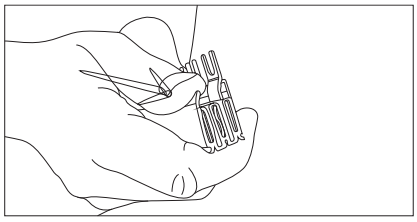
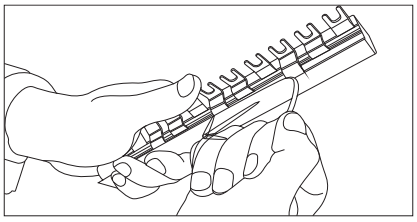
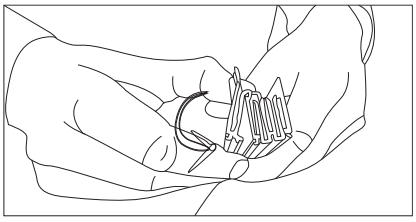
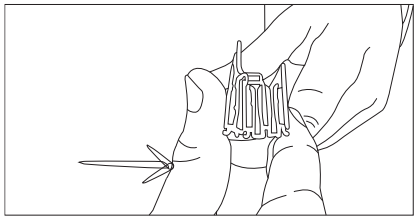
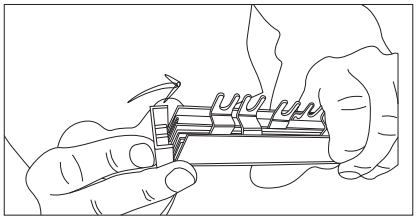
	BB-EV.
General	
Heat deflection temperature	≥80°C UL94 V0
Standards	EN 60947-1:2007 / IEC 60947-1:2007 / IEC 60999:2000
Climate stability	according to DIN EN 60068
Insulation coordination	Overvoltage category III / Degree of pollution 2
Electrical	
Impulse voltage strenght	≥4.5 kV
Min. air distance	>5.5 mm
Min. creeping distance	>5 mm
Max. operating voltage	690 V AC/DC 1,000 V DC 1-pole only
Max. current I_s/Phase	
10 mm^2	63 A
16 mm^2	80 A
Protection class	IP20
Short circuit rating I_{CC}	25kA - NH3 355A gC500V JM
Dielectric strenght	PC - ABS >32 kV / mm

Assembly instruction:

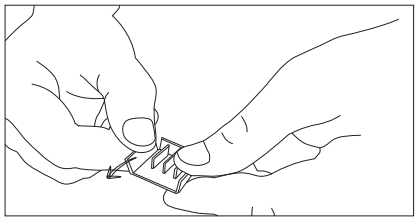
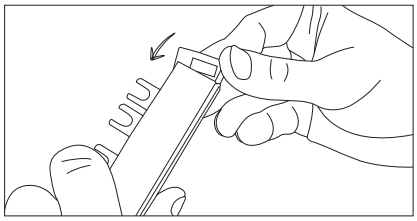
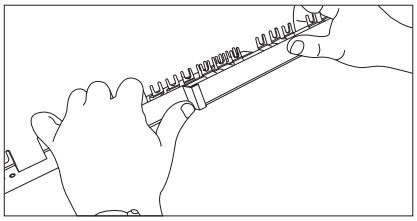
Cutting

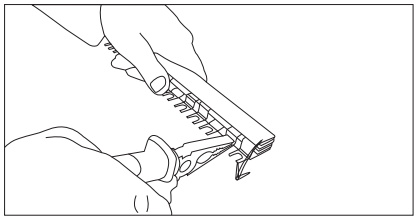
Mounting of an extension busbar

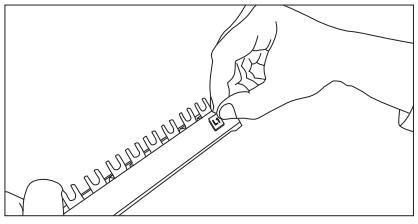
Overlapping mounting or further connection, resp.

Brecking out of connection lugs



Sticking on phase marking



Busbar UL489 Z-BB/UL

SG13713

- For MCB FAZ-NA/RT/DU
- Sliceable
- 18 and 25 mm^2
- Pin busbar
- Accessories available:
  - End cap
  - Terminal
  - Busbar tag shrouds
- Length 1 m

Busbar UL489 sliceable 1m 18mm², 25mm² (Pin), Z-BB/UL

for FAZ-NA/RT/DU

- Delivered without end caps

SG13713

18 mm², Rated Current 80 A

Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package
1-phase	17.6	0.39	Z-BB/UL18/1P1MU/57	171128	10
1-phase + AUX	26.4	0.378	Z-BB/UL18/1P1MU+AUX/37	171134	10
2x 1-phase + AUX	26.4	0.56	Z-BB/UL18/2X1P1MU+AUX/38	171142	10
3x 1-phase + AUX	26.4	0.945	Z-BB/UL18/3X1P1MU+AUX/39	171140	10
2-phase	17.6	0.625	Z-BB/UL18/2P1MU/56	171129	10
2-phase + AUX	17.6 + 26.4	0.625	Z-BB/UL18/2P1MU+AUX/46	171135	10
3-phase	17.6	0.95	Z-BB/UL18/3P1MU/57	171130	10
3-phase + AUX	2x 17.6 + 26.4	0.93	Z-BB/UL18/3P1MU+AUX/48	171136	10

SG14213

25 mm², Rated Current 100 A

Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package
1-phase	17.6	0.535	Z-BB/UL25/1P1MU/57	171131	10
1-phase + AUX	26.4	0.745	Z-BB/UL25/1P1MU+AUX/37	171137	10
2x 1-phase + AUX	26.4	0.78	Z-BB/UL25/2X1P1MU+AUX/38	171143	10
3x 1-phase + AUX	26.4	1.315	Z-BB/UL25/3X1P1MU+AUX/39	171141	10
2-phase	17.6	0.888	Z-BB/UL25/2P1MU/56	171132	10
2-phase + AUX	17.6 + 26.4	0.87	Z-BB/UL25/2P1MU+AUX/46	171138	10
3-phase	17.6	1.31	Z-BB/UL25/3P1MU/57	171133	10
3-phase + AUX	2x 17.6 + 26.4	1.28	Z-BB/UL25/3P1MU+AUX/48	171139	10

Accessories

End cap Z-ECUL

Description	Cu-factor	Type Designation	Article No.	Units per package
	-	Z-ECUL	171145	10

Terminal Z-TEUL35

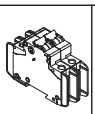
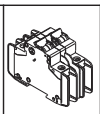
Description	Cu-factor	Type Designation	Article No.	Units per package
	0,038	Z-TEUL35	171144	10

Busbar Tag Shrouds Z-FPUL

SG08613

Description	Cu-factor	Type Designation	Article No.	Units per package
	-	Z-FPUL	171146	10

Description of the Busbar UL489, Z-BB/UL for FAZ-NA, -RT, -DU

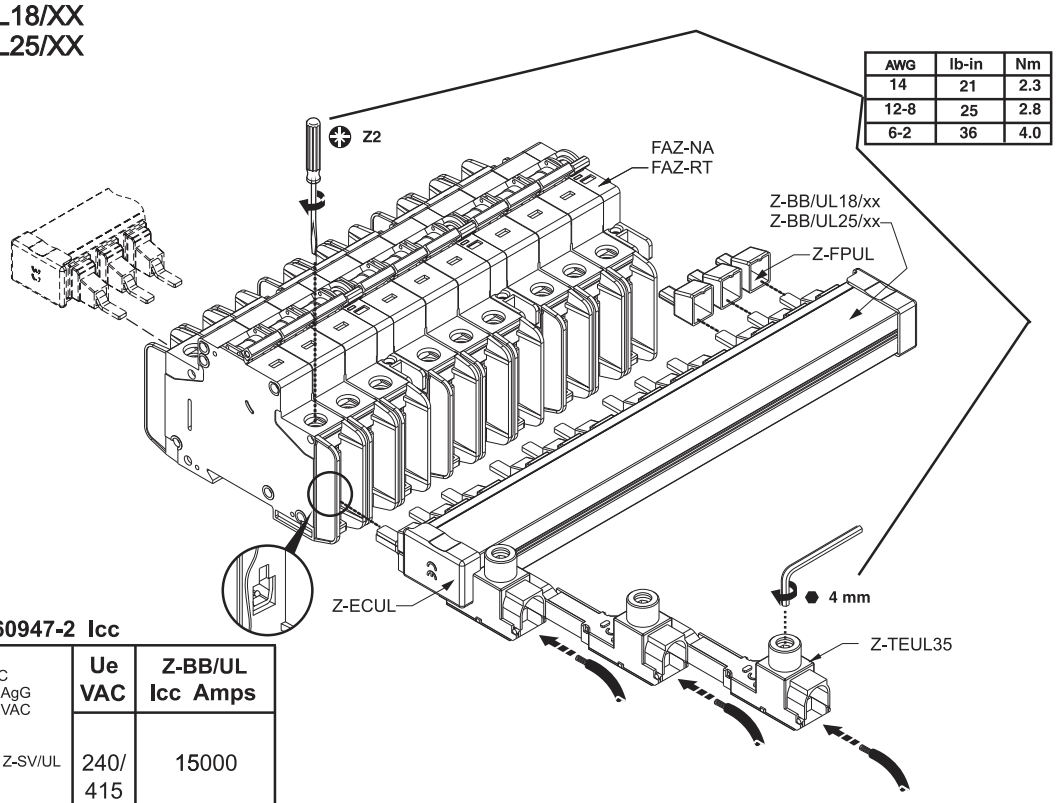
									
Z-BB/UL18/1P1MU/57	171128	57	-	-	-	-	-	-	-
Z-BB/UL18/2P1MU/56	171129	-	56	-	-	-	-	-	-
Z-BB/UL18/3P1MU/57	171130	-	-	57	-	-	-	-	-
Z-BB/UL25/1P1MU/57	171131	57	-	-	-	-	-	-	-
Z-BB/UL25/2P1MU/56	171132	-	56	-	-	-	-	-	-
Z-BB/UL25/3P1MU/57	171133	-	-	57	-	-	-	-	-
Z-BB/UL18/1P1MU+AUX/37	171134	-	-	-	37	-	-	-	-
Z-BB/UL18/2P1MU+AUX/46	171135	-	-	-	-	-	-	46	-
Z-BB/UL18/3P1MU+AUX/48	171136	-	-	-	-	-	-	-	48
Z-BB/UL25/1P1MU+AUX/37	171137	-	-	-	37	-	-	-	-
Z-BB/UL25/2P1MU+AUX/46	171138	-	-	-	-	-	-	46	-
Z-BB/UL25/3P1MU+AUX/48	171139	-	-	-	-	-	-	-	48
Z-BB/UL18/3X1MU+AUX/39	171140	-	-	-	-	-	39	-	-
Z-BB/UL25/3X1MU+AUX/39	171141	-	-	-	-	-	39	-	-
Z-BB/UL18/2X1MU+AUX/38	171142	-	-	-	-	38	-	-	-
Z-BB/UL25/2X1MU+AUX/38	171143	-	-	-	-	38	-	-	-
Z-TEUL35	171144	-	-	-	-	-	-	-	-
Z-ECUL	171145	-	-	-	-	-	-	-	-
Z-FPUL	171146	-	-	-	-	-	-	-	-

Technical Data

	Z-BB/UL
General	
Heat deflection temperature	>100°C - UL94 V0
Standards	UL489, EN 60947-1, IEC 60947-1:2004
Climate stability	according to DIN EN 60068
Insulation coordination	Overvoltage category III / Degree of pollution 2
Electrical	
Impulse voltage strenght	⩾10 kV
Min. air distance	⩾1" ext.
Min. creeping distance	⩾2" ext.
Max. operating voltage	
1-pole	1,000 V AC/DC
2-, 3-pole	600 V AC/DC
Max. current I_s/Phase	
18 mm^2	80 A
25 mm^2	100 A
Protection class	IP20
Short circuit rating I_{CC}	10 kA
Dielectric strenght	PA66-V0, >35 kV

Mounting example of busbar UL489, Z-BB/UL for FAZ-NA, -RT, -DU

Z-BB/UL18/XX
Z-BB/UL25/XX



AWG	lb-in	Nm
14	21	2.3
12-8	25	2.8
6-2	36	4.0

IEC/EN 60947-2 Icc

Ue HRC 315AgG 500VAC Z-SV/UL	Ue VAC	Z-BB/UL Icc Amps
	240/ 415	15000

UL SCCR

Ue Z-SV/UL FAZ-NA FAZ-RT	FAZ-NA FAZ-RT In Amps	Ue VAC	Z-BB/UL SCCR RMS Sym Amps
	0.5-32	480Y/ 277	10000
	35-40	240	10000

Busbar UL508 BB/UL

- For MCB FAZ
- Sliceable
- 18 and 25 mm^2
- Pin busbar
- Accessories available:
  - End caps
  - Terminals
  - Busbar tag shrouds
- Length 1 m

	Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package

Busbar UL508 sliceable 1m 18mm², 25mm² (Pin), BB/UL

for FAZ

- Delivered without end caps

18 mm², Rated Current 80 A

1-phase	17.8	0.33	BB-UL-18/1P-1M/57	121981	10
2-phase	17.8	0.508	BB-UL-18/2P-2M/56	121982	10
3-phase	17.8	0.8	BB-UL-18/3P-3M/57	121983	10
1-phase + AUX	27	0.33	BB-UL-18/1P-1,5M/37	121984	10
2-phase + AUX	17.8 + 26.7	0.52	BB-UL-18/2P+AS-2,5M/46	121987	10
3-phase + AUX	2x 17.8 + 26.7	0.8	BB-UL-18/3P+AS-3,5M/48	121988	10

25 mm², Rated Current 100 A

1-phase	17.8	0.45	BB-UL-25/1P-1M/57	121989	10
2-phase	17.8	0.68	BB-UL-25/2P-2M/56	121990	10
3-phase	17.8	1.07	BB-UL-25/3P-3M/57	121991	10
1-phase + AUX	27	0.45	BB-UL-25/1P-1,5M/37	121992	10
2-phase + AUX	17.8 + 26.7	0.69	BB-UL-25/2P+AS-2,5M/46	121995	10
3-phase + AUX	2x 17.8 + 26.7	1.03	BB-UL-25/3P+AS-3,5M/48	121996	10

	Description	Cu-factor	Type Designation	Article No.	Units per package

Accessories

End caps BB-UL-EC

1-phasig	-	BB-UL-EC/1	122000	10
3-phasig	-	BB-UL-EC/3	122001	10

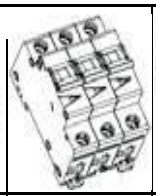
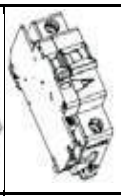
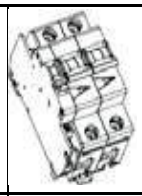
Terminals BB-UL-TE

6 - 35mm² (single and multi wire)	0,035	BB-UL-TEP/35	121997	10
6 - 50mm²	0,038	BB-UL-TEPA/35	169823	10
6 - 50mm² (single and multi wire)	0,038	BB-UL-TE/50	121998	10

Busbar Tag Shrouds BB-IP/5

for 5 pins	-	BB-IP/5	121999	10

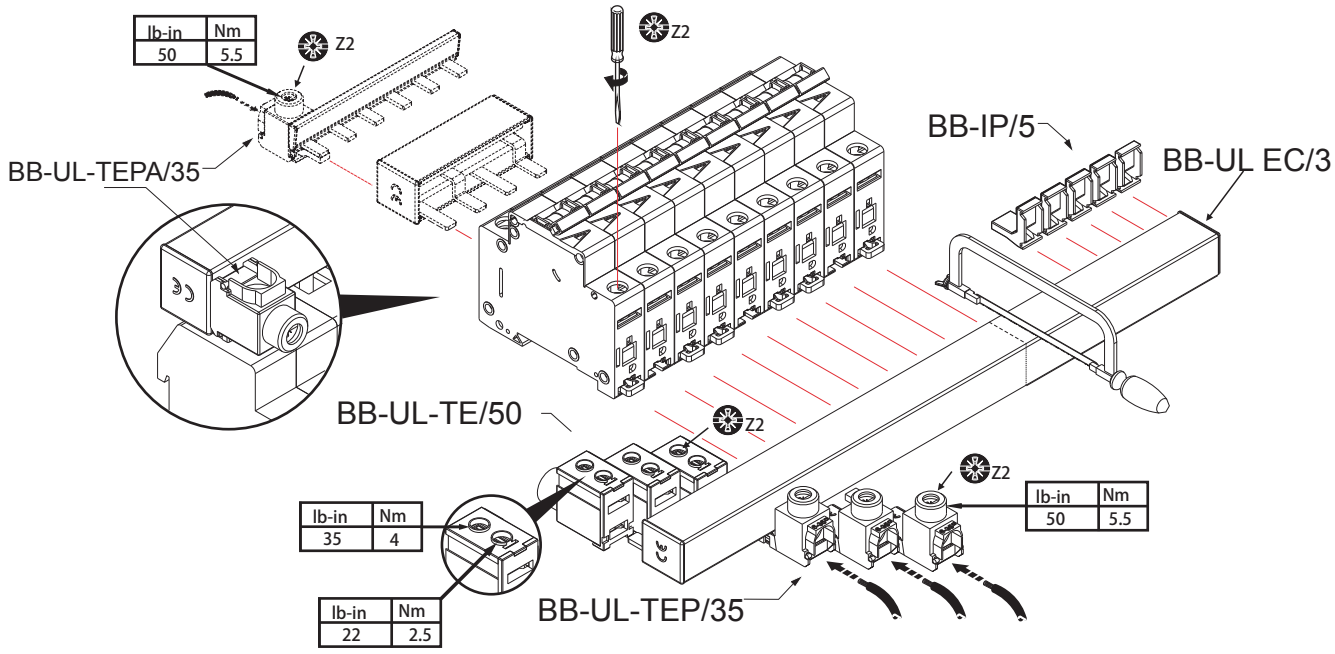
Description of the Busbar UL508, BB/UL for FAZ

Article No.							
121981	BB-UL-18/1P-1M/57	57	-	-	-	-	-
121982	BB-UL-18/2P-2M/56	-	28	-	-	-	-
121983	BB-UL-18/3P-3M/57	-	-	19	-	-	-
121984	BB-UL-18/1P-1,5M/37	-	-	-	37	-	-
121987	BB-UL-18/2P+AS-2,5M/46	-	-	-	-	23	-
121988	BB-UL-18/3P+AS-3,5M/48	-	-	-	-	-	16
121989	BB-UL-25/1P-1M/57	57	-	-	-	-	-
121990	BB-UL-25/2P-2M/56	-	28	-	-	-	-
121991	BB-UL-25/3P-3M/57	-	-	19	-	-	-
121992	BB-UL-25/1P-1,5M/37	-	-	-	37	-	-
121995	BB-UL-25/2P+AS-2,5M/46	-	-	-	-	23	-
121996	BB-UL-25/3P+AS-3,5M/48	-	-	-	-	-	16
121997	BB-UL-TEP/35	-	-	-	-	-	-
169823	BB-UL-TEPA/35	-	-	-	-	-	-
121998	BB-UL-TE/50	-	-	-	-	-	-
121999	BB-IP/5	-	-	-	-	-	-
122000	BB-UL-EC/1	-	-	-	-	-	-
122001	BB-UL-EC/3	-	-	-	-	-	-

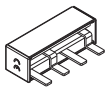
Technical Data

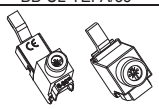
	Z-BB/UL
General	
Heat deflection temperature	125°C - UL94 V0
Standards	DIN EN 60947-2, VDE 0660 - 101 = IEC 60947-2, IEC 60999:2000, UL508, UL486A, CSA C22.2
Climate stability	according to DIN EN 60068
Insulation coordination	Overvoltage category III / Degree of pollution 2
Electrical	
Impulse voltage strenght	≥9.5 kV
Min. air distance	>9.5 mm
Min. creeping distance	>12.7 mm
Max. operating voltage	
1-pole	1,000 V AC/DC
2-, 3-pole	IEC/EN 690 V AC/DC 600 V AC/DC UL Fuse 480 V AC/DC UL-SP
Terminals	1, 000 V AC/DC
Max. current I_s/Phase	
18 mm^2	80 A (feed in the center: 160 A)
25 mm^2	100 A (feed in the center: 200 A)
Protection class	IP20
Short circuit rating	10kA 3 cycles@480V / 100 kA Fuse Class J 175A@18mm^2 - 200A@25mm^2
Dielectric strenght	>32 kV/mm

Mounting example of busbar UL508, BB/UL for FAZ



BB-UL-TE/50			
	UL508		EN/IEC 60947-2
U_e	480 V AC		240/690V AC
f	50/60 Hz	----------	50/60 Hz
I_e	115 A @ 40° C		160 A @ 30° C
	#1-14 AWG 60/75° C Cu		1.5 – 50 mm² Cu
	0.56 in		14 mm

BB-UL		
	UL508	EN/IEC 60947-2
U_e	480 V AC	690V AC
f	50/60 Hz	
I_{pk}	10kA	15kA
I_e	18mm☒	25mm☒
Infeed at the start of the busbar	80A@40° C	100A@30° C
Infeed at the center of the busbar	160A@40° C	200A@30° C

BB-UL-TEP/35 / BB-UL-TEPA/35			
	UL508		EN/IEC 60947-2
U_e	480 V AC		240/690V AC
f	50/60 Hz	----------	50/60 Hz
I_e	115 A@40° C		80 A@30° C
	#2-14 AWG 60/75° C Cu		2.5 – 35 mm² Cu
	0.56 in		14 mm

*-UL508 SHORT CIRCUIT RATINGS

-SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 10,000 RMS SYMETRICAL AMPERES, 600 VOLTS MAXIMUM.
-SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN 100,000 RMS SYMETRICAL AMPERES, 600 VOLTS MAXIMUM WHEN PROTECTED BY A CLASS J FUSE RATED 175A.

Busbar UL489 Z-SV/UL16

wa_sg03511

- For MCB FAZ-NA/RT/DU
- 16 mm^2
- Pin busbar
- Accessories available:
  - Terminals
  - Busbar tag shrouds
- Several length

	Description	Step Distance (mm)	Cu-factor	Type Designation	Article No.	Units per package

Busbar UL489 16mm² (Pin), Z-SV/UL16

for FAZ-NA/RT/DU, not sliceable!!

- Delivered with end caps

wa_sg03511

16 mm², Rated Current 80 A

1-phase, 6MU	17.6	0.035	Z-SV/UL-16/1P-1MU/6	104892	10
1-phase, 12MU	17.6	0.07	Z-SV/UL-16/1P-1MU/12	104893	10
1-phase, 18MU	17.6	0.105	Z-SV/UL-16/1P-1MU/18	104894	10
2-phase, 6MU	17.6	0.07	Z-SV/UL-16/2P-2MU/6	104895	10
2-phase, 12MU	17.6	0.14	Z-SV/UL-16/2P-2MU/12	104896	10
2-phase, 18MU	17.6	0.21	Z-SV/UL-16/2P-2MU/18	104897	10
3-phase, 6MU	17.6	0.14	Z-SV/UL-16/3P-3MU/6	104898	10
3-phase, 12MU	17.6	0.221	Z-SV/UL-16/3P-3MU/12	104899	10
3-phase, 18MU	17.6	0.332	Z-SV/UL-16/3P-3MU/18	104900	10

	Description	Cu-factor	Type Designation	Article No.	Units per package

Accessories

Terminals Z-TEUL35

SG07506

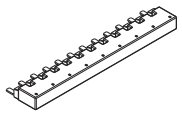
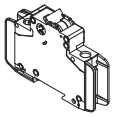
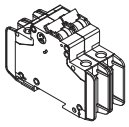
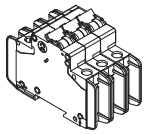
2.5 - 35mm²	0.035	Z-EK/35/UL	104901	3
1.5 - 50mm²	0.038	Z-EB/50/UL	104902	3

Busbar Tag Shrouds Z-FPUL

SG07706

for 3 pins	-	ZV-BS-UL	104904	10

Description of the Busbar UL489, Z-SV/UL-16 for FAZ-NA/RT/DU

Article No.				
104892	Z-SV/UL-16/1P-1TE/6	6	-	-
104893	Z-SV/UL-16/1P-1TE/12	12	-	-
104894	Z-SV/UL-16/1P-1TE/18	18	-	-
104895	Z-SV/UL-16/2P-2TE/6	-	3	-
104896	Z-SV/UL-16/2P-2TE/12	-	6	-
104897	Z-SV/UL-16/2P-2TE/18	-	9	-
104898	Z-SV/UL-16/3P-3TE/6	-	-	2
104899	Z-SV/UL-16/3P-3TE/12	-	-	4
104900	Z-SV/UL-16/3P-3TE/18	-	-	6
104901	Z-EK/35/UL	-	-	-
104902	Z-EB/50/UL	-	-	-
104904	ZV-BS-UL	-	-	-

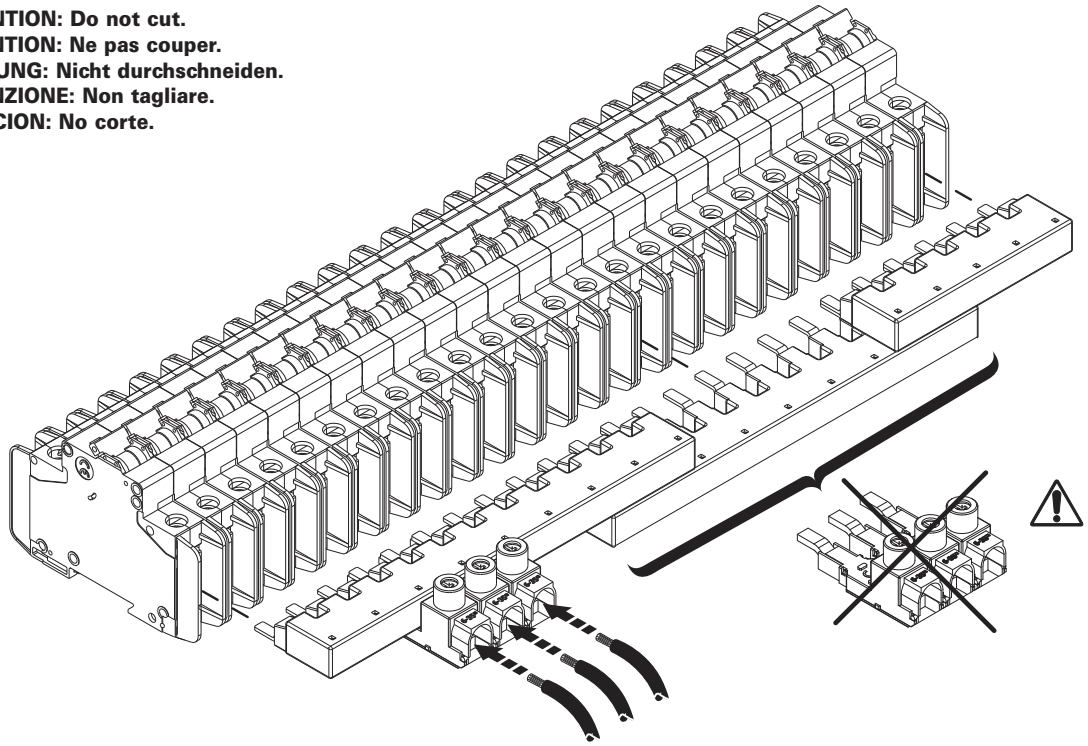
Technical Data

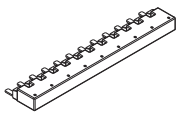
	Z-SV/UL16
General	
Heat deflection temperature	125°C - UL94 V0
Standards	
Busbar	UL489, DIN EN 60947-1, VDE 0660 part 100 = IEC 60947-1:2004, IEC 60947-2:2003
Terminal	IEC 60999:2000, UL489, UL486A, CSA C22.2
Climate stability	according to DIN EN 60068
Insulation coordination	Overvoltage category III / Degree of pollution 2
Electrical	
Impulse voltage strenght	⩾9.5 kV (1kV / mmLS)
Min. air distance	>9.5mm/25.4mm (intern/external)
Min. creeping distance	>12.7mm/50.8mm (intern/external)
Max. operating voltage	
1-, 3-phase	690 V IEC 480Y/277V & 240V AC
Terminals	1,000 V AC/DC
Max. current I_s/Phase	80 A
Protection class	IP20
Short circuit rating	15kA with NH3 355 A gL 500V JM / 7.5kA 3 cycles @ 600V
Dielectric strenght	>30 kV/mm

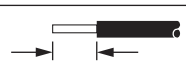
Mounting example of busbar UL489, Z-SV/UL-16 for FAZ-NA, -RT, -DU

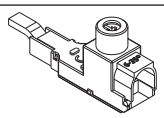
ATTENTION: Maximum of 3 commoning links
allowed. Any combination of same pole configuration.
ATTENTION: 3 liaisons communes autorisées au maximum.
Toute combinaison de configurations de polarité identiques.
ACHTUNG: Maximal 3 Schienenblöcke. Beliebige Kombination gleichpoliger Konfigurationen.
ATTENZIONE: Sono consentiti al massimo 3 pettini di collegamento
in qualsiasi combinazione della stessa configurazione di poli.
ATENCION: Se permite un máximo de 3 enlaces comunes.
Cualquier combinación del mismo tipo de configuración de polo

ATTENTION: Do not cut.
ATTENTION: Ne pas couper.
ACHTUNG: Nicht durchschneiden.
ATTENZIONE: Non tagliare.
ATENCION: No corte.

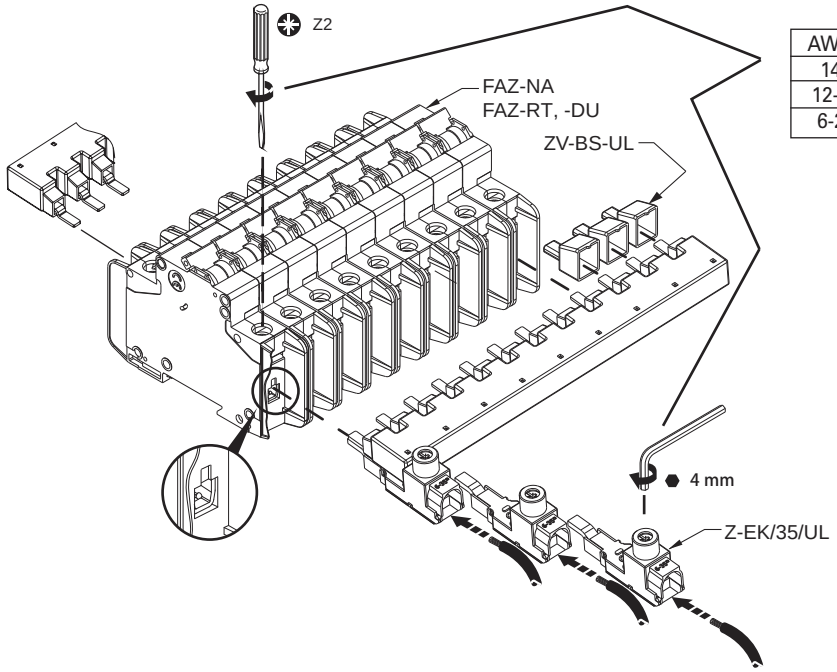


	UL489		EN/IEC 00947-2
U_e	480 V AC	96 V DC	240/415 V AC
f	50/60 Hz	----------	50/60 Hz
U_{imp}	----------		9.5 kV
I_e	80 A @ 40°C		80 A @ 30°C
Cross section	----------		16 mm²

	UL489		EN/IEC 00947-2
U_e	480 V AC	96 V DC	240/415 V AC
f	50/60 Hz	----------	50/60 Hz
U_{imp}	----------		9.5 kV
	#1-14 AWG 60/75°C Cu		1.5-50 mm² Cu
	0.56 in		14 mm

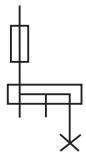
	UL489		EN/IEC 00947-2
U_e	480 V AC	96 V DC	240/415 V AC
f	50/60 Hz	----------	50/60 Hz
U_{imp}	----------		9.5 kV
I_e	80 A @ 40°C		80 A @ 30°C
	#2-14 AWG 60/75°C Cu		2.5-35 mm² Cu
	0.56 in		14 mm

Mounting example of busbar UL489, Z-SV/UL-16 for FAZ-NA, -RT, -DU



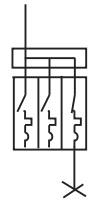
AWG	lb-in	Nm
14	21	2.3
12-8	25	2.8
6-2	36	4.0

IEC/EN 60947-2 Icc



Ue VAC	Z-SV/UL Icc Amps
240/ 415	15000

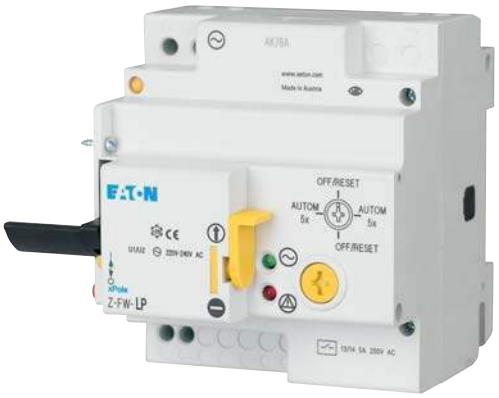
UL SCCR



FAZ-NA FAZ-RT/-DU In Amps	Ue VAC	Z-SV/UL SCCR RMS Sym Amps
0.5-32	480Y/ 277	10000
35-40	240	10000

Accessories for RCDs, MCBs, Combined RCD/MCB Devices

SG30811



- Auxiliary Switch
- RCD-Tripping Module
- Shunt Trip Release
- Undervoltage Release
- Remote Control and Automatic Switching Device
- Switching Interlocks
- Terminal Covers

SG60811

Auxiliary Switch Z-HK, Z-AHK, Z-HD; Tripping Signal Switch Z-NHK
Design: for screwing

	For Protective Device / Function	Type Designation	Article No.	Units per package
SG34812	RCCB / 1NO+1NC	Z-HK	248432	4/120
SG60911	MCB, RCBO, RCCB / 1NO+1NC	Z-AHK	248433	4/120
SG61011	MCB, RCBO, RCCB / 2CO	Z-NHK	248434	4/120
SG34412	RCCB / 1CO+1NC	Z-HD	265620	1

Specifications | Auxiliary Switch Z-HK, Z-AHK; Tripping Signal Switch Z-NHK

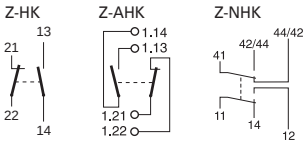
Description

- Design according to IEC/EN 60947-5-1, IEC/EN 62019
- Can be mounted subsequently (screws) onto FRCmM, FRCdM
- The specified minimum voltages are per contact. Take into account particularly in case of series connection!
- **Z-AHK, Z-NHK:** Contact function with relative movement (self-cleaning contacts)
- Contact material and design particularly suitable for extra low voltage
- **Z-NHK:** The function of one of the two change-over contacts can be switched from “auxiliary switch” to “tripping signal switch”
- Tripping signal contact transmits message of electric tripping, not mechanical switch-off
- Test key for contact function “electrical tripping”

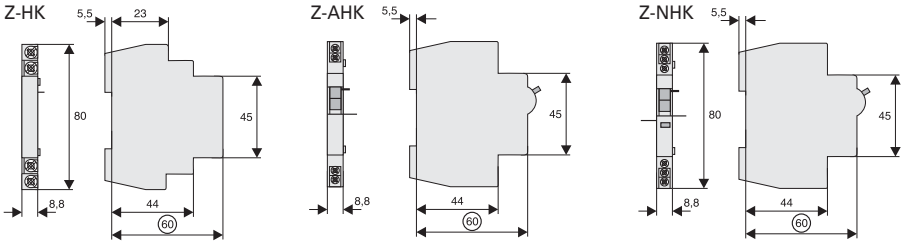
Technical Data

		Z-HK	Z-AHK	Z-NHK
Electrical				
Contact function		1NO + 1NC	1NO + 1NC	2CO
Rated voltage		250 V	250 V	250 V
Frequency		50/60 Hz	50/60 Hz	50/60 Hz
Rated current		8 A	4 A	4 A
Rated thermal current	I_{th}	8 A	4 A	4 A
Utilisation category AC13				
Rated operational current	I_e	6A/250V AC	3A/250V AC	3A/250V AC
		2A/440V AC	–	–
Utilisation category AC15				
Rated operational current	I_e	–	2A/250V AC	2A/250V AC
Utilisation category DC12				
Rated operational current	I_e	–	0.5A/110V DC	0.5A/110V DC
Utilisation category DC13				
Rated operational current	I_e	0.5A/230V DC	–	–
		2A/110V DC	–	–
		4A/60V DC	–	–
Rated insulation voltage	U_i	250 V AC	250 V AC	250 V AC
Minimum operational voltage per contact	U_{min}	24 V AC/DC	5 V DC	5 V DC
Minimum operational current	I_{min}	50 mA AC/DC	10 mA DC	10 mA DC
Rated peak withstand voltage	U_{imp} (1.2/50µ)	2.5 kV	2.5 kV	2.5 kV
Conditional short circuit current	I_k			
with back-up fuse 6A or FAZ-B4-HS		1 kA	1 kA	1 kA
Max. back-up fuse, overload and short circuit		6 A gL / FAZ-4/../B-HS	4 A gL / FAZ-4/../B-HS	4 A gL / FAZ-4/../B-HS
Mechanical				
Can be mounted from the left onto		RCCB	MCB, RCBO	MCB, RCBO
Can be mounted from the right onto		–	–	RCCB
Tripping indicator “electrical tripping”		–	–	blue/white
Frame size		45 mm	45 mm	45 mm
Device height		80 mm	80 mm	80 mm
Device width		8.8 mm (0.5MU)	8.8 mm (0.5MU)	8.8 mm (0.5MU)
Mounting		onto switching device	onto switching device	onto switching device
Degree of protection, built-in		IP40	IP40	IP40
Terminal protection		finger and hand touch safe according to BGV A3, ÖVE-EN 6		
Terminals		lift terminals	lift terminals	lift terminals
Terminal capacity		0.5-2.5 mm^2	0.5-2.5 mm^2	0.5-2.5 mm^2
Terminal screws		M3 (Pozidrive Z0)	M3 (Pozidrive Z0)	M3 (Pozidrive Z0)
Fastening torque of terminal screws		max. 0.8-1.0 Nm	max.0.8-1.0 Nm	max. 0.8-1.0 Nm

Connection diagram

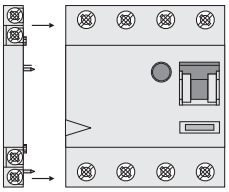


Dimensions (mm)



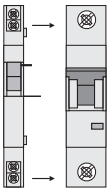
Accessories for Protective Devices

Example: Z-HK+RCCB



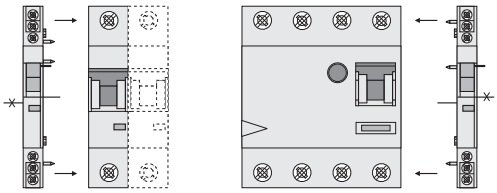
1NO+1NC 24V 50mA min.

Example: Z-AHK+MCB



1NO+1NC 5V 10mA min.

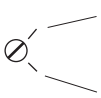
Example: Z-NHK+MCB RCCB+Z-NHK



2CO 5V 10mA min.

Specifications | Auxiliary Switch Z-HD

Function Auxiliary Switch Z-HD



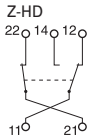
Tripping signal switch: detects if RCD tripping occured by an fault current

Auxiliary switch: shows the contact position of the RCD

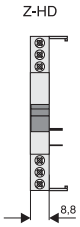
Technical Data

	Z-HD
Electrical	
Subsequent installation to the left onto	FRCmM-125A
Contacts	1CO + 1NC
Load rating	
AC11	6 A / 230 V AC
DC11	1 A / 230 V DC
Mechanical	
Terminal capacity	up to 2.5 mm^2

Connection diagram



Dimensions (mm)



Auxiliary Switch ZP-AHK, ZP-IHK, ZP-WHK; Tripping Signal Switch ZP-NHK
Design: for snapping

	For Protective Device / Function	Type Designation	Article No.	Units per package
SG60811	MCB, RCBO / 1NO+1NC	ZP-IHK	286052	4/120
SG34612	MCB, RCBO / 1CO	ZP-WHK	286053	4/120
SG34512	MCB, RCBO / 2CO	ZP-NHK	248437	4/120

Specifications | Auxiliary Switch ZP-IHK, ZP-WHK; Tripping Signal Switch ZP-NHK

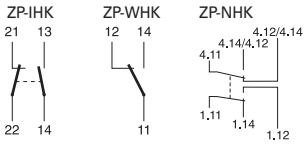
Description

- Design according to IEC/EN 62019
- No screws required. Can be snapped onto FAZ and FRBmM-1N subsequently
- **ZP-IHK, ZP-WHK:** Can be snapped on additionally 1 time onto itself
- The specified minimum voltages are per contact. Take into account particularly in case of series connection!
- Contact material and design particularly suitable for extra low voltage.
- Contact function with relative movement (self-cleaning contacts)e)
- **ZP-NHK:** The function of one of the two change-over contacts can be switched from “auxiliary switch” to "tripping signal switch"
- Tripping signal contact transmits message of electric tripping, not mechanical switch-off
- **ZP-NHK:** The “Service button” is used to check whether or not the auxiliary switch is correctly wired in the tripping-signal-switch position. Activating the “service button” will mechanically simulate an electrical switch-off, so the mechanism for the electrical switchoff will disengage and can be checked. The main switchgear (MCB or combined MCB/RCD) connected to the ZP-NHK auxiliary switch does not need to trip as well during an inspection through the service button.

Technical Data

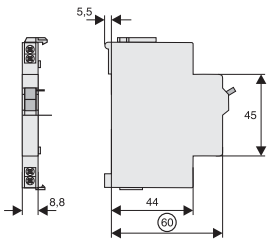
		ZP-IHK	ZP-WHK	ZP-NHK
Electrical				
Contact function		1NO + 1NC	1CO	2CO
Rated voltage		250 V	250 V	250 V
Frequency		50/60 Hz	50/60 Hz	50/60 Hz
Rated current		6 A	6 A	4 A
Rated thermal current	I_{th}	6 A	6 A	4 A
Utilisation category AC13				
Rated operational current	I_e	3A/250V AC	3A/250V AC	3A/250V AC
Utilisation category AC15				
Rated operational current	I_e	2A/250V AC	2A/250V AC	2A/250V AC
Utilisation category DC12				
Rated operational current	I_e	0.5A/110V DC	0.5A/110V DC	0.5A/110V DC
Rated insulation voltage	U_i	250 V AC	250 V AC	250 V AC
Minimum operational voltage per contact	U_{min}	5 V DC	5 V DC	5 V DC
Minimum operational current	I_{min}	10 mA DC	10 mA DC	10 mA DC
Rated peak withstand voltage	U_{imp} (1.2/50µ)	2.5 kV	2.5 kV	2.5 kV
Conditional short circuit current	I_k			
with back-up fuse 6A or PLSM-B4-HS		1 kA	1 kA	1 kA
Max. back-up fuse, overload and short circuit		6 A gL / FAZ-B4-HS	6 A gL / FAZ-B4-HS	6 A gL / FAZ-B4-HS
Mechanical				
Can be mounted from the left onto		MCB, RCBO	MCB, RCBO	MCB, RCBO
Accessories:		ZP-ASA	ZP-ASA	ZP-ASA
Tripping indicator “electrical tripping”		–	–	blue/white
Frame size		45 mm	45 mm	45 mm
Device height		80 mm	80 mm	80 mm
Device width		8.8 mm (0.5MU)	8.8 mm (0.5MU)	8.8 mm (0.5MU)
Degree of protection, built-in		IP40	IP40	IP40
Terminal protection		finger and hand touch safe according to BGV A3, ÖVE-EN 6		
Terminals		lift terminals	lift terminals	lift terminals
Terminal capacity		0.5-2.5 mm²	0.5-2.5 mm²	0.5-2.5 mm²
Terminal screws		M4 (Pozidrive Z2)	M4 (Pozidrive Z2)	M3 (Pozidrive Z0)
Fastening torque of terminal screws		max. 1.2 Nm	max. 1.2 Nm	max. 0.8-1.0 Nm

Connection diagram

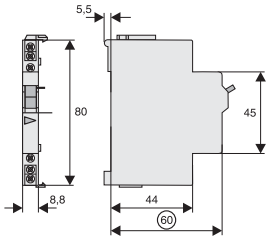


Dimensions (mm)

ZP-IHK, ZP-WHK

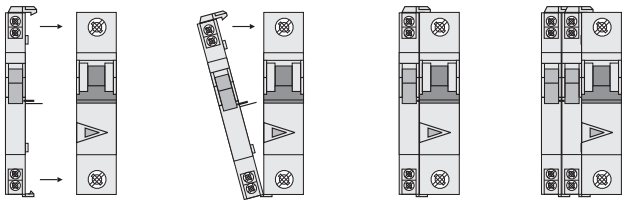


ZP-NHK

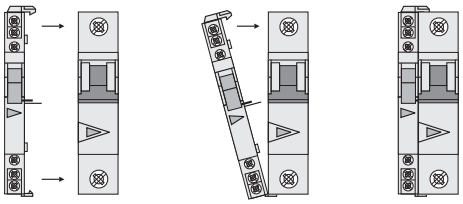


Accessories for Protective Devices

Example: ZP-IHK/(ZP-WHK)+MCB



Example: ZP-NHK+MCB



CUTLER HAMMER FAZ CIRCUIT BREAKERS

RCCB-Tripping Module Z-.AM

	For Protective Device	Type Designation	Article No.	Units per package
SG16011	RCCB	Z-FAM	248293	1/60
SG16211	RCBO	Z-KAM	248294	1/60

Specifications | RCCB Tripping Module Z-FAM, Z-KAM

Description

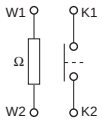
- For remote switch-off of RCCBs, standard and electronic combined RCD/MCB devices
- Remote switch-off by one or several parallel potential-free contacts, e.g. pushbutton max. rated current 3 A at 250 V, take into account maximum pushbutton voltage
- Remote tripping test by means of remote testing module Z-FW
- Can be mounted subsequently, to be wired according to connection diagram with the respective terminals of the RCCB
- No undesired voltage rise in the consumer system during remote switch-off thanks to integrated breaker contact K1-K2

Technical Data

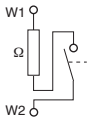
		Z-FAM	Z-KAM
Electrical			
Rated voltage		230(400) V AC	230(400) V AC
Frequency		50-60 Hz	50-60 Hz
Rated tripping current	$I_{\Delta n}$	0.01 - 0.3 A	0.01 - 0.3 A
Function		1NO	1NO
Mechanical			
Tripping module for		RCCB	RCBO
Frame size		45 mm	45 mm
Device height		80 mm	80 mm
Device width		8.8 mm (0.5MU)	8.8 mm (0.5MU)
Degree of protection, built-in		IP40	IP40
Terminal capacity		1 - 2x2.5 mm^2	1 - 2x2.5 mm^2
Terminal protection		finger and hand touch safe, according to BGV A3, ÖVE-EN 6	

Connection diagram

Z-FAM

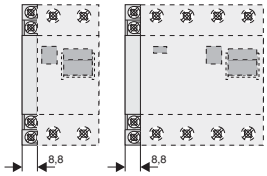


Z-KAM

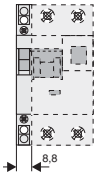


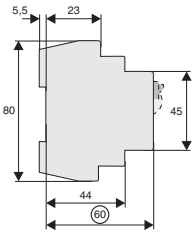
Dimensions (mm)

Z-FAM



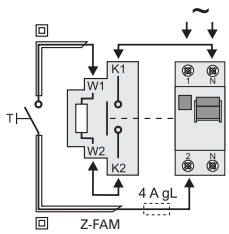
Z-KAM



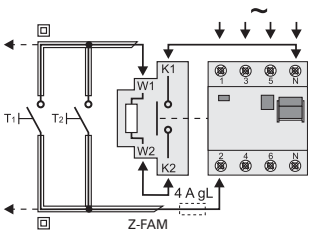


Connection examples

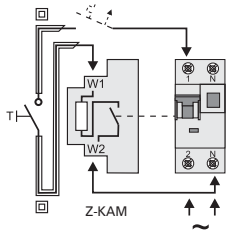
Lay lines to the switching devices with double insulation **and** overload protection, e.g. 4A gL or CLS6-4..-HS



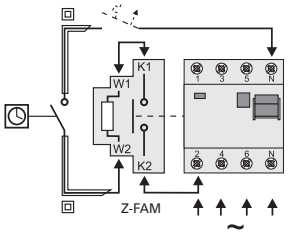
Connection diagram:
RCCB-2p, RCCB feed above



Connection diagram:
RCCB-4p, RCCB feed above



Connection diagram:
RCBO-2p, RCBO feed below



Connection diagram:
RCCB-4p, RCCB feed below

Shunt Trip Release Z-ASA, ZP-ASA

SG00712

Operational voltage range (V~)	Type Designation	Article No.	Units per package
To be glued on			
12-110	Z-ASA/24	248286	1/60
110-415	Z-ASA/230	248287	1/60

SG00212

To be snapped on			
12-110	ZP-ASA/24	248438	1/60
110-415	ZP-ASA/230	248439	1/60

Specifications | Shunt Trip Release Z-ASA, ZP-ASA

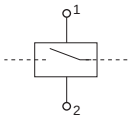
Description

- Remote release for subsequent mounting onto FAZ, FRBmM-1N, Z-MS
- Module width 1MU
- Additional installation of standard auxiliary switch is possible
- Position indicator red - green
- Type ZP-ASA for snap-on mounting

Technical Data

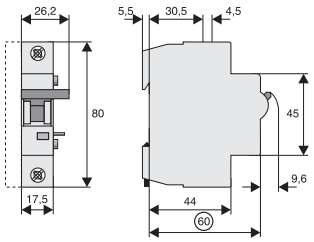
	Z-ASA24	Z-ASA230	ZP-ASA24	ZP-ASA230
Electrical				
Minimum pulse duration	15 ms	10 ms	15 ms	10 ms
Internal resistance	2.2 Ω	215 Ω	2.2 Ω	215 Ω
Duty cycle	100%	100%	100%	100%
Tripping time	< 20 ms	< 20 ms	< 20 ms	< 20 ms
Rated peak withstand voltage (1.2/50µs)	2.5 kV	2.5 kV	2.5 kV	2.5 kV
Endurance	> 4000 operating cycles	> 4000 operating cycles	> 4000 operating cycles	> 4000 operating cycles
AC voltage range				
Operating limit	10 V	60 V	10 V	60 V
Operational voltage range	12-110 V	110-415 V	12-110 V	110-415 V
Maximum current consumption during switch-on	15 A		2.1 A	15 A 2.1 A
Current flow time at max. current consumption	10 ms		10 ms	10 ms 10 ms
DC voltage range				
Operating limit	9 V	72 V	9 V	72 V
Operational voltage range	10-60 V	110-220 V	10-60 V	110-220 V
Maximum current consumption during switch-on	21 A		1 A	21 A 1 A
Current flow time at max. current consumption	2 ms		2 ms	2 ms 2 ms
Mechanical				
Frame size	45 mm	45 mm	45 mm	45 mm
Device height	80 mm	80 mm	80 mm	80 mm
Device width	17.5 mm (1MU)	17.5 mm (1MU)	17.5 mm (1MU)	17.5 mm (1MU)
Mounting	bonding	bonding	to snap on	to snap on
Degree of protection, built-in	IP40	IP40	IP40	IP40
Terminals above/below	open mouthed/lift	open mouthed/lift	open mouthed/lift with guide	open mouthed/lift with guide
Klemmquerschnitt	1-25 mm^2	1-25 mm^2	1-25 mm^2	1-25 mm^2
Fastening torque of terminal screws	max. 2.4 Nm	max. 2.4 Nm	max. 2.4 Nm	max. 2.4 Nm

Connection diagram

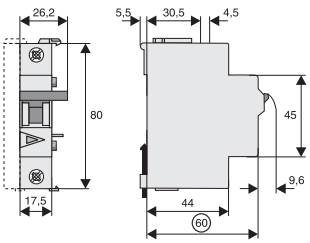


Dimensions (mm)

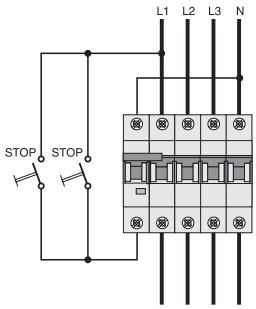
Z-ASA



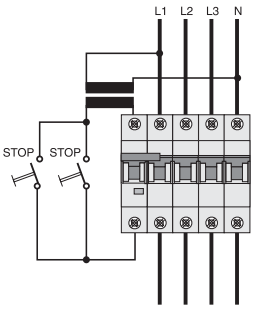
ZP-ASA



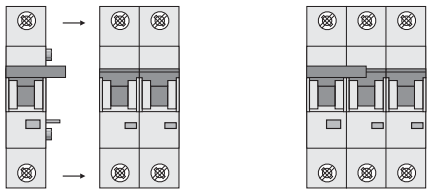
Connection Example 230 V



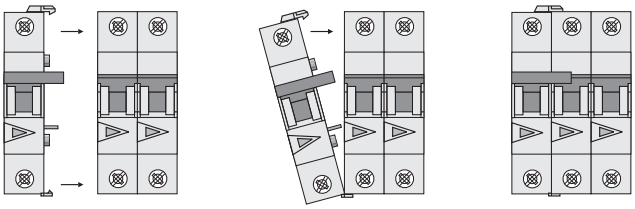
Connection Example 24 V



Example: Z-ASA + MCB



Example: ZP-ASA + MCB



Undervoltage Release Z-USA, Z-USD

SG78811

Operational voltage range (V~) / Function	Type Designation	Article No.	Units per package
To be screwed on			
115 / undelayed	Z-USA/115	248288	1/60
230 / undelayed	Z-USA/230	248289	1/60
400 / undelayed	Z-USA/400	248290	1/60
115 / delayed 0.4s	Z-USD/115	248292	1/60
230 / delayed 0.4s	Z-USD/230	248291	1/60

Specifications | Undervoltage Release Z-USA, Z-USD

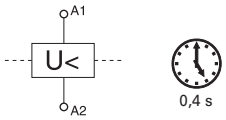
Description

- Tripping:
  Instantaneous Z-USA
  Delayed Z-USD, typ. 0,4 s
- Voltage control indicator blue/white
- Service key for zero voltage switch-on for testing purposes
- Can be used with FAZ

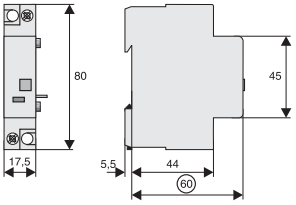
Technical Data

		Z-US./115	Z-US./230	Z-US./400
Electrical				
Rated voltage	U_n	115 V AC	230 V AC	400 V AC
Frequency		50-60 Hz	50-60 Hz	50-60 Hz
Making threshold		80% of U_n	80% of U_n	80% of U_n
Tripping threshold		50% of U_n	50% of U_n	50% of U_n
Mechanical				
Frame size		45 mm	45 mm	45 mm
Device height		80 mm	80 mm	80 mm
Device width		17.5 mm (1MU)	17.5 mm (1MU)	17.5 mm (1MU)
Mounting		quick fastening on DIN rail IEC/EN 60715		
Degree of protection, built-in		IP40	IP40	IP40
Terminals		open mouthed/lift	open mouthed/lift	open mouthed/lift
Terminal capacity		1 - 2x2.5 mm^2	1 - 2x2.5 mm^2	1 - 2x2.5 mm^2
Terminal protection		finger and hand touch safe, according to BGV A3, ÖVE-EN 6		

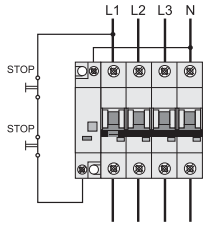
Connection diagram



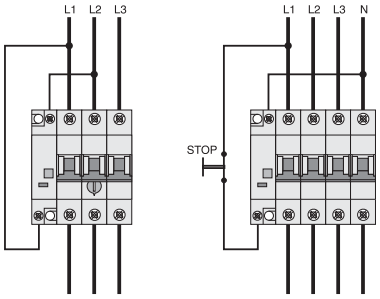
Dimensions (mm)



Connection Example Release



Connection Examplees 400V and 230V



Connection example
Z-USA/400 + Z-MS

Connection example
Z-USA/230 + MCB

CUTLER HAMMER FAZ CIRCUIT BREAKERS

Switching interlocks IS/SPE-1TE, Z-IS/SPE-1TE

SG47812

Description	Type Designation	Article No.	Units per package
Switching interlock without lock for Isolators, RCDs, combined RCD/MCBs, ...	IS/SPE-1TE	101911	5/30
Switching interlock without lock for MCBs and Circuit Breaker ZP-A	Z-IS/SPE-1TE	274418	5/30

Specifications | Switching interlocks IS/SPE-1TE, Z-IS/SPE-1TE

Description

- Without lock

Type IS/SPE-1TE:

- for Isolators, RCDs, combined RCD/MCBs, ...

Type Z-IS/SPE-1TE:

- for MCB

CUTLER HAMMER FAZ CIRCUIT BREAKERS

Accessories for Add-on Residual Current Protection Unit FBHmV

Shunt Trip Release Kit Z-BHASA

SG09411

Operational voltage range V~	Type Designation	Article No.	Units per package
110-415	Z-BHASA/230	248445	8
12-60	Z-BHASA/24	248444	8

Specifications | Shunt Trip Release Kit Z-BHASA

Description

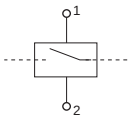
- Can be mounted subsequently
- Contact position indicator red - green
- Wide operational voltage range
- Sufficient power of extra low voltage source must be ensured
  FBHmV-ASA/24: min. 90 VA
- Screws for mounting included FBHmV => BHASA => AZ

Accessories for Add-on Residual Current Protection Unit FBHmV

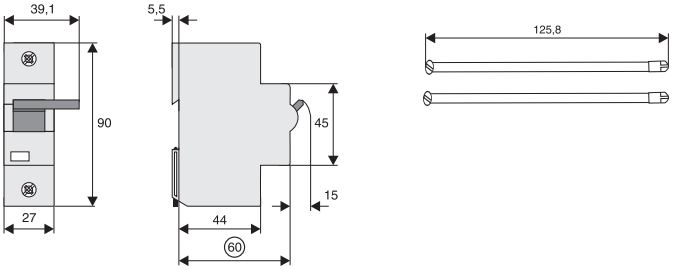
Technical Data

	Z-BHASA/24	Z-BHASA/230
Electrical		
Minimum pulse duration	15 ms	10 ms
Internal resistance	2 W	130 W
Duty	100%	100%
Tripping time	< 20 ms	< 20 ms
Peak withstand voltage (1.2/50µs)	2 kV	2 kV
Endurance	>4,000 operating cycles	>4,000 operating cycles
AC voltage range:		
Responding limit	8 V	70 V
Operational voltage range	12-60 V	110-415 V
Maximum current consumption during switch-on	14 A	3.4 A
Current flow time at max. current consumption	4.0 ms	4.5 ms
DC voltage range:		
Responding limit	11 V	90 V
Operational voltage range	12-60 V	110-230 V
Maximum current consumption during switch-on	23.5 A typ.	1.7 A typ.
Current flow time at max. current consumption	2 ms	4 ms
Mechanical		
Frame size	45 mm	45 mm
Device height	90 mm	90 mm
Device width	27 mm	27 mm
Mounting	quick fastening on DIN rail IEC/EN 60715	
Degree of protection, built-in	IP40	IP40
Upper and lower terminal screws	lift terminals	lift terminals
Terminal capacity	2.5-30 mm^2	2.5-30 mm^2
Fastening torque of terminal screws	4 Nm	4 Nm

Connection diagram



Dimensions (mm)



Accessories for Miniature Circuit Breakers AZ

Shunt Trip Release Z-LHASA

SG09311

Operational voltage range V~	Type Designation	Article No.	Units per package
110-415	Z-LHASA/230	248442	8
12-60	Z-LHASA/24	248441	8

Specifications | Shunt Trip Release Z-LHASA

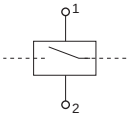
Description

- Can be mounted subsequently
- Contact position indicator red - green
- Wide operational voltage range
- Sufficient power of extra low voltage source must be ensured
  Z-LHASA/24: min. 90 VA

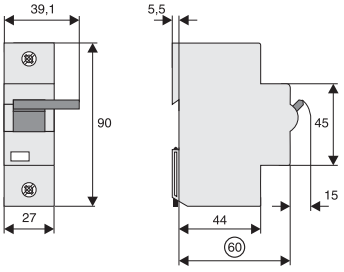
Technical Data

	Z-LHASA/24	Z-LHASA/230
Electrical		
Minimum pulse duration	15 ms	10 ms
Internal resistance	2 W	130 W
Duty	100%	100%
Tripping time	< 20 ms	< 20 ms
Peak withstand voltage (1.2/50µs)	2 kV	2 kV
Endurance	>4,000 operating cycles	>4,000 operating cycles
AC voltage range:		
Responding limit	8 V	70 V
Operational voltage range	12-60 V	110-415 V
Maximum current consumption during switch-on	14 A	3.4 A
Current flow time at max. current consumption	4.0 ms	4.5 ms
DC voltage range:		
Responding limit	11 V	90 V
Operational voltage range	12-60 V	110-230 V
Maximum current consumption during switch-on	23.5 A typ.	1.7 A typ.
Current flow time at max. current consumption	2 ms	4 ms
Mechanical		
Frame size	45 mm	45 mm
Device height	90 mm	90 mm
Device width	27 mm	27 mm
Mounting	quick fastening on DIN rail IEC/EN 60715	
Degree of protection, built-in	IP40	IP40
Upper and lower terminal screws	lift terminals	lift terminals
Terminal capacity	2.5-30 mm^2	2.5-30 mm^2
Fastening torque of terminal screws	4 Nm	4 Nm

Connection diagram



Dimensions (mm)



Accessories for Miniature Circuit Breakers AZ

Auxiliary Switch Z-LHK

SG16111

Function	Type Designation	Article No.	Units per package
1NO+1NC	Z-LHK	248440	10/100

Specifications | Auxiliary Switch Z-LHK

Description

- Auxiliary switch according to IEC 947-5-1
- Can be mounted subsequently

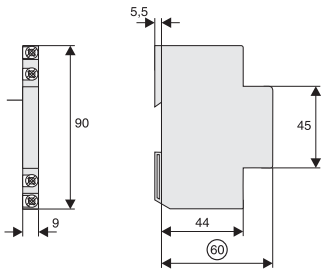
Technical Data

		Z-LHK
Electrical		
Contact function		1NO + 1NC
Rated voltage		250 V
Frequency		50/60 Hz
Rated current		8 A
Rated thermal current	I_{th}	8 A
Utilisation category AC13		
Rated operational current	I_e	6A/250V AC 2A/440V AC
Utilisation category AC15		
Rated operational current	I_e	–
Utilisation category DC12		
Rated operational current	I_e	–
Utilisation category DC13		
Rated operational current	I_e	0.5A/230V DC 2A/110V DC 4A/60V DC
Rated insulation voltage	U_i	250 V AC
Minimum operational voltage per contact	U_{min}	24 V AC/DC
Minimum operational current	I_{min}	50 mA AC/DC
Rated peak withstand voltage	U_{imp} (1.2/50µ)	2.5 kV
Conditional short circuit current	I_k	
with back-up fuse 6A or FAZ-B4-HS		1 kA
Max. back-up fuse, overload and short circuit		6 A gL / FAZ-4/../B-HS
Mechanical		
Can be mounted from the left onto		AZ
Can be mounted from the right onto		–
Tripping indicator “electrical tripping”		–
Frame size		45 mm
Device height		80 mm
Device width		8.8 mm (0.5MU)
Mounting		onto switching device
Degree of protection, built-in		IP40
Terminal protection		finger and hand touch safe according to BGV A3, ÖVE-EN 6
Terminals		lift terminals
Terminal capacity		0.5-2.5 mm^2
Terminal screws		M3 (Pozidrive Z0)
Fastening torque of terminal screws		max. 0.8-1.0 Nm

CUTLER HAMMER FAZ CIRCUIT BREAKERS

Connection diagram

Dimensions (mm)



Accessories for Miniature Circuit Breakers AZ

Interlocks LH-SP

Function	Type Designation	Article No.	Units per package
Tripping interlock	LH-SPL	285752	1
Tripping interlock	LH-SPE	215999	1
Switchoff interlock	LH-SPA	216000	1

Specifications | Anti-Tamper Device LH-SPE, LH-SPL

Description

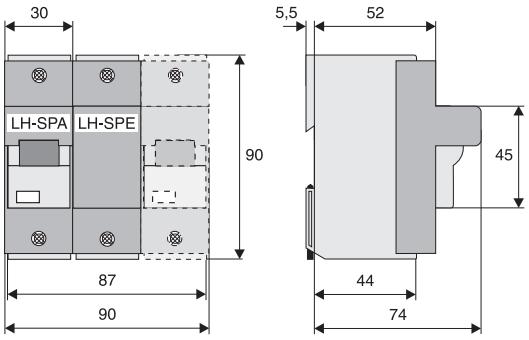
• Prevents undesired switching ON or OFF

Specifications | Switchoff Interlock LH-SPA

Description

• Prevents undesired switch-OFF

Dimensions (mm)



Accessories for Miniature Circuit Breaker FAZ-..-NA, -RT, -DU

Auxiliary Contact Z-IHK-NA

SG60711

Operational Voltage Range	Type Designation	Article No.	Units per package
250 VAC	Z-IHK-NA	113895	1

Specifications | Auxiliary Contact Z-IHK-NA

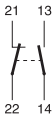
Description

- Design according to IEC/EN 60947-5-1, IEC/EN 62019
- Field installable
- The specified minimum voltages are per contact—take into account particularly in case of series connection
- Self-cleaning contacts
- Contact material and design particularly suitable for extra low voltage
- Tripping signal contact transmits message of electric tripping, not mechanical switch-off
- Test key for contact function “electrical tripping”
- Will allow for > 480Y/277 VAC rating

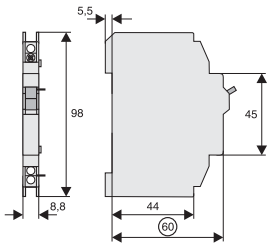
Technical Data

		Z-IHK-NA
Electrical		
Contact function		1NO + 1NC
Rated voltage		250V
Rated current		6A
Rated thermal current	I_{th}	6A
Utilization category AC13		
Rated operational current	I_e	3A/250 Vac
Utilization category AC15		
Rated operational current	I_e	2A/250 Vac
Utilization category DC12		
Rated operational current	I_e	0.5A/110 Vdc
Rated insulation voltage	U_i	250 Vac
Minimum operational voltage per contact	U_{min}	5 Vdc
Minimum operational current	I_{min}	10 mA AC/DC
Rated peak withstand voltage	U_{imp} (1.2/50µ)	4 kV
Conditional short circuit current	I_k	
with Back-Up Fuse 6A		1 kA
Max. back-up fuse, overload and short circuit		6 A gL / FAZ-4/../B-HS
Mechanical		
Tripping indicator “electrical tripping”		—
Frame size		45 mm
Device height		80 mm
Device width		8.8 mm (0.5MU)
Mounting		—
Degree of protection, built-in		IP40
Terminal protection		Finger and hand touch safe according to BGV A3, ÖVE-EN 6
Terminals		Lift terminals
Terminal capacity		0.5–2.5 mm^2
Terminal screws		M3 (Pozidrive Z2)
Tightening torque of terminal screws		max. 1.2 Nm

Connection diagram



Dimensions (mm)



Accessories for Miniature Circuit Breaker FAZ-..-NA, -RT, -DU

Shunt Trip FAZ-XAA-NA

SG13511

Operational Voltage Range	Type Designation	Article No.	Units per package
12–110 VAC 12–60 VDC	FAZ-XAA-NA12-110VAC	102037	1
110–415 VAC 110–230 VDC	FAZ-XAA-NA110-415VAC	102036	1

Specifications | Shunt Trip FAZ-XAA-NA

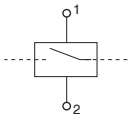
Description

- Remote release for subsequent mounting onto FAZ-NA
- Additional installation of standard auxiliary switch is possible
- Position indicator red–green

Technical Data

	FAZ-XAA-NA12-110VAC	FAZ-XAA-NA110-415VAC
Electrical		
Can be mounted onto	FAZ-NA / FAZ-NA-DC / FAZ-RT/-DU	FAZ-NA / FAZ-NA-DC / FAZ-RT/-DU
Operational voltage range	12–110 Vac 12–60 Vdc	110–415 Vac 110–230 Vdc
Frequency	50/60 Hz	50/60 Hz
Mechanical		
Frame size	45 mm	45 mm
Device height	105 mm	105 mm
Device width	17.5 mm	17.5 mm
Mounting	Quick fastening with two lock-in positions on EN 50022	
Degree of protection, built-in	IP40	IP40
Terminal protection	Finger and hand touch safe according to BGV A3, ÖVE-EN 6	Finger and hand touch safe according to BGV A3, ÖVE-EN 6
Terminals	Open mouthed/lift	Open mouthed/lift
Terminal capacity, one and two wires	18–10 AWG	18–10 AWG

Connection diagram



CUTLER HAMMER FAZ CIRCUIT BREAKERS

Terminal Covers

Description	Type Designation	Article No.	Units per package
Terminal Covers for RCDs			
2-pole	Z-RC/AK-2TE	285385	10
4-pole	Z-RC/AK-4TE	101062	10
Terminal Covers for Add-on Device			
2-pole	Z-CV/AO-2P	221957600	10
3+4-pole	Z-CV/AO-3-4P	221957500	10
Terminal Covers for MCB, RCBO			
2-pole	Z-CV/SD-2P	221954800	10
3-pole	Z-CV/SD-3P	221954900	10
4-pole	Z-CV/SD-4P	221953900	10
Terminal Cover for MCB			
1-pole	Z7-AK-1TE	750754200	10

CUTLER HAMMER FAZ CIRCUIT BREAKERS

Remote Control and Automatic Switching Device Z-ZW

SG30811

Function	Type Designation	Article No.	Units per package
Automatic restarting 230VAC	Z-FW-LP	248296	1/20
Automatic restarting 24-48VDC	Z-FW-LPD	265244	1/20

SG30711

+ Remote control ON/OFF/TEST (only in connection with Z-FW-LP, -LPD from delivery date 2006!)	Z-FW-MO	284730	1

Pre-mounted sets Z-FW

SG31311

Operational voltage range	Type Designation	Article No.	Units per package
230 VAC	Z-FW-LP/MO	290171	1/12
24-48 VDC	Z-FW-LPD/MO	290172	1/12

Remote Testing Module Z-FW (for Z-FW-LP./MO set use only)

SG12111

Operational voltage range	Type Designation	Article No.	Units per package
0.01 A	Z-FW/001	248297	4/120
0.03 A	Z-FW/003	248298	4/120
0.1 A	Z-FW/010	248299	4/120
0.3 A	Z-FW/030	248300	4/120
0.5 A	Z-FW/050	248301	4/120

Specifications | Remote Control and Automatic Switching Z-FW

Description

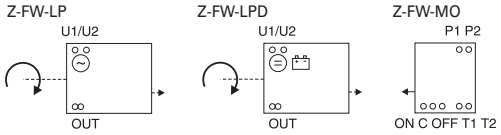
- Shape compatible switching device suitable for subsequent installation for automatic re-setting and remote control of CLS6, PFIM, PFHM-4p, dRCM, Z-A40, PFR, Z-MS
- Mechanical interlock, can be sealed with leads
- Mechanical switching capability up to max. PFIM-100/4p, CLS6-100/4p
- Operating and alarm display by green and red LED
- Function extension with Switching Modul Z-FW-MO Operating and trouble display by LED pre-assembled only with Z-FW...

Accessories for Protective Devices

Technical Data

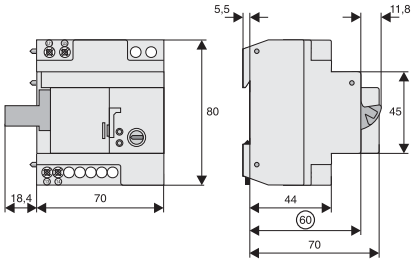
	Z-FW-LP	Z-FW-LPD	Z-FW-MO
Electrical			
Possible operating voltages	220-240 V AC	24-48 V DC	–
Frequency	50/60 Hz	–	–
Testing module (0.5MU) for remote testing of RCDs	Z-FW...	Z-FW...	–
Control voltage for remote control	–	–	24-230 V AC/DC
Relay output for tripping test with Z-FW	–	–	400 V AC max.
Relay output for alarm, potential-free	5A/250V AC	5A/250V AC	–
Functions	automatic restarting	automatic restarting	+ON/OFF/TEST
Function selector	Automatic 5x, OFF/RESET	Automatic 5x, OFF/RESET	ON, OFF/RESET
Remote control function via telephone with Telecommander	–	–	–
Mechanical			
Frame size	45 mm	45 mm	45 mm
Device height	80 mm	80 mm	80 mm
Device width	70 mm	70 mm	35 mm
Mounting	quick fastening with 2 lock-in positions on DIN rail IEC/EN 60715		–
Degree of protection, built-in	IP40	IP40	IP40
Terminal protection	finger and hand touch safe according to BGV A3, ÖVE-EN 6		
Terminals	lift terminals	lift terminals	lift terminals
Terminal capacity	2 x 1.5 mm^2 or 1 x 2.5 mm^2	2 x 1.5 mm^2 or 1 x 2.5 mm^2	4 x 1.5 mm^2 or 2 x 2.5 mm^2
Scope of delivery	–	–	Coupling plug

Connection diagram

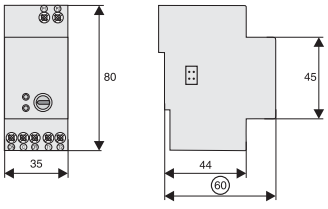


Dimensions (mm)

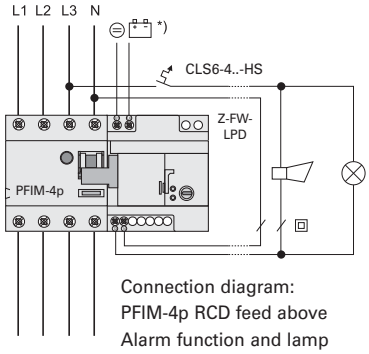
Z-FW-LP, -LPD



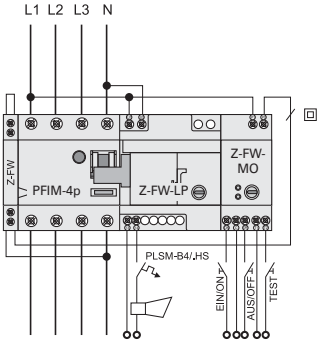
Z-FW-MO



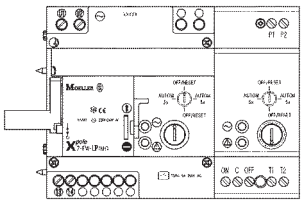
Connection example



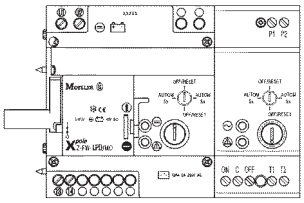
Connection diagram:
PFIM-4p RCD feed above
Alarm function and lamp
*) discretionary polarity



Pre-mounted Sets



Z-FW-LP/MO



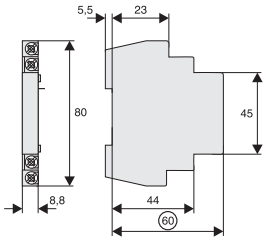
Z-FW-LPD/MO

Specifications | Remote Testing Module Z-FW (for Z-FW-LP)

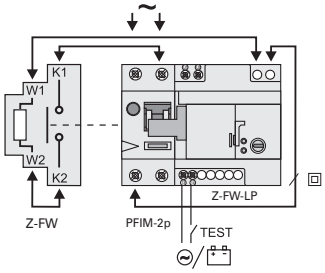
Description

- External testing module with testing resistor for RCDs
- Proper "external" test key function according to the applicable rules thanks to design adapted to the rated tripping current
- For remote testing with remote control and automatic switching device Z-FW-LP
- No undesired voltage rise in the consumer system during remote switch-off thanks to integrated breaker contact K1-K2
- Can also be used as a remote tripping module for PFIM, PFHM

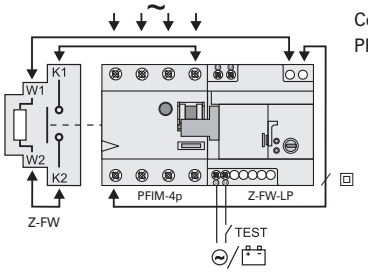
Dimensions (mm)



Connection examples



Connection diagram:
PFIM-2p, RCD feed above



Connection diagram:
PFIM-4p, RCD feed above

Technical Data **TD01213001E**

J-Frame 310+ molded-case circuit breaker 20–250A

Product description

- The Series G® J-Frame is NEMA®, UL®, and CSA® rated
- Zone selective interlocking and Arcflash Reduction Maintenance System™ can now be enabled on the J-Frame
- The 310+ electronic trip unit eliminates the need for rating plugs and is compatible with the cause of trip display and cause of trip LED

Table 1. Frame Trip Ratings

Frame	Interrupting Capacity (kAIC)	Ampere Rating
JGE	35	20–50 ①
JGS	50	40–100 ②
JGH	65	63–160 ③
JGC	100	100–250 ④
JGU	150	
JGX	200	

① 50A frame.

② 100A frame.

③ 160A frame.

④ 250A frame.

Powering Business Worldwide

Table 2. JGE, JGS, JGH, JGC, JGU, and JGX Rating and Ampere Range

Specification		Description					
Breaker type		JGE	JGS	JGH	JGC	JGU	JGX
Short-Circuit Current Ratings (kA rms) AC 50–60 Hz							
NEMA UL 489	240 Vac	65	85	100	200	200	300
	480 Vac	35	50	65	100	150	200
	600 Vac	18	25	35	35	50	50
Number of poles		2, 3, 4	2, 3, 4	2, 3, 4	3, 4	3, 4	3, 4
Adjustable long-time pickup CSA 22.2 No. 5	50		A = 20 E = 32	B = 20 F = 40	C = 25 G = 45	D = 30 H = 50	
	100		A = 40 E = 70	B = 45 F = 80	C = 50 G = 90	D = 63 H = 100	
	160		A = 63 E = 110	B = 80 F = 125	C = 90 G = 150	D = 100 H = 160	
	250		A = 100 E = 175	B = 125 F = 200	C = 150 G = 225	D = 160 H = 250	
Electronic rms		LS, LSI, LSG, LSIG					
Dimensions in inches (mm)	Two/three-pole	H	W	D			
		7.00 (177.8)	4.13 (104.9)	3.57 (90.7)			
	Four-pole	H	W	D			
		7.00 (177.8)	5.34 (135.6)	3.57 (90.7)			
Weight (approximate) lbs (kg)		Two/three-pole	Four-pole				
		11.4 (5.2)	15.3 (6.9)				

Table 3. Line and Load Terminals

Maximum Breaker Amperes	Terminal Body Material	Wire Type	AWG Wire Range/ No. of Conductors	Metric Wire Range (mm²)	Catalog Number
Standard Copper/Aluminum Pressure Terminals					
250	Aluminum	Cu/Al	4–35 kcmil	25–185	**TA250FJ**
250	Stainless steel	Cu	4–35 kcmil	25–185	**T250FJ** ①

① Standard line and load terminals.

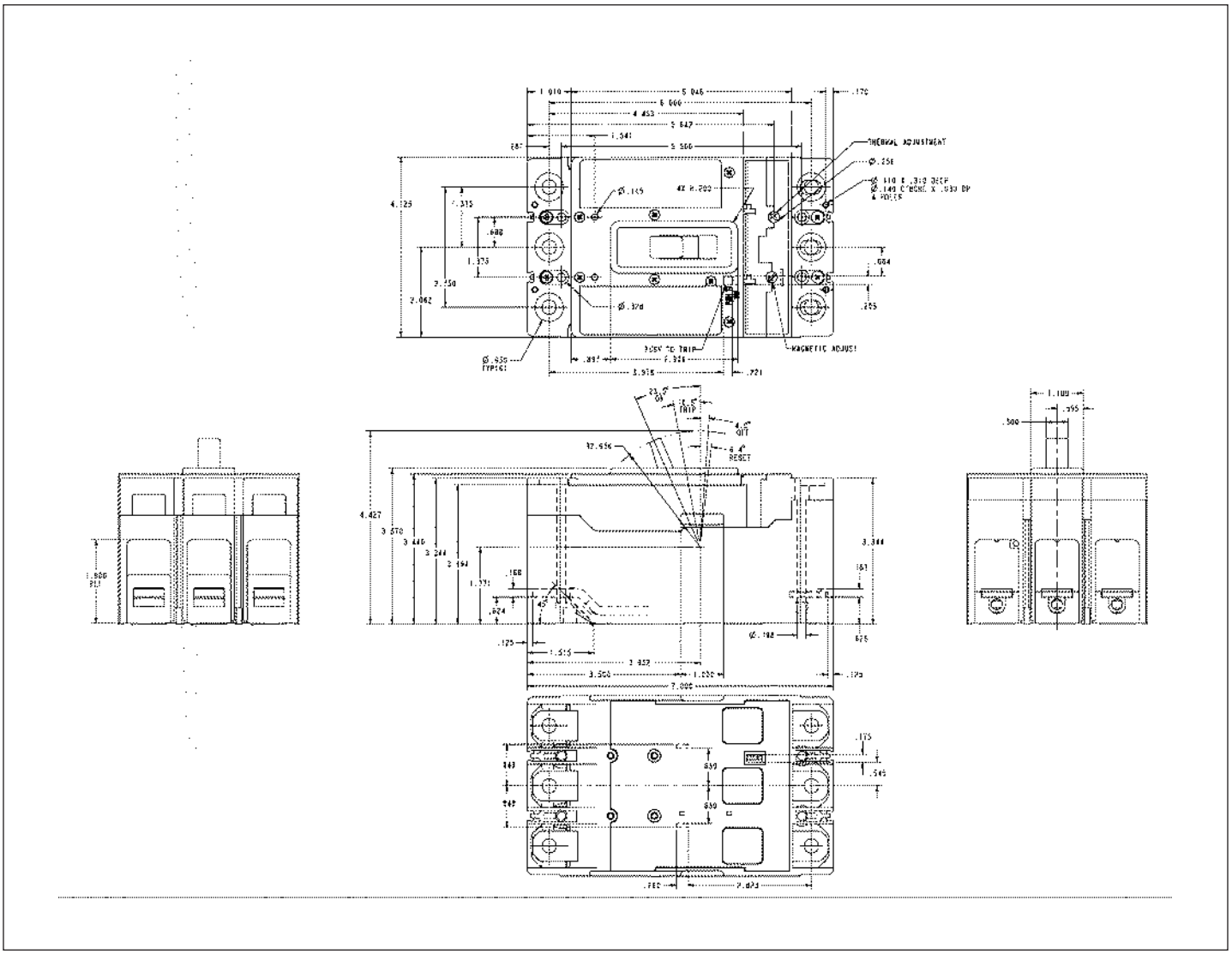


Figure 1. AB DE-ION® Circuit Breaker—JG 310+ Frame

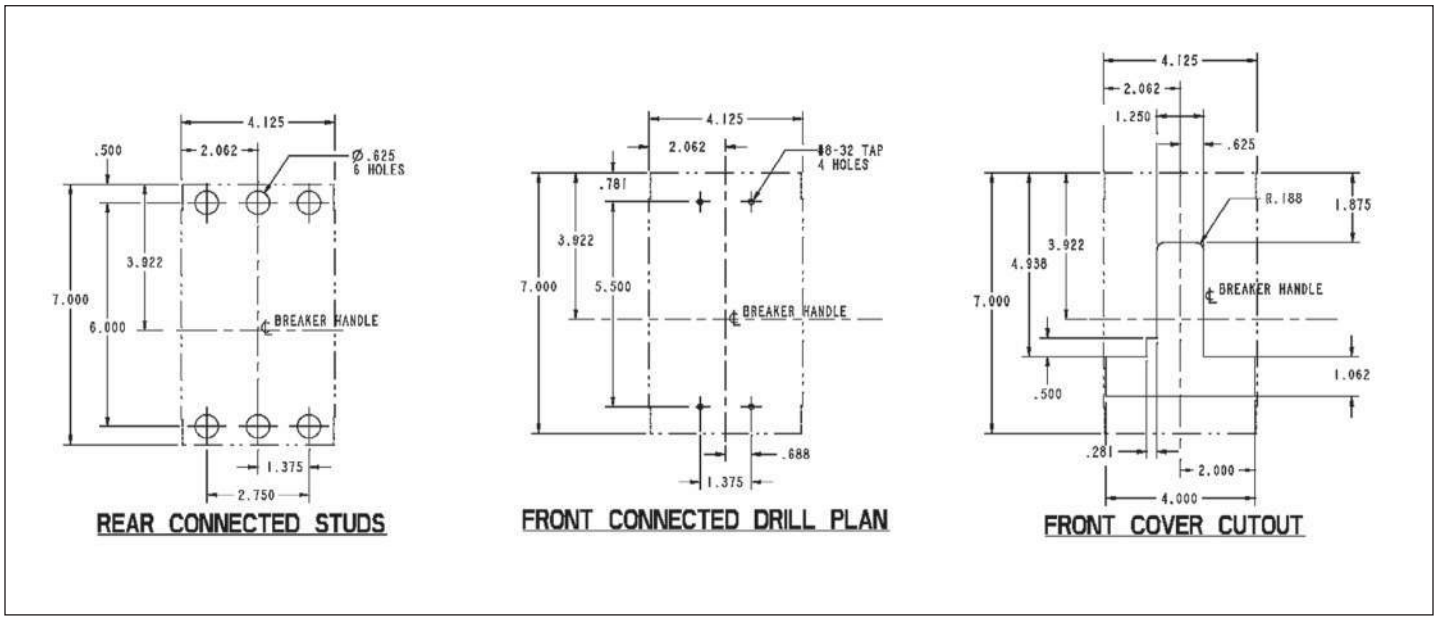


Figure 2. Type JG 310+ Three-Pole Breakers

Eaton Corporation
Electrical Sector
1111 Superior Avenue
Cleveland, OH 44114 USA
Eaton.com

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March 2012

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Powering Business Worldwide

pe.eaton.com

Eaton Type MTE industrial control transformer

C0500E2AFB

UPC:786680420962

Dimensions:

- **Height:** 6.142 IN
- **Length:** 5.512 IN
- **Width:** 5.236 IN

Weight:19.4 LB

Notes: Epoxy encapsulated, Laminations of high quality silicon steel to minimize core losses and optimize performance, 50/60Hz operation, 130°C insulation system standard, Molded-in terminals for maximum durability

Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Specifications:

- **Coil Material:** Copper windings
- **Design:** MTE
- **Modification 1:** Factory-mounted 2-pole primary fuse block for rejection type fuses
- **Primary Voltage:** 240 X 480V, 230 X 460V, 220 X 440V
- **Secondary Voltage:** 120/115/110V
- **Tap Size:** None
- **Temperature Rating:** 55°C
- **Type:** Industrial Control Transformer
- **Volt Ampere Rating:** 500 VA

Supporting documents:

- dry-type distribution transformer-flex center line card
- Industrial control transformers brochure

- Transformer distribution catalog, volume 2, tab 2
- Eatons Volume 7-Logic Control, Operator Interface and Connectivity Solutions
- MTE Control Transformer 500 VA Series 2 - C0500E2AFB
- Transformer consulting application guide
- Eaton Specification Sheet - C0500E2AFB

Certifications:

- UL Listed
- CSA Certified
- cUL Certified

Product compliance:

- RoHS Compliant

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DATASHEET - FAZ-D20/1-NA

Similar to illustration

Miniature circuit breaker (MCB), 20 A, 1p, characteristic: D

Part no.	**FAZ-D20/1-NA**
Catalog No.	**102111**
Alternate Catalog No.	**FAZ-D20/1-NA**
EL-Nummer (Norway)	**0001691636**

Delivery program

Basic function			Miniature circuit-breakers
Number of poles			1 pole
Tripping characteristic			D
Application			Switchgear for export to North America (UL-listed)
Rated current	I_n	A	20
Rated switching capacity acc. to IEC/EN 60947-2	I_{cu}	kA	15
Product range			FAZ-NA

Technical data

Electrical

Standards			UL 489, CSA C22.2 No. 5 IEC 60947-2
Rated operational voltage	U_e	V	
	U_e	V AC	277/480 Y
		V DC	60
Rated voltage according to IEC/EN 60947-2	U_n	V AC	240/415
Rated voltage according to UL	U_n	V AC	277
Rated switching capacity acc. to IEC/EN 60947-2	I_{cu}	kA	15
Characteristic			B, C, D
Selectivity Class			3
lifespan			
Lifespan	Operations		> 20000
Direction of incoming supply			as required

Mechanical

Standard front dimension		mm	45
Enclosure height		mm	105
Mounting width per pole		mm	17.7
Mounting			IEC/EN 60715 top-hat rail
Degree of Protection			IP20, IP40 (when fitted)
Terminals top and bottom			Twin-purpose terminals
Terminal protection			Finger and back-of-hand proof to BGV A2
Tightening torque of fixing screws		N/m	max. 2.4 UL: #18-12 AWG: 2.4 Nm (21 lb-in) #10-8 AWG: 2.8 Nm (25 lb-in) #6 AWG: 4 Nm (36 lb-in)
Mounting position			As required

Design verification as per IEC/EN 61439

Technical data for design verification			
Rated operational current for specified heat dissipation	I_n	A	20
Heat dissipation per pole, current-dependent	P_{vid}	W	0

Equipment heat dissipation, current-dependent	P_{vid}	W	1.8
Static heat dissipation, non-current-dependent	P_{vs}	W	0
Heat dissipation capacity	P_{diss}	W	0
Operating ambient temperature min.		°C	-25
Operating ambient temperature max.		°C	75
			linear, per +1 °C, results in a 0.5% reduction of current carrying capacity
IEC/EN 61439 design verification			
10.2 Strength of materials and parts			
10.2.2 Corrosion resistance			Meets the product standard's requirements.
10.2.3.1 Verification of thermal stability of enclosures			Meets the product standard's requirements.
10.2.3.2 Verification of resistance of insulating materials to normal heat			Meets the product standard's requirements.
10.2.3.3 Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects			Meets the product standard's requirements.
10.2.4 Resistance to ultra-violet (UV) radiation			Meets the product standard's requirements.
10.2.5 Lifting			Does not apply, since the entire switchgear needs to be evaluated.
10.2.6 Mechanical impact			Does not apply, since the entire switchgear needs to be evaluated.
10.2.7 Inscriptions			Meets the product standard's requirements.
10.3 Degree of protection of ASSEMBLIES			Does not apply, since the entire switchgear needs to be evaluated.
10.4 Clearances and creepage distances			Meets the product standard's requirements.
10.5 Protection against electric shock			Does not apply, since the entire switchgear needs to be evaluated.
10.6 Incorporation of switching devices and components			Does not apply, since the entire switchgear needs to be evaluated.
10.7 Internal electrical circuits and connections			Is the panel builder's responsibility.
10.8 Connections for external conductors			Is the panel builder's responsibility.
10.9 Insulation properties			
10.9.2 Power-frequency electric strength			Is the panel builder's responsibility.
10.9.3 Impulse withstand voltage			Is the panel builder's responsibility.
10.9.4 Testing of enclosures made of insulating material			Is the panel builder's responsibility.
10.10 Temperature rise			The panel builder is responsible for the temperature rise calculation. Eaton will provide heat dissipation data for the devices.
10.11 Short-circuit rating			Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.12 Electromagnetic compatibility			Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.13 Mechanical function			The device meets the requirements, provided the information in the instruction leaflet (IL) is observed.

Technical data ETIM 7.0

Circuit breakers and fuses (EG000020) / Miniature circuit breaker (MCB) (EC000042)

Electric engineering, automation, process control engineering / Electrical installation, device / Miniature circuit breaker system (MCB) / Miniature circuit breaker (MCB) (ecl@ss10.0.1-27-14-19-01 [AAB905014])

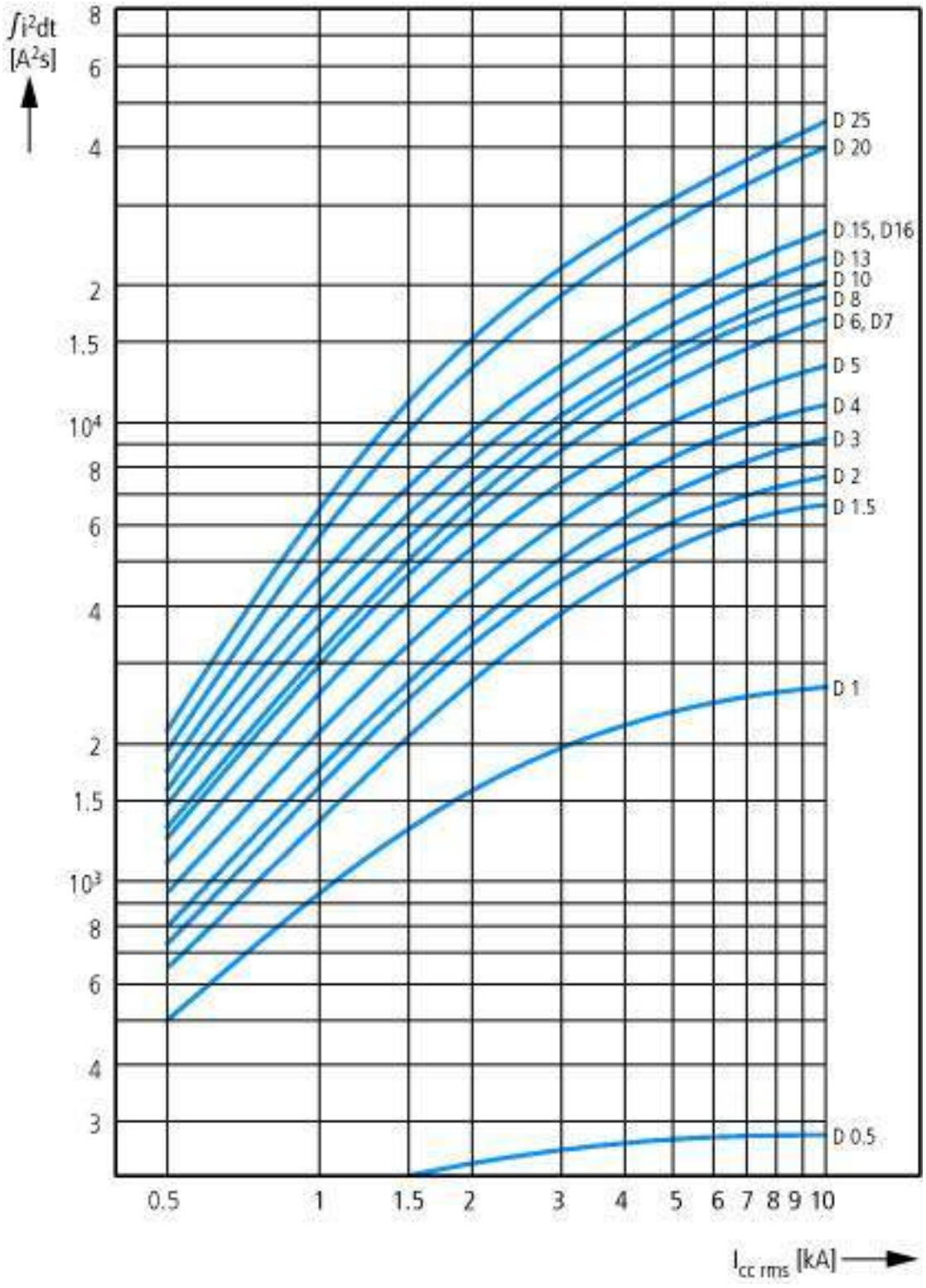
Release characteristic		D
Number of poles (total)		1
Number of protected poles		1
Rated current	A	20
Rated voltage	V	240
Rated insulation voltage Ui	V	440
Rated impulse withstand voltage Uimp	kV	4
Rated short-circuit breaking capacity Icn EN 60898 at 230 V	kA	0
Rated short-circuit breaking capacity Icn EN 60898 at 400 V	kA	0
Rated short-circuit breaking capacity Icu IEC 60947-2 at 230 V	kA	15
Rated short-circuit breaking capacity Icu IEC 60947-2 at 400 V	kA	15
Voltage type		AC
Frequency	Hz	50 - 60
Current limiting class		3
Suitable for flush-mounted installation		No
Concurrently switching N-neutral		No
Over voltage category		3

Pollution degree			2
Additional equipment possible			Yes
Width in number of modular spacings			1
Built-in depth		mm	70.5
Degree of protection (IP)			IP20
Ambient temperature during operating		°C	-25 - 75
Connectable conductor cross section multi-wired		mm^2	1 - 25
Connectable conductor cross section solid-core		mm^2	1 - 25

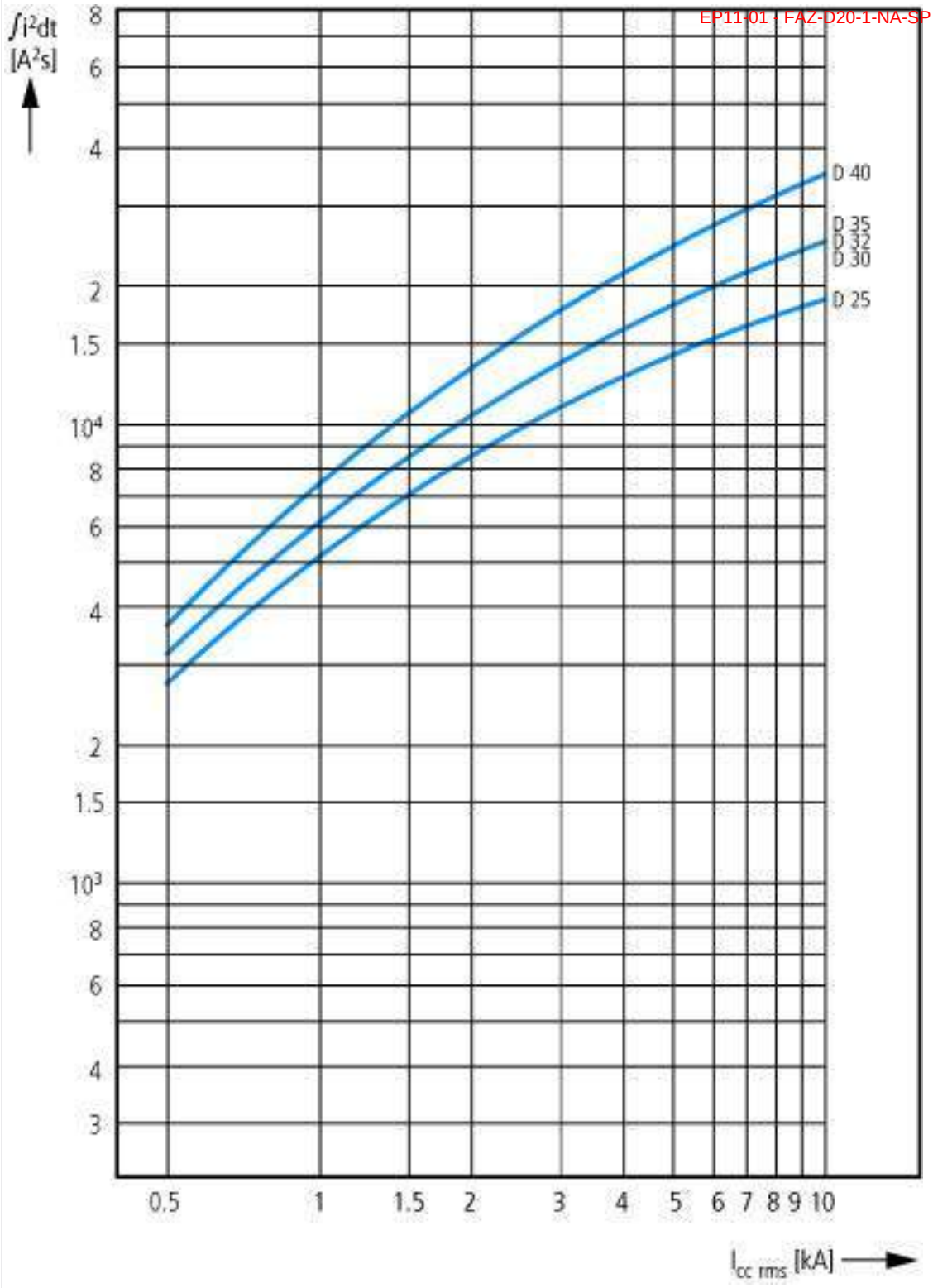
Approvals

Product Standards			IEC/EN 60947-2; UL 489; CSA-C22.2 No. 5-09; CE marking
UL File No.			E235139
UL Category Control No.			DIVQ
CSA File No.			204453
CSA Class No.			1432-01
North America Certification			UL listed, CSA certified
Specially designed for North America			Yes, suitable as BCPD
Suitable for			Feeder circuits, branch circuits
Current Limiting Circuit-Breaker			Yes
Max. Voltage Rating			≤ 32 A
Degree of Protection			IEC: IP20, UL/CSA Type: -

Characteristics



Let-through energy I^2t
Characteristic D (0.5 - 20 A), 277 V



Characteristic D (25 - 40 A), 240 V

Additional product information (links)

Temperature dependency, derating	https://www.eaton.com/content/dam/eaton/technicaldocumentation/technical-data-tables/Derating table FAZ-NA-RT.pdf

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10 × 38, 14 × 51, 22 × 58 CH Series

Features:

- 10 × 38 Dovetail design provides maximum flexibility in assembling multiple poles
- Touchsafe design - No exposed contacts
- DIN rail mount (35mm)
- Optional open fuse indication lights
- Excellent for switchboard panel, control consoles, small motors, transformers, and similar applications
- Handle/fusepuller to install and remove fuses easily
- Available in single and multi-pole configurations
- Circuit marking system (P/N CH10CL and CH10CM)
- Wire ready: Saves time as terminals are ready to accept wires.
- CE marking

Standards:

North American 10 × 38 Class CC
Listed U.L. 512, Guide IZLT, File E14853
Certified CSA Std. C22.2 No. 39, Class 6225-01, File LR47235

North American 10 × 38 Midget
U.L. Recognized 512, Guide IZLT2, File E14853
CSA Certified, Std. C22.2 No. 39, Class 6225-01, File LR47235

European 10 × 38 IEC 269-2-1
14 × 51 IEC 269-2***
U.L. Recognized, CSA Certified
22 × 58 IEC 269-2***
U.L. Recognized, CSA Certified

Recommended Buss® Fuse Types:

10 × 38 North American Class CC Fuses - LP-CC, FNQ-R, KTK-R
10 × 38 North American Midget Fuses - FNQ, KTK, AGU, KLM, BAF, BAN, FNM, FWA, FWC, & FNQ
14 × 51 Fuses - FWX, FWH, FWP & NON
22 × 58 Fuses - FWP

Specifications

Fuse Size (mm)		**10 × 38**	**14 × 51**	**22 × 56**
Voltage	U.L./CSA***	600V	750V***	750V***
	IEC	690V	660V	660V
Amperage	U.L./CSA***	30A	30A***	50A***
	IEC	32A	50A(See Watts Loss)	125A(See Watts Loss)
Wire Size		#8 - #18 Cu only	#6 - #14 Cu only	#1 - #14 Cu only
Wire Type (& Temp.)		Solid/Stranded (75°)	Solid/Stranded (75°)	Solid/Stranded (75°)
Torque (in-lbs)		12 in-lbs	17.7 in-lbs	22.1 in-lbs
IP Rating		IP 20	IP 20	IP 20
Contact Material (fuseclip)		Tin-plated copper	Tin-plated copper	Tin-plated copper
Connector Material		Steel	Steel	Steel
Maximum Watts Loss of Fuse		3W‡	5W‡	9.5W‡
Dual Wire Rating		Please consult factory		

10 × 38	30A, 600V	30A, 600V	32A, 690V
Description	North American Class CC Fuseholder	North American Midget Fuseholder	European 10 × 38 Fuseholder
1 Pole	CHCC1	CHM1	CH101
1 Pole w/Indication	CHCC1I	CHM1I	CH101I
2 Pole	CHCC2	CHM2	CH102
2 Pole w/Indication	CHCC2I	CHM2I	CH102I
3 Pole	CHCC3	CHM3	CH103
3 Pole w/Indication	CHCC3I	CHM3I	CH103I
*Assembly Pins - 2 Poles	CH102AP	CH102AP	CH102AP
*Assembly Pins - 3 Poles	CH103AP	CH103AP	CH103AP
**Circuit markers	CH10CM	CH10CM	CH10CM
**Circuit marker labels	CH10CL	CH10CL	CH10CL
Spare Fuseholder	5TPH	5TPH	5TPH

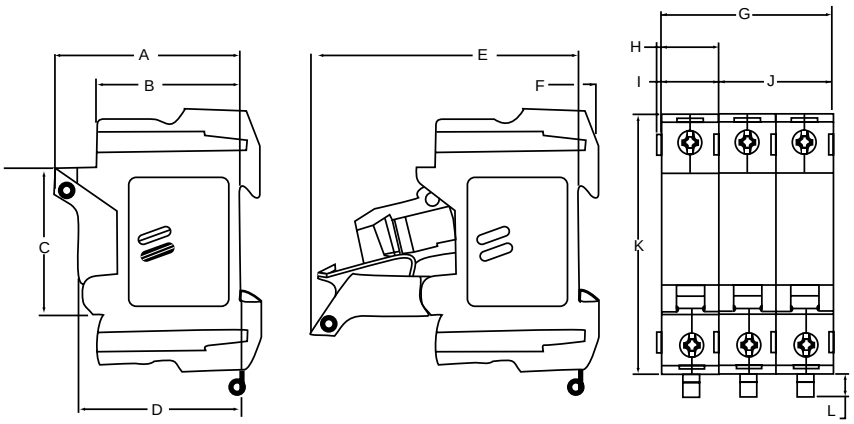
‡Refer to BIF documents 720003, 720008, 720025 and 720028 for watts loss of applicable fuses.
*CH102AP and CH103AP are packaged in quantities of ten pins. One pin is required to gang units together, and rating multiple poles.
**CH10CM are packaged in quantities of ten. CH10CL are packaged in quantities of ten sheets of labels.
***U.L./CSA part numbers include U.L. suffix.

	14 × 51		**22 × 58**	
Description	Part No.	Ctn. Qty.	Part No.	Ctn. Qty.
1 Pole	CH141G	6	CH221G	6
1 Pole w/U.L. markings	CH141GUL	6	CH221GUL	6
1 Pole w/microswitch	CH141MSG	6	CH221MSG	6
2 Pole	CH142G	3	CH222G	3
3 Pole	CH143G	2	CH223G	2
3 Pole w/U.L. markings	CH143GUL	2	CH223GUL	2
3 Pole w/microswitch	CH143MSG	2	CH223MSG	2
Handle Profile - 2 Poles	CH142HCG	10	CH222HCG	10
Handle Profile - 3 Poles	CH143HCG	10	CH223HCG	10

CE CE logo denotes compliance with European Union Low Voltage Directive (50-1000 Vac, 75-1500 Vdc). Refer to BIF document #8002 or contact Bussmann Application Engineering at 314-527-1270 for more information.

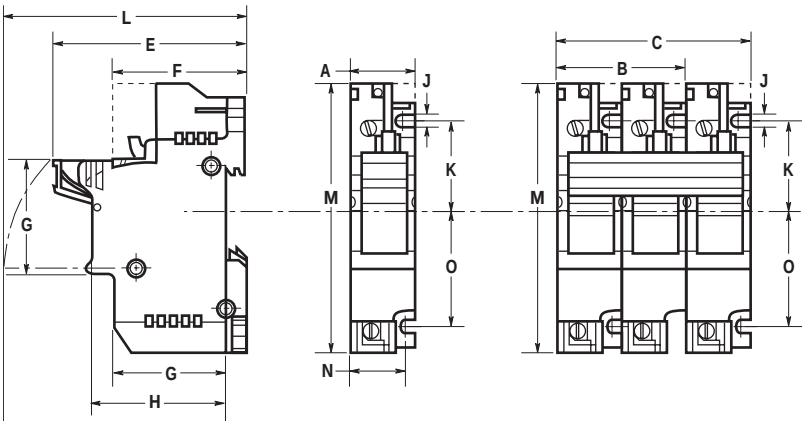
10 × 38, 14 × 51, 22 × 58 CH Series

Size: 10 × 38 Fuseholder



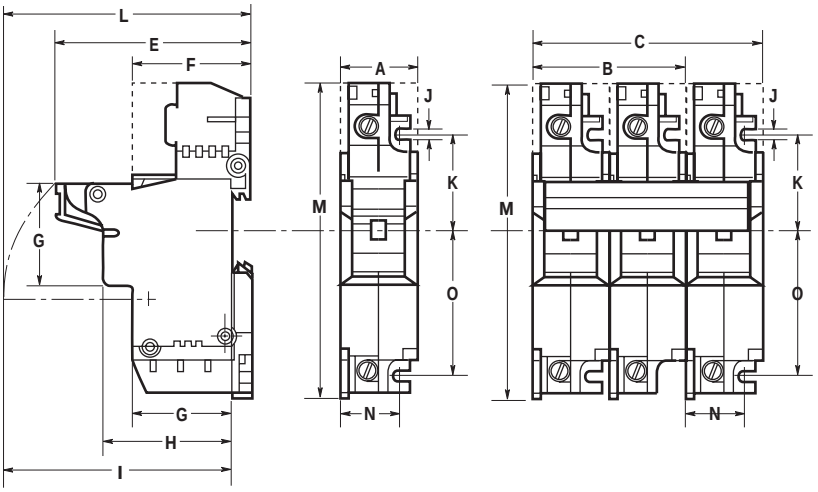
	in	(mm)		in	(mm)
A	2.26	(57.5)	**G**	2.07	(52.5)
B	1.73	(44.0)	**H**	0.75	(19.0)
C	1.78	(45.2)	**I**	0.69	(17.5)
D	1.97	(49.9)	**J**	1.38	(35.0)
E	3.24	(82.2)	**K**	3.18	(80.7)
F	0.24	(6.0)	**L**	0.30	(7.6)

Size: 14 × 51 Fuseholder



	in	(mm)		in	(mm)
A	0.98	(26.0)	**I**	3.50	(89.0)
B	2.05	(52.0)	**J**	0.20	(5.0)
C	3.07	(78.0)	**K**	1.28	(32.5)
E	3.19	(81.0)	**L**	3.86	(98.0)
F	2.11	(53.5)	**M**	4.17	(106.0)
G	1.75	(44.5)	**N**	0.83	(21.0)
H	2.07	(52.6)	**O**	1.72	(43.8)

Size: 22 × 58 Fuseholder



	in	(mm)		in	(mm)
A	1.38	(35.0)	**I**	4.06	(103.0)
B	2.76	(70.0)	**J**	0.18	(4.5)
C	4.13	(105.0)	**K**	1.77	(45.0)
E	3.46	(88.0)	**L**	4.41	(112.0)
F	2.09	(53.0)	**M**	5.51	(140.0)
G	1.77	(45.0)	**N**	1.04	(26.5)
H	2.28	(58.0)	**O**	2.48	(63.0)

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DATASHEET - CLASS CC FAST ACTING FUSE CLASS CC

Fuse-link, low voltage, 0.1 A, AC 600 V, 200 kA, 10 x 38 mm, CC, UL, rejection-type, fast-acting

Part no. CLASS CC FAST ACTING FUSE CLASS CC
Catalog No. KTK-R-1/10

Similar to illustration

Delivery program

Product range			Fuse
Basic function			Fuse-link
Field of application			low voltage
Rated current	I	A	0.1
Rated voltage			AC 600 V
Size			10 x 38 mm
Utilization category			CC
Description			rejection-type
Breaking Capacity		kA	200
usable for size/applications			branch circuit
Release characteristic	class		fast-acting
Standard/Approval			UL
Shape			cylindrical

Technical data ETIM 7.0

Circuit breakers and fuses (EG000020) / Cylindrical fuse (EC002704)			
Electric engineering, automation, process control engineering / Electrical installation, device / Safety fuse inserts / Cylindrical fuse (safety fuse) (ecl@ss10.0.1-27-14-20-02 [AFZ797013])			
Size			10x38 mm
Rated voltage		V	600 - 600
Rated voltage			Other
Voltage type			AC
Utilization category			Other
Rated operating frequency		Hz	45 - 62
Nominal current		A	0.1
With striker			No
Release characteristic			CC
Breaking capacity		kA	200

Additional product information (links)

Product datasheet (PDF)	http://www.cooperindustries.com/content/dam/public/bussmann/Electrical/Resources/product-datasheets-b/Bus_Ele_DS_1015_KTK-R.pdf
Product overview (WEB)	http://www.cooperindustries.com/content/public/en/bussmann/electrical/products/fuses_class_cc_j_rk1_rk5/class_cc/ktk-r1.html

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Test disconnect terminal block - PTME 4 - 3212139

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Test disconnect terminal block, nom. voltage: 500 V, nominal current: 24 A, connection method: Push-in connection, number of connections: 2, cross section: 0.2 mm² - 6 mm², AWG: 24 - 10, width: 6.2 mm, height: 48.8 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- Feed-through terminal blocks of the same shape are available
- Clear selection thanks to printed switching symbols
- Clear
- Easy operation
- compact design
- Flexible and comprehensive accessories
- Reliably snapped into the end positions
- Contact made via screw terminal points

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
GTIN	4 046356 512725
GTIN	4046356512725
Weight per Piece (excluding packing)	14.400 g
Custom tariff number	85369010
Country of origin	Poland

Technical data

General

Number of levels	1
Number of connections	2

Test disconnect terminal block - PTME 4 - 3212139

Technical data

General

Potentials	1
Nominal cross section	4 mm²
Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Rated surge voltage	6 kV
Overvoltage category	III
Insulating material group	I
Maximum power dissipation for nominal condition	1.02 W
Maximum load current	24 A
Nominal current I_N	24 A
Nominal voltage U_N	500 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of flexion and pull-out test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.2 mm² / 0.2 kg
	4 mm² / 0.9 kg
Tensile test result	Test passed
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Result of temperature-rise test	Test passed
Requirement temperature-rise test	Increase in temperature ≤ 45 K
Short circuit stability result	Test passed
Conductor cross section short circuit testing	4 mm²
Short-time current	0.5 kA
Conductor cross section short circuit testing	4 mm²

Test disconnect terminal block - PTME 4 - 3212139

Technical data

General

Short-time current	0.15 kA
Conductor cross section short circuit testing	4 mm²
Short-time current	1.25 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Result of aging test	Test passed
Ageing test for screwless modular terminal block temperature cycles	192
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 1, class B, body mounted
Test frequency	f_1 = 5 Hz to f_2 = 150 Hz
ASD level	1.857 $(m/s^2)^2/Hz$
Acceleration	0,8 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	5g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
End cover width	2.2 mm

Test disconnect terminal block - PTME 4 - 3212139

Technical data

Dimensions

Length	70.5 mm
Height	48.8 mm
Height NS 35/7,5	49.5 mm
Height NS 35/15	57 mm

Connection data

Connection	1 level
Connection method	Push-in connection
Stripping length	10 mm ... 12 mm
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	24
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.25 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, minimum	0.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	1 mm²
Connection cross sections directly pluggable	0.5 mm² 6 mm²
Conductor cross section solid min.	0.5 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
Internal cylindrical gage	A4

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %

Test disconnect terminal block - PTME 4 - 3212139

Technical data

Ambient conditions

Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

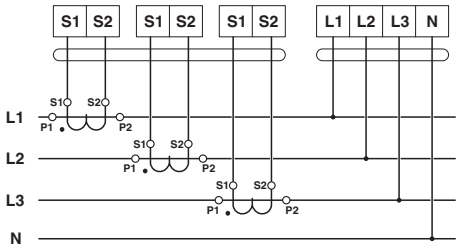
Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

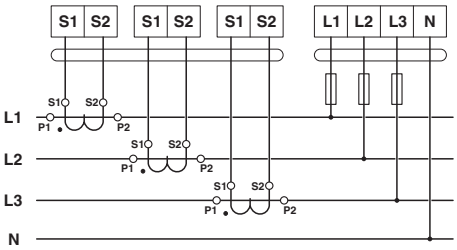
Drawings

Circuit diagram

Circuit diagram

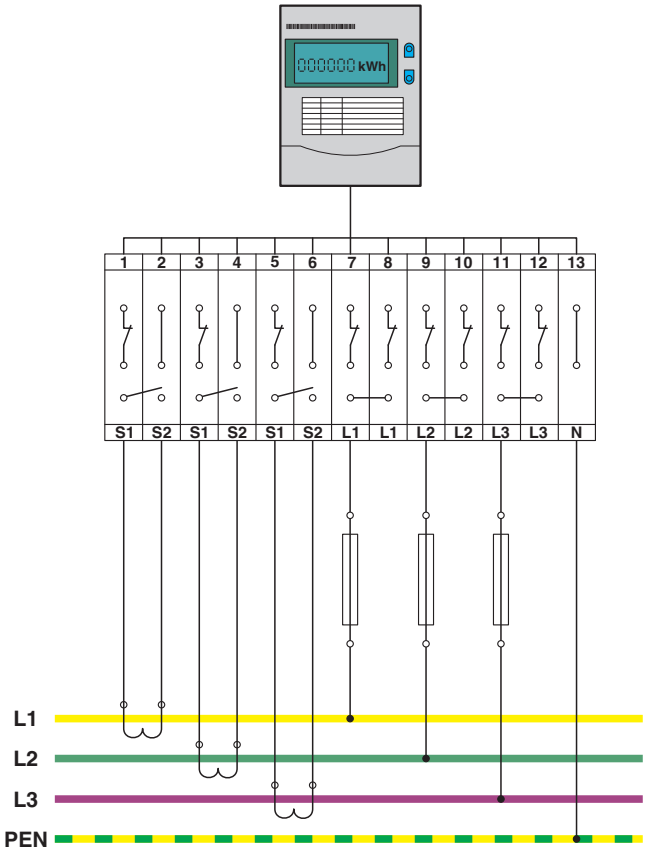


Circuit diagram



Test disconnect terminal block - PTME 4 - 3212139

Circuit diagram



Classifications

eCl@ss

eCl@ss 10.0.1	27141126
eCl@ss 11.0	27141126
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141126
eCl@ss 8.0	27141126
eCl@ss 9.0	27141126

ETIM

ETIM 2.0	EC000902

Test disconnect terminal block - PTME 4 - 3212139

Classifications

ETIM

ETIM 3.0	EC000902
ETIM 4.0	EC000902
ETIM 5.0	EC000902
ETIM 6.0	EC000902
ETIM 7.0	EC000902

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

CSA / UL Recognized / cUL Recognized / EAC / cULus Recognized

Ex Approvals

Approval details

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

	B	C
Nominal voltage UN	300 V	300 V
Nominal current IN	26 A	26 A
mm²/AWG/kcmil	24-10	24-10

Test disconnect terminal block - PTME 4 - 3212139

Approvals

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
Nominal voltage UN	300 V	300 V
Nominal current IN	26 A	26 A
mm²/AWG/kcmil	24-10	24-10

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
Nominal voltage UN	300 V	300 V
Nominal current IN	26 A	26 A
mm²/AWG/kcmil	24-10	24-10

EAC		RU C-DE.BL08.B.00644

cULus Recognized	

Accessories

Accessories

Cover profile

Cover profile - AP-ME METER - 3034361

Cover profile, for covering terminal strips, snapped onto APT-ME cover profile carrier or APH-ME end bracket. A cover profile carrier should be positioned at the ends and at intervals of around 40 cm. Length supplied: 1 m

Cover profile carrier

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Cover profile carrier - APH-ME - 3034374

Cover profile carrier, for mounting on NS 35/7,5 DIN rail, for fixing the AP-ME cover profile, can be sealed as an option

---

Cover profile carrier - APT-ME - 3034358

Cover profile carrier for mounting on NS 35/7.5 DIN rail for attaching the cover profile AP-ME

DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Test disconnect terminal block - PTME 4 - 3212139

Accessories

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

---

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

Test disconnect terminal block - PTME 4 - 3212139

Accessories

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Documentation

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

---

End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

Test disconnect terminal block - PTME 4 - 3212139

Accessories

End cover

End cover - D-PTME 4 - 3212167

End cover, length: 70.6 mm, width: 2.2 mm, height: 39.7 mm, color: gray

Insulating sleeve

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 4/0,5 - 3002885

Insulating sleeve, color: gray

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Insulating sleeve - ISH 4/1,0 - 3002898

Insulating sleeve, color: black

Jumper

Plug-in bridge - FBS 20-6 - 3030365

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: red

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Plug-in bridge - FBS 10-6 - 3030271

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: red

---

Plug-in bridge - FBS 6-6 - 1008238

Plug-in bridge, One side not fully isolated, pitch: 6.2 mm, width: 35.5 mm, number of positions: 6, color: red

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Plug-in bridge - FBS 5-6 - 3030349

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: red

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Plug-in bridge - FBS 4-6 - 3030255

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: red

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Plug-in bridge - FBS 3-6 - 3030242

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: red

---

Plug-in bridge - FBS 2-6 - 3030336

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: red

---

Plug-in bridge - FBS 50-6 - 3032224

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: red

---

Plug-in bridge - FBSR 2-6 - 3033715

Plug-in bridge, pitch: 6.2 mm, number of positions: 2, color: red

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Plug-in bridge - FBSR 3-6 - 3001594

Plug-in bridge, pitch: 6.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBSR 4-6 - 3001595

Plug-in bridge, pitch: 6.2 mm, number of positions: 4, color: red

---

Plug-in bridge - FBSR 5-6 - 3001596

Plug-in bridge, pitch: 6.2 mm, number of positions: 5, color: red

---

Plug-in bridge - FBSR 10-6 - 3033716

Plug-in bridge, pitch: 6.2 mm, number of positions: 10, color: red

---

Plug-in bridge - FBS 2-6 BU - 3036932

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: blue

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Plug-in bridge - FBS 3-6 BU - 3036945

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: blue

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Plug-in bridge - FBS 4-6 BU - 3036958

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: blue

---

Plug-in bridge - FBS 5-6 BU - 3036961

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: blue

---

Plug-in bridge - FBS 10-6 BU - 3032198

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: blue

---

Plug-in bridge - FBS 20-6 BU - 3032208

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: blue

---

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Plug-in bridge - FBS 50-6 BU - 3032211

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: blue

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Labeled terminal marker

Zack marker strip - ZB 6 CUS - 0824992

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 6,LGS:FORTL.ZAHLEN - 1051016

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 6,QR:FORTL.ZAHLEN - 1051029

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 6,LGS:GLEICHE ZAHLEN - 1051032

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Marker for terminal blocks - ZB 6,LGS:L1-N,PE - 1051414

Marker for terminal blocks, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - ZB 6,LGS:U-N - 1051430

Marker for terminal blocks, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: U, V, W, N, GND, U, V, W, N, GND, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 6 CUS - 0824589

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TM 6 CUS - 0829602

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6 CUS - 0825027

Zack Marker strip, flat, Strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Marker for terminal blocks - UC-TMF 6 CUS - 0824646

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TMF 6 CUS - 0829665

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6,LGS:FORTL.ZAHLEN - 0808749

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,QR:FORTL.ZAHLEN - 0808765

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,LGS:GERADE ZAHLEN - 0810834

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Zack Marker strip, flat - ZBF 6,LGS:UNGERADE ZAHLEN - 0810876

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - TMT 6 R CUS - 0824488

Marker for terminal blocks, can be ordered: by line, white, labeled according to customer specifications, mounting type: snap into universal marker groove, snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 6.35 x 6.15 mm

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Marker carriers

Group marker label for terminal marking - GBS-ZB/26X6 - 0809298

Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

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Marker carriers - CARRIER-TM 300 - 0828282

Marker carriers, gray, unlabeled, mounting type: snap into flat marker groove, lettering field size: 10.5 x 300 mm

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Partition plate

Separating plate - TS-UK 6-T - 3072820

Separating plate, length: 66.5 mm, width: 1 mm, height: 62.5 mm, color: gray

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Short-circuit connector

Short-circuit connector - FBSRH 2-6 - 3033812

Short-circuit connector, pitch: 6.2 mm, number of positions: 2, color: red

Switch module

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Connecting bridge - C-ME 4/2 - 3035759

Connection bridge, for connecting 2 test disconnect terminal blocks

Operating lever - C-ME 4/3 - 3035760

Operating lever, for connecting three test disconnect terminal blocks

Operating lever - C-ME 4/1 - 1062645

Operating lever, for switching test disconnect terminal blocks on and off

Switching jumper

Switching jumper - SB-ME 2-6 - 3035755

Switching jumper, pitch: 6.2 mm, length: 21.2 mm, width: 12.3 mm, number of positions: 2, color: gray/orange

Switching jumper - SB-ME 3-6 - 3035756

Switching jumper, pitch: 6.2 mm, length: 21.2 mm, width: 18.5 mm, number of positions: 3, color: gray/orange

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Switching jumper - SB-ME 4-6 - 3035757

Switching jumper, pitch: 6.2 mm, length: 21.2 mm, width: 24.7 mm, number of positions: 4, color: gray/orange

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Switching lock

Switching lock - S-ME 4 - 3035758

Switching lock, length: 12 mm, width: 6.2 mm, color: white

Terminal marking

Group marker label for terminal marking - GBS 5-25X12 - 0810588

Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5

Zack marker strip - ZB 6:UNBEDRUCKT - 1051003

Zack marker strip, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 6 - 0818085

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 80

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Marker for terminal blocks - UCT-TM 6 - 0828736

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6:UNBEDRUCKT - 0808710

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 6 - 0818140

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TMF 6 - 0828746

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

Marker for terminal blocks - TMT 6 R - 0816498

Marker for terminal blocks, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL 2.0, THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK ROLLMASTER 300/600, THERMOMARK X1.2, THERMOMARK S1.1, perforated, mounting type: snap into universal marker groove, snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 6.35 x 6.15 mm, Number of individual labels: 16000

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Marker for terminal blocks - TMT (EX9,5)R - 0828295

Marker for terminal blocks, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL 2.0, THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK ROLLMASTER 300/600, THERMOMARK X1.2, mounting type: snap into universal marker groove, snap into tall marker groove, for terminal block width: 50000 mm, lettering field size: 9.5 x 50000 mm, Number of individual labels: 1

Marker for terminal blocks - US-TM 100 - 0829255

Marker for terminal blocks, Card, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into universal marker groove, lettering field size: 104 x 9.8 mm, Number of individual labels: 13

Test plug terminal block

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Test plugs - PS-6 - 3030996

Test plugs, Modular test plug, color: red

Test plugs - PS-6/2,3MM RD - 3038736

Test plugs, color: red

Test disconnect terminal block - PTME 4 - 3212139

Accessories

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test disconnect terminal block - PTME 4 - 3212139

Accessories

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Bulletin 1606-XLE Essential Switched Mode Power Supplies

Designed with simplicity in mind, the XLE line offers high performing, ultra slim power supplies with the most basic feature set. These products contain the essential features for long service life and high reliability. This line is ideal if you are interested in a cost-effective solution to power your operations.

- Rated outputs between 80…960 W (3.3…40 A at 24V DC)
- Cost-effective solution for single-phase applications

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current			Cat. No.
					120V AC	230V AC	400V AC-480V AC	
Bulletin 1606-XLE Essential Single Phase ✶	100…120/200…240V AC	24…28	80	3.3	1.50	0.68		1606-XLE80E
		24…28	120	5	2.34	1.23		606-XLE120E
		24…28	120	5	2.34	1.23		❄ 1606-XLE120EC
	90…132V AC	24…28	120	5	1.23	–		1606-XLE120EN
	180…264V AC	24…28	120	5	–	1.17		1606-XLE120EE
	100…120/200…240V AC	24…28	240	10	4.34	2.23		1606-XLE240E
	90…132V AC	24…28	240	10	3.73	–	–	1606-XLE240EN
	180…264V AC	24…28	240	10	–	2.20		1606-XLE240EE
	100…120/200…240V AC	24…28	240	10	4.34	2.00		1606-XLE240EP
	100…120/200…240V AC	48…52	240	5	4.34	2.23		♦ 1606-XLE240F
	100…240V AC	24…28	480	20	4.36	2.33		1606-XLE480EP
	100…240V AC	48…56	480	10	4.36	2.33		1606-XLE480FP
Three Phase ✶	380…480V AC, 600V DC	12…15	96	8			2x 0.56	1606-XLE96B-2
	380…480V AC, 600V DC	48…56	240	5			3x 0.60	606-XLE240F-3
	380…480V AC, 600V DC	24…28	120	5	–	–	0.68	1606-XLE120E-2
	380…480V AC, 600V DC	24…28	240	10			3x 0.60	1606-XLE240E-3
	480 V AC	24	960	40			3x 1.40	1606-XLE960DX-3N
	480 V AC	48	960	20			3x 1.40	1606-XLE960MX-3N

Bulletin 1606-XLP Compact Switched Mode Power Supplies

When saving critical space is one of your main objectives, the XLP line is an excellent choice. These devices are equipped with many of the same features and certifications as previous generations and support low-power applications. This line is ideal if you require a cost-effective way to save space while delivering safe and reliable power.

- Rated outputs between 15…100 W (0.6…4.2 A at 24V DC)
- Multiple output voltages available
- Smaller, cost-effective solution for low power applications

	Input Voltage	Output Voltage [V DC]	Output Power [W]	Output Current [A]	Steady State Input Current			Cat. No.
					120V AC	230V AC	400V AC-480V AC	
Bulletin 1606-XLP Compact Single Phase ⌘	100…240V AC, 85…375V DC	5…5.5	15	3	0.28	0.17		1606-XLP15A
		12…15	15	1.3	0.28	0.17		1606-XLP15B
		24…28	15	0.6	0.28	0.17		1606-XLP15E
		5…5.5	25	5	0.60	0.30		1606-XLP25A
		10…12	30	3	0.60	0.25		1606-XLP30B
		24…28	30	1.3	0.60	0.35		1606-XLP30E
		24…28	30	1.3	0.54	0.30		1606-XLP30EQ
		± 12/15	36	2.8	0.65	0.40		1606-XLP36C
		12…15	50	4.2	1.00	0.60		1606-XLP50B
		24…28	50	2.1	0.77	0.44		1606-XLP50E
		24…28	50	2.1	1.00	0.60	–	1606-XLP50EZ
		48…56	50	1	1.00	0.60		1606-XLP50F
	100…240V AC, 110…300V DC	12…15	54	4.5	0.91	0.54		1606-XLP60BQ
		12…15	54	4.5	0.97	0.61		1606-XLP60BQT
		24…28	60	2.5	0.98	0.58		1606-XLP60EQ
		24…28	60	2.5	1.05	0.66		1606-XLP60EQT
	100…120/220…240V AC, 220…375V DC	24…28	72	3	1.60	0.80		1606-XLP72E
		12…15	90	7.5	1.90	0.90		✠ ♦ 1606-XLP90B
	100…200/200…240V AC, 220…375V DC	24…28	95	3.9	2.00	0.95		♦ 1606-XLP95E
		24…28	100	4.2	2.10	1.00		✠ ♦ 1606-XLP100E
		48…56	100	2.1	2.10	1.00		✠ ♦ 1606-XLP100F
Two Phase ✠ ⌘ ✦	380…480V AC	24…28	90	3.75	–	–	2x 0.36	1606-XLP90E-2
		24…28	100	4.2	–	–	2x 0.40	1606-XLP100E-2

DATASHEET - FAZ-C3/1-NA

Similar to illustration

Miniature circuit breaker (MCB), 3 A, 1p, characteristic: C

Part no.	**FAZ-C3/1-NA**
Catalog No.	**102081**
Alternate Catalog No.	**FAZ-C3/1-NA**
EL-Nummer (Norway)	**0001691570**

Delivery program

Basic function			Miniature circuit-breakers
Number of poles			1 pole
Tripping characteristic			C
Application			Switchgear for export to North America (UL-listed)
Rated current	I_n	A	3
Rated switching capacity acc. to IEC/EN 60947-2	I_{cu}	kA	15
Product range			FAZ-NA

Technical data

Electrical

Standards			UL 489, CSA C22.2 No. 5 IEC 60947-2
Rated operational voltage	U_e	V	
	U_e	V AC	277/480 Y
		V DC	60
Rated voltage according to IEC/EN 60947-2	U_n	V AC	254
Rated voltage according to UL	U_n	V AC	277
Rated switching capacity acc. to IEC/EN 60947-2	I_{cu}	kA	15
Breaking capacity according to UL		kA	10 (UL489)
Characteristic			B, C, D
Selectivity Class			3
lifespan			
Lifespan	Operations		> 20000
Direction of incoming supply			as required

Mechanical

Standard front dimension		mm	45
Enclosure height		mm	105
Mounting width per pole		mm	17.7
Mounting			IEC/EN 60715 top-hat rail
Degree of Protection			IP20, IP40 (when fitted)
Terminals top and bottom			Twin-purpose terminals
Terminal protection			Finger and back-of-hand proof to BGV A2
Tightening torque of fixing screws		N/m	max. 2.4 UL: #18-12 AWG: 2.4 Nm (21 lb-in) #10-8 AWG: 2.8 Nm (25 lb-in) #6 AWG: 4 Nm (36 lb-in)
Mounting position			As required

Design verification as per IEC/EN 61439

Technical data for design verification			
Rated operational current for specified heat dissipation	I_n	A	3

EP14-03 FAZ-C03-1-NA-SP Eaton Circuit Breaker Datasheet

Heat dissipation per pole, current-dependent	P_{vid}	W	0
Equipment heat dissipation, current-dependent	P_{vid}	W	1.2
Static heat dissipation, non-current-dependent	P_{vs}	W	0
Heat dissipation capacity	P_{diss}	W	0
Operating ambient temperature min.		°C	-25
Operating ambient temperature max.		°C	75
			linear, per +1 °C, results in a 0.5% reduction of current carrying capacity
IEC/EN 61439 design verification			
10.2 Strength of materials and parts			
10.2.2 Corrosion resistance			Meets the product standard's requirements.
10.2.3.1 Verification of thermal stability of enclosures			Meets the product standard's requirements.
10.2.3.2 Verification of resistance of insulating materials to normal heat			Meets the product standard's requirements.
10.2.3.3 Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects			Meets the product standard's requirements.
10.2.4 Resistance to ultra-violet (UV) radiation			Meets the product standard's requirements.
10.2.5 Lifting			Does not apply, since the entire switchgear needs to be evaluated.
10.2.6 Mechanical impact			Does not apply, since the entire switchgear needs to be evaluated.
10.2.7 Inscriptions			Meets the product standard's requirements.
10.3 Degree of protection of ASSEMBLIES			Does not apply, since the entire switchgear needs to be evaluated.
10.4 Clearances and creepage distances			Meets the product standard's requirements.
10.5 Protection against electric shock			Does not apply, since the entire switchgear needs to be evaluated.
10.6 Incorporation of switching devices and components			Does not apply, since the entire switchgear needs to be evaluated.
10.7 Internal electrical circuits and connections			Is the panel builder's responsibility.
10.8 Connections for external conductors			Is the panel builder's responsibility.
10.9 Insulation properties			
10.9.2 Power-frequency electric strength			Is the panel builder's responsibility.
10.9.3 Impulse withstand voltage			Is the panel builder's responsibility.
10.9.4 Testing of enclosures made of insulating material			Is the panel builder's responsibility.
10.10 Temperature rise			The panel builder is responsible for the temperature rise calculation. Eaton will provide heat dissipation data for the devices.
10.11 Short-circuit rating			Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.12 Electromagnetic compatibility			Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.13 Mechanical function			The device meets the requirements, provided the information in the instruction leaflet (IL) is observed.

Technical data ETIM 7.0

Circuit breakers and fuses (EG000020) / Miniature circuit breaker (MCB) (EC000042)

Electric engineering, automation, process control engineering / Electrical installation, device / Miniature circuit breaker system (MCB) / Miniature circuit breaker (MCB) (ecl@ss10.0.1-27-14-19-01 [AAB905014])

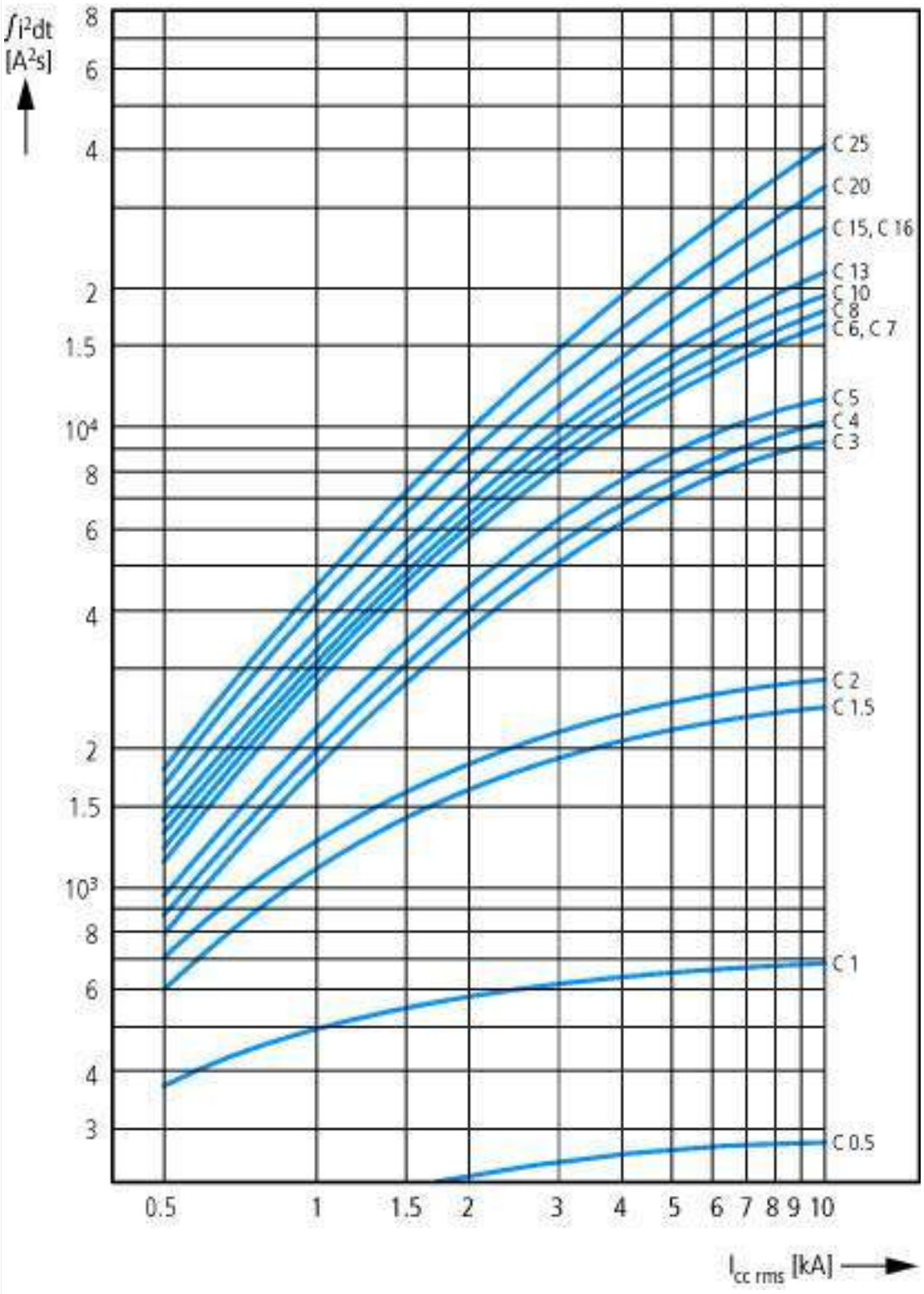
Release characteristic			C
Number of poles (total)			1
Number of protected poles			1
Rated current		A	3
Rated voltage		V	240
Rated insulation voltage Ui		V	440
Rated impulse withstand voltage Uimp		kV	4
Rated short-circuit breaking capacity Icn EN 60898 at 230 V		kA	0
Rated short-circuit breaking capacity Icn EN 60898 at 400 V		kA	0
Rated short-circuit breaking capacity Icu IEC 60947-2 at 230 V		kA	15
Rated short-circuit breaking capacity Icu IEC 60947-2 at 400 V		kA	15
Voltage type			AC
Frequency		Hz	50 - 60
Current limiting class			3
Suitable for flush-mounted installation			No
Concurrently switching N-neutral			No

Over voltage category			3
Pollution degree			2
Additional equipment possible			Yes
Width in number of modular spacings			1
Built-in depth		mm	70.5
Degree of protection (IP)			IP20
Ambient temperature during operating		°C	-25 - 75
Connectable conductor cross section multi-wired		mm^2	1 - 25
Connectable conductor cross section solid-core		mm^2	1 - 25

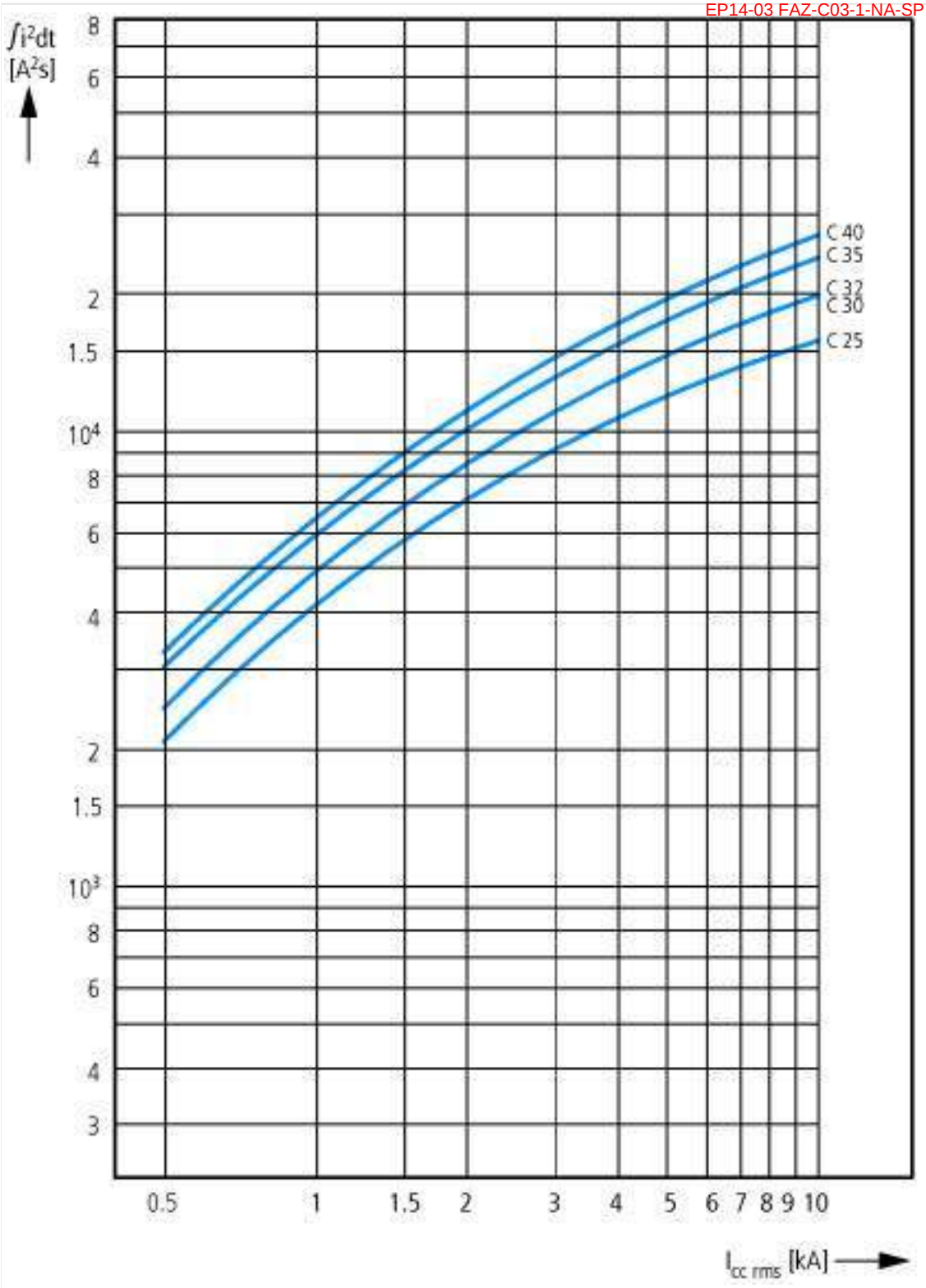
Approvals

Product Standards			IEC/EN 60947-2; UL 489; CSA-C22.2 No. 5-09; CE marking
UL File No.			E235139
UL Category Control No.			DIVQ
CSA File No.			204453
CSA Class No.			1432-01
North America Certification			UL listed, CSA certified
Specially designed for North America			Yes, suitable as BCPD
Suitable for			Feeder circuits, branch circuits
Current Limiting Circuit-Breaker			Yes
Max. Voltage Rating			≤ 32 A
Degree of Protection			IEC: IP20, UL/CSA Type: -

Characteristics



Let-through energy I^2t
Characteristic C (0.5 - 20 A), 277 V



Characteristic C (25 - 40 A), 240 V

Additional product information (links)

Temperature dependency, derating	https://www.eaton.com/content/dam/eaton/technicaldocumentation/technical-data-tables/Derating table FAZ-NA-RT.pdf

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EP14-03 Rockwell Motor Protection - Contactor Connector 140M0D-PNC37

	Description		For Use With	Cat. No.
	Legend Plate	Marking: "Hauptschalter" and "Main Switch"	140-CDN66	140M-C-DFCN
		Marking: "Not-Aus" and "Emergency Off"	140-CDRY66	140M-C-DFCRY
	IP65 Non-Metallic Enclosure • Knockouts for M20 and M25 fittings • Suitable for flexible cable with internal ground wire or conduit when externally grounded around the outside of the enclosure (no UL/CSA approval)	Black Handle	140M-C	198E-AYTG2
		Red/Yellow Handle	140M-C	198E-AYTJ2
	Screw Adapter • For screw arrangement of a motor protection circuit breaker • Must be ordered in multiples of 10 (10 pcs/pkg)		140M-C, D, F 140U- D	140M-C-N45

	Description	For Use With	Cat. No.
	ECO Connecting Module — 12 A • For DOL and reversing starters • Eco-starters mount on single DIN Rail (140M on DIN Rail) • Electrical and mechanical interconnection of 140M and 100-K contactors	140M-C to 100-K	140M-C-PEK12
	ECO Connecting Modules — 25 A • Eco-starters mount on single DIN Rail (140M on DIN Rail) • Electrical and mechanical interconnection of 140M MPCB and 100-C (with AC coils or 24V DC electronic coils) contactors	140M-C to 100-C09…C23	140M-C-PEC23
		140M-D to 100-C09…C23	140M-D-PEC23
	ECO Connecting Modules — 25 A • Eco-starters mount on single DIN Rail (100-C on DIN Rail) • Electrical and mechanical interconnection of 140M MPCB and 100-C (with conventional DC coils)	140M-C, 140M-D to 100-C09…C23	140M-C-PEC23A
	Connecting Modules — 25 and 45 A • Contactor and MPCB MUST BE mounted separately on (2) DIN Rails Electrical interconnection of 140M and 100-C (with AC coils)	140M-C to 100-C09…C23	140M-C-PNC23
		140M-D to 100-C09…C23	140M-D-PNC23
		140M-D to 100-C30…C37	140M-D-PNC37
		140M-F to 100-C30…C37	140M-F-PNC37
		140M-F to 100-C43	140M-F-PNC43
	Coil Modules — 25 A and 45 A • For use with Bulletin 103T/107T 3-component starters	140M-C, -D to 100-C09…C23	140M-C-PSC23
		140M-D, -F to 100-C30…C43	140M-F-PSC43
	Spacing Adapter • Required for self-protected combination motor controller (Type E) applications of Bul. 140M-C, -D, and -F MPCBs. Not for use with bus bars.	140M-C, -D	140M-C-TE1
		140M-F	140M-F-TE

HOFFMAN Cabinet Heater

TOUCH-SAFE HEATERS

INDUSTRY STANDARDS

cURus Component Recognized; File No. E150057

IP 20
CE

APPLICATION

Protect electronic, mechanical equipment from low temperatures, condensation, and corrosion with this heater, which will maintain stable enclosure temperatures by using natural convection resulting in current circulation of warm air.

SPECIFICATIONS

- Heating element PTC resistor - temperature limiting
- Double Insulated Protection
- Mounting clip for 35mm DIN rail, EN 60 715
- Vertical mount

FINISH

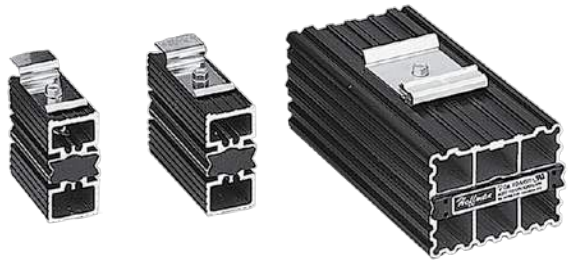
- UL 94 V-0 Black Plastic Housing

Performance Data

CATALOG NUMBERS	DAH101TS	DAH201TS	DAH501TS
Electrical Data			
Rated Voltage (AC/DC)	**110/120**	**110/120**	**110/120**
Power Consumption (Watts)	10	20	50
Start Nominal Current (Amps)	2.5	4.5	8
Unit Construction			
H x W x D (in./mm)	3.9 X 1.5 X 3.0/98 x 38 x 75	3.9 X 1.5 X 3.0/98 x 38 x 75	4.3 X 2.4 X 3.5/110 x 60 x 90
Weight (oz)	5.0	6.1	10.4

HOFFMAN Cabinet Heater

SEMICONDUCTOR HEATERS



INDUSTRY STANDARDS

cURus Component Recognized; File No. E150057

IEC IP54
CE

APPLICATION

Protect electronic, pneumatic, hydraulic and mechanical equipment from low temperatures, condensation and corrosion with this heater, which maintains a stable enclosure temperature.

SPECIFICATIONS

- PTC (Positive Temperature Coefficient) heating element
- Mounting clip for 35-mm DIN rails EN 50022

FINISH

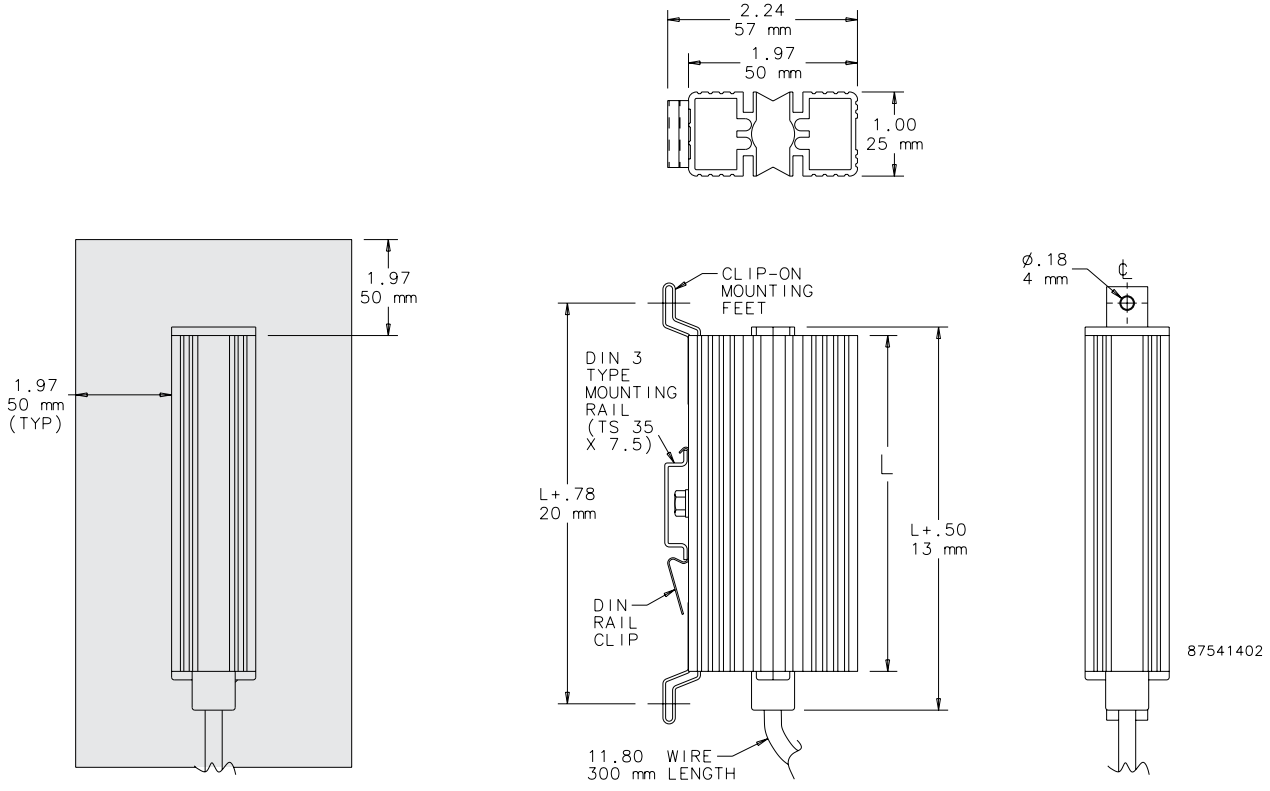
- Black anodized, extruded aluminum.

Performance Data **Semiconductor Heater**

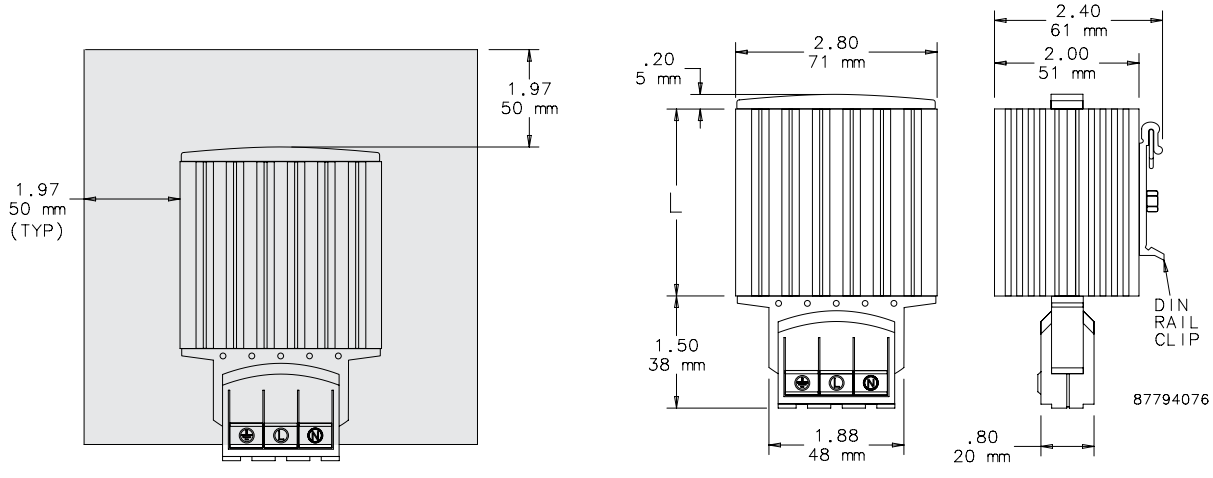
CATALOG NUMBERS	DAH101	DAH301	DAH601
ELECTRICAL DATA			
Rated Voltage	**AC/DC 110/120**	**AC/DC 110/120**	**AC/DC 110/250**
Power Consumption (Watts)	10	30	60
Start Nominal Current (Amps)	0.8	1.2	2.5
HEATING PERFORMANCE			
Watts	**10**	**30**	**60**
UNIT CONSTRUCTION			
L (in./mm)	1.97/50	3.93/100	5.5/140
Weight (lb./kg)	0.45/0.20	0.66/0.30	1.10/0.50

HOFFMAN Cabinet Heater

Clearance Range for DAH101 and DAH301



Clearance Range for DAH601



HOFFMAN Cabinet Heater

ELECTRIC HEATERS

115/230 Volt
100/200 Watt

115/230 Volt
400/800 Watt

115/230 Volt
1300 Watt

INDUSTRY STANDARDS

UL 508A Component Recognized; File No. E61997

CSA Certified, CSA File No. LR42186
CE

APPLICATION

Protect mechanical, electrical and electronic equipment from low temperatures, condensation and corrosion with this thermostatically controlled, fan-driven heater that maintains a stable enclosure temperature.
Fan draws cool air from the bottom of the enclosure and passes this air across the thermostat and heating element before being released into enclosure cavity. Heated air is discharged through the top of the heater unit.

SPECIFICATIONS

- Aluminum housing
- Thermostat range adjustable from 0 F to 100 F (-18 C to 38 C)
- Four 10-32 x self-tapping screws are included with each heater
- Ball bearing fan
- Terminal strip with clamp connector that accepts both solid and stranded wire

FINISH

- Brushed aluminum

⚠ CAUTION

These electric heaters are not designed for use in dusty, dirty, corrosive, or hazardous locations. Portions of the heater can get hot. Adequate protection must be taken to protect people from potential burns, and to protect other components from this heat. Pentair Technical Products recommends this heater only be installed in a totally-enclosed metal enclosure.

DO NOT INSTALL HEATERS ON WOOD PANELS.
Heat sensitive components should not be placed near the heater discharge area since this air can be quite warm. The clearance range defines the space that must be kept free of these components for proper and safe operation of the heater.

HOFFMAN Cabinet Heater

Performance Data **100 and 200 Watt Heaters**

CATALOG NUMBERS	DAH1001A	DAH1002A	DAH2001A	DAH2002A
ELECTRICAL DATA				
Rated Voltage	**115**	**230**	**115**	**230**
Frequency (Hz)	50/60	50/60	50/60	50/60
Power Consumption (Watts)	100	100	200	200
Nominal Current (Amps)	0.98	0.49	1.89	0.95
HEATING PERFORMANCE				
Watts	**100**	**100**	**200**	**200**
UNIT CONSTRUCTION				
Weight (lb./kg)	1.6/0.73	1.6/0.73	1.6/0.73	1.6/0.73
X (in./mm)	4.00/102	4.00/102	4.00/102	4.00/102

Performance Data **400 and 800 Watt Heaters**

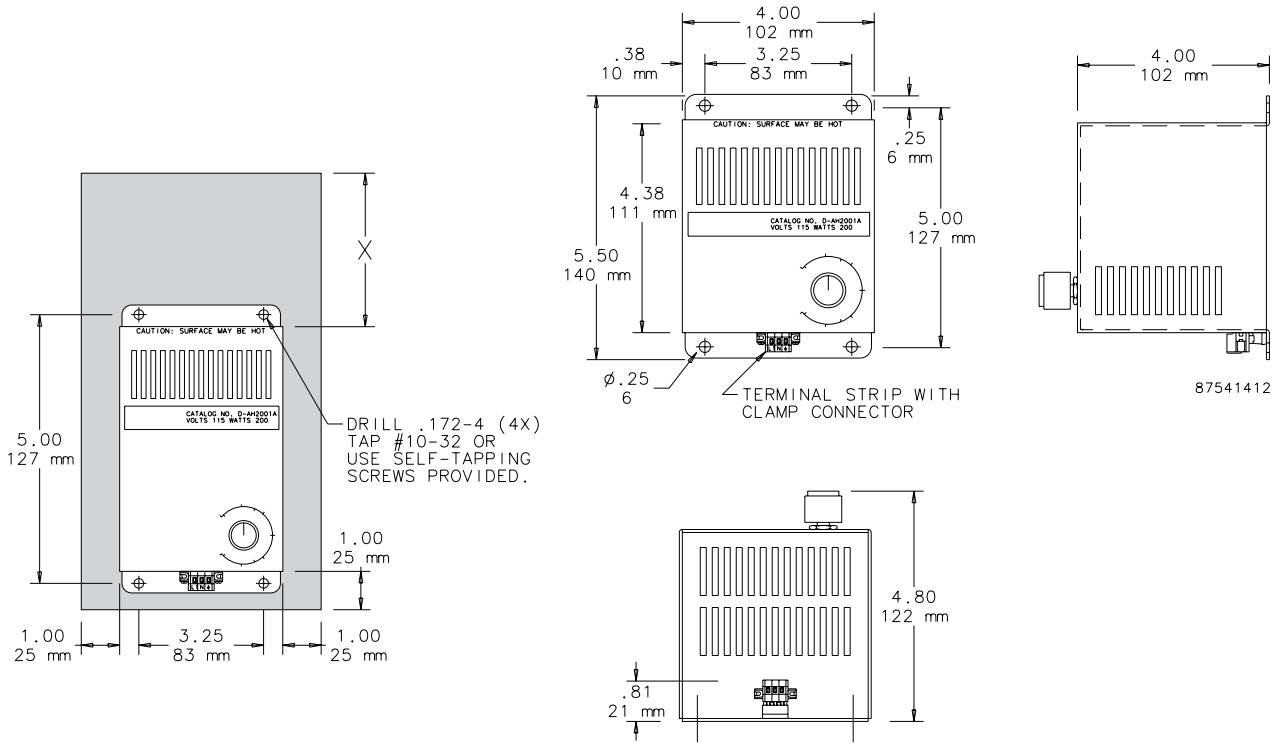
CATALOG NUMBERS	DAH4001B	DAH4002B	DAH8001B	DAH8002B
ELECTRICAL DATA				
Rated Voltage	**115**	**230**	**115**	**230**
Frequency (Hz)	50/60	50/60	50/60	50/60
Power Consumption (Watts)	400	400	800	800
Nominal Current (Amps)	3.72	1.86	7.37	3.69
HEATING PERFORMANCE				
Watts	**400**	**400**	**800**	**800**
UNIT CONSTRUCTION				
Weight (lb./kg)	2.2/1.00	2.2/1.00	2.2/1.00	2.2/1.00
X (in./mm)	6.00/152	6.00/152	8.00/203	8.00/203

Performance Data **1300 Watt Heaters**

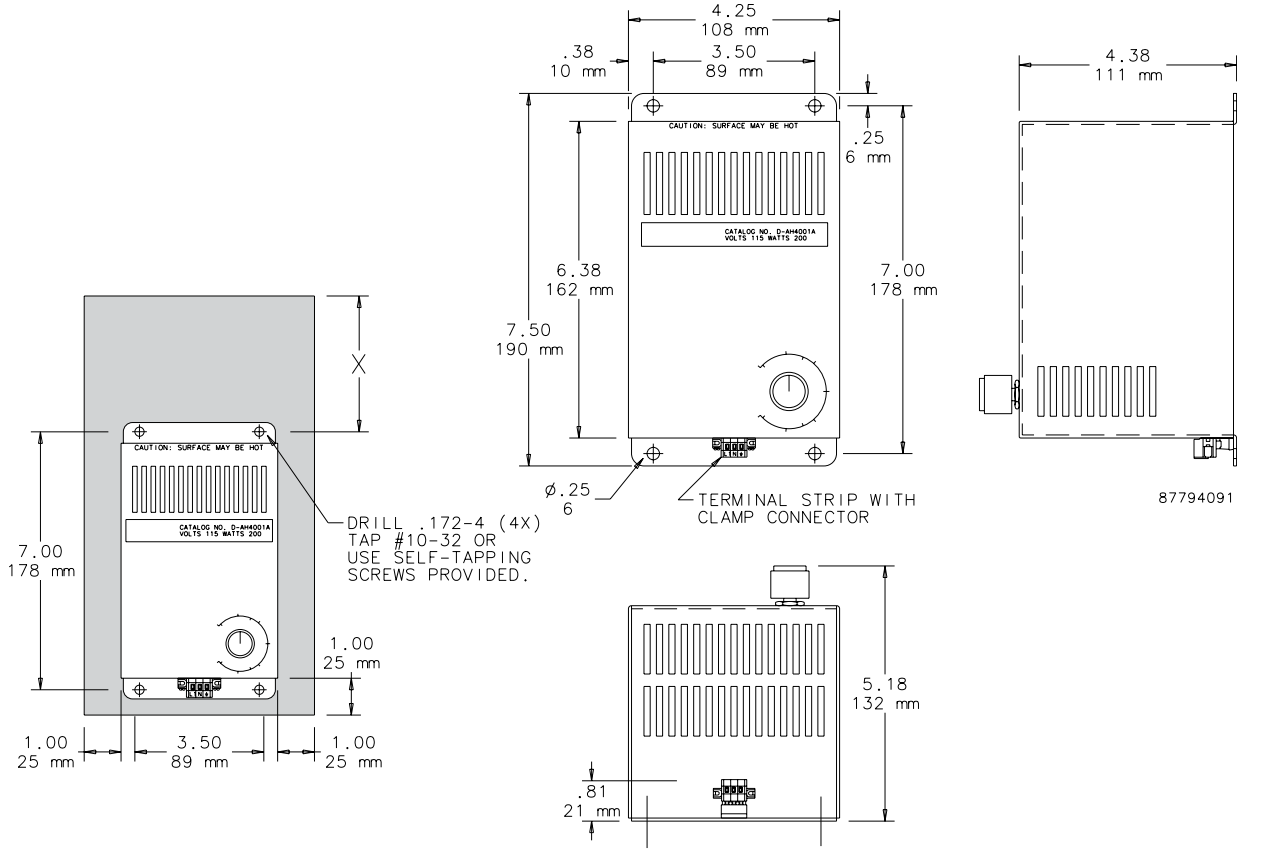
CATALOG NUMBERS	DAH13001C	DAH13002C
ELECTRICAL DATA		
Rated Voltage	**115**	**230**
Frequency (Hz)	50/60	50/60
Power Consumption (Watts)	1300	1300
Nominal Current (Amps)	11.5	5.7
HEATING PERFORMANCE		
Watts	**1300**	**1300**
UNIT CONSTRUCTION		
Weight (lb./kg)	3.4/1.54	3.4/1.54
X (in./mm)	8.00/203	8.00/203

HOFFMAN Cabinet Heater

Dimensions and Clearance Range Drawing for DAH1001A, -2A and DAH2001A, -2A

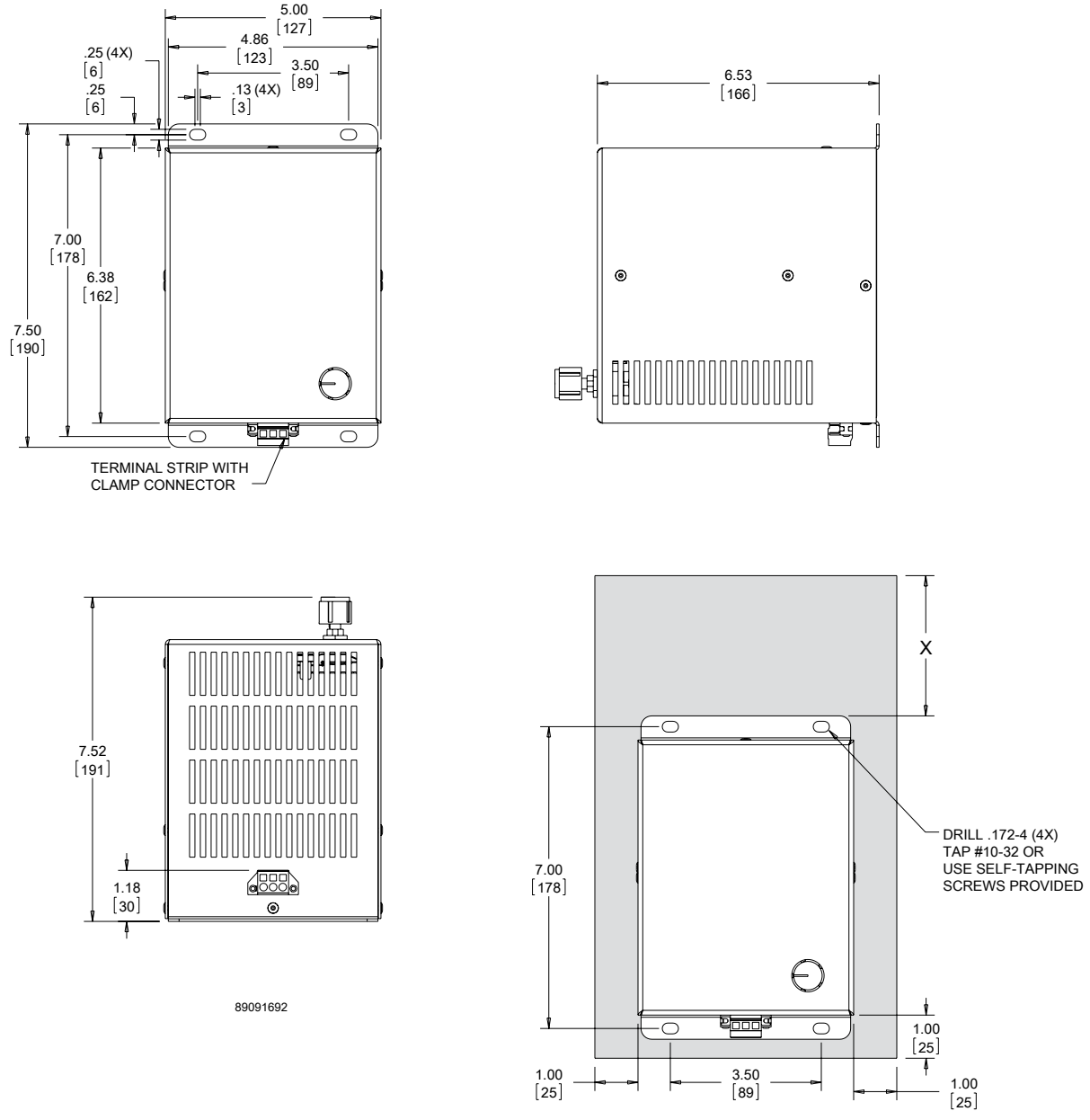


Dimensions and Clearance Range Drawing for DAH4001B, -2B and DAH8001B, -2B



HOFFMAN Cabinet Heater

Dimensions and Clearance Range Drawing for DAH13001C and DAH13002C



HOFFMAN Cabinet Heater

HAZARDOUS LOCATION HEATER

INDUSTRY STANDARDS

CE
Conformity Certificate LCIE (Laboratoire Central des Industries Electriques) LCIE 01 ATEX 6073
EEx d IIC T4/II 2 GD, IP6x T135°C
IEC 60529, IP65/I (grounded)

APPLICATION

Designed for use in hazardous locations where electronic components require protection from condensation and corrosion, sudden temperature drops and low temperatures.

FEATURES

- Maintenance-free
- High-performance heating cartridge (element)
- Large convection surface
- Extruded aluminum heat sink
- DIN clip for mounting
- Connection cable: Si HF-JZ 3 x AWG 18 x 3.3 ft. (0.75 mm² x 1 m)
- Operating voltage 110-120 VAC

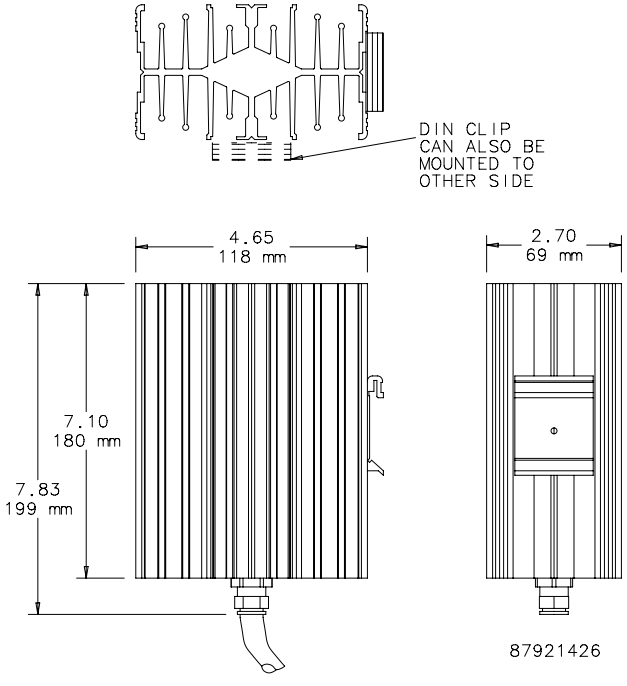
FINISH

- Black anodized

Performance Data **Hazardous Location Heater**

CATALOG NUMBERS	HLHEAT100
DESIGN DATA	
Heating Power (Watts)	100
Surface Temperature T4 (°F/°C) *	275/135
UNIT CONSTRUCTION	
Unit Dimensions - H x W x D (in. / mm)	7.10/180 x 4.65/118 x 2.70/69

* Surface temperature when mounted vertically.



DISCONNECT ENCLOSURE WITH HANDLE, TYPE 12

- External formed body flange channels away liquids
- Removable door with continuous hinge
- Data pocket is high impact thermoplastic
- Oil-resistant gasket
- Collar studs for mounting optional panels
- Holes in body and door for mounting disconnect operating handle, operating mechanism, and door hardware
- Available with or without POWERGLIDE handle and latching hardware
- Includes latch pivot post(s) and cover interlock bracket welded to door, cover latch bar for door, and instructions for installing disconnects
- Model numbers ending with "PL" include POWERGLIDE handle and latching hardware
- Installation instructions provided

INDUSTRY STANDARDS

UL 508A Listed; Type 12, 13; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 12, 13; File No. E61997

NEMA/EEMAC Type 12, 13
CSA File No. 42186: Type 12
IEC 60529, IP65

APPLICATION

These general purpose disconnect enclosures accept major brand disconnect switches and circuit breakers, available with or without the Hoffman-supplied defeater door handle and handle hardware.

SPECIFICATIONS

- 14 gauge steel
- Seams continuously welded and ground smooth
- Bonding provision on door
- External welded-on mounting brackets for easy installation

FINISH

Body: White inside with ANSI 61 gray finish outside.
Door: ANSI 61 gray inside and outside.

ACCESSORIES

Panels for Type 3R, 4, 4X, 12 and 13 Enclosures
Blank Adapter Plates, Mild Steel
Compact Cooling Fans
PANELITE Enclosure Lights
POWERGLIDE Defeater Handle Kit
Steel and Stainless Steel Window Kits

ORDERING

Note: Some flexible cable operating mechanisms may not work in 8-in. deep enclosures due to interference with cable control hardware on inside of flange.

Depending on model, order as follows:
PL models:
- Operating mechanism and disconnect switch or circuit breakers
- Disconnect operating handle

All other models:
- Operating mechanism and disconnect switch or circuit breakers
- Disconnect operating handle
- POWERGLIDE Defeater Handle Kit or Door Hardware

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

BULLETIN: A25

Standard Product

Catalog Number	AxBxC in.	AxBxC mm	Footnotes	With or Without Handle	Panel	Conductive Panel	Panel Size D x E (in.)	Panel Size D x E (mm)	Data Pocket Size D x E (in.)	Data Pocket Size D x E (mm)
A20SA2208LP	20.00 x 21.38 x 8.00	508 x 543 x 203	–	Without	A20P20	A20P20G	17.00 x 17.00	432 x 432	6.00 x 6.00	152 x 152
A20SA2208LPPL	20.00 x 21.38 x 8.00	508 x 543 x 203	–	With	A20P20	A20P20G	17.00 x 17.00	432 x 432	6.00 x 6.00	152 x 152
A24SA2208LP	24.00 x 21.38 x 8.00	610 x 543 x 203	–	Without	A24P20	A24P20G	21.00 x 17.00	533 x 432	6.00 x 6.00	152 x 152
A24SA2208LPPL	24.00 x 21.38 x 8.00	610 x 543 x 203	–	With	A24P20	A24P20G	21.00 x 17.00	533 x 432	6.00 x 6.00	152 x 152
A24SA2608LP	24.00 x 25.38 x 8.00	610 x 645 x 203	–	Without	A24P24	A24P24G	21.00 x 21.00	533 x 533	6.00 x 6.00	152 x 152
A24SA2608LPPL	24.00 x 25.38 x 8.00	610 x 645 x 203	–	With	A24P24	A24P24G	21.00 x 21.00	533 x 533	6.00 x 6.00	152 x 152
A30SA2208LP	30.00 x 21.38 x 8.00	762 x 543 x 203	–	Without	A30P20	A30P20G	27.00 x 17.00	686 x 432	6.00 x 6.00	152 x 152
A30SA2208LPPL	30.00 x 21.38 x 8.00	762 x 543 x 203	–	With	A30P20	A30P20G	27.00 x 17.00	686 x 432	6.00 x 6.00	152 x 152
A30SA2608LP	30.00 x 25.38 x 8.00	762 x 645 x 203	–	Without	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A30SA2608LPPL	30.00 x 25.38 x 8.00	762 x 645 x 203	–	With	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A36SA2608LP	36.00 x 25.38 x 8.00	914 x 645 x 203	–	Without	A36P24	A36P24G	33.00 x 21.00	838 x 533	12.00 x 12.00	305 x 305
A36SA2608LPPL	36.00 x 25.38 x 8.00	914 x 645 x 203	–	With	A36P24	A36P24G	33.00 x 21.00	838 x 533	12.00 x 12.00	305 x 305
A36SA3208LP	36.00 x 31.38 x 8.00	914 x 797 x 203	–	Without	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A36SA3208LPPL	36.00 x 31.38 x 8.00	914 x 797 x 203	–	With	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A42SA3208LP	42.00 x 31.38 x 8.00	1067 x 797 x 203	–	Without	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3208LPPL	42.00 x 31.38 x 8.00	1067 x 797 x 203	–	With	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3808LP	42.00 x 37.38 x 8.00	1067 x 949 x 203	–	Without	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A42SA3808LPPL	42.00 x 37.38 x 8.00	1067 x 949 x 203	–	With	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A48SA3808LP	48.00 x 37.38 x 8.00	1219 x 949 x 203	–	Without	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A48SA3808LPPL	48.00 x 37.38 x 8.00	1219 x 949 x 203	–	With	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A60SA3808LP	60.00 x 37.38 x 8.00	1524 x 949 x 203	–	Without	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A60SA3808LPPL	60.00 x 37.38 x 8.00	1524 x 949 x 203	–	With	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A20SA2210LP	20.00 x 21.38 x 10.00	508 x 543 x 254	–	Without	A20P20	A20P20G	17.00 x 17.00	432 x 432	6.00 x 6.00	152 x 152

Catalog Number	AxBxC in.	AxBxC mm	Footnotes	With or Without Handle	Panel	Conductive Panel	Panel Size D x E (in.)	Panel Size D x E (mm)	Data Pocket Size D x E (in.)	Data Pocket Size D x E (mm)
A20SA2210LPPL	20.00 x 21.38 x 10.00	508 x 543 x 254	–	With	A20P20	A20P20G	17.00 x 17.00	432 x 432	6.00 x 6.00	152 x 152
A24SA2210LP	24.00 x 21.38 x 10.00	610 x 543 x 254	–	Without	A24P20	A24P20G	21.00 x 17.00	533 x 432	6.00 x 6.00	152 x 152
A24SA2210LPPL	24.00 x 21.38 x 10.00	610 x 543 x 254	–	With	A24P20	A24P20G	21.00 x 17.00	533 x 432	6.00 x 6.00	152 x 152
A24SA2610LP	24.00 x 25.38 x 10.00	610 x 645 x 254	–	Without	A24P24	A24P24G	21.00 x 21.00	533 x 533	6.00 x 6.00	152 x 152
A24SA2610LPPL	24.00 x 25.38 x 10.00	610 x 645 x 254	–	With	A24P24	A24P24G	21.00 x 21.00	533 x 533	6.00 x 6.00	152 x 152
A30SA2210LP	30.00 x 21.38 x 10.00	762 x 543 x 254	–	Without	A30P20	A30P20G	27.00 x 17.00	686 x 432	6.00 x 6.00	152 x 152
A30SA2210LPPL	30.00 x 21.38 x 10.00	762 x 543 x 254	–	With	A30P20	A30P20G	27.00 x 17.00	686 x 432	6.00 x 6.00	152 x 152
A30SA2610LP	30.00 x 25.38 x 10.00	762 x 645 x 254	–	Without	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A30SA2610LPPL	30.00 x 25.38 x 10.00	762 x 645 x 254	–	With	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A36SA2610LP	36.00 x 25.38 x 10.00	914 x 645 x 254	–	Without	A36P24	A36P24G	33.00 x 21.00	838 x 533	12.00 x 12.00	305 x 305
A36SA2610LPPL	36.00 x 25.38 x 10.00	914 x 645 x 254	–	With	A36P24	A36P24G	33.00 x 21.00	838 x 533	12.00 x 12.00	305 x 305
A36SA3210LP	36.00 x 31.38 x 10.00	914 x 797 x 254	–	Without	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A36SA3210LPPL	36.00 x 31.38 x 10.00	914 x 797 x 254	–	With	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A42SA3210LP	42.00 x 31.38 x 10.00	1067 x 797 x 254	–	Without	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3210LPPL	42.00 x 31.38 x 10.00	1067 x 797 x 254	–	With	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3810LP	42.00 x 37.38 x 10.00	1067 x 949 x 254	–	Without	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A42SA3810LPPL	42.00 x 37.38 x 10.00	1067 x 949 x 254	–	With	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A48SA2610LPPL	48.00 x 25.38 x 10.00	1219 x 645 x 254	–	With	A48P24	A48P24G	45.00 x 21.00	1143 x 533	12.00 x 12.00	305 x 305
A48SA3810LP	48.00 x 37.38 x 10.00	1219 x 949 x 254	–	Without	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A48SA3810LPPL	48.00 x 37.38 x 10.00	1219 x 949 x 254	–	With	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A60SA3810LP	60.00 x 37.38 x 10.00	1524 x 949 x 254	–	Without	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A60SA3810LPPL	60.00 x 37.38 x 10.00	1524 x 949 x 254	–	With	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A60SA3812LPPL	60.00 x 37.38 x 12.00	1524 x 949 x 305	–	With	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A36SA3216LPPL	36.00 x 31.38 x 16.00	914 x 797 x 406	–	With	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A42SA3216LPPL	42.00 x 31.38 x 16.00	1067 x 797 x 406	–	With	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3816LPPL	42.00 x 37.38 x 16.00	1067 x 949 x 406	–	With	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A48SA3816LPPL	48.00 x 37.38 x 16.00	1219 x 949 x 406	–	With	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A60SA3816LP	60.00 x 37.38 x 16.00	1524 x 949 x 406	–	Without	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A60SA3816LPPL	60.00 x 37.38 x 16.00	1524 x 949 x 406	–	With	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A30SA2612LP	30.00 x 25.38 x 12.00	762 x 645 x 305	a	Without	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A30SA2612LPPL	30.00 x 25.38 x 12.00	762 x 645 x 305	a	With	A30P24	A30P24G	27.00 x 21.00	686 x 533	12.00 x 12.00	305 x 305
A36SA3212LP	36.00 x 31.38 x 12.00	914 x 797 x 305	a	Without	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A36SA3212LPPL	36.00 x 31.38 x 12.00	914 x 797 x 305	a	With	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A42SA3212LP	42.00 x 31.38 x 12.00	1067 x 797 x 305	a	Without	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3212LPPL	42.00 x 31.38 x 12.00	1067 x 797 x 305	a	With	A42P30	A42P30G	39.00 x 27.00	991 x 686	6.00 x 6.00	152 x 152
A42SA3812LP	42.00 x 37.38 x 12.00	1067 x 949 x 305	a	Without	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A42SA3812LPPL	42.00 x 37.38 x 12.00	1067 x 949 x 305	a	With	A42P36	A42P36G	39.00 x 33.00	991 x 838	12.00 x 12.00	305 x 305
A48SA3812LP	48.00 x 37.38 x 12.00	1219 x 949 x 305	a	Without	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A48SA3812LPPL	48.00 x 37.38 x 12.00	1219 x 949 x 305	a	With	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A60SA3812LP	60.00 x 37.38 x 12.00	1524 x 949 x 305	a	Without	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305
A36SA3216LP	36.00 x 31.38 x 16.00	914 x 797 x 406	a	Without	A36P30	A36P30G	33.00 x 27.00	838 x 686	12.00 x 12.00	305 x 305
A48SA3816LP	48.00 x 37.38 x 16.00	1219 x 949 x 406	a	Without	A48P36	A48P36G	45.00 x 33.00	1143 x 838	12.00 x 12.00	305 x 305
A60SA3812A24LP	60.00 x 37.38 x 12.00	1524 x 949 x 305	b	Without	A60P36	A60P36G	57.00 x 33.00	1448 x 838	12.00 x 12.00	305 x 305

[a]When using a Siemens ITE circuit breaker and an enclosure with an A dimension of 30-, 36- or 42-in., verify the amount of wire bend space required for both the line and load sides. Enclosures 12- and 16-in. deep can be modified to accept Siemens ITE 800 A and 1200 A circuit breakers. (Consult factory for details.)

[b]Catalog number A60SA3812A24LP enclosure will receive only 400 A and 600 A Allen-Bradley Bulletin 1494V disconnect switches, and Siemens ITE 800 Amp and 1200 Amp circuit breakers. The 400 Amp and 600 Amp Allen-Bradley disconnect switch will not fit any other size enclosure from the Bulletin A25 family. Blank Adapter Plates will not fit catalog number A60SA3812A24LP.

Purchase panels separately.

Table 430.10(B) **Minimum Wire Bending Space at the Terminals of Enclosed Motor Controllers**

Size of Wire (AWG or kcmil)	Wires per Terminal 1 (mm)	Wires per Terminal 1 (in.)	Wires per Terminal 2(mm)	Wires per Terminal 2 (in.)
14-10	Not specified	Not specified	–	–
8-6	30	1.5	–	–
4-3	50	2	–	–
2	65	2.5	–	–
1	75	3	–	–
1/0	125	5	125	5
2/0	150	6	150	6
3/0-4/0	175	7	175	7
250	200	8	200	8
300	250	10	250	10
350-500	300	12	300	12
600-700	350	14	400	16
750-900	450	18	475	19

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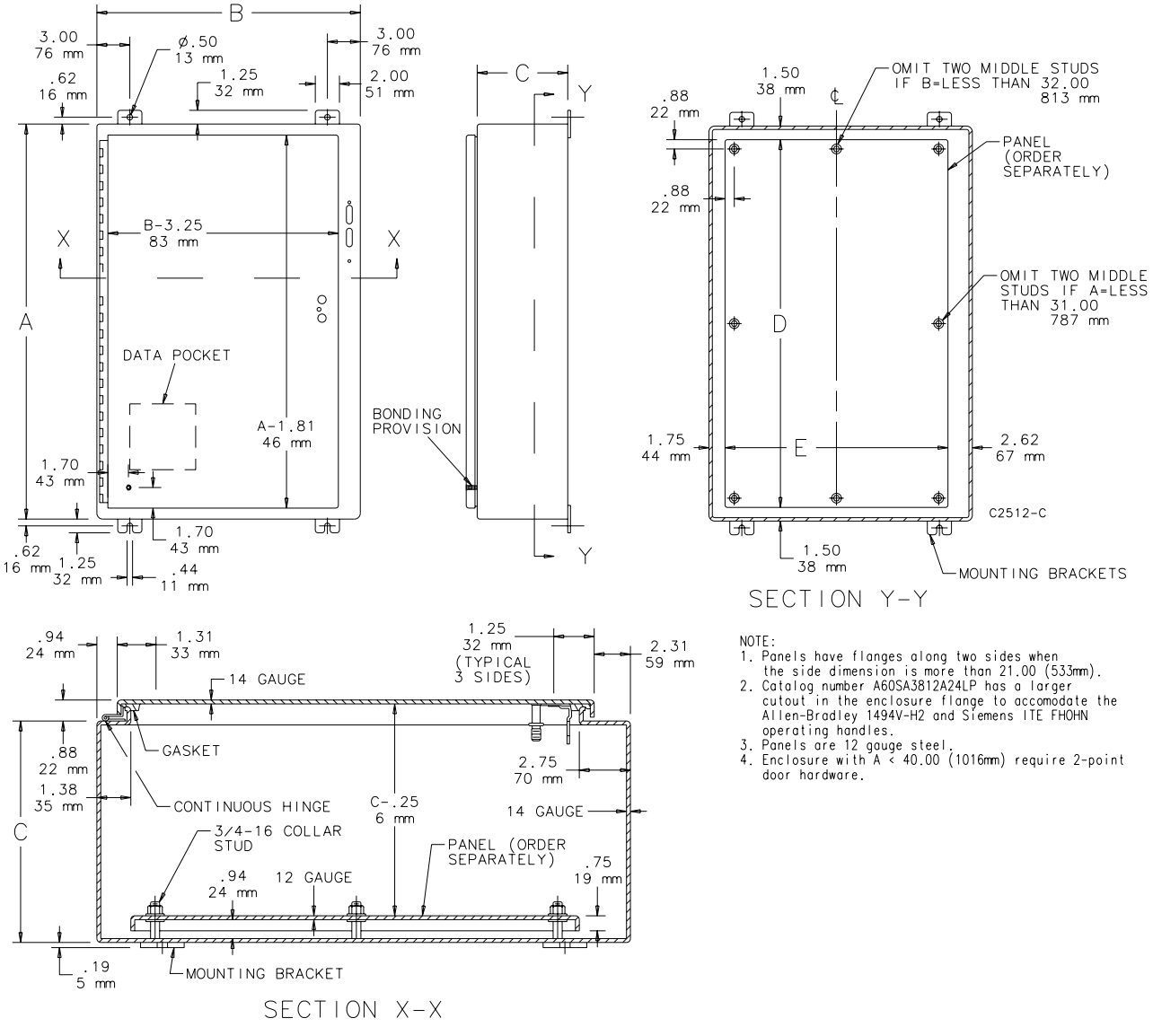
Where provision for 3 or more wires per terminal exists, the minimum wire bending space shall be in accordance with the requirements of Article 312.



NOTE:
1. Panels have flanges along two sides when the side dimension is more than 21.00 (533mm).
2. Catalog number A60SA3812A24LP has a larger cutout in the enclosure flange to accomodate the Allen-Bradley 1494V-H2 and Siemens ITE FHOHN operating handles.
3. Panels are 12 gauge steel.
4. Enclosure with A < 40.00 (1016mm) require 2-point door hardware.

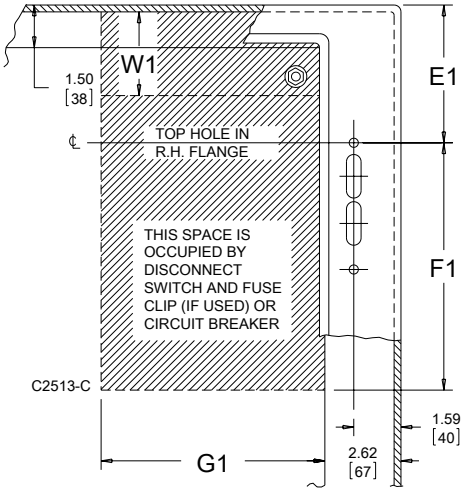
DISCONNECT MOUNTING SPACE

Disconnects will occupy space on panel shown by dimensions E1, F1 and G1 in Disconnect Mounting Space diagram. Wiring space W1 is available when disconnect is installed in the enclosure.
E1 = 4.75 in. (121 mm) when C = 8.00 in. (203 mm)
E1 = 7.09 in. (180 mm) when C =10.00 in. (254 mm)
E1 = 11.62 in. (294 mm) when C = 12.00 in. (305 mm)
E1 = 11.62 in. (294 mm) when C = 16.00 in. (406 mm)
E1 = 18.38 in. (467 mm) for A60SA3812A24LP
W1 = Wiring Space.

See Technical Information for wire bend space.

Refer to ***NATIONAL ELECTRICAL CODE 2005*** article 430.10(B) for wiring space required for line side conductors to be connected to disconnect.

Verify your application to determine if wiring space is adequate.



Consult disconnect manufacturer for F1 and G1 dimensions.

POWERGLIDE DEFEATER HANDLE KIT

This clockwise defeater model includes door hardware for Bulletin A25 enclosures.

BULLETIN: A80

Catalog Number	Description
AL55CWD	Medium POWERGLIDE Handle - Clockwise opening with defeater and door hardware

PREFERRED-CUTOUT OVERVIEW

APPLICATION

Enclosures having the preferred cutout are sized for use with up to 200A disconnect switches and up to 400A circuit breakers unless otherwise specified. The preferred cutout accepts the smaller operating handle whose mounting hole centers are 4.688 in. apart. Preferred cutouts are standard in mild steel wall-mount enclosures, modular enclosures and some select large mild steel enclosures. They are also present on all standard stainless steel offerings. Mild steel operator adapter plates with brand specific preferred cutouts are available for enclosures with a rectangular universal cutout.

Preferred cutouts are designed to house the following:

Allen-Bradley

- Bulletin 1494U universal disconnect switches with flange-mount handles for either variable-depth, cable-operated mechanisms
- Bulletin 1494V disconnect switches with flange-mount variable-depth operating mechanisms and Bulletin 1494V flange-mount variable-depth operating mechanisms for circuit breakers
- Bulletin 140U flexible cable operating mechanisms for 140U molded case circuit breakers
- Bulletin 140G flexible cable and variable-depth, flange-mount, molded case circuit breakers
- Bulletin 1494C cable-operated disconnect switches with flange-mount handles
- Bulletin 194RC cable-operated flange-mount handles for use with the NFPA 79 compliant 194R IEC rotary disconnect switches

Allen-Bradley Bulletin 1494V-R1, -R2 and -W2 operating handles and Allen-Bradley Bulletin 1494F disconnect devices or Bulletin 1494D circuit breaker operators will NOT fit these enclosures.

ABB Controls flange-mount variable-depth operating mechanisms for disconnect switches and circuit breakers. Also the cable version for circuit breakers.

Eaton Cutler-Hammer Type C361 flange-mount variable-depth operating mechanisms with disconnect switches and Type C371 flange-mount variable-depth operating mechanisms for circuit breakers.

General Electric Type STDA flange handles and variable-depth operating mechanisms for disconnect switches and circuit breakers. Also SPECTRAFLEX cable operators for circuit breakers.

Siemens ITE MAX FLEX® flange-mount variable-depth operating handles for circuit breakers.

Schneider Square D® Class 9422 disconnect switches with flange-mount variable-depth operating mechanisms or cable mechanisms and Class 9422 flange-mount variable-depth operating mechanisms or cable mechanisms for circuit breakers.
These enclosures will NOT accept Square D Class 9422 bracket-mounted disconnect devices, Class 9422TG1 or TG2 devices.

ORDERING

The disconnect switch, operating handle, and operating mechanism must be ordered from disconnect equipment supplier. See Technical Information in the nVent HOFFMAN Specifier's Guide for wire bend space available when various manufacturers' disconnect switches are installed. Check the enclosure dimension drawings to verify the chosen disconnect switch will fit in the enclosure.

CONTINUOUS HINGE WITH CLAMPS, TYPE 12

SPECIFICATIONS

- 16 or 14 gauge steel
- Seams continuously welded and ground smooth
- External welded-on mounting brackets for easy installation
- Formed external return flanges around all sides of enclosure opening
- Screw-down door clamps
- Removable heavy-gauge continuous hinge pin
- Hasp and staple for padlocking
- Data pocket is high-impact thermoplastic
- Collar studs for mounting optional panels
- Bonding provision on door
- Removable door with continuous hinge
- Seamless foam-in-place gasket

INDUSTRY STANDARDS

UL 508A Listed; Type 12, 13; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 12, 13; File No. E61997

NEMA/EEMAC Type 12 and 13
CSA, File No. 42186: Type 12
IEC 60529, IP65

APPLICATION

For applications requiring a bright white interior to increase control visibility, this enclosure includes a padlocking hasp and staple for security and screw-down clamps for secure closure.

FINISH

Body: White inside with ANSI 61 gray finish outside.
Door: ANSI 61 gray inside and outside.

ACCESSORIES

Panels for 3R, 4, 4X, 12, and 13 Enclosures
Drip Shield Kit for Type 12 Enclosures
Electric Heater
Fast-Operating Clamp Assembly
Compact Cooling Fans
Steel and Stainless Steel Window Kits
HF Side-Mount Filter Fans

MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

BULLETIN: A12

Standard Product

Catalog Number	AxBxC in./mm	Body Gauge	Panel	Conductive Panel	Panel Size D x E in./mm	F in./mm	Number of Clamps	Data Pocket
A122406LP	12.00 x 24.00 x 6.00 305 x 610 x 152	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	3.00 76	2	Small
A161206LP	16.00 x 12.00 x 6.00 406 x 305 x 152	16	A16P12	A16P12G	13.00 x 9.00 330 x 229	1.25 32	2	Small
A161606LP	16.00 x 16.00 x 6.00 406 x 406 x 152	16	A16P16	A16P16G	13.00 x 13.00 330 x 330	3.00 76	2	Small
A162006LP	16.00 x 20.00 x 6.00 406 x 508 x 152	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A201206LP	20.00 x 12.00 x 6.00 508 x 305 x 152	16	A20P12	A20P12G	17.00 x 9.00 432 x 229	1.25 32	2	Small
A201606LP	20.00 x 16.00 x 6.00 508 x 406 x 152	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A202006LP	20.00 x 20.00 x 6.00 508 x 508 x 152	16	A20P20	A20P20G	17.00 x 17.00 432 x 432	3.00 76	2	Small
A202406LP	20.00 x 24.00 x 6.00 508 x 610 x 152	16	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A241206LP	24.00 x 12.00 x 6.00 610 x 305 x 152	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	1.25 32	2	Small
A241606LP	24.00 x 16.00 x 6.00 610 x 406 x 152	16	A24P16	A24P16G	21.00 x 13.00 533 x 330	3.00 76	2	Small
A242006LP	24.00 x 20.00 x 6.00 610 x 508 x 152	16	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242406LP	24.00 x 24.00 x 6.00 610 x 610 x 152	16	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A301606LP	30.00 x 16.00 x 6.00 762 x 406 x 152	14	A30P16	A30P16G	27.00 x 13.00 686 x 330	3.00 76	2	Small
A302006LP	30.00 x 20.00 x 6.00 762 x 508 x 152	14	A30P20	A30P20G	27.00 x 17.00 686 x 432	3.00 76	2	Small
A302406LP	30.00 x 24.00 x 6.00 762 x 610 x 152	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A362406LP	36.00 x 24.00 x 6.00 914 x 610 x 152	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363006LP	36.00 x 30.00 x 6.00 914 x 762 x 152	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large

HOFFMAN ENCLOSURE, CONTINUOUS HINGE

Catalog Number	AxBxC in./mm	Body Gauge	Panel	Conductive Panel	Panel Size D x E in./mm	F in./mm	Number of Clamps	Data Pocket
A122408LP	12.00 x 24.00 x 8.00 305 x 610 x 203	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	3.00 76	2	Small
A161208LP	16.00 x 12.00 x 8.00 406 x 305 x 203	16	A16P12	A16P12G	13.00 x 9.00 330 x 229	1.25 32	2	Small
A161608LP	16.00 x 16.00 x 8.00 406 x 406 x 203	16	A16P16	A16P16G	13.00 x 13.00 330 x 330	3.00 76	2	Small
A162008LP	16.00 x 20.00 x 8.00 406 x 508 x 203	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A201208LP	20.00 x 12.00 x 8.00 508 x 305 x 203	16	A20P12	A20P12G	17.00 x 9.00 432 x 229	1.25 32	2	Small
A201608LP	20.00 x 16.00 x 8.00 508 x 406 x 203	16	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A202008LP	20.00 x 20.00 x 8.00 508 x 508 x 203	16	A20P20	A20P20G	17.00 x 17.00 432 x 432	3.00 76	2	Small
A202408LP	20.00 x 24.00 x 8.00 508 x 610 x 203	16	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A241208LP	24.00 x 12.00 x 8.00 610 x 305 x 203	16	A12P24	A12P24G	9.00 x 21.00 229 x 533	1.25 32	2	Small
A241608LP	24.00 x 16.00 x 8.00 610 x 406 x 203	16	A24P16	A24P16G	21.00 x 13.00 533 x 330	3.00 76	2	Small
A242008LP	24.00 x 20.00 x 8.00 610 x 508 x 203	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242408LP	24.00 x 24.00 x 8.00 610 x 610 x 203	16	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A243008LP	24.00 x 30.00 x 8.00 610 x 762 x 203	14	A30P24G	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Small
A302008LP	30.00 x 20.00 x 8.00 762 x 508 x 203	14	A30P20	A30P20G	27.00 x 17.00 686 x 432	3.00 76	2	Small
A302408LP	30.00 x 24.00 x 8.00 762 x 610 x 203	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A303008LP	30.00 x 30.00 x 8.00 762 x 762 x 203	14	A30P30	A30P30G	27.00 x 27.00 686 x 686	3.00 76	2	Large
A303608LP	30.00 x 36.00 x 8.00 762 x 914 x 203	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A362408LP	36.00 x 24.00 x 8.00 914 x 610 x 203	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363008LP	36.00 x 30.00 x 8.00 914 x 762 x 203	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A363608LP	36.00 x 36.00 x 8.00 914 x 914 x 203	14	A36P36	A36P36G	33.00 x 33.00 838 x 838	3.00 76	2	Large
A422408LP	42.00 x 24.00 x 8.00 1067 x 610 x 203	14	A42P24	A42P24G	39.00 x 21.00 991 x 533	3.00 76	2	Large
A423008LP	42.00 x 30.00 x 8.00 1067 x 762 x 203	14	A42P30	A42P30G	39.00 x 27.00 991 x 686	3.00 76	2	Small
A423608LP	42.00 x 36.00 x 8.00 1067 x 914 x 203	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large
A482408LP	48.00 x 24.00 x 8.00 1219 x 610 x 203	14	A48P24	A48P24G	45.00 x 21.00 1143 x 533	3.00 76	3	Large
A483008LP	48.00 x 30.00 x 8.00 1219 x 762 x 203	14	A48P30	A48P30G	45.00 x 27.00 1143 x 686	3.00 76	3	Small
A483608LP	48.00 x 36.00 x 8.00 1219 x 914 x 203	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603608LP	60.00 x 36.00 x 8.00 1524 x 914 x 203	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A161210LP	16.00 x 12.00 x 10.00 406 x 305 x 254	14	A16P12	A16P12G	13.00 x 9.00 330 x 229	1.25 32	2	Small
A201610LP	20.00 x 16.00 x 10.00 508 x 406 x 254	14	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A202010LP	20.00 x 20.00 x 10.00 508 x 508 x 254	14	A20P20	A20P20G	17.00 x 17.00 432 x 432	3.00 76	2	Small
A241210LP	24.00 x 12.00 x 10.00 610 x 305 x 254	14	A12P24	A12P24G	9.00 x 21.00 229 x 533	1.25 32	2	Small
A242010LP	24.00 x 20.00 x 10.00 610 x 508 x 254	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242410LP	24.00 x 24.00 x 10.00 610 x 610 x 254	14	A24P24G	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A302010LP	30.00 x 20.00 x 10.00 762 x 508 x 254	14	A30P20	A30P20G	27.00 x 17.00 686 x 432	3.00 76	2	Small
A302410LP	30.00 x 24.00 x 10.00 762 x 610 x 254	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A362410LP	36.00 x 24.00 x 10.00 914 x 610 x 254	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363010LP	36.00 x 30.00 x 10.00 914 x 762 x 254	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A423010LP	42.00 x 30.00 x 10.00 1067 x 762 x 254	14	A42P30	A42P30G	39.00 x 27.00 991 x 686	3.00 76	2	Small
A423610LP	42.00 x 36.00 x 10.00 1067 x 914 x 254	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large

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Catalog Number	AxBxC in./mm	Body Gauge	Panel	Conductive Panel	Panel Size D x E in./mm	F in./mm	Number of Clamps	Data Pocket
A483010LP	48.00 x 30.00 x 10.00 1219 x 762 x 254	14	A48P30	A48P30G	45.00 x 27.00 1143 x 686	3.00 76	3	Small
A483610LP	48.00 x 36.00 x 10.00 1219 x 914 x 254	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603610LP	60.00 x 36.00 x 10.00 1524 x 914 x 254	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A201612LP	20.00 x 16.00 x 12.00 508 x 406 x 305	14	A20P16	A20P16G	17.00 x 13.00 432 x 330	3.00 76	2	Small
A242012LP	24.00 x 20.00 x 12.00 610 x 508 x 305	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242412LP	24.00 x 24.00 x 12.00 610 x 610 x 305	14	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A302412LP	30.00 x 24.00 x 12.00 762 x 610 x 305	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A303012LP	30.00 x 30.00 x 12.00 762 x 762 x 305	14	A30P30	A30P30G	27.00 x 27.00 686 x 686	3.00 76	2	Large
A362412LP	36.00 x 24.00 x 12.00 914 x 610 x 305	14	A36P24	A36P24G	33.00 x 21.00 838 x 533	3.00 76	2	Large
A363012LP	36.00 x 30.00 x 12.00 914 x 762 x 305	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A363612LP	36.00 x 36.00 x 12.00 914 x 914 x 305	14	A36P36	A36P36G	33.00 x 33.00 838 x 838	3.00 76	2	Large
A423012LP	42.00 x 30.00 x 12.00 1067 x 762 x 305	14	A42P30	A42P30G	39.00 x 27.00 991 x 686	3.00 76	2	Small
A423612LP	42.00 x 36.00 x 12.00 1067 x 914 x 305	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large
A483612LP	48.00 x 36.00 x 12.00 1219 x 914 x 305	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603612LP	60.00 x 36.00 x 12.00 1524 x 914 x 305	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A723612LP	72.00 x 36.00 x 12.00 1829 x 914 x 305	14	A72P36	A72P36G	69.00 x 33.00 1753 x 838	3.00 76	3	Large
A242016LP	24.00 x 20.00 x 16.00 610 x 508 x 406	14	A24P20	A24P20G	21.00 x 17.00 533 x 432	3.00 76	2	Small
A242416LP	24.00 x 24.00 x 16.00 610 x 610 x 406	14	A24P24	A24P24G	21.00 x 21.00 533 x 533	3.00 76	2	Small
A302416LP	30.00 x 24.00 x 16.00 762 x 610 x 406	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A363016LP	36.00 x 30.00 x 16.00 914 x 762 x 406	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A423616LP	42.00 x 36.00 x 16.00 1067 x 914 x 406	14	A42P36	A42P36G	39.00 x 33.00 991 x 838	3.00 76	2	Large
A483616LP	48.00 x 36.00 x 16.00 1219 x 914 x 406	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603616LP	60.00 x 36.00 x 16.00 1524 x 914 x 406	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A302420LP	30.00 x 24.00 x 20.00 762 x 610 x 508	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large
A363020LP	36.00 x 30.00 x 20.00 914 x 762 x 508	14	A36P30	A36P30G	33.00 x 27.00 838 x 686	3.00 76	2	Large
A483620LP	48.00 x 36.00 x 20.00 1219 x 914 x 508	14	A48P36	A48P36G	45.00 x 33.00 1143 x 838	3.00 76	3	Large
A603620LP	60.00 x 36.00 x 20.00 1524 x 914 x 508	14	A60P36	A60P36G	57.00 x 33.00 1448 x 838	3.00 76	3	Large
A302424LP	30.00 x 24.00 x 24.00 762 x 610 x 610	14	A30P24	A30P24G	27.00 x 21.00 686 x 533	3.00 76	2	Large

Purchase panels separately. Optional stainless steel, conductive, composite and aluminum panels are available for most sizes.

Small Data Pocket is 6.00 in. x 6.00 in. Large Data Pocket is 12.00 in. x 12.00 in.

Catalog number A723612LP has an oil-resistant strip gasket instead of foam-in-place gasket.

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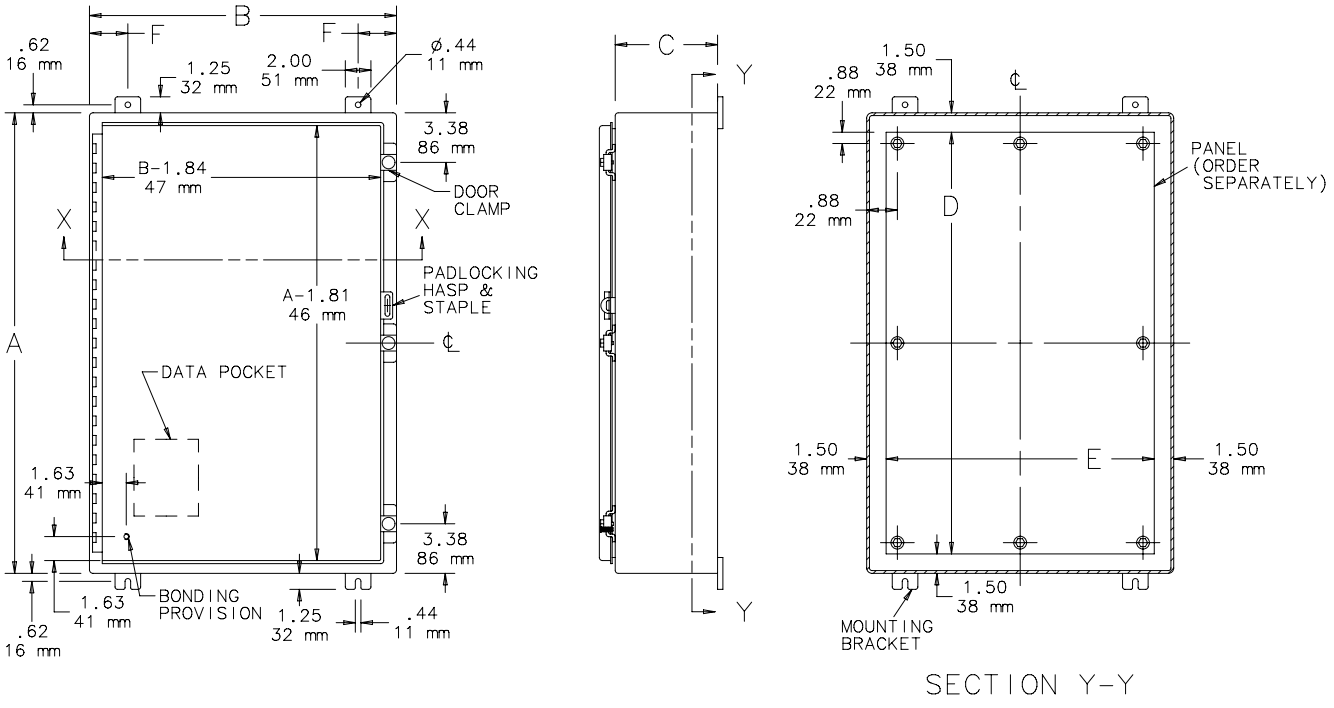
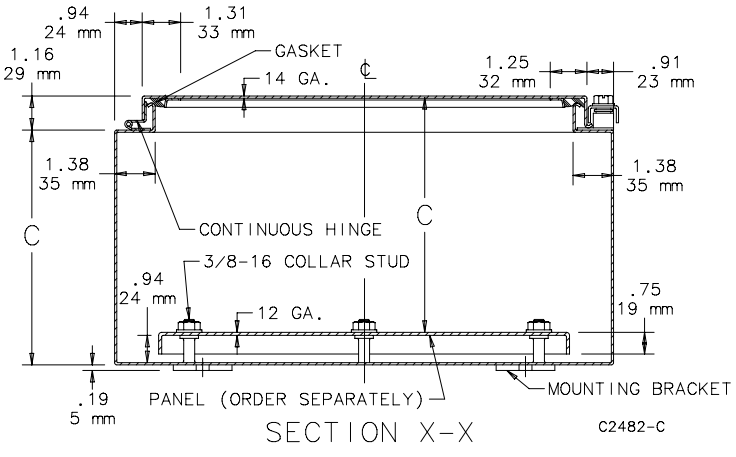




RJ Series Relays

Features

- Compact size:
  Blade: 12.7 x 27 x 28.8 mm
  PCB: 12.7 x 25.5 x 28.8 mm
- Contact rating:
  Blade: 8A (DPDT), 12A (SPDT)
  PCB: 8A (DPDT & DPST-NO), 12A (SPDT & SPST-NO), 16A (SPDT & SPST-NO)
- Operational life:
  200K cycles at full resistive AC load;
  50 million cycles, no load
- Blade model has optional green, non-polarized LED
- RoHS compliant

Specifications

			Blade Models		PCB Models		
			RJ1S	RJ2S	RJ1V	RJ1V (High Capacity)	RJ2V
General Information	No. of poles		1	2	1	1	2
	Contact Configuration		SPDT	DPDT	SPDT, SPST-NO		DPDT, DPST-NO
	Contact Rating		12A	8A	12A	16A	8A
	Contact Material		AgNi		AgNi	AgSnIn	AgNi
	Enclosure Ratings		–		Flux protection		
	Contact Resistance		50 milliohms max		50 milliohms max[Note 1]		
	Operating Time		15ms max		15ms max[Note 2]		
	Release Time		10ms max		10ms max[Note 2]		
	Dielectric Strength	Between contact & coil	5,000V AC, 1 minute		5,000V AC, 1 minute		
		Between contacts of same poles	1,000V AC, 1 minute		1,000V AC, 1 minute		
		Between contacts of different poles	–	3,000V AC, 1 min.	–		3,000V AC, 1 min.
	Vibration Resistance	Damage limits	10-55Hz, amplitude 0.75mm		10-55Hz, amplitude 0.75mm		
		Operating extremes	10-55Hz, amplitude 0.75mm		10-55Hz, amplitude 0.75mm		
	Shock Resistance	Damage limits	100m/s² min (10G)		NO contact: 200m/s² (20G) NC contact: 100m/s² (10G)		
		Operating extremes	1,000m/s² min (100G)		1,000m/s² min (100G)		
	Mechanical Life	AC	30,000,000 operations		30,000,000 operations		
		DC	50,000,000 operations		50,000,000 operations		
	Electrical Life @ Full Rated Load	AC	200,000 operations		200,000 operations		
		DC	100,000 operations		100,000 operations		
	Operating Temperature		-40 to 70° C		-40 to 70° C[Note 3]		
	Operating Humidity		5 to 85% RH		5 to 85% RH		
	Dimensions (H x W x D mm)		12.7 x 27 x 28.8		12.7 x 25.5 x 28.8		
	Weight (Approx.)		19g		SPDT: 17g, SPST-NO: 16g		DPDT: 17g, DPST-NO: 16g

Notes:
1. Measured using 5V DC, 1A voltage drop method.
2. Measured at the rated voltage (at 20°C), excluding contact bounce time.
3. 100% rated voltage.

Ordering Information

Blade Models

R J [ ] S - C [ ] - [ ]

Contact Configuration	Options	Coil Voltage
1 - SPDT 2 - DPDT	Blank - Standard L - LED	D12 - 12V DC D24 - 24V DC D48 - 48V DC D100 - 100-110V DC A24 - 24V AC A120 - 120V AC A240 - 240V AC

PCB Models

R J [ ] V - [ ] [ ] - [ ]

Number of Poles	Contact Configuration	Contact Configuration	Coil Voltage
1 - SP (Single Pole) 2 - DP (Double Pole)	C - FORM C (DT Double Throw) A - FORM A (ST Single Throw)	Blank - Standard H - High Capacity Type (RJ1 only)	D5 - 5V DC D6 - 6V DC D12 - 12V DC D24 - 24V DC D48 - 48V DC D100 - 100-110V DC A24 - 24V AC A120 - 120V AC A240 - 240V AC

Specifications con't on following page

Contact Ratings

	Type			Contact	Allowable Contact Power		Rated Load			Allowable Switching Current	Allowable Switching Voltage	Minimum Applicable Load
					Resistive Load	Inductive Load	Voltage	Resistive Load	Inductive Load cos_=0.3 L/R=7ms			
Contact Ratings	Blade Models	1 pole		NO	AC3000V	AC1875VA	250V AC	12A	7.5A	6A	AC250V DC30V	DC5V 100mA
				NC	AC3000V	AC1875VA	250V AC	12A	7.5A	6A/3A		
		2 poles		NO	AC2000V	AC1000VA	250V AC	8A	4A	4A	AC250V DC30V	DC5V 100mA
				NC	AC2000V	AC1000VA	250V AC	8A	4A	4A/2A		
	PCB Models	1 pole	Standard Type	NO	AC3000V	AC1875VA	AC250V	12A	7.5A	12A	AC250V DC125V	DC5V 100mA
					DC360W	DC180W	DC30V	12A	6A			
				NC	AC3000V	AC1875VA	AC250V	12A	7.5A			
					DC180W	DC90W	DC30V	6A	3A			
			High Capacity Type	NO	AC4000V	AC2000VA	AC250V	16A	8A	16A	AC250V DC125V	DC5V 100mA
					DC480W	DC240W	DC30V	16A	8A			
				NC	AC4000V	AC2000VA	AC250V	16A	8A			
					DC240W	DC120W	DC30V	8A	4A			
		2 poles		NO	AC2000V	AC1000VA	AC250V	8A	4A	8A	AC250V DC125V	DC5V 10mA
					DC240W	DC120W	DC30V	8A	4A			
				NC	AC2000V	AC1000VA	AC250V	8A	4A			
					DC120W	DC60W	DC30V	4A	2A			

Coil Ratings

		Rated Voltage		Coil Voltage Code	Rated Current (mA) ±15% (at 20°C)				Coil Resistance (ohms)±10% (at 20°C)	Operating Characteristics[2]			Power Consumption
					Without LED[1]		With LED[1]			Minimum Pickup Voltage	Dropout Voltage	Maximum Allowable Voltage[3]	
					50Hz	60Hz	50Hz	60Hz					
Coil Ratings	AC	Blade & PCB Models	24V	A24	43.9	37.5	47.5	41.1	243	80% max	30% min	140%	0.9VA (60Hz)
			120V	A120	8.8	7.5	8.7	7.4	6,400				
			240V	A240	4.3	3.7	4.3	3.7	25,570				
	DC	Blade Models	12V	D12	44.2		48.0		271	70% max	10% min	170%	0.53W
			24V	D24	22.1		25.7		1,080				
			48V	D48	11.0		10.7		4,340				
			100-110V	D100	5.3 - 5.8		5.2 - 5.7		18,870			160%	
		PCB Models	5V	D5	106		–		47.2	70% max	10% min	170%	0.53-0.64W
			6V	D6	88.3		–		67.9				
			12V	D12	44.2		–		271				
			24V	D24	22.1		–		1,080				
			48V	D48	11.0		–		4,340				
			100-110V	D100	5.3 - 5.8		–		18,870			160%	

Notes:
1. LED Indicator is only available on Blade relays.
2. Operating characteristics are against rated values at 20°C.
3. The maximum allowable voltage is the maximum value which can be applied to the relay coils.

Accessories

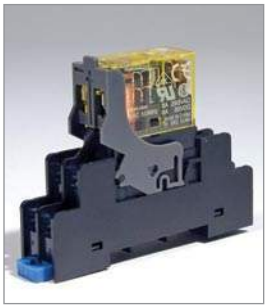
Socket Part Numbers

	Relay Type	Socket Type	Socket Part Number
Blade Models	RJ1S (Std)	DIN Rail Standard	SJ1S-05B
		DIN Rail Fingersafe	SJ1S-07L
		PCB Mount	SJ1S-61
	RJ1S-☐H (HC), RJ2S	DIN Rail Standard	SJ2S-05B
		DIN Rail Fingersafe	SJ2S-07L
		PCB Mount	SJ2S-61
PCB Models	RJ1V (Std)	DIN Rail Fingersafe	SQ1V-07B*
		PCB Mount	SQ1V-63
	RJ1V-☐H (HC), RJ2V	DIN Rail Fingersafe	SQ2V-07B*
		PCB Mount	SQ2V-63

*Hold-down clip or spring must be removed to use with RJ relays.

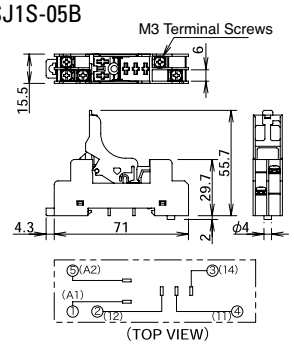
Socket Specifications

		SJ1S	SJ2S
Specifications	Rated Insulation Voltage	250V AC/DC	
	Applicable Wire	Max up to 2 - #14 AWG	
	Applicable Crimping Terminal	$2mm^2$ x 2	
	Screw Size	M3 Slotted-Phillips screw	
	Weight	30g	34g

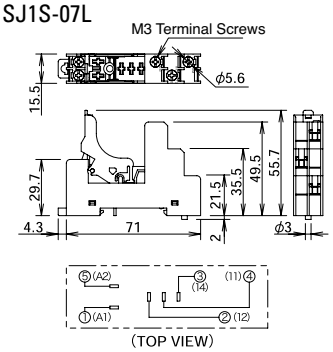


Socket Dimensions - for Blade Relays (mm)

SJ1S-05B



SJ1S-07L



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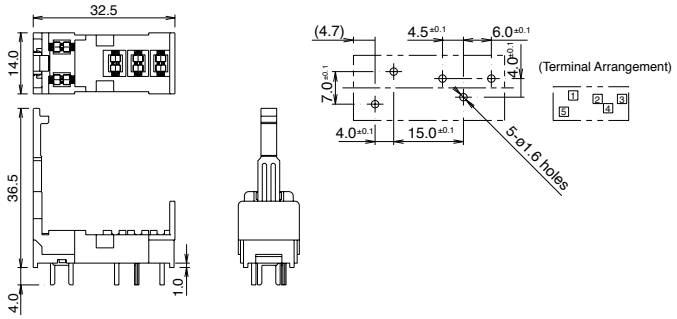

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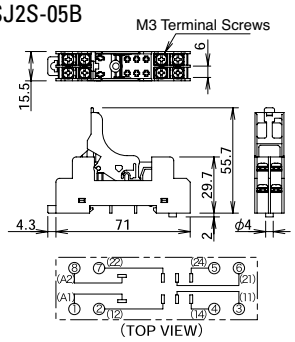

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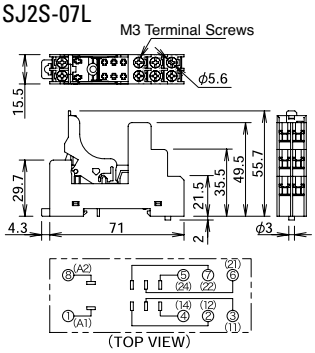
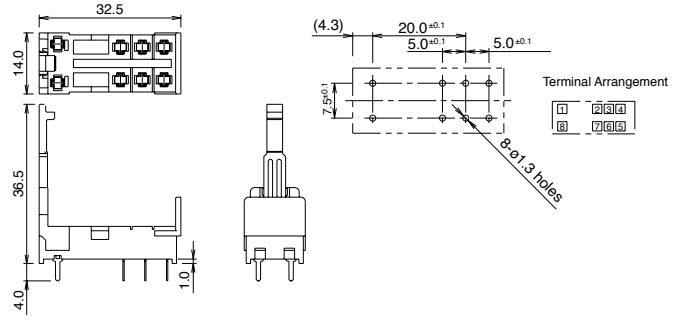
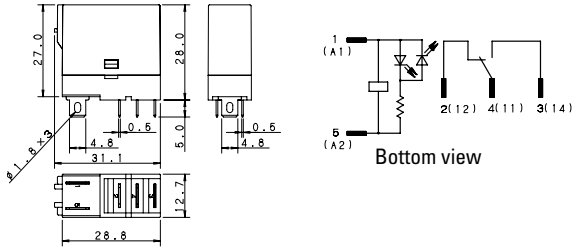


SJ1S-61

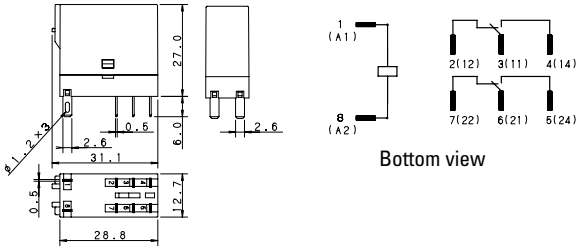


Blade Relay Dimensions (mm)

RJ1S

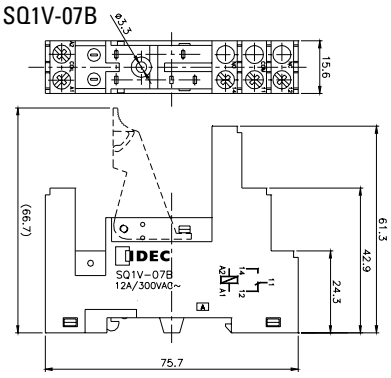


RJ2S

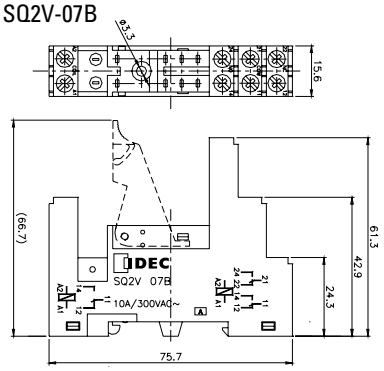


SQ Socket Dimensions - for PCB Relays (mm)

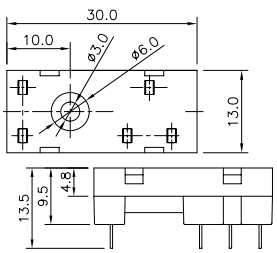
SQ1V-07B



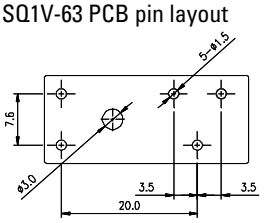
SQ2V-07B



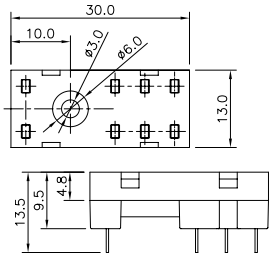
SQ1V-63



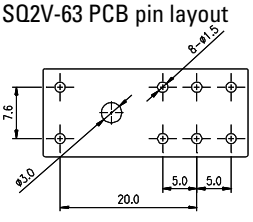
SQ1V-63 PCB pin layout



SQ2V-63



SQ2V-63 PCB pin layout

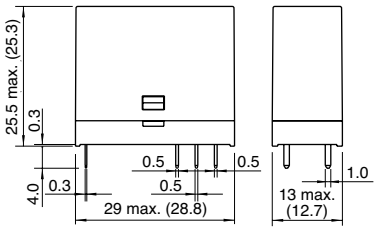


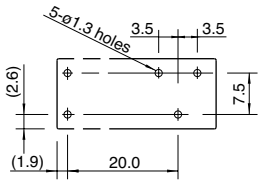
PCB Relay Dimensions (mm)

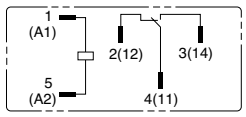
PCB Mounting Hole Layout
(Bottom View)

PCB Internal Circuit Diagrams
(Bottom View)

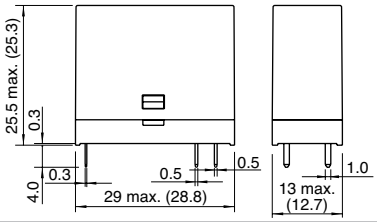
RJ1V-C-*
SPDT

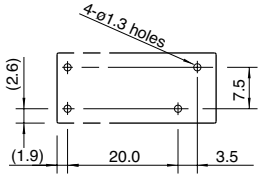


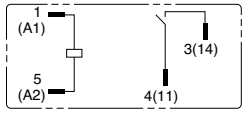




RJ1V-A-*
SPST-NO







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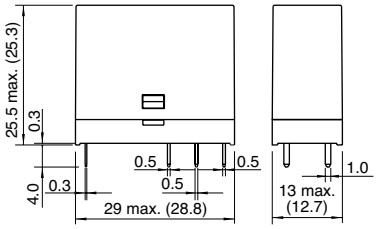
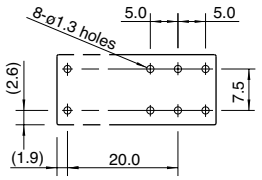
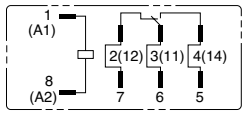
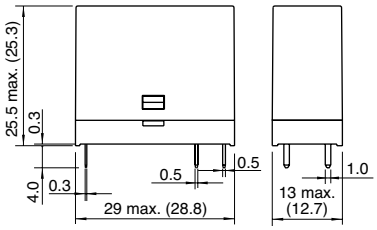
SPDT
High Capacity

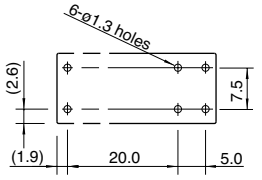


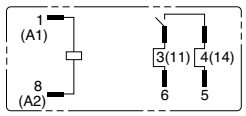




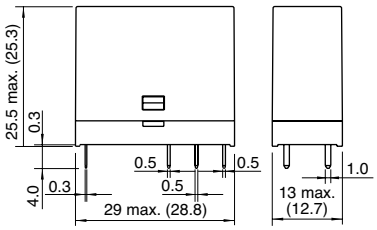
RJ1V-AH-*
SPST-NO
High Capacity

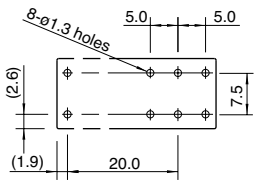


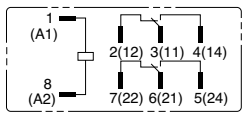




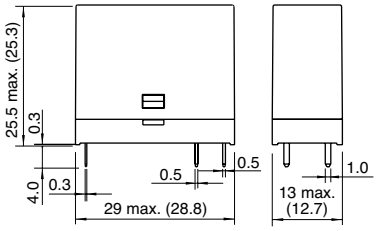
RJ2V-C-*
DPDT

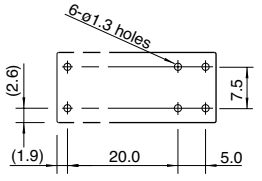


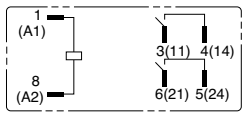




RJ1V-A-*
DPST-NO







For more information on the these
and other IDEC relays, visit:

www.idec.com/relay

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Feed-through terminal block - ST 4 - 3031364

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 32 A, connection method: Spring-cage connection, number of connections: 2, cross section: 0.08 mm² - 6 mm², AWG: 28 - 10, width: 6.2 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- As well as saving space, the compact design and front connection enable user-friendly wiring in a small amount of space
- The consistent double function shaft offers every opportunity for time-saving potential distribution and accommodating test accessories
- The large wiring space enables the use of conductors with ferrules and plastic collars within the nominal cross section
- Tested for railway applications

Key Commercial Data

Packing unit	50 pc
GTIN	4 017918 186838
GTIN	4017918186838

Technical data

General

Number of levels	1
Number of connections	2
Potentials	1
Nominal cross section	4 mm²
Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Rated surge voltage	8 kV

Feed-through terminal block - ST 4 - 3031364

Technical data

General

Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum power dissipation for nominal condition	1.02 W
Maximum load current	40 A (with 6 mm² conductor cross section)
Nominal current I_N	32 A
Nominal voltage U_N	800 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	9.8 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of bending test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.08 mm² / 0.1 kg
	4 mm² / 0.9 kg
	6 mm² / 1.4 kg
Tensile test result	Test passed
Conductor cross section tensile test	0.08 mm²
Tractive force setpoint	5 N
Conductor cross section tensile test	4 mm²
Tractive force setpoint	60 N
Conductor cross section tensile test	6 mm²
Tractive force setpoint	80 N
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Requirements, voltage drop	≤ 3.2 mV
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA
Conductor cross section short circuit testing	6 mm²
Short-time current	0.72 kA

Feed-through terminal block - ST 4 - 3031364

Technical data

General

Result of thermal test	Test passed
Ageing test for screwless modular terminal block temperature cycles	192
Proof of thermal characteristics (needle flame) effective duration	30 s
Result of aging test	Test passed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
Acceleration	3.12 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
End cover width	2.2 mm
Length	56 mm

Feed-through terminal block - ST 4 - 3031364

Technical data

Dimensions

Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

Connection data

Connection	1 level
Connection method	Spring-cage connection
Stripping length	8 mm ... 10 mm
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	28
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	1 mm²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Internal cylindrical gage	A4

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental Product Compliance

Feed-through terminal block - ST 4 - 3031364

Technical data

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram

Approvals

Approvals

Approvals

DNV GL / CSA / PRS / BV / LR / KR / NK / UL Recognized / cUL Recognized / IECEE CB Scheme / VDE Gutachten mit Fertigungsüberwachung / EAC / RS / cULus Recognized

Ex Approvals

IECEx / ATEX / EAC Ex

Approval details

DNV GL	https://approvalfinder.dnvgl.com/	TAE00001CS

CSA	http://www.csagroup.org/services-industries/product-listing/	13631

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	30 A	30 A
mm²/AWG/kcmil	28-10	28-10

PRS	http://www.prs.pl/	TE/2156/880590/17

Feed-through terminal block - ST 4 - 3031364

Approvals

BV		http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	13403/D0 BV

LR		http://www.lr.org/en	04/20034 (19/39034)

KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL002

NK		http://www.classnk.or.jp/hp/en/	09 ME 140

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	30 A	30 A
mm²/AWG/kcmil	28-10	28-10

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	30 A	30 A
mm²/AWG/kcmil	28-10	28-10

IECEE CB Scheme		http://www.iecee.org/	DE1-62192

Nominal voltage UN	800 V
Nominal current IN	32 A
mm²/AWG/kcmil	4

Feed-through terminal block - ST 4 - 3031364

Approvals

VDE Gutachten mit Fertigungsüberwachung	VDE	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40009034

Nominal voltage UN	800 V
Nominal current IN	32 A
mm²/AWG/kcmil	0.2-4

EAC	EAC	RU C-DE.A*30.B.01742

RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272

cULus Recognized	c UL us

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Spring cage ground terminal block - ST 4-PE - 3031380

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Spring cage ground terminal block, connection method: Spring-cage connection, number of connections: 2, cross section: 0.08 mm² - 6 mm², AWG: 28 - 10, width: 6.2 mm, color: green-yellow, mounting type: NS 35/7,5, NS 35/15

Key Commercial Data

Packing unit	1 pc
GTIN	4 017918 186852
GTIN	4017918186852
Weight per Piece (excluding packing)	12.800 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of levels	1
Number of connections	2
Nominal cross section	4 mm²
Color	green-yellow
Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Rated surge voltage	8 kV

Spring cage ground terminal block - ST 4-PE - 3031380

Technical data

General

Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2$/Hz
Acceleration	3.12 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3

Spring cage ground terminal block - ST 4-PE - 3031380

Technical data

General

Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
End cover width	2.2 mm
Length	56 mm
Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

Connection data

Note	Please observe the current carrying capacity of the DIN rails.
Connection	1 level
Connection method	Spring-cage connection
Stripping length	8 mm ... 10 mm
Connection in acc. with standard	IEC 60947-7-2
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	28
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	1 mm²
Connection in acc. with standard	IEC/EN 60079-7
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Internal cylindrical gage	A4

Spring cage ground terminal block - ST 4-PE - 3031380

Technical data

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-2
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram

Classifications

eCl@ss

eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141141
eCl@ss 8.0	27141141
eCl@ss 9.0	27141141

Spring cage ground terminal block - ST 4-PE - 3031380

Classifications

ETIM

ETIM 2.0	EC000901
ETIM 3.0	EC000901
ETIM 4.0	EC000901
ETIM 5.0	EC000901
ETIM 6.0	EC000901
ETIM 7.0	EC000901

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / CSA / PRS / BV / LR / KR / NK / UL Recognized / cUL Recognized / IECEE CB Scheme / VDE Gutachten mit Fertigungsüberwachung / EAC / RS / cULus Recognized

Ex Approvals

IECEx / ATEX / EAC Ex

Approval details

DNV GL		https://approvalfinder.dnvgl.com/	TAE00001CS

Spring cage ground terminal block - ST 4-PE - 3031380

Approvals

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

mm²/AWG/kcmil	28-10

PRS		http://www.prs.pl/	TE/2156/880590/17

BV		http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	13403/D0 BV

LR		http://www.lr.org/en	04/20034 (19/39034)

KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL002

NK		http://www.classnk.or.jp/hp/en/	09 ME 140

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

mm²/AWG/kcmil	28-10

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

mm²/AWG/kcmil	28-10

Spring cage ground terminal block - ST 4-PE - 3031380

Approvals

IECEE CB Scheme	CB scheme	http://www.iecee.org/	DE1-51418

mm²/AWG/kcmil	4

VDE Gutachten mit Fertigungsüberwachung	VDE	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40010329

Nominal current IN	32 A
mm²/AWG/kcmil	0.2-4

EAC	EAC	RU C-DE.A*30.B.01742

RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272

cULus Recognized	c UL us

Accessories

Accessories

DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

---

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

---

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

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End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Documentation

Mounting material - ST-IL - 3039900

Operating decal for the ST terminal block

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

End clamp - E/UK - 1201442

End clamp, width: 9.5 mm, height: 35.3 mm, material: PA, length: 50.5 mm, Mounting on a DIN rail NS 32 or NS 35, color: gray

End clamp - E/UK 1 - 1201413

End clamps, for supporting the ends of double-level and three-level terminal blocks, width: 10 mm, color: gray

End cover

End cover - D-ST 4 - 3030420

End cover, length: 55.9 mm, width: 2.2 mm, height: 29 mm, color: gray

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Insulating sleeve

Insulating sleeve - ISH 4/0,5 - 3002885

Insulating sleeve, color: gray

Insulating sleeve - ISH 4/1,0 - 3002898

Insulating sleeve, color: black

Labeled terminal marker

Zack marker strip - ZB 6 CUS - 0824992

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 6,LGS:FORTL.ZAHLEN - 1051016

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 6,QR:FORTL.ZAHLEN - 1051029

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Zack marker strip - ZB 6,LGS:GLEICHE ZAHLEN - 1051032

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - ZB 6,LGS:L1-N,PE - 1051414

Marker for terminal blocks, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, Horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - ZB 6,LGS:U-N - 1051430

Marker for terminal blocks, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: U, V, W, N, GND, U, V, W, N, GND, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 6 CUS - 0824589

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TM 6 CUS - 0829602

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 60

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Zack Marker strip, flat - ZBF 6 CUS - 0825027

Zack Marker strip, flat, Strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 6 CUS - 0824646

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TMF 6 CUS - 0829665

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6,LGS:FORTL.ZAHLEN - 0808749

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,QR:FORTL.ZAHLEN - 0808765

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Zack Marker strip, flat - ZBF 6,LGS:GERADE ZAHLEN - 0810834

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,LGS:UNGERADE ZAHLEN - 0810876

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker carriers

Group marker label for terminal marking - GBS-ZB/26X6 - 0809298

Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

Marker carriers - CARRIER-TM 300 - 0828282

Marker carriers, gray, unlabeled, mounting type: snap into flat marker groove, lettering field size: 10.5 x 300 mm

Partition plate

Partition plate - ATP-ST 4 - 3030721

Partition plate, length: 59.8 mm, width: 2 mm, height: 39 mm, color: gray

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Screwdriver - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Group marker label for terminal marking - GBS 5-25X12 - 0810588

Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5

Zack marker strip - ZB 6:UNBEDRUCKT - 1051003

Zack marker strip, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 6.15 x 10.5 mm, Number of individual labels: 10

Spring cage ground terminal block - ST 4-PE - 3031380

Accessories

Marker for terminal blocks - UC-TM 6 - 0818085

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TM 6 - 0828736

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into tall marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 10.5 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6:UNBEDRUCKT - 0808710

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 6 - 0818140

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TMF 6 - 0828746

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

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Double-level spring-cage terminal block - STTB 4 - 3031429

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Double-level spring-cage terminal block, connection method: Spring-cage connection, cross section: 0.08 mm² - 6 mm², AWG: 28 - 10, width: 6.2 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- Compact design for maximum space savings
- Tested for railway applications
- Connect the levels using FBS ...-PV bridges

Key Commercial Data

Packing unit	1 pc
GTIN	4 017918 186920
GTIN	4017918186920
Weight per Piece (excluding packing)	16.730 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of levels	2
Number of connections	4
Nominal cross section	4 mm²
Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry

Double-level spring-cage terminal block - STTB 4 - 3031429

Technical data

General

	Machine building
	Plant engineering
	Process industry
Rated surge voltage	6 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum power dissipation for nominal condition	1.02 W (the value is multiplied when connecting multiple levels)
Connection in acc. with standard	IEC 60947-7-1
Nominal current I_N	30 A (with 4 mm² conductor cross section)
Maximum load current	32 A (with 6 mm² conductor cross section)
Nominal voltage U_N	500 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	7.3 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Checking the mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of bending test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.08 mm² / 0.1 kg
	4 mm² / 0.9 kg
	6 mm² / 1.4 kg
Tensile test result	Test passed
Conductor cross section tensile test	0.08 mm²
Tractive force setpoint	5 N
Conductor cross section tensile test	4 mm²
Tractive force setpoint	60 N
Conductor cross section tensile test	6 mm²
Tractive force setpoint	80 N
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35

Double-level spring-cage terminal block - STTB 4 - 3031429

Technical data

General

Setpoint	1 N
Result of voltage-drop test	Test passed
Requirements, voltage drop	≤ 3.2 mV
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA
Conductor cross section short circuit testing	6 mm²
Short-time current	0.72 kA
Result of aging test	Test passed
Ageing test for screwless modular terminal block temperature cycles	192
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2$/Hz
Acceleration	3.12 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec.; UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2
Surface flammability NFPA 130 (ASTM E 162)	passed

Double-level spring-cage terminal block - STTB 4 - 3031429

Technical data

General

Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
Length	83.5 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Connection data

Connection method	Spring-cage connection
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	1 mm²
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A4

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3

Double-level spring-cage terminal block - STTB 4 - 3031429

Technical data

Standards and Regulations

Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram

Classifications

eCl@ss

eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141120
eCl@ss 8.0	27141120
eCl@ss 9.0	27141120

Double-level spring-cage terminal block - STTB 4 - 3031429

Classifications

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 5.0	EC000897
ETIM 6.0	EC000897
ETIM 7.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / CSA / BV / LR / KR / NK / UL Recognized / cUL Recognized / IECEE CB Scheme / VDE Gutachten mit Fertigungsüberwachung / EAC / EAC / RS / cULus Recognized

Ex Approvals

IECEx / ATEX / EAC Ex

Approval details

DNV GL		https://approvalfinder.dnvgl.com/	TAE00001CS

Double-level spring-cage terminal block - STTB 4 - 3031429

Approvals

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

	B	C
Nominal voltage UN	300 V	300 V
Nominal current IN	30 A	30 A
mm²/AWG/kcmil	28-10	28-10

BV		http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	13403/D0 BV

LR		http://www.lr.org/en	04/20034 (19/39034)

KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL002

NK		http://www.classnk.or.jp/hp/en/	09 ME 140

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	30 A	30 A	5 A
mm²/AWG/kcmil	28-10	28-10	28-10

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	30 A	30 A	5 A

Double-level spring-cage terminal block - STTB 4 - 3031429

Approvals

	B	C	D
mm²/AWG/kcmil	28-10	28-10	28-10

IECEE CB Scheme	CB scheme	http://www.iecee.org/	DE1-62192

Nominal voltage UN	500 V
Nominal current IN	32 A
mm²/AWG/kcmil	4

VDE Gutachten mit Fertigungsüberwachung	VDE	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40009034

Nominal voltage UN	500 V
Nominal current IN	32 A
mm²/AWG/kcmil	0.2-4

EAC	EAC	EAC-Zulassung

EAC	EAC	RU C-DE.A*30.B.01742

RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272

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Accessories

Accessories

DIN rail

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

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End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

---

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

Documentation

Mounting material - ST-IL - 3039900

Operating decal for the ST terminal block

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

End clamp - E/UK - 1201442

End clamp, width: 9.5 mm, height: 35.3 mm, material: PA, length: 50.5 mm, Mounting on a DIN rail NS 32 or NS 35, color: gray

End clamp - E/UK 1 - 1201413

End clamps, for supporting the ends of double-level and three-level terminal blocks, width: 10 mm, color: gray

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

End cover

End cover - D-STTB 4 - 3030462

End cover, length: 83.5 mm, width: 2.2 mm, height: 39.7 mm, color: gray

Insulating sleeve

Insulating sleeve - ISH 4/0,5 - 3002885

Insulating sleeve, color: gray

Insulating sleeve - ISH 4/1,0 - 3002898

Insulating sleeve, color: black

Jumper

Plug-in bridge - FBS 20-6 - 3030365

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: red

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Plug-in bridge - FBS 10-6 - 3030271

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: red

Plug-in bridge - FBS 6-6 - 1008238

Plug-in bridge, One side not fully isolated, pitch: 6.2 mm, width: 35.5 mm, number of positions: 6, color: red

Plug-in bridge - FBS 5-6 - 3030349

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: red

Plug-in bridge - FBS 4-6 - 3030255

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: red

Plug-in bridge - FBS 3-6 - 3030242

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: red

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Plug-in bridge - FBS 2-6 - 3030336

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: red

Plug-in bridge - FBS 50-6 - 3032224

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-6 - 3033715

Plug-in bridge, pitch: 6.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-6 - 3001594

Plug-in bridge, pitch: 6.2 mm, number of positions: 3, color: red

Plug-in bridge - FBSR 4-6 - 3001595

Plug-in bridge, pitch: 6.2 mm, number of positions: 4, color: red

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Plug-in bridge - FBSR 5-6 - 3001596

Plug-in bridge, pitch: 6.2 mm, number of positions: 5, color: red

Plug-in bridge - FBSR 10-6 - 3033716

Plug-in bridge, pitch: 6.2 mm, number of positions: 10, color: red

Plug-in bridge - FBS 2-6 BU - 3036932

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: blue

Plug-in bridge - FBS 3-6 BU - 3036945

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: blue

Plug-in bridge - FBS 4-6 BU - 3036958

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: blue

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Plug-in bridge - FBS 5-6 BU - 3036961

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: blue

Plug-in bridge - FBS 10-6 BU - 3032198

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-6 BU - 3032208

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-6 BU - 3032211

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: blue

Labeled terminal marker

Warning cover - WST 4 - 3030954

Warning cover, Strip, yellow, labeled, mounting type: plug in, for terminal block width: 6.2 mm, lettering field size: 4.5 x 5.55 mm, Number of individual labels: 5

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Zack Marker strip, flat - ZBF 6 CUS - 0825027

Zack Marker strip, flat, Strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 6 CUS - 0824646

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Marker for terminal blocks - UCT-TMF 6 CUS - 0829665

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

Zack Marker strip, flat - ZBF 6,LGS:FORTL.ZAHLEN - 0808749

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,QR:FORTL.ZAHLEN - 0808765

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Zack Marker strip, flat - ZBF 6,LGS:GERADE ZAHLEN - 0810834

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 6,LGS:UNGERADE ZAHLEN - 0810876

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker carriers

Marker carriers - STP 5-2 - 0800967

Double marker carrier, snaps onto the double-level spring-cage terminal block STTB 2,5, STTB 4, PTTB 2,5, PTTB 4 can be marked with UC-TM 5, ZB 5 or UC-TMF 5, ZBF 5

Partition plate

Partition plate - ATP-STTB 4 - 3030747

Partition plate, length: 88.7 mm, width: 2 mm, height: 53 mm, color: gray

Screwdriver tools

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Screwdriver - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Short-circuit connector

Short-circuit connector - FBSRH 2-6 - 3033812

Short-circuit connector, pitch: 6.2 mm, number of positions: 2, color: red

Terminal marking

Zack Marker strip, flat - ZBF 6:UNBEDRUCKT - 0808710

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.15 x 6.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 6 - 0818140

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.6 x 5.1 mm, Number of individual labels: 80

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Marker for terminal blocks - UCT-TMF 6 - 0828746

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 6.2 mm, lettering field size: 5.4 x 4.7 mm, Number of individual labels: 60

Test plug terminal block

Test plugs - PS-6 - 3030996

Test plugs, color: red

Test plugs - PS-6/2,3MM RD - 3038736

Test plugs, color: red

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Double-level spring-cage terminal block - STTB 4 - 3031429

Accessories

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Protective conductor double-level terminal block - STTB 4-PE - 3036039

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Protective conductor double-level terminal block, connection method: Spring-cage connection, cross section: 0.08 mm² - 6 mm², AWG: 28 - 10, width: 6.2 mm, color: green-yellow, mounting type: NS 35/7,5, NS 35/15

Your advantages

- Additional labeling options
- Low contact resistance
- Corrosion-free terminal points
- Tested for railway applications
- Green-yellow housing

Key Commercial Data

Packing unit	1 pc
GTIN	4 017918 817299
GTIN	4017918817299
Weight per Piece (excluding packing)	20.650 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of levels	2
Number of connections	4
Nominal cross section	4 mm²
Color	green-yellow
Insulating material	PA

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Technical data

General

Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Rated surge voltage	6 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-2
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
Acceleration	3.12 g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec.; UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Behavior in fire for rail vehicles (DIN 5510-2)	Test passed
Flame test method (DIN EN 60695-11-10)	V0
Oxygen index (DIN EN ISO 4589-2)	>32 %
NF F16-101, NF F10-102 Class I	2
NF F16-101, NF F10-102 Class F	2

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Technical data

General

Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	6.2 mm
Length	83.5 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Connection data

Note	Please observe the current carrying capacity of the DIN rails.
Connection method	Spring-cage connection
Conductor cross section solid min.	0.08 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section flexible min.	0.08 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	28
Conductor cross section AWG max.	10
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	4 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	1 mm²
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A4

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-2
Flammability rating according to UL 94	V0
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Technical data

Standards and Regulations

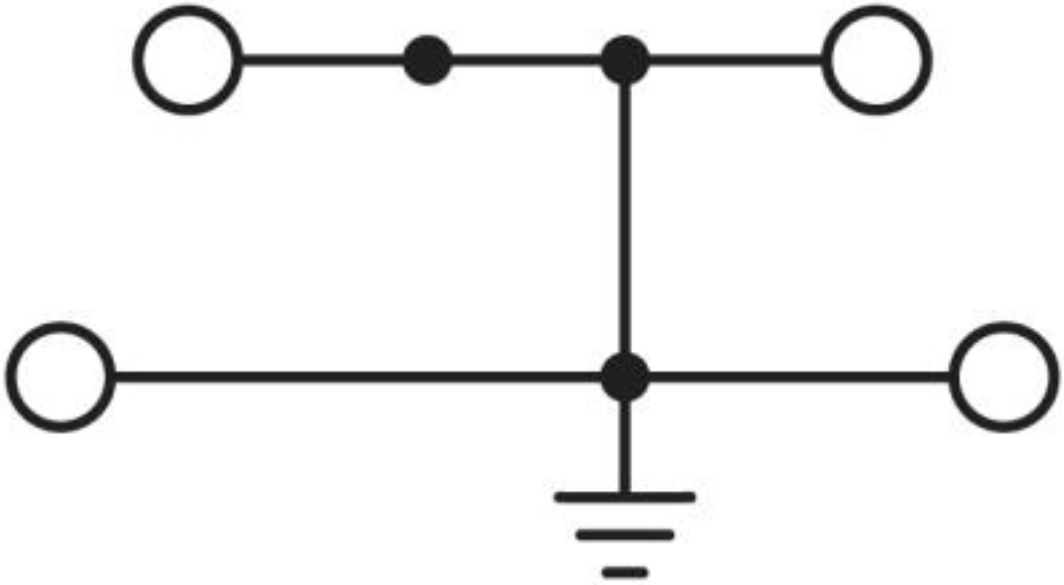
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141141
eCl@ss 8.0	27141141
eCl@ss 9.0	27141141

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Classifications

ETIM

ETIM 2.0	EC000901
ETIM 3.0	EC000901
ETIM 4.0	EC000901
ETIM 5.0	EC000901
ETIM 6.0	EC000901
ETIM 7.0	EC000901

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / CSA / BV / LR / KR / NK / UL Recognized / cUL Recognized / IECEE CB Scheme / VDE Gutachten mit Fertigungsüberwachung / EAC / EAC / RS / cULus Recognized

Ex Approvals

IECEx / ATEX / EAC Ex

Approval details

DNV GL		https://approvalfinder.dnvgl.com/	TAE00001CS

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Approvals

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

mm²/AWG/kcmil	28-10

BV		http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	13403/D0 BV

LR		http://www.lr.org/en	04/20034 (19/39034)

KR		http://www.krs.co.kr/eng/main/main.aspx	HMB17372-EL002

NK		http://www.classnk.or.jp/hp/en/	09 ME 140

UL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

mm²/AWG/kcmil	28-10

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

mm²/AWG/kcmil	28-10

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Approvals

IECEE CB Scheme	CB scheme	http://www.iecee.org/	DE1-51418

mm²/AWG/kcmil	4

VDE Gutachten mit Fertigungsüberwachung	VDE	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40010329

Nominal current IN	32 A
mm²/AWG/kcmil	0.2-4

EAC	EAC	EAC-Zulassung

EAC	EAC	RU C-DE.A*30.B.01742

RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272

cULus Recognized	c UL us

Accessories

Accessories

DIN rail

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

Documentation

Mounting material - ST-IL - 3039900

Operating decal for the ST terminal block

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

End block

End clamp - E/AL-NS 35 - 1201662

End clamp, for end support of UKH 50 to UKH 240, is pushed onto DIN rail NS 35 and fixed with 2 screws, width: 10 mm, color: aluminum

End cover

End cover - D-STTB 4 - 3030462

End cover, length: 83.5 mm, width: 2.2 mm, height: 39.7 mm, color: gray

Insulating sleeve

Insulating sleeve - ISH 4/0,5 - 3002885

Insulating sleeve, color: gray

Insulating sleeve - ISH 4/1,0 - 3002898

Insulating sleeve, color: black

Jumper

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Plug-in bridge - FBS 20-6 - 3030365

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: red

Plug-in bridge - FBS 10-6 - 3030271

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: red

Plug-in bridge - FBS 6-6 - 1008238

Plug-in bridge, One side not fully isolated, pitch: 6.2 mm, width: 35.5 mm, number of positions: 6, color: red

Plug-in bridge - FBS 5-6 - 3030349

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: red

Plug-in bridge - FBS 4-6 - 3030255

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: red

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Plug-in bridge - FBS 3-6 - 3030242

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: red

Plug-in bridge - FBS 2-6 - 3030336

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: red

Plug-in bridge - FBS 50-6 - 3032224

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-6 - 3033715

Plug-in bridge, pitch: 6.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-6 - 3001594

Plug-in bridge, pitch: 6.2 mm, number of positions: 3, color: red

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Plug-in bridge - FBSR 4-6 - 3001595

Plug-in bridge, pitch: 6.2 mm, number of positions: 4, color: red

Plug-in bridge - FBSR 5-6 - 3001596

Plug-in bridge, pitch: 6.2 mm, number of positions: 5, color: red

Plug-in bridge - FBSR 10-6 - 3033716

Plug-in bridge, pitch: 6.2 mm, number of positions: 10, color: red

Plug-in bridge - FBS 2-6 BU - 3036932

Plug-in bridge, pitch: 6.2 mm, width: 10.7 mm, number of positions: 2, color: blue

Plug-in bridge - FBS 3-6 BU - 3036945

Plug-in bridge, pitch: 6.2 mm, width: 16.9 mm, number of positions: 3, color: blue

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Plug-in bridge - FBS 4-6 BU - 3036958

Plug-in bridge, pitch: 6.2 mm, width: 23.1 mm, number of positions: 4, color: blue

Plug-in bridge - FBS 5-6 BU - 3036961

Plug-in bridge, pitch: 6.2 mm, width: 29.3 mm, number of positions: 5, color: blue

Plug-in bridge - FBS 10-6 BU - 3032198

Plug-in bridge, pitch: 6.2 mm, width: 60.3 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-6 BU - 3032208

Plug-in bridge, pitch: 6.2 mm, width: 122.3 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-6 BU - 3032211

Plug-in bridge, pitch: 6.2 mm, width: 308.3 mm, number of positions: 50, color: blue

Marker carriers

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Marker carriers - STP 5-2 - 0800967

Double marker carrier, snaps onto the double-level spring-cage terminal block STTB 2,5, STTB 4, PTTB 2,5, PTTB 4 can be marked with UC-TM 5, ZB 5 or UC-TMF 5, ZBF 5

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Screwdriver - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Short-circuit connector

Short-circuit connector - FBSRH 2-6 - 3033812

Short-circuit connector, pitch: 6.2 mm, number of positions: 2, color: red

Test plug terminal block

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Test plugs - PS-6 - 3030996

Test plugs, color: red

Test plugs - PS-6/2,3MM RD - 3038736

Test plugs, color: red

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

---

Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

---

Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

---

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Protective conductor double-level terminal block - STTB 4-PE - 3036039

Accessories

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Extract from the online catalog

ST 16-PE

Order No.: 3036165

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3036165

Spring cage ground terminal block, Type of connection: Spring-cage connection, Spring-cage connection, Cross section: 0.2 mm² - 25 mm², AWG 24 - 4, Width: 12.2 mm, Color: green-yellow, Mounting type: NS 35/7.5, NS 35/15

Commercial data	
GTIN (EAN)	4 017918 821098
sales group	A603
Pack	25 pcs.
Customs tariff	85369010
Catalog page information	Page 81 (CL-2009)

Product notes

WEEE/RoHS-compliant since: 01/01/2003

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Number of levels	1
Number of connections	2
Color	green-yellow

Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	12.2 mm
Length	80 mm
Height NS 35/7.5	51.5 mm
Height NS 35/15	59 mm

Technical data

Maximum load current	90 A (with 25 mm^2 conductor cross section)
Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-2
Nominal current I_N	76 A
Open side panel	ja

Connection data

Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	25 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	16 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	4
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm²
Conductor cross section stranded, with ferrule without plastic sleeve max.	16 mm²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm²
Conductor cross section stranded, with ferrule with plastic sleeve max.	16 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	1.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	4 mm²
Type of connection	Spring-cage connection

Stripping length	18 mm
Internal cylindrical gage	A7

Certificates / Approvals

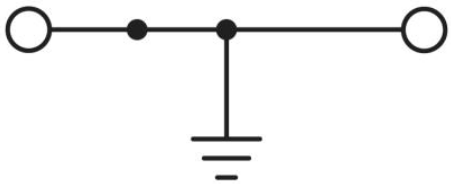
Certification	BV, CB, CSA, CUL, DNV, GL, GOST, KR, LR, NK, UL, VDE-PZI
Certification Ex:	IECEx, KEMA-EX

Accessories

Item	Designation	Description
Assembly		
3036657	D-ST 16	End cover, Length: 80 mm, Width: 2.2 mm, Height: 51.1 mm, Color: gray
Bridges		
3005950	FBS 2-12	Plug-in bridge, Number of positions: 2, Color: red
General		
0812146	ZB 12,LGS:L1-N,PE	Zack marker strip, printed horizontally: 5-section, L1, L2, L3, N, PE, color: White
Marking		
3030006	WST 10/35	Warning cover, 5-pos., for terminal widths of 10.2 mm, 12.2 mm, and 16 mm
0812133	ZB 12:SO/CMS	Zack marker strip, 5-section, divisible, special printing, marking according to customer requirements
0812120	ZB 12:UNPRINTED	Zack marker strip without color print: 5-section, for individual labeling with B-STIFT, ZB-T or CMS system, sufficient for labeling 50 terminal blocks per pack
0809735	ZBF 12:UNBEDRUCKT	Zack strip, flat, unprinted, 5-section, divisible, for labeling by the customer
Tools		
1206612	SZF 3-1,0X5,5	Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 1.0 x 5.5 x 150 mm, 2-component grip, with non-slip grip

Diagrams/Drawings

Circuit diagram



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Wiring Duct & Wiring Trough

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Wiring Duct & Wiring Trough

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Ty-Duct® Wiring Duct

Ty-Duct® — The versatile configurations you need for routing and concealing wiring!

Thomas & Betts' innovative new Ty-Duct products offer a total solution for routing and concealing wiring in control panels. Many different sizes are available to accommodate anything from the smallest wallmount panel to the larger integrated systems!

Here are some of the impressive features incorporated into our wiring duct solutions.

Ty-Duct® Features

- Available in Wide and Narrow Slot versions to meet your capacity and flexibility needs
- Widths from .75" to 6" and depths from 1" to 5"
- Complete selection of accessories and tools for installation
- Lead-free construction
- Lightweight halogen-free material available for Wide Slot Wiring Duct

Ty-Duct® Certifications

- UL® Recognized Continuous-Use Temperature — 122° F (50° C) for Standard PVC Material 203° F (95° C) for Halogen-Free Material
- UL® 94 Flammability — Rating of V-0 for Standard PVC Material Rating of V-1 for Halogen-Free Material
- Conforms with NFPA 79-2011 Section 13.3.1 Requirement for Flame-Retardant Material
- CE compliant for European shipping
- CSA Certified
- RoHS Certified

Available in 2 Colors

Gray White

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Fax: 901.252.1354

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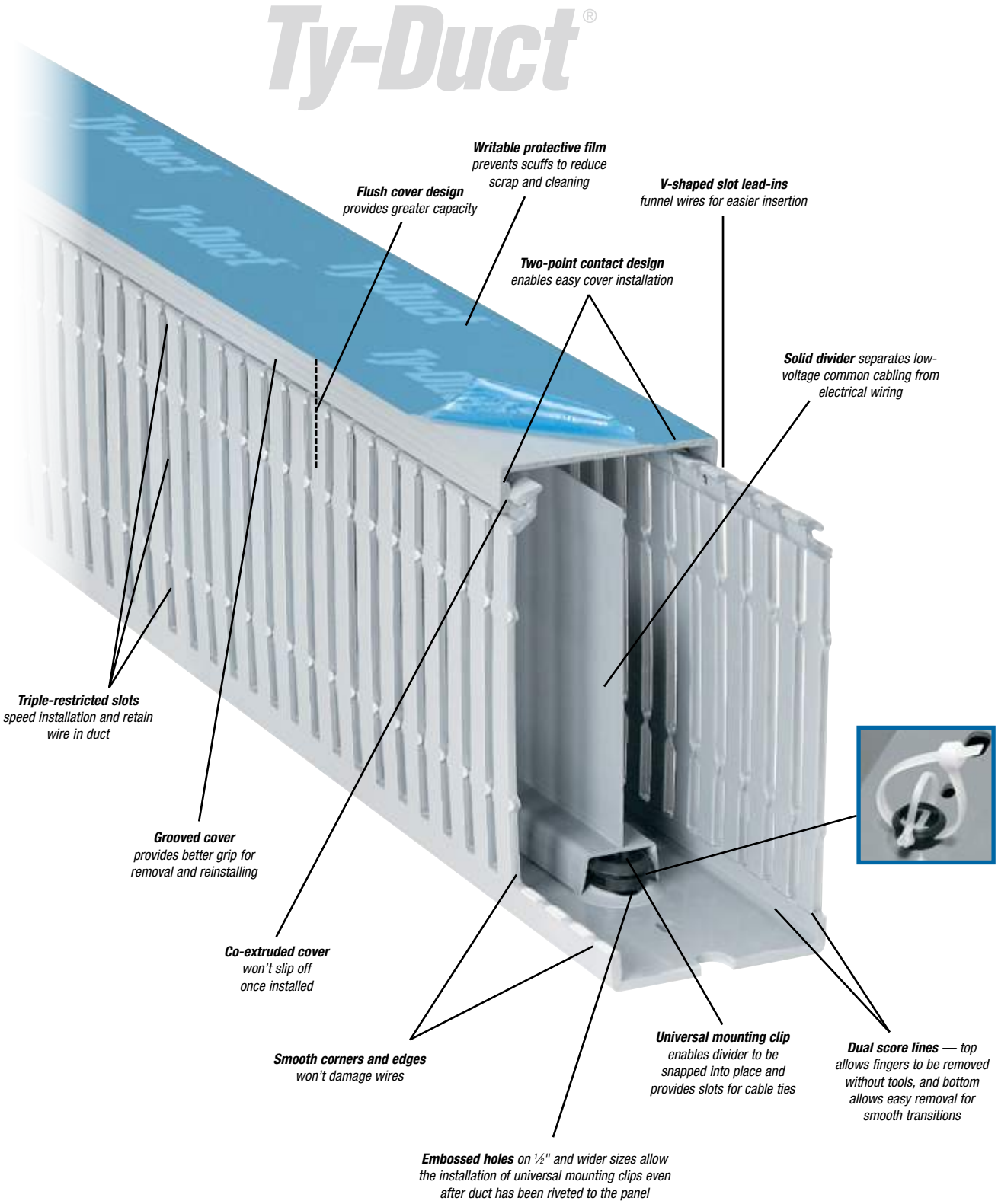
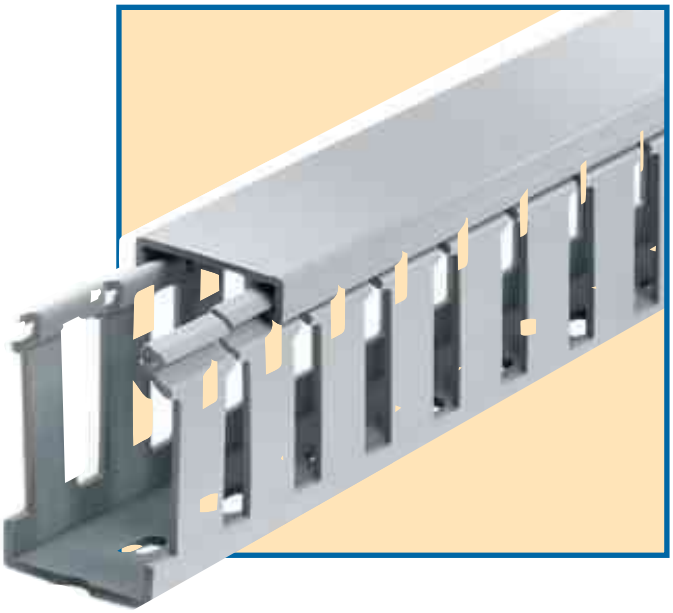
Ty-Duct® Wiring Duct



Ty-Duct® Wiring Duct

Ordering the Ty-Duct® products you need is easy!

Select the appropriate Ty-Duct® solutions for your application.



For Ty-Duct® Wiring Duct:

TY ___ x ___ ___ 6 ___

Width	Height	Style	Color	Length	Special

[_] = space for color identifier:

G = Gray

W = White

For Ty-Duct® Covers:

TY ___ CP ___ 6

Width	Color	Length

2 *To order duct without mounting holes, add suffix NM to catalog number.* ***Example:*** *TY75X1WPG6NM is a .75" x 1" wide slot gray duct with no mounting holes.*

Examples

CAT. NO.	DESCRIPTION	SIZE (W X H) IN.	SIZE (W X H) MM	COVER CAT. NO.	DUCT STD. CTN. QTY.	COVER STD. CTN. QTY.	LENGTH (FT.)
TY75X1WP[G]6NM	.75 x 1 Wide Slot Duct	.94 x 1.09	23.9 x 27.7		120		
TY75X15WP[W]6	.75 x 1.5 Wide Slot Duct	.94 x 1.56	23.9 x 39.6	TY75CP[_]6	120	120	6
TY75X2WP[W]6	.75 x 2 Wide Slot Duct	.94 x 2.07	23.9 x 52.6		120		

Nominal Width x Nominal Height

Standard Carton Quantity

WP *= Wide Slot*
NP *= Narrow Slot*

1 *Catalog Number must be completed by adding suffix* ***G*** *for Gray,* ***W*** *for White.*
Example: *TY75x2WPW6 is a .75" x 2" wide slot white duct. Cover color must be specified also.*

Standard lengths are 6 feet.

Note: *See product expiration date on packages with adhesive. Periodically check product for adhesion and replace as needed. Product is for wire management only and is not intended for use as a primary support of wire, cable, etc.*

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Ty-Duct® Wiring Duct

Order Ty-Duct® Accessories

For Ty-Duct® Dividers:

Catalog Number must be completed by adding suffix SP for Solid or WP for Wide Slot.
Example: *TY2DSPG6 is a 2" high solid wall gray divider.*

CAT. NO.	DESCRIPTION	LENGTH (FT.)	STD. CTN. QTY
TY2D[SP][G]6	2" High Wall Divider	6	120

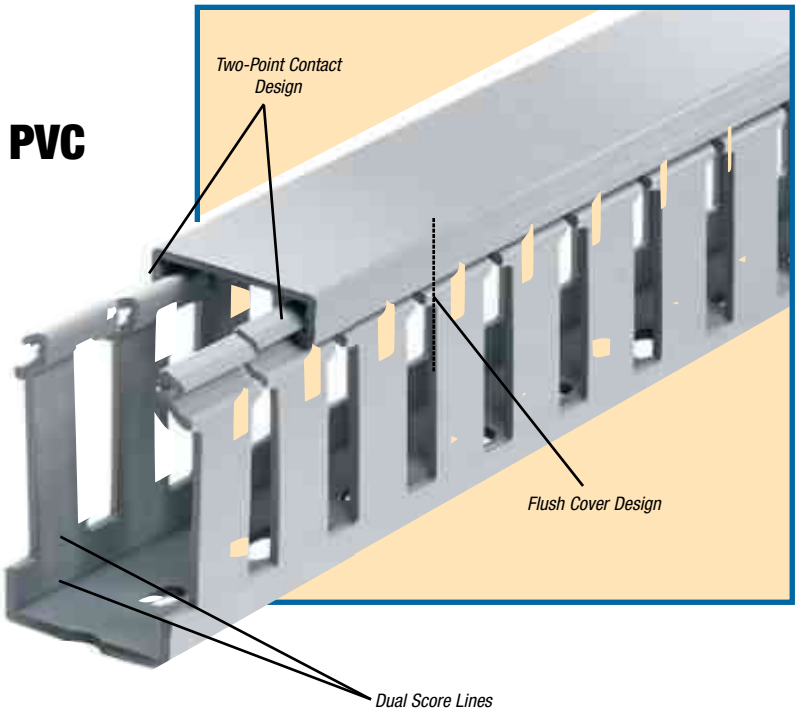
Catalog Number must be completed by adding suffix G for Gray, W for White.

Ty-Duct® Wiring Duct

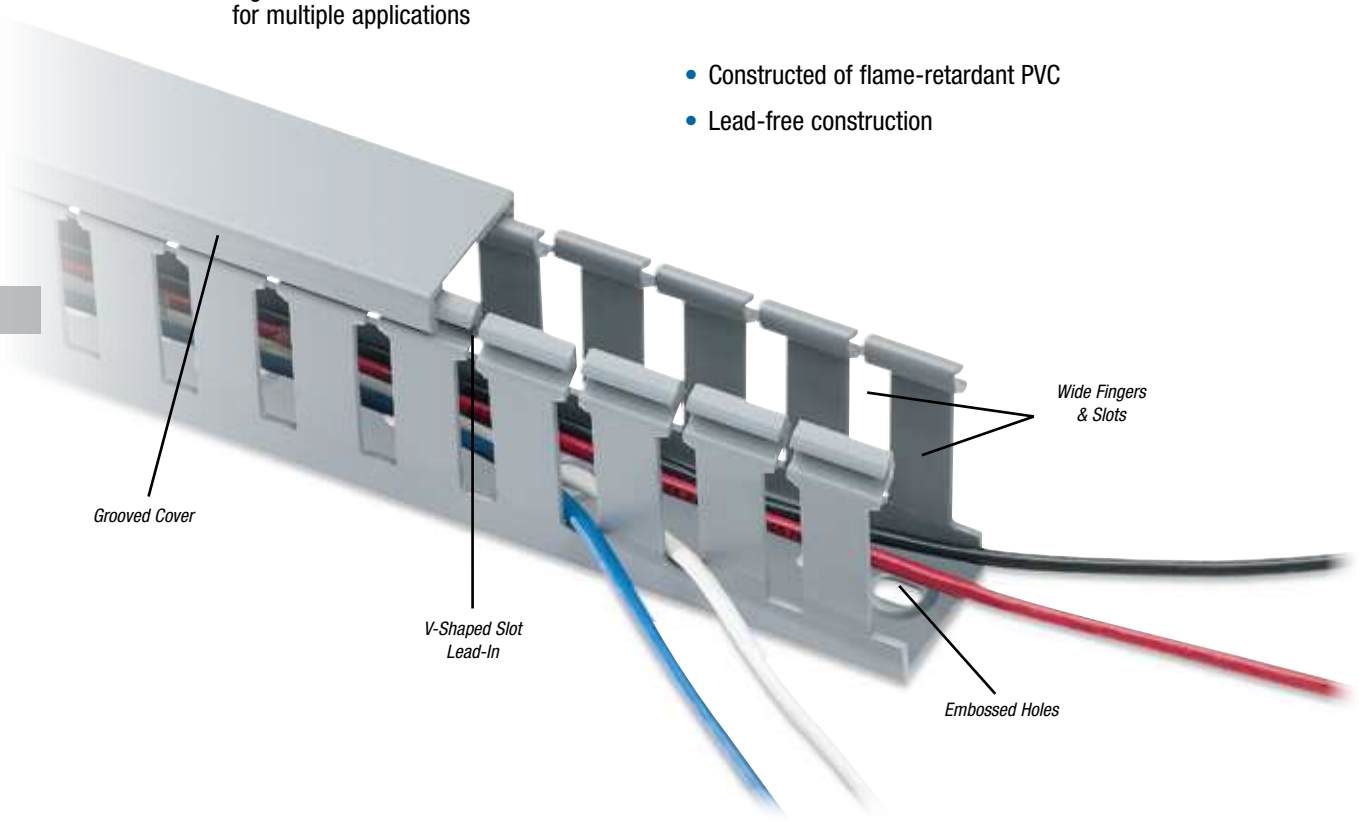
Greater sidewall rigidity with increased versatility!

Wide Slot Wiring Duct — PVC

- Wide fingers and slots increase rigidity and enable insertion of bundles
- Non-slip cover does not slide easily and resists vibration
- Rounded edges keep hands and wires free of abrasion
- V-shaped slot lead-in enables easier and faster wire installation
- Dual score lines are designed to yield clean breakoffs at the base of the slot and the duct
- Restricted slot design makes sure that wires are held with or without the cover inserted
- Cover attaches flush with sidewall for finished look and increased wire capacity
- Versatile North American and DIN Standard mounting holes enables same duct for multiple applications



- Constructed of flame-retardant PVC
- Lead-free construction



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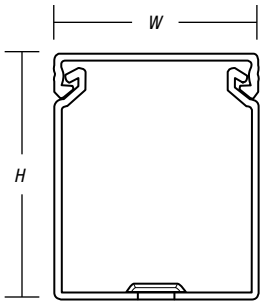
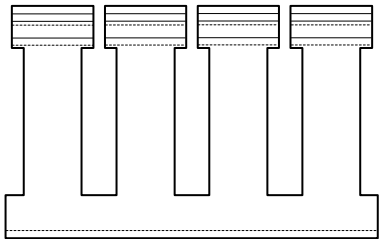


Front View with Cover



Side View without Cover

For a complete listing of Wide Slot mounting and dimensional details, see page C-84.

CAT. NO.*	DESCRIPTION	SIZE (W X H) IN.	SIZE (W X H) MM	COVER CAT. NO.*	DUCT STD. CTN. QTY.	COVER STD. CTN. QTY.	LENGTH (FT.)
TY75X15WP[_]6	.75" x 1.5"	.94 x 1.70	23.9 x 43.2	**TY75CP[_]6**	120	120	6
TY75X2WP[_]6	.75" x 2"	.94 x 2.19	23.9 x 55.6		120		
TY1X1WP[_]6	1" x 1"	1.25 x 1.24	31.8 x 31.5		120		
TY1X15WP[_]6	1" x 1.5"	1.25 x 1.70	31.8 x 43.2		120		
TY1X2WP[_]6	1" x 2"	1.25 x 2.19	31.8 x 55.6	**TY1CP[_]6**	120	120	6
TY1X3WP[_]6	1" x 3"	1.25 x 3.14	31.8 x 79.8		120		
TY1X4WP[_]6	1" x 4"	1.25 x 4.46	31.8 x 113.3		60		
TY15X15WP[_]6	1.5" x 1.5"	1.75 x 1.70	44.5 x 43.2		120		
TY15X2WP[_]6	1.5" x 2"	1.75 x 2.19	44.5 x 55.6	**TY15CP[_]6**	120	120	6
TY15X3WP[_]6	1.5" x 3"	1.75 x 3.14	44.5 x 79.8		120		
TY15X4WP[_]6	1.5" x 4"	1.75 x 4.46	44.5 x 113.3		60		
TY2X1WP[_]6	2" x 1"	2.25 x 1.24	57.2 x 31.5		120		
TY2X15WP[_]6	2" x 1.5"	2.25 x 1.70	57.2 x 43.2		120		
TY2X2WP[_]6	2" x 2"	2.25 x 2.19	57.2 x 55.6	**TY2CP[_]6**	120	120	6
TY2X3WP[_]6	2" x 3"	2.25 x 3.14	57.2 x 79.8		60		
TY2X4WP[_]6	2" x 4"	2.25 x 4.46	57.2 x 113.3		60		
TY2X5WP[_]6	2" x 5"	2.25 x 5.15	57.2 x 130.8		60		
TY25X2WP[_]6	2.5" x 2"	2.75 x 2.19	69.9 x 55.6		120		
TY25X3WP[_]6	2.5" x 3"	2.75 x 3.14	69.9 x 79.8	**TY25CP[_]6**	60	120	6
TY25X4WP[_]6	2.5" x 4"	2.75 x 4.46	69.9 x 113.3		60		
TY3X1WP[_]6	3" x 1"	3.25 x 1.24	82.6 x 31.5		120		
TY3X2WP[_]6	3" x 2"	3.25 x 2.19	82.6 x 55.6		60		
TY3X3WP[_]6	3" x 3"	3.25 x 3.14	82.6 x 79.8	**TY3CP[_]6**	60	120	6
TY3X4WP[_]6	3" x 4"	3.25 x 4.46	82.6 x 113.3		60		
TY3X5WP[_]6	3" x 5"	3.25 x 5.15	82.6 x 130.8		60		
TY4X3WP[_]6	4" x 3"	4.25 x 3.14	108.0 x 79.8	**TY4CP[_]6**	60	120	6
TY4X4WP[_]6	4" x 4"	4.25 x 4.46	108.0 x 113.3		30		
TY4X5WP[_]6	4" x 5"	4.25 x 5.15	108.0 x 130.8		30		
TY6X4WP[_]6	6" x 4"	6.25 x 4.46	158.8 x 113.3	**TY6CP[_]6**	30	60	6

[_] = space for color identifier:
G = Gray
W = White

* *Catalog Number must be completed by adding suffix G for Gray, W for White.*
Example: *TY75X1WPG6 is a .75" x 1" wide slot gray duct.*

To order duct without mounting holes, add suffix NM to catalog number.
Example: *TY75X1WPG6NM is a .75" x 1" wide slot gray duct with no mounting holes.*

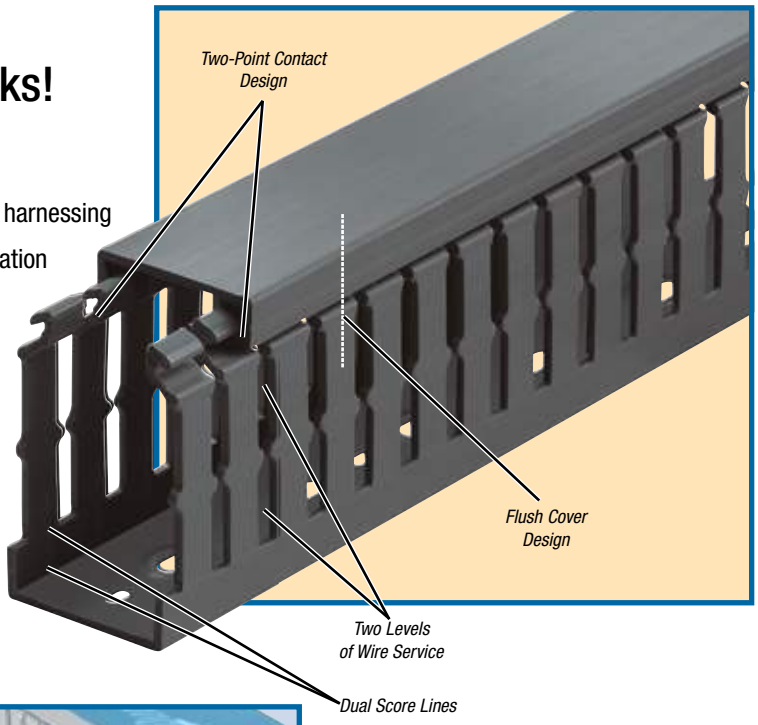
PVC duct is UL® Recognized, CSA Certified and CE Compliant.

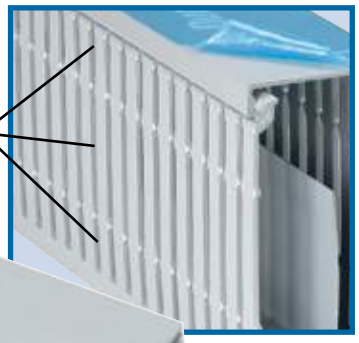
Ty-Duct® Wiring Duct

Designed to fit the spacing of high-density terminal blocks!

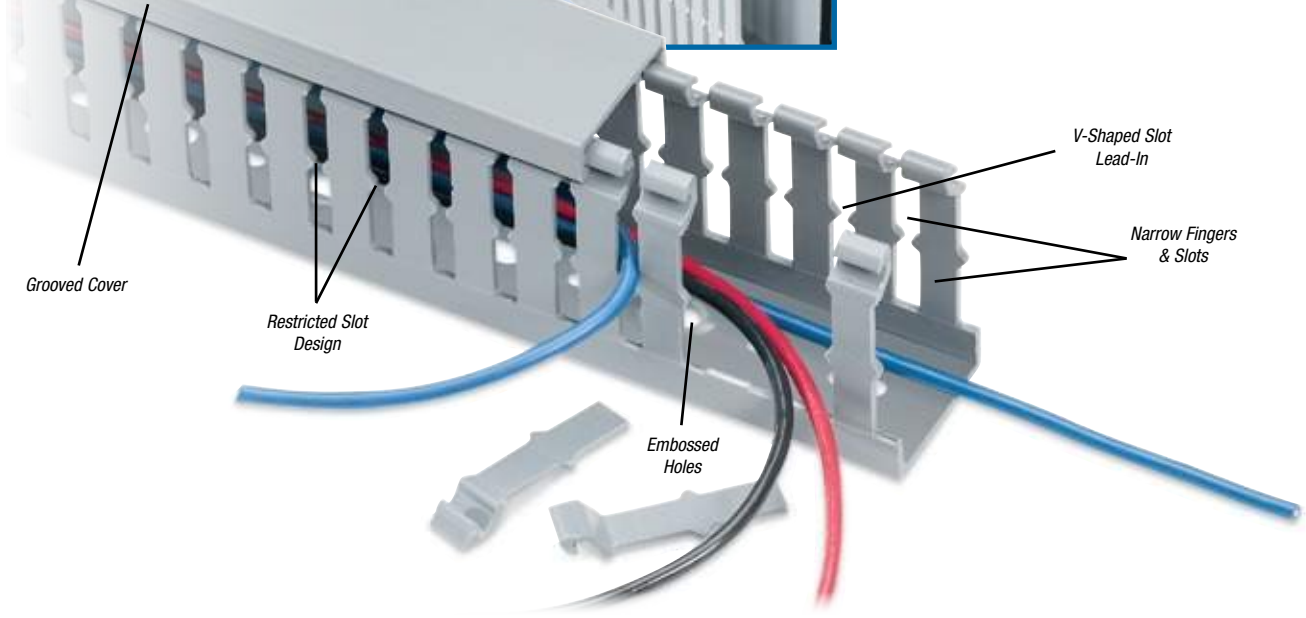
Narrow Slot Wiring Duct

- Smaller, higher number of fingers for more concise harnessing
- Non-slip cover does not slide easily and resists vibration
- Rounded edges keep hands and wires free of abrasion
- V-shaped slot lead-in enables easier and faster wire installation
- Restricted slot design makes sure that wires are held with or without the cover inserted
- Cover attaches flush with sidewall for finished look and increased wire capacity
- Versatile North American and DIN Standard mounting holes enable same duct for multiple applications
- Dual score lines are designed to yield clean breakoffs at the base of the slot and the duct





- Lead-free construction
- Constructed of flame-retardant PVC



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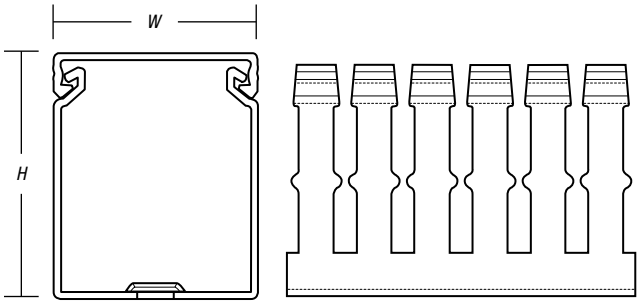
Ty-Duct® Wiring Duct



Front View with Cover

Side View without Cover

For a complete listing of Narrow Slot mounting and dimensional details, see page C-85.

CAT. NO.*	DESCRIPTION	SIZE (W X H) IN.	SIZE (W X H) MM	COVER CAT. NO.*	DUCT STD. CTN. QTY.	COVER STD. CTN. QTY.	LENGTH (FT.)
TY75X15NP[_]6	.75" x 1.5"	.94 x 1.70	23.9 x 43.2	**TY75CP[_]6**	120	120	6
TY1X1NP[_]6	1" x 1"	1.25 x 1.24	31.8 x 31.5		120		
TY1X15NP[_]6	1" x 1.5"	1.25 x 1.70	31.8 x 43.2		120		
TY1X2NP[_]6	1" x 2"	1.25 x 2.19	31.8 x 55.6	**TY1CP[_]6**	120	120	6
TY1X3NP[_]6	1" x 3"	1.25 x 3.14	31.8 x 79.8		120		
TY1X4NP[_]6	1" x 4"	1.25 x 4.46	31.8 x 113.3		60		
TY15X1NP[_]6	1.5" x 1"	1.75 x 1.24	44.5 x 31.5		120		
TY15X15NP[_]6	1.5" x 1.5"	1.75 x 1.70	44.5 x 43.2		120		
TY15X2NP[_]6	1.5" x 2"	1.75 x 2.19	44.5 x 55.6	**TY15CP[_]6**	120	120	6
TY15X3NP[_]6	1.5" x 3"	1.75 x 3.14	44.5 x 79.8		120		
TY15X4NP[_]6	1.5" x 4"	1.75 x 4.46	44.5 x 113.3		60		
TY2X1NP[_]6	2" x 1"	2.25 x 1.24	57.2 x 31.5		120		
TY2X15NP[_]6	2" x 1.5"	2.25 x 1.70	57.2 x 43.2		120		
TY2X2NP[_]6	2" x 2"	2.25 x 2.19	57.2 x 55.6	**TY2CP[_]6**	120	120	6
TY2X3NP[_]6	2" x 3"	2.25 x 3.14	57.2 x 79.8		60		
TY2X4NP[_]6	2" x 4"	2.25 x 4.46	57.2 x 113.3		60		
TY2X5NP[_]6	2" x 5"	2.25 x 5.15	57.2 x 130.8		60		
TY25X2NP[_]6	2.5" x 2"	2.75 x 2.19	69.9 x 55.6		120		
TY25X3NP[_]6	2.5" x 3"	2.75 x 3.14	69.9 x 79.8	**TY25CP[_]6**	60	120	6
TY25X4NP[_]6	2.5" x 4"	2.75 x 4.46	69.9 x 113.3		60		
TY3X1NP[_]6	3" x 1"	3.25 x 1.24	82.6 x 31.5		120		
TY3X2NP[_]6	3" x 2"	3.25 x 2.19	82.6 x 55.6		60		
TY3X3NP[_]6	3" x 3"	3.25 x 3.14	82.6 x 79.8	**TY3CP[_]6**	60	120	6
TY3X4NP[_]6	3" x 4"	3.25 x 4.46	82.6 x 113.3		60		
TY3X5NP[_]6	3" x 5"	3.25 x 5.15	82.6 x 130.8		60		
TY4X2NP[_]6	4" x 2"	4.25 x 2.19	108.0 x 55.6		60		
TY4X3NP[_]6	4" x 3"	4.25 x 3.14	108.0 x 79.8	**TY4CP[_]6**	60	120	6
TY4X4NP[_]6	4" x 4"	4.25 x 4.46	108.0 x 113.3		30		
TY4X5NP[_]6	4" x 5"	4.25 x 5.15	108.0 x 130.8		30		

[_] = space for color identifier:
G = Gray
W = White

** Catalog Number must be completed by adding suffix G for Gray, W for White.*
Example: *TY75X15NPB6 is a .75" x 1.5" narrow slot black duct.*

To order duct without mounting holes, add suffix NM to catalog number.
Example: *TY75X15NPB6NM is a .75" x 1.5" narrow slot black duct with no mounting holes.*

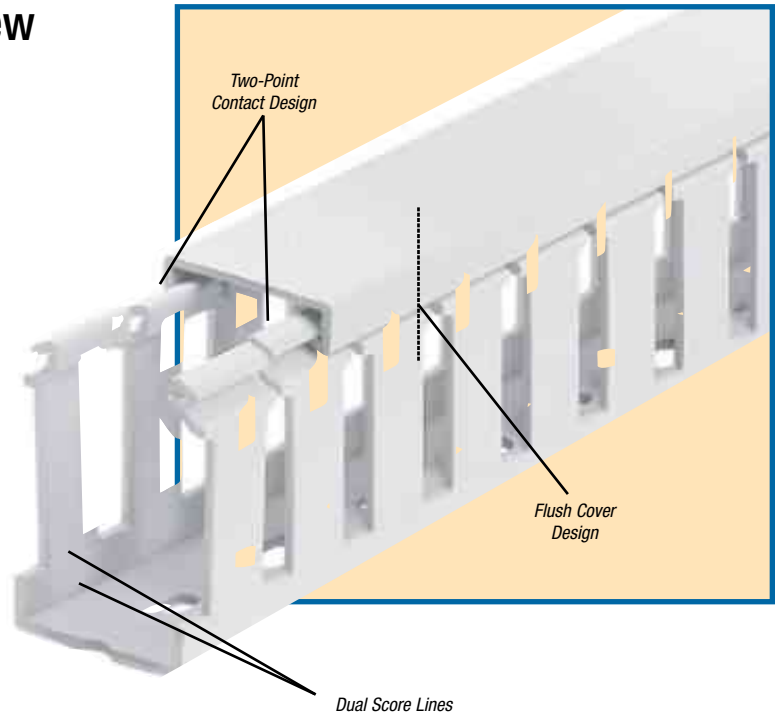
PVC duct is UL Recognized, CSA Certified and CE Compliant.

Ty-Duct® Wiring Duct

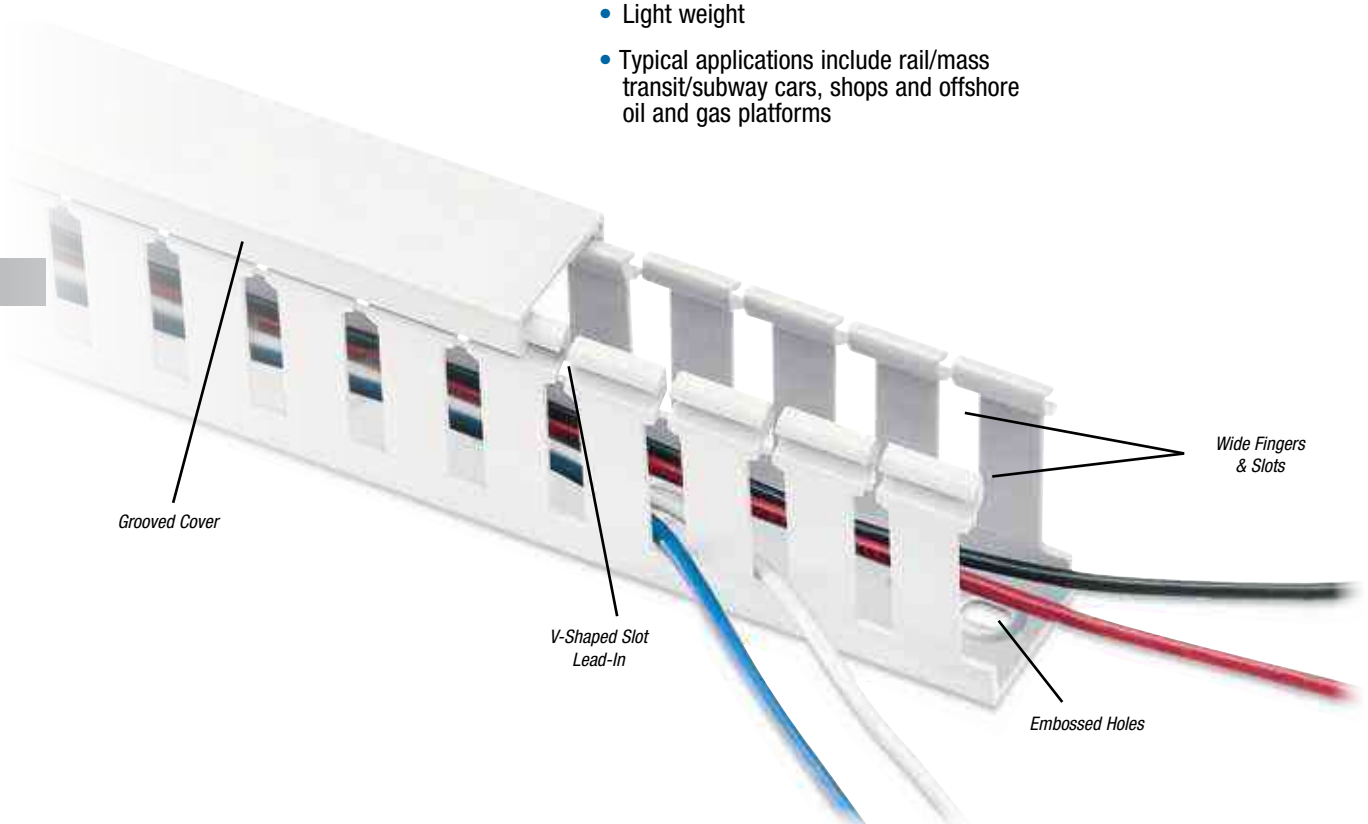
Perfect for passenger or crew areas where smoke toxicity is a concern!

Halogen-Free Wide Slot Wiring Duct

- Halogen-free construction — RoHS Compliant
- Higher temperature rating than standard PVC material (203° F/95° C)
- UL94V-1 flammability rating
- Wide fingers and slots increase rigidity and enable for insertion of bundles
- Non-slip cover does not slide easily and resists vibration
- Dual score lines are designed to yield clean breakoffs at the base of the slot and the duct
- V-shaped slot lead-in enables easier and faster wire installation



- Light weight
- Typical applications include rail/mass transit/subway cars, shops and offshore oil and gas platforms



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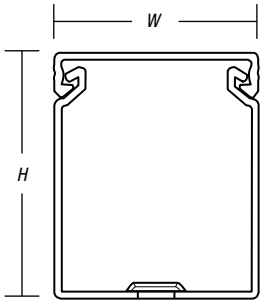
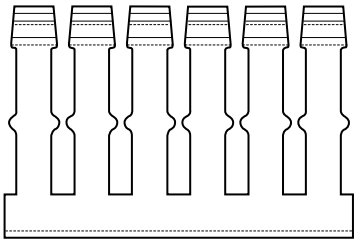
Ty-Duct® Wiring Duct



Front View with Cover



Side View without Cover

For a complete listing of Solid Wall mounting and dimensional details, see page C-84.

CAT. NO.	DESCRIPTION	SIZE (W X H) IN.	SIZE (W X H) MM	COVER CAT. NO.	DUCT STD. CTN. QTY.	COVER STD. CTN. QTY.	LENGTH (FT.)
TY1X1WHW6	1" x 1"	1.25 x 1.24	31.8 x 31.5		120		
TY1X15WHW6	1" x 1.5"	1.25 x 1.70	31.8 x 43.2		120		
TY1X2WHW6	1" x 2"	1.25 x 2.19	31.8 x 55.6	**TY1CHW6**	120	120	6
TY1X3WHW6	1" x 3"	1.25 x 3.14	31.8 x 79.8		120		
TY1X4WHW6	1" x 4"	1.25 x 4.46	31.8 x 113.3		60		
TY15X15WHW6	1.5" x 1.5"	1.75 x 1.70	44.5 x 43.2		120		
TY15X2WHW6	1.5" x 2"	1.75 x 2.19	44.5 x 55.6	**TY15CHW6**	120	120	6
TY15X3WHW6	1.5" x 3"	1.75 x 3.14	44.5 x 79.8		120		
TY15X4WHW6	1.5" x 4"	1.75 x 4.46	44.5 x 113.3		60		
TY2X1WHW6	2" x 1"	2.25 x 1.24	57.2 x 31.5		120		
TY2X2WHW6	2" x 2"	2.25 x 2.19	57.2 x 55.6	**TY2CHW6**	120	120	6
TY2X3WHW6	2" x 3"	2.25 x 3.14	57.2 x 79.8		60		
TY2X4WHW6	2" x 4"	2.25 x 4.46	57.2 x 113.3		60		
TY3X1WHW6	3" x 1"	3.25 x 1.24	82.6 x 31.5		120		
TY3X2WHW6	3" x 2"	3.25 x 2.19	82.6 x 55.6		60		
TY3X3WHW6	3" x 3"	3.25 x 3.14	82.6 x 79.8	**TY3CHW6**	60	120	6
TY3X4WHW6	3" x 4"	3.25 x 4.46	82.6 x 113.3		60		
TY3X5WHW6	3" x 5"	3.25 x 5.15	82.6 x 130.8		60		
TY4X2WHW6	4" x 2"	4.25 x 2.19	108.0 x 55.6		60		
TY4X3WHW6	4" x 3"	4.25 x 3.14	108.0 x 79.8	**TY4CHW6**	60	120	6
TY4X4WHW6	4" x 4"	4.25 x 4.46	108.0 x 113.3		30		
TY4X5WHW6	4" x 5"	4.25 x 5.15	108.0 x 130.8		30		

Halogen-Free Wiring Duct Solid Divider Wall

CAT. NO.	FITS DUCT TRADE SIZE	STD. CTN. QTY.	LENGTH (FT.)
TY1DSHW6	1" H	120	6
TY1.5DSHW6	1½" H	120	6
TY2DSHW6	2" H	120	6
TY3DSHW6	3" H	1120	6
TY4DSHW6	4" H	120	6
TY5DSHW6	5" H	120	6

W = White

To order duct without mounting holes, add suffix NM to catalog number.
Example: *TY1XWHW6NM is a 1" x 1" wide slot halogen-free white duct with no mounting holes.*

Halogen-free (modified PPE) duct is UL® Recognized, CSA Certified and meets the JIC requirements.

Wiring Duct Tools and Accessories

Create multiple channels inside wiring ducts!

Divider Wall

- Separates high and low voltage to reduce shortages and interference
- Mount inside any Ty-Duct® PVC wiring duct using Universal Mounting Clips
- Solid and Wide Slotted style

CAT. NO.	DESCRIPTION	LENGTH (FT.)	STD. CTN. QTY.
TY1D[_]P[_]6	1" High Wall Divider	6	120
TY1.5D[_]P[_]6	1.5" High Wall Divider	6	120
TY2D[_]P[_]6	2" High Wall Divider	6	120
TY3D[_]P[_]6	3" High Wall Divider	6	120
TY4D[_]P[_]6	4" High Wall Divider	6	120
TY5D[_]P[_]6	5" High Wall Divider	6	120

+Catalog number must be completed first by adding S for Solid divider or W for Wide Finger Slotted divider and then by adding G for Gray, W for White.

Examples: *TY2DSPG6 is a 2" high solid wall gray divider.*
TY2DWPG6 is a 2" high slotted gray divider.

One size fits all!

Universal Mounting Clips

- Added before or after the duct is in place, without additional hardware
- Twists into place — holds securely
- Installs easily using a screwdriver
- Accommodates up to 40 lb. cable ties
- Black polycarbonate
- For ½" and wider wiring duct sizes

CAT. NO.	DESCRIPTION	QTY.
UMC	Universal Fastener Mount	100 pk

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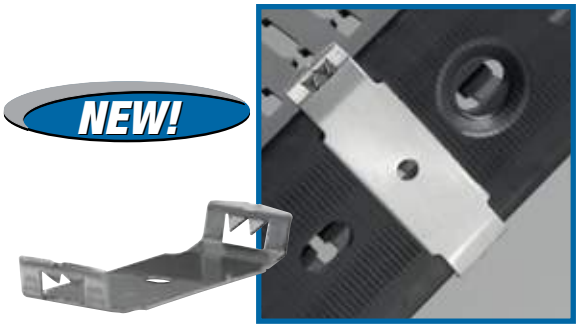
Wiring Duct Tools and Accessories

Ideal for high-temperature environments!

Mounting Clips

- Speeds duct mounting
- Enables duct removal
- Provides a stand-off between panel and duct to prevent direct heat transfer — ideal for high-temperature environments



CAT. NO.	WIDTH (IN.)	STD. CTN. QTY.
TY1MC	1	100
TY15MC	1.5	100
TY2MC	2	100
TY3MC	3	100

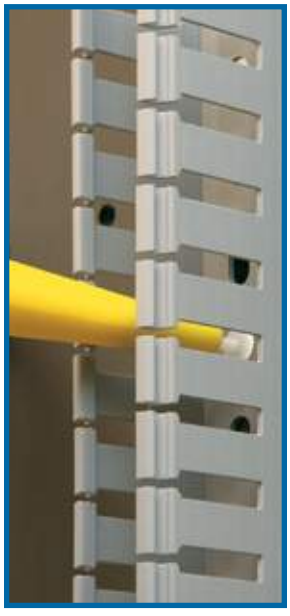
All are .75"D x .35"H and made of Type 316 stainless steel.

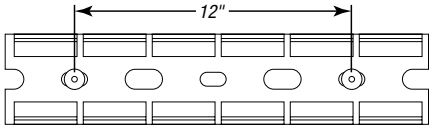
Plastic rivets make mounting ducts easy!

Plastic Rivets

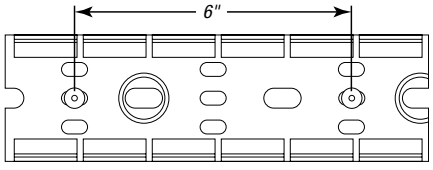
- Fast installation
- Durable and economical
- Used with panel thickness from .030"–.125" thick
- Recommended Panel Hole size: .196" ± .02

STD. CAT. NO.	DESCRIPTION	QTY.
08200C	3⁄16" Plastic Rivet	100 pk
08200M	3⁄16" Plastic Rivet	1,000 pk

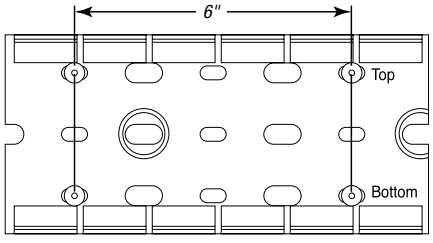




Minimum mounting rivet distance for ducts less than 1½" wide.



Minimum mounting rivet distance for ducts 1½" to 2½" wide.



Minimum mounting rivet distance for ducts greater than 2½" wide. Installed top and bottom.

Wiring Duct Tools and Accessories

The wiring duct tools you need for every application!

Features include:

- Duct Cutting Tools for a clean professional finish
- Finger Cutting Tools that make modifications simple
- Notching Tools for duct sidewalls to facilitate tee and corner junctions
- Benchmount Cutting Tools for fast, high volume duct cutting
- Rivet Installation Tools for quick duct mounting

Lightweight and durable!

Duct/ Cover Cutting Tool

- All-steel construction
- Sharp cutting surface
- Replaceable blades available

CAT. NO.	DESCRIPTION
CC125	Handheld Duct Cutter
SX-25TB	Handheld Duct Cutter — Long

Cut duct fingers easily!

Finger Cutting Tool

- Rugged die-cast construction with insulated handles for a comfortable, non-slip grip
- Removes duct fingers in tight places
- Works with all slotted wiring duct
- Also cuts round and solid wall duct
- Spring loaded

CAT. NO.	DESCRIPTION
DK-65TB	Duct Finger Cutter

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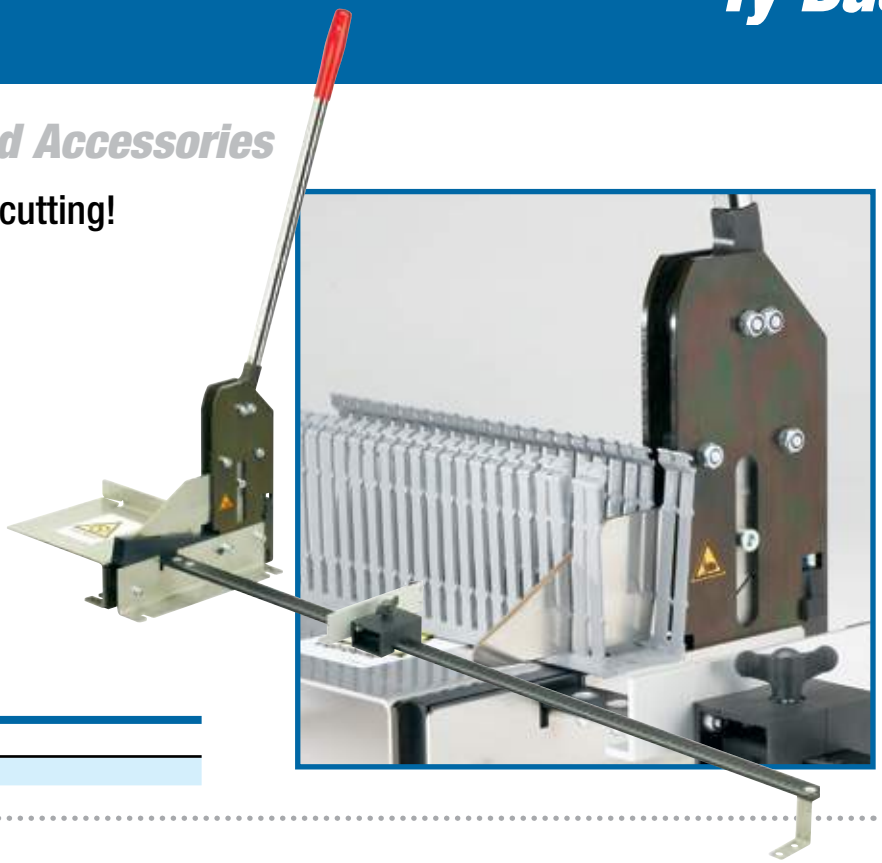
Wiring Duct Tools and Accessories

For fast, high-volume duct cutting!

Benchmount Cutting Tool

- Engineered for use with Ty-Duct® plastic wiring ducts and covers
- All-steel construction lasts for years
- Adjustable gauge sets the desired length of duct
- Easy-to-read measuring indicator
- Adjustable stop for easy repeated cutting
- Sharp, easy-to-replace blades



CAT. NO.	DESCRIPTION
DC-125TB	Benchmount Duct Cutter

Notch duct sidewalls fast!

Notching Tool

- Notches sidewalls to bottom scoreline
- Facilitates tee and corner junctions
- Rugged design
- Easy to use
- Spring loaded

CAT. NO.	DESCRIPTION
DNT-100TB	Duct Notching Tool

Mount ducts quickly!

Rivet Installation Tool

- Use for setting duct rivets
- Pressure on the tool head secures the rivet in place

You may also need...

Plastic Rivets
(see page C-79)

CAT. NO.	DESCRIPTION
08205	08200 Series Rivet Installation Tool

Wiring Duct Technical Information

Wiring Duct — Wire Fill Capacity

Note: *Wire fill is based on 50% fill of duct area.*

NORMAL DUCT SIZE (IN.)			AREA (INCHES²)	ELECTRICAL												DATA CABLE		
				8 AWG	10 AWG	12 AWG		14 AWG			16 AWG		18 AWG		22 AWG	24 AWG		
				0.216	0.153	0.122	0.158	0.105	0.139	0.165	0.096	0.125	0.084	0.113	0.065	0.217	0.250	0.422
W		H		THHN	THHN	THHN	MTW	THHN	MTW	MTW	THHN	MTW	THHN	MTW	MTW	UTP/CM CAT5E	UTP/CM CAT6	UTP/CM
.75	X	1.00	.750	5	9	14	9	19	11	8	23	14	30	17	51	5	3	1
.75	X	1.50	1.125	7	14	22	13	29	17	12	35	21	46	25	76	7	5	2
.75	X	2.00	1.500	9	18	29	17	39	22	16	47	27	61	34	101	9	7	2
1.00	X	1.00	1.000	6	12	19	11	26	15	10	31	18	40	22	68	6	5	2
1.00	X	1.50	1.500	9	18	29	17	39	22	16	47	27	61	34	101	9	7	2
1.00	X	2.00	2.000	12	24	38	23	52	30	21	62	37	81	45	135	12	9	3
1.00	X	3.00	3.000	18	37	58	34	78	44	31	93	55	121	67	203	18	14	5
1.00	X	4.00	4.000	24	49	77	46	104	59	42	124	73	162	90	270	24	18	6
1.50	X	1.00	1.500	9	18	29	17	39	22	16	47	27	61	34	101	9	7	2
1.50	X	1.50	2.250	14	27	43	26	58	33	24	70	41	91	50	152	14	10	4
1.50	X	2.00	3.000	18	37	58	34	78	44	31	93	55	121	67	203	18	14	5
1.50	X	3.00	4.500	27	55	86	52	117	67	47	140	82	182	101	304	27	21	7
1.50	X	4.00	6.000	36	73	115	69	155	89	63	186	110	243	134	406	36	27	10
2.00	X	1.00	2.000	12	24	38	23	52	30	21	62	37	81	45	135	12	9	3
2.00	X	1.50	3.000	18	37	58	34	78	44	31	93	55	121	67	203	18	14	5
2.00	X	2.00	4.000	24	49	77	46	104	59	42	124	73	162	90	270	24	18	6
2.00	X	3.00	6.000	36	73	115	69	155	89	63	186	110	243	134	406	36	27	10
2.00	X	4.00	8.000	48	98	154	92	207	118	84	248	146	324	179	541	49	37	13
2.00	X	5.00	10.000	60	122	192	114	259	148	105	310	183	405	224	676	61	46	16
2.50	X	2.00	5.000	30	61	96	57	130	74	52	155	91	202	112	338	30	23	8
2.50	X	3.00	7.500	45	92	144	86	194	111	79	233	137	304	168	507	46	34	12
2.50	X	4.00	10.000	60	122	192	114	259	148	105	310	183	405	224	676	61	46	16
3.00	X	1.00	3.000	18	37	58	34	78	44	31	93	55	121	67	203	18	14	5
3.00	X	2.00	6.000	36	73	115	69	155	89	63	186	110	243	134	406	36	27	10
3.00	X	3.00	9.000	54	110	173	103	233	133	94	279	165	364	201	609	55	41	14
3.00	X	4.00	12.000	72	146	230	137	311	177	126	372	219	486	269	811	73	55	19
3.00	X	5.00	15.000	90	183	288	172	389	222	157	465	274	607	336	1014	91	69	24
4.00	X	1.50	6.000	36	73	115	69	155	89	63	186	110	243	134	406	36	27	10
4.00	X	2.00	8.000	48	98	154	92	207	118	84	248	146	324	179	541	49	37	13
4.00	X	3.00	12.000	72	146	230	137	311	177	126	372	219	486	269	811	73	55	19
4.00	X	4.00	16.000	96	195	307	183	415	237	168	496	293	648	358	1082	97	73	26
4.00	X	5.00	20.000	120	244	384	229	518	296	210	620	366	810	448	1352	121	91	32
6.00	X	4.00	24.000	144	293	461	275	622	355	252	744	439	972	537	1623	146	110	39

Formula for Calculating Fill Capacity

$$\text{Number of wires} = \frac{\text{Duct W x H}}{1.75 \times (\text{Wire O.D.})^2} \Big/ 2$$

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Wiring Duct Technical Information

Properties of Materials Used in Wiring Duct

PROPERTY	UNITS	ASTM TEST	PVC	HALOGEN FREE
Specific Gravity		D792	1.43	1.10
IZOD	ft.-lb./in.	D256	2	5.0
Flexural Strength	psi	D790	10,900	12,800
Flexural Modulus	psi	D790	382,000	360,000
Tensile Strength	psi	D638	5,500	7,800
Compressive Strength	psi	D695	8,600	16,000
Water Absorption	24 hrs.–%	D570	.10	.07
Hardness	Rockwell Duro D	D785 D676	R-111 78	R-115
Dielectric Strength 60Hz, 25° C, s/t	vpm	D149		400
Dielectric Constant 60Hz, Dry 1MHz, Dry		D150	1.9	2.65 2.64
Volume Resistivity	ohm-cm	D257		1017
Heat Deflecting (° F@ 264 psi)	° F	D648	158	212
Flammability			94 V-0	94 V-1

The above information is believed reliable. The user should, however, check the applicable specifications to verify values.

Rigid Polyvinyl Chloride (PVC)

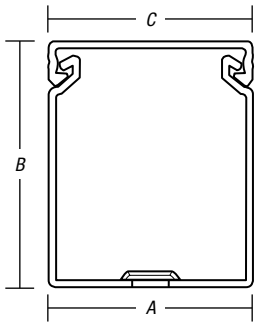
- General-purpose material for indoor applications
- UL94 flammability rating of V-0
- UL® Recognized for use in temperatures up to 50° C (122° F)
- Economical wiring duct material

Halogen Free

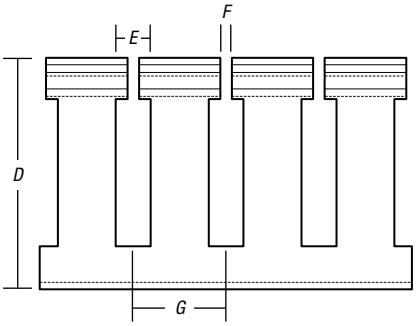
- For use in halogen-free or high-temperature applications
- UL94 flammability rating of V-1
- UL® Recognized for use in higher temperatures up to 95° C (203° F)
- 20% lighter than PVC

Wiring Duct Technical Information

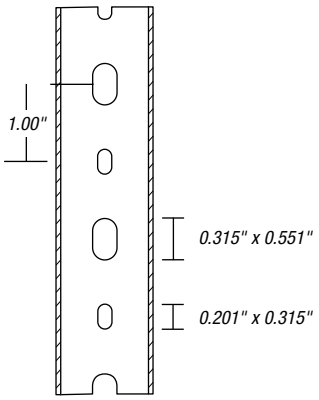
Ty-Duct® Wide Slot Wiring Duct Dimensions



Front View with Cover



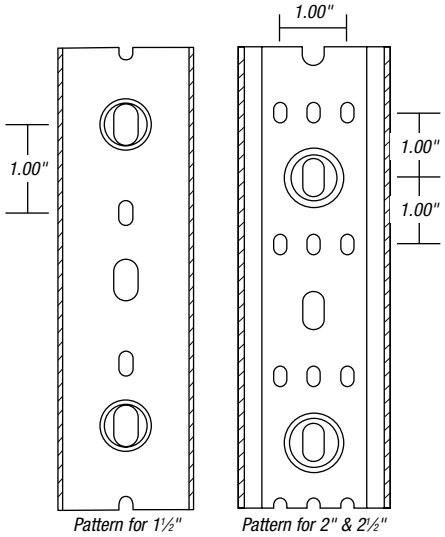
Side View without Cover



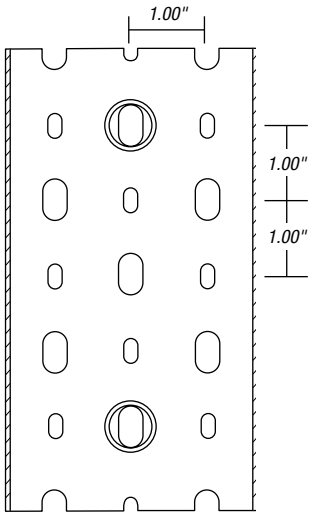
Pattern for ¾" & 1"

TRADE SIZE			DIMENSIONS (INCHES)						
W		H	A	B	C	D	E	F	G
.75	X	1.00	.94	1.24	.94	1.03	.30	.10	.80
.75	X	1.50	.94	1.70	.94	1.50	.30	.10	.80
.75	X	2.00	.94	2.19	.94	2.01	.30	.10	.80
1.00	X	1.00	1.25	1.24	1.25	1.03	.30	.10	.80
1.00	X	1.50	1.25	1.70	1.25	1.50	.30	.10	.80
1.00	X	2.00	1.25	2.19	1.25	2.01	.30	.10	.80
1.00	X	3.00	1.25	3.14	1.25	2.99	.30	.10	1.00
1.00	X	4.00	1.25	4.46	1.25	4.32	.30	.10	1.00
1.50	X	1.00	1.75	1.24	1.75	1.03	.30	.10	.80
1.50	X	1.50	1.75	1.70	1.75	1.50	.30	.10	.80
1.50	X	2.00	1.75	2.19	1.75	2.01	.30	.10	.80
1.50	X	3.00	1.75	3.14	1.75	2.99	.30	.10	1.00
1.50	X	4.00	1.75	4.46	1.75	4.32	.30	.10	1.00
2.00	X	1.00	2.25	1.24	2.25	1.05	.30	.10	.80
2.00	X	1.50	2.25	1.70	2.25	1.52	.30	.10	.80
2.00	X	2.00	2.25	2.19	2.25	2.03	.30	.10	.80
2.00	X	3.00	2.25	3.14	2.25	3.00	.30	.10	1.00
2.00	X	4.00	2.25	4.46	2.25	4.33	.30	.10	1.00
2.00	X	5.00	2.25	5.15	2.25	5.02	.38	.10	1.33
2.50	X	2.00	2.75	2.19	2.75	2.03	.30	.10	.80
2.50	X	3.00	2.75	3.14	2.75	3.00	.30	.10	1.00
2.50	X	4.00	2.75	4.46	2.75	4.33	.30	.10	1.00
3.00	X	1.00	3.25	1.24	3.25	1.06	.30	.10	.80
3.00	X	2.00	3.25	2.19	3.25	2.08	.30	.10	.80
3.00	X	3.00	3.25	3.14	3.25	3.06	.30	.10	1.00
3.00	X	4.00	3.25	4.46	3.25	4.39	.30	.10	1.00
3.00	X	5.00	3.25	5.15	3.25	5.06	.38	.10	1.33
4.00	X	1.50	4.25	1.70	4.25	1.58	.30	.10	.80
4.00	X	2.00	4.25	2.19	4.25	2.08	.30	.10	.80
4.00	X	3.00	4.25	3.14	4.25	3.06	.30	.10	1.00
4.00	X	4.00	4.25	4.46	4.25	4.39	.30	.10	1.00
4.00	X	5.00	4.25	5.15	4.25	5.06	.38	.10	1.33
6.00	X	4.00	6.25	4.46	6.25	4.39	.30	.10	1.00

Dimensions shown are for reference only. Contact T&B for specific dimensional needs.



Pattern for 1½" Pattern for 2" & 2½"



Pattern for 3", 4" & 6"

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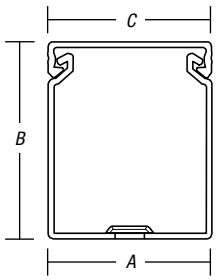
Wiring Duct Technical Information

Ty-Duct® Narrow Slot Wiring Duct Dimensions



Front View with Cover

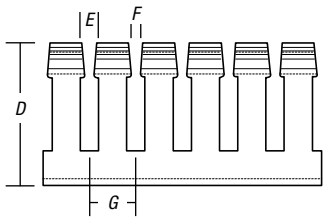


Figure 1: Side View without Cover

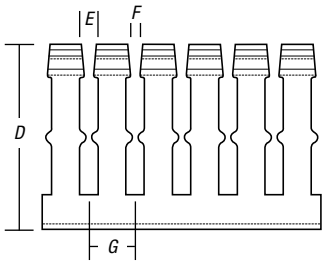


Figure 2: Side View without Cover

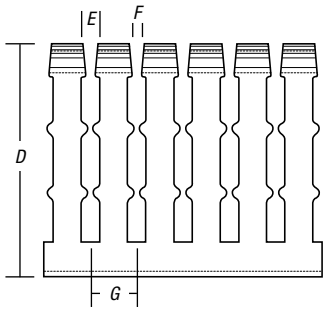
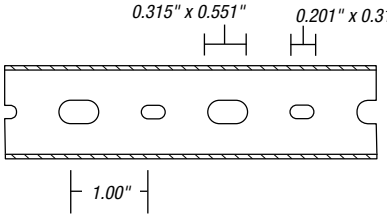
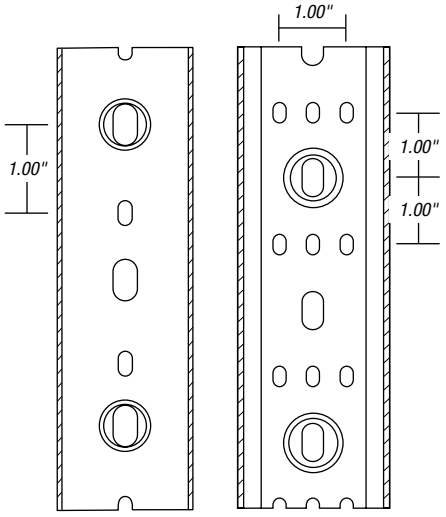


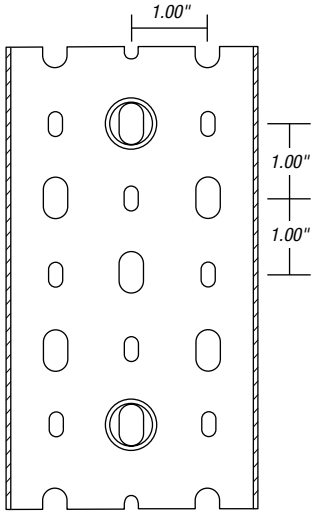
Figure 3: Side View without Cover



Pattern for ¾" & 1"



Pattern for 1½" Pattern for 2" & 2½"



Pattern for 3", 4" & 6"

TRADE SIZE				DIMENSIONS (INCHES)						
W		H	FIG.	A	B	C	D	E	F	G
.75	X	1.50	1	.94	1.70	.94	1.70	.195	.10	.50
1.00	X	1.00	1	1.25	1.24	1.25	1.24	.195	.10	.50
1.00	X	1.50	1	1.25	1.70	1.25	1.70	.195	.10	.50
1.00	X	2.00	2	1.25	2.19	1.25	2.19	.195	.10	.50
1.00	X	3.00	3	1.25	3.14	1.25	3.14	.195	.10	.50
1.00	X	4.00	3	1.25	4.46	1.25	4.46	.195	.10	.50
1.50	X	1.00	1	1.75	1.24	1.75	1.24	.195	.10	.50
1.50	X	1.50	1	1.75	1.70	1.75	1.70	.195	.10	.50
1.50	X	2.00	2	1.75	2.19	1.75	2.19	.195	.10	.50
1.50	X	3.00	3	1.75	3.14	1.75	3.14	.195	.10	.50
1.50	X	4.00	3	1.75	4.46	1.75	4.46	.195	.10	.50
2.00	X	1.00	1	2.25	1.24	2.25	1.05	.195	.10	.50
2.00	X	1.50	1	2.25	1.70	2.25	1.52	.195	.10	.50
2.00	X	2.00	2	2.25	2.19	2.25	2.03	.195	.10	.50
2.00	X	3.00	3	2.25	3.14	2.25	3.00	.195	.10	.50
2.00	X	4.00	3	2.25	4.46	2.25	4.33	.195	.10	.50
2.00	X	5.00	3	2.25	5.15	2.25	5.02	.195	.10	.50
2.50	X	2.00	2	2.75	2.19	2.75	2.03	.195	.10	.50
2.50	X	3.00	3	2.75	3.14	2.75	3.00	.195	.10	.50
2.50	X	4.00	3	2.75	4.46	2.75	4.33	.195	.10	.50
3.00	X	1.00	1	3.25	1.24	3.25	1.06	.195	.10	.50
3.00	X	2.00	2	3.25	2.19	3.25	2.08	.195	.10	.50
3.00	X	3.00	3	3.25	3.14	3.25	3.06	.195	.10	.50
3.00	X	4.00	3	3.25	4.46	3.25	4.39	.195	.10	.50
3.00	X	5.00	3	3.25	5.15	3.25	5.06	.195	.10	.50
4.00	X	2.00	2	4.25	2.19	4.25	2.08	.195	.10	.50
4.00	X	3.00	3	4.25	3.14	4.25	3.06	.195	.10	.50
4.00	X	4.00	3	4.25	4.46	4.25	4.39	.195	.10	.50
4.00	X	5.00	3	4.25	5.15	4.25	5.06	.195	.10	.50

Dimensions shown are for reference only. Contact T&B for specific dimensional needs.

Wiring Duct Technical Information

Ty-Duct® Wiring Duct meets all of the prominent agency approvals and standards.

Agency Approvals

Thomas & Betts Ty-Duct® wiring duct is UL® recognized for all requirements set forth in UL standard 1565 "Positioning Device."

Ty-Duct® wiring duct meets all applicable requirements of the Canadian Standard Association as described in CSA C22.2 No. 18.5.

All Ty-Duct® wiring duct components comply with the European Directives for CE (Conformite European) Marking.

All materials used in the making of the Ty-Duct® wiring duct comply with the European Directives 2002/95/EC (RoHS), 2002/96/EC (WEEE), and 2003/11/EC.

Standards

NFPA-79-2011

Thomas & Betts Ty-Duct® wiring duct is compliant with the National Fire Protection Agency NFPA-79-2011. All materials used in the manufacturing of the Ty-Duct® components are selected from flame-retardant material and comply with IEC 60332-1. The testing is required in order to comply with NFPA-79-2011, Section 13.3.1.

UL 508/UL 508A

As required in UL508/UL508A a factory-installed conductor shall be separated from a conductor used in a different circuit when the conductors are not insulated for the maximum voltage of either circuit. The Ty-Duct® wiring duct with a divider wall creates the required separation to meet this requirement.

DIN 43 659

This European standard specifies dimensions for slotted trunkings installed in electrical switchgear assemblies. The standard defines the following dimensions:

- The mounting hole pattern
- The mounting hole slot dimensions
- The mounting hole pitch and location
- The minimum overall product length

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Carlon® Wiring Trough and Accessories

No wires to pull, no hard-to-work-with metal components.

Carlon® Wire Safe® Wireway and Wiring Trough

Carlon® leads the way with the world's broadest line of non-metallic wiring management products designed for easier installation, greater performance and lower installed cost. That includes our Carlon® Wire Safe® wireway, wiring trough and fittings. It's the perfect solution for containing electrical, electronic and communication wire and cable. That's because it's easy to install, provides durable protection and eliminates the need to pull conductors, too. Just compare it point for point against the competition and you'll see why it's the bestalternative for you.

Easy to Cut and Assemble.

Wireway and trough can be cut easily and cleanly with either a hacksaw or fine-tooth saw to make field fabrication a snap. And it's equally easy to couple components with either Carlon® primer and PVC cement or non-metallic push rivets.

Rugged Yet Lightweight.

UV-stabilized, high-impact resistant PVC provides a strong, durable, non-corrosive, non-conductive housing for wire and cable. At the same time, components are so light and easy to handle that installation can be done by one person.

Application Flexibility.

Wireway and trough are suitable for a wide range of applications, from the most demanding commercial and industrial uses, including food service companies and chemical plants, to communication and computer facilities. Both wireway and trough can be used on walls, ceilings or across supports.

A Complete Non-Metallic System.

Both wireway and trough are available in 2" x 2", 3" x 3", 4" x 4" and 6" x 6" dimensions. Wireway comes cut in easy-to-use 10' lengths for larger jobs, and for tighter spaces, we offer specific lengths of wiring trough to fit distances of 1' to 10'. Both can be used with our non-metallic enclosures, conduit and fittings to create a total non-metallic wire and cable management system far superior to metal counterparts.

No Wires to Pull.

Once your wireway or trough is installed, just lay your wire and cable in, pop the cover on and you're done. It's as easy as that, and that's a lot easier than pulling wire or cable.

Easy to Rewire.

Clip-on cover design enables easy access for adding or removing wire and cable after initial installation.

Improved NEMA 12 Wireway End Caps.

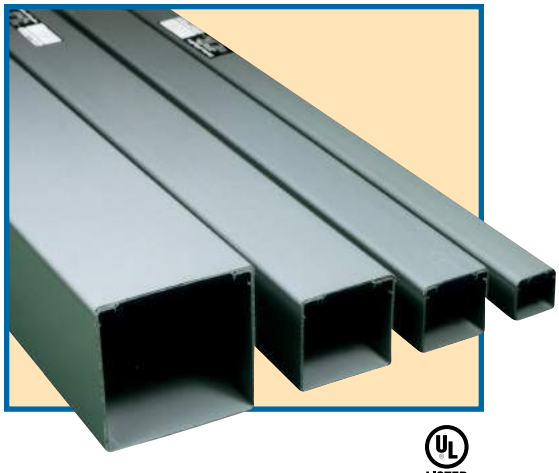
Our new wireway end caps are now made with pre-installed adhesive-backed gaskets. This new design makes them easier to use and also qualifies them for a NEMA 12 rating.

Carlon® Wiring Trough and Accessories

Wire Safe® Wireway

CAT. NO.	OUTSIDE NOMINAL DIMENSIONS (IN.)	LENGTH (FT.)	STD. CTN.	STD. WT. (LBS.) PER 10'
17011	2 x 2	10	1	4.7
17013	3 x 3	10	1	11.2
17015	4 x 4	10	1	11.2
17017	6 x 6	10	1	21.4

Note: *Endcaps are not supplied with this series.*

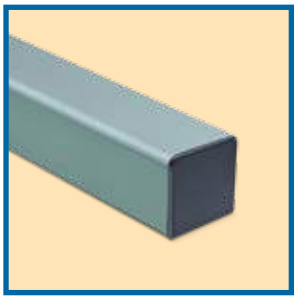


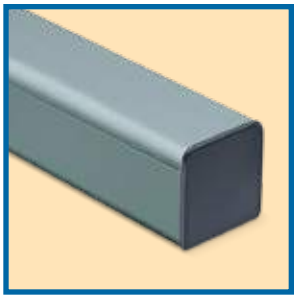
UL LISTED
E151021

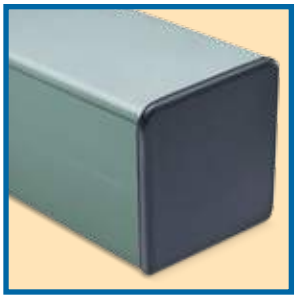
Wire Safe® Wiring Trough

CAT. NO.	OUTSIDE NOMINAL DIMENSIONS (IN.)	STD. CTN.	STD. WT. (LBS.)
12" Trough			
18111	2 x 2	1	.6
18113	3 x 3	1	1.0
18115	4 x 4	1	1.4
18117	6 x 6	1	3.1
24" Trough			
18211	2 x 2	1	1.1
18213	3 x 3	1	1.8
18215	4 x 4	1	2.6
18217	6 x 6	1	5.3
36" Trough			
18311	2 x 2	1	1.5
18313	3 x 3	1	2.6
18315	4 x 4	1	3.7
18317	6 x 6	1	7.4
48" Trough			
18411	2 x 2	1	2.0
18413	3 x 3	1	3.3
18415	4 x 4	1	4.8
18417	6 x 6	1	9.6
60" Trough			
18511	2 x 2	1	2.5
18513	3 x 3	1	4.1
18515	4 x 4	1	5.9
18517	6 x 6	1	11.7
72" Trough			
18611	2 x 2	1	2.9
18613	3 x 3	1	4.9
18615	4 x 4	1	7.1
18617	6 x 6	1	13.8
120" Trough			
18011	2 x 2	1	4.8
18013	3 x 3	1	8.1
18015	4 x 4	1	11.6
18017	6 x 6	1	22.4

All wiring trough is made to order and is supplied with a pair of end caps.







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Carlon® Wiring Trough and Accessories

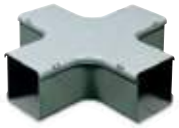
Except where noted by ▶

UL LISTED E151021

Wire Safe® Fittings

Flat Cross (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGFCJ *	2 x 2	1	.5
EGFCL *	3 x 3	1	1.3
EGFCN †	4 x 4	1	1.7
EGFCR †	6 x 6	1	4.8



90° Bend Flat Cover (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGLFJ *	2 x 2	1	.3
EGLFL *	3 x 3	1	.6
EGLFN †	4 x 4	1	1.1
EGLFR †	6 x 6	1	3.3

90° Bend External Cover (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGLEJ *	2 x 2	1	.3
EGLEL †	3 x 3	1	.8
EGLEN †	4 x 4	1	1.2
EGLER †	6 x 6	1	3.3

Flange

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGFJ ▶	2 x 2	10	1.1
EGFL ▶	3 x 3	10	1.4
EGFN ▶	4 x 4	10	2.2
EGFR ▶	6 x 6	10	3.0

End Cap (UL NEMA 12 Rated)

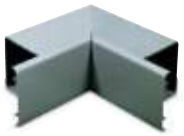
CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGSEJ *	2 x 2	10 Pair	.6
EGSEL *	3 x 3	10 Pair	.9
EGSEN *	4 x 4	10 Pair	1.6
EGSER ††	6 x 6	10 Pair	5.0

External Coupling

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGCEJ	2 x 2	10	1.3
EGCEL	3 x 3	10	2.2
EGCEN	4 x 4	10	2.5
EGCER	6 x 6	10	7.8

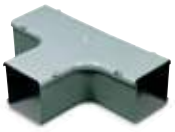
90° Bend Internal Cover (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGLIJ *	2 x 2	1	.3
EGLIL †	3 x 3	1	.7
EGLIN †	4 x 4	1	1.1
EGLIR †	6 x 6	1	3.0



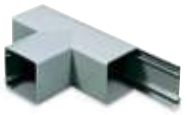
Tee Flat Cover (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGTFJ *	2 x 2	1	.4
EGTFL *	3 x 3	1	.9
EGTFN †	4 x 4	1	1.4
EGTFR †	6 x 6	1	3.8



Tee External Cover (Clip-On Cover)

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGTEJ †	2 x 2	1	.4
EGTEL †	3 x 3	1	.9
EGTEN †	4 x 4	1	1.4
EGTER †	6 x 6	1	3.8



Internal Coupling

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGCIJ ▶	2 x 2	10	1.3
EGCIL ▶	3 x 3	10	2.2
EGCIN ▶	4 x 4	10	2.5
—	6 x 6	N/A	N/A

Push Rivets

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGPR ▶	N/A	200	.4

Hangers

CAT. NO.	SIZE (IN.)	STD. CTN.	STD. WT. (LBS.)
EGSBJ ▶	2 x 2	10	.9
EGSBL ▶	3 x 3	10	1.3
EGSBN ▶	4 x 4	10	1.9
EGSBR ▶	6 x 6	10	2.8

** Molded fitting — couplings not needed*

† Fabricated fitting — order couplings separately

†† No coupling is required for 6" fabricated end cap

Wiring Trough Technical Information

Installation Instructions

Description.

Carlon® Wire Safe® Wireway and Wiring Trough is manufactured from extruded PVC. The standard color is gray. The wireway consists of a base channel that is formed to receive a clip-on cover. Wiring troughs include a pair of ready-to-install end caps.

Cover Installation and Removal.

The cover can be installed by exerting hand pressure along its front face in such a manner as to engage and clip projections on the side walls of the base channel. The cover can be removed by inserting a tool (i.e., a screwdriver shaft) into one end of the wireway enclosure and exerting pressure against the underside of the cover, which is then "peeled off" from the base.

Wireway Fittings.

Fittings enable the wireway to be positioned around corners and enable tees and crosses to be created without detracting from the protective characteristics. Interconnecting pieces can be assembled using couplings and rivets or cement as necessary.

Molded fittings do not require couplings because they fit on the exterior of the wireway. However, primer and solvent cement are needed. See cementing instructions on the following page.

Fabricated fittings do require internal or external couplings, and these must be ordered separately. To install fittings, a 9/32"-diameter hole should be drilled in the wireway to match the external coupling hole. A push rivet should be used to connect the two pieces. To connect an internal coupling to the inside of a fitting, use Carlon® Quick-Set Clear Cement.

Applications.

These systems are designed for use in commercial and industrial areas. They may be used for the containment of electrical wiring/cables for power and lighting circuits and also communication and computer facilities. They are suitable for mounting on the surface of walls or ceilings or suspended across suitably positioned supports. Ambient temperatures should not exceed 122° F.

Installation.

1. Mark the surface upon which the wireway is to be mounted.
2. Measure the run and identify position of fittings.
3. Remove cover from wireway, starting at one end, with a peeling action (use of a screwdriver or similar lever is recommended).
4. Drill mounting holes through base at 36" centers maximum. To evenly distribute the load, drill two rows of mounting holes adjacent to each wall of the wireway.
5. The holes in the wireway should be drilled oversize to enable expansion. Mount washers under the head of the mounting device. Do not fully tighten the mounting head.
6. Mount the wireway using screws or bolts.
7. Affix the wireway cover by aligning it to the wireway base. Starting at one end, press the cover into its engaged position.
8. Overlap the cover to the base joint to improve rigidity of the joint.

Engineering Specifications

Code Approvals.

Carlon® Wire Safe® Wireway and Wiring Trough is recognized by the current National Electrical Code®, Article 378, for non-metallic wireways. It is UL Listed for electrical wiring up to 600 volts. UL File Numbers: UL E151021.

Specification for Carlon® Wire Safe Wireway and Wiring Trough.

- The wireway and wiring troughs shall be Carlon® Wire Safe Wireway and Wiring Trough.
- The Carlon® Wire Safe Wireway and Wiring Trough shall provide protection for electrical, low-voltage, data and communication wiring or cables.
- The Carlon® Wire Safe Wireway and Wiring Trough shall be listed and installed per the NEC® Article 378 for non-metallic wireways.
- The Carlon® Wire Safe Wireway and Wiring Trough shall be manufactured from gray precision-extruded Polyvinyl Chloride (PVC) meeting UL 94 V-0 requirements and shall be suitable for field painting.
- The Carlon® Wire Safe Wireway and Wiring Trough shall include base, cover, fittings, etc.
- The Carlon® Wire Safe Wireway and Wiring Trough shall provide all fittings required to form a complete, integrated surface raceway system. End caps shall be gasketed and shall have a NEMA Type 12 rating.
- The Carlon® Wire Safe Wireway and Wiring Trough shall provide raceway with the following cross sectional areas:
  1. 2 x 2 — 3.165 in.^{2} (20.4 cm^2)
  2. 3 x 3 — 7.378 in.^{2} (47 cm^2)
  3. 4 x 4 — 13.694 in.^{2} (88 cm^2)
  4. 6 x 6 — 31.871 in.^{2} (205 cm^2)

Fittings.

Internal and external elbow shall be a fitting cover that snaps onto the main base. Flat elbows and flat tees shall be a fitting cover that snaps on to the main base. End caps shall be gasketed and NEMA Type 12 rated.

Installation.

Install in accordance with the manufacturer's instructions, NFPA 70 and NEC® standard. Install base, cover, fittings, accessories, etc., as necessary for a complete system.

NEC and National Electrical Code are registered trademarks of the National Fire Protection Association, Inc.

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Wiring Trough Technical Information

Cementing Instructions

1. Make a square cut using a miter box or precisely marked line on the wireway to provide a smooth connection.
2. Make certain surfaces to be bonded are free of dirt, dust, etc., by wiping them clean with a rag and by removing sawcut burrs with a knife or rasp.
3. With a dauber, place a coating of Carlon® Clear Primer on the wireway and its mating parts. Thoroughly coat the surfaces to be mated.
4. Allow the Carlon® Clear Primer a few seconds to soften the PVC surface (the time may need to be adjusted depending upon the temperature).
5. Apply a complete coating of Carlon® Quick-Set Clear Cement to matching ends that will be joined.
6. Hold the parts in position by exerting pressure on the surfaces with clamps.
7. Allow 15 minutes or more before removing clamps.

Clear Primer

CAT. NO.	STANDARD SIZE	STD. CTN.	STD. WT. (LBS.)
VC9903	Pint, Dauber Top	24	27.0
VC9902	Quart, Dauber Top	12	25.0

Cement and primer not needed for end caps.

All-Weather Quick-Set Clear Cement

CAT. NO.	STANDARD SIZE	STD. CTN.	STD. WT. (LBS.)
VC9984	Half-Pint, Dauber Top	10	7.0
VC9983	Pint, Dauber Top	24	30.0
VC9982	Quart, Dauber Top	12	29.0
VC9981P	Gallon, Pour Top	6	54.0

Expansion And Contraction

Wireway will expand or contract with variations in temperature. To compensate for this expansion and contraction, during installation leave a .25" gap at joint, glue only one side of internal coupling or use external coupling with push rivets. All mounting holes should be drilled oversize and fasteners should not be tightened fully to allow for expansion and contraction.

Materials

PVC Homopolymer (ASTM F1784)	minimum cell class 12354B
Specific Gravity (ASTM D792)	1.46
Thermal Conductivity (ASTM C177)	1.3 BTU/hr./ft.^{2}/°F/in.
Heat-Deflection Temperature	
@ 264 psi (ASTM D648)	70° C
Tensile Strength (ASTM D638)	6000 psi
Flammability (UL 94)	V-0

Physical Properties

SIZE (IN.)	CRUSH STRENGTH[1] (LBS.)	IMPACT STRENGTH[2] (FT.-LBS.)
2 x 2	650	40
3 x 3	500	30
4 x 4	500	40
6 x 6	600	50

1 — Load on 6" long sample just prior to wall buckling; fully recoverable.
2 — 5-lb. weight with 1¼" dia. face at 73° F.

Dimensions

OUTSIDE NOMINAL SIZE (IN.)	OUTSIDE ACTUAL SIZE (IN.)	INSIDE HEIGHT (IN.)	INSIDE WIDTH (IN.)	INSIDE AREA (IN.^{2})	WIREWAY THICKNESS (IN.)	COVER THICKNESS (IN.)	WT./FT. (LB./FT.)
2 x 2	1.97 x 1.97	1.8	1.79	3.31	.09	.08	.6
3 x 3	2.96 x 2.96	2.8	2.76	7.94	.10	.08	.85
4 x 4	3.94 x 3.94	3.75	3.72	14.39	.11	.08	1.48
6 x 6	5.91 x 5.91	5.67	5.67	13.48	.12	.12	2.29

All information represents typical values and does not represent a minimum performance specification.

Wiring Trough Technical Information

Wire Fill Chart

CONDUCTOR SIZE AWG/KCMIL	AREA OF CONDUCTOR (SQ. IN.) A RFH-2, RH, RHH, RHW***, SF-2***	B TF, THW, TW†	C TFN, THHN, THWN	D XHHW, ZW††	WIRE SAFE® WIREWAY SIZE AND MAXIMUM NUMBER OF CONDUCTORS ALLOWED (AREAS SHOWN ARE 20% OF THE FULL INTERIOR CROSS SECTIONAL AREA OF THE WIREWAY) 2 x 2 (.6 IN.²) A	B	C	D	3 x 3 (1.5 IN.²) A	B	C	D	4 x 4 (2.7 IN.²) A	B	C	D	6 x 6 (6.4 IN.²) A	B	C	D
#18 AWG	.0167	.0088	.0062	—	36	68	96	—	89	170	241	—	161	306	435	—	383	727	1032	—
#6 AWG	.0196	.0109	.0079	—	31	55	76	—	76	137	189	—	137	247	341	—	326	587	810	—
#14 AWG	.0230	.0135	.0087	—	26	44	69	—	65	111	172	—	117	200	310	—	278	474	735	—
#14 AWG	.0327*	—	—	—	18	—	—	—	45	—	—	—	82	—	—	—	195	—	—	—
#14 AWG	—	.0206†	—	.0131	—	29	—	46	—	72	—	114	—	131	—	206	—	310	—	488
#12 AWG	.0278	.0172	.0117	—	21	35	51	—	53	87	128	—	97	156	230	—	230	372	547	—
#12 AWG	.0384*	—	—	—	16	—	—	—	39	—	—	—	70	—	—	—	166	—	—	—
#12 AWG	—	.0252†	—	.0167	—	24	—	36	—	59	—	89	—	107	—	161	—	253	—	383
#10 AWG	.0460	.0222	.0184	—	13	27	33	—	32	67	81	—	58	121	146	—	139	288	347	—
#10 AWG	—	.0311	—	.0216	—	19	—	28	—	48	—	69	—	86	—	125	—	205	—	296
#8 AWG	.0845	.0471	.0373	—	7	13	16	—	17	31	40	—	31	57	72	—	75	135	171	—
#8 AWG	—	.0598†	—	.0456	—	10	—	13	—	25	—	32	—	45	—	59	—	107	—	140
#6 AWG	.1238	.0819	.0519	.0625	4	7	11	10	12	18	28	24	21	32	52	43	51	78	123	102
#4 AWG	.1605	.1087	.0845	.0845	4	6	7	7	9	13	17	17	16	24	31	31	39	58	75	75
#3 AWG	.1817	.1263	.0995	.0995	3	5	6	6	8	11	15	15	14	21	27	27	35	50	64	64
#2 AWG	.2067	.1473	.1182	.1182	3	4	5	5	7	10	12	12	13	18	22	22	30	43	54	54
#1 AWG	.2715	.2027	.1590	.1590	2	3	4	4	5	7	9	9	9	13	16	16	23	31	40	40
1/0 AWG	.3107	.2367	.1893	.1893	2	2	3	3	4	6	7	7	8	11	14	14	20	27	33	33
2/0 AWG	.3578	.2781	.2265	.2265	1	2	2	2	4	5	6	6	7	9	11	11	17	23	28	28
3/0 AWG	.4151	.3288	.2715	.2715	1	1	2	2	3	4	5	5	6	8	9	9	15	19	23	23
4/0 AWG	.4840	.3904	.3278	.3278	1	1	1	1	3	4	4	4	5	6	8	8	13	16	19	19
250 kcmil	.5917	.4877	.4026	.4026	1	1	1	1	2	3	3	3	4	5	6	6	10	13	15	15
300 kcmil	.6837	.5581	.4669	.4669	—	1	1	1	2	2	3	3	3	4	5	5	9	11	13	13
350 kcmil	.7620	.6291	.5307	.5307	—	—	1	1	1	2	2	2	3	4	5	5	8	10	12	12
400 kcmil	.8365	.6969	.5931	.5931	—	—	1	1	1	2	2	2	3	3	4	4	7	9	10	10
500 kcmil	.9834	.8316	.7163	.7163	—	—	—	—	1	1	2	2	2	3	3	3	6	7	8	8
600 kcmil	1.1940	1.0261	.8791	.9043	—	—	—	—	1	1	1	1	2	2	3	3	5	6	7	7
700 kcmil	1.3355	1.1575	1.0011	1.0297	—	—	—	—	1	1	1	1	2	2	2	2	4	5	6	6
750 kcmil	1.4082	1.2252	1.0623	1.0936	—	—	—	—	1	1	1	1	1	2	2	2	4	5	6	5
800 kcmil	1.4784	1.2908	1.1234	1.1499	—	—	—	—	1	1	1	1	1	2	2	2	4	4	5	5
900 kcmil	1.6173	1.4208	1.2449	1.2668	—	—	—	—	—	1	1	1	1	1	2	2	3	4	5	5
1000 kcmil	1.7530	1.5482	1.3623	1.3893	—	—	—	—	—	—	1	1	1	1	1	1	3	4	4	4
1250 kcmil	2.2062	1.9532	—	1.7671	—	—	—	—	—	—	—	—	1	1	—	1	2	3	—	3
1500 kcmil	2.5475	2.2751	—	2.0612	—	—	—	—	—	—	—	—	1	1	—	1	2	2	—	3
1750 kcmil	2.8832	2.5930	—	2.3779	—	—	—	—	—	—	—	—	—	1	—	1	2	2	—	2
2000 kcmil	3.2079	2.9013	—	2.6590	—	—	—	—	—	—	—	—	—	—	—	1	1	2	—	2

* *Dimensions of RHH and RHW.*

*** *Dimensions of RHH and RHW without outer covering are the same as THW No. 18 through No. 10, solid as well as No. 8 and larger, stranded.*

† *Dimensions of THW in sizes No. 14 through No. 8. No. 6 THW and larger are same dimension as TW.*

†† *No. 14 through No. 2.*

Notes:

1) The ampacities of the conductors shall be reduced as shown in the table ***below.***

2) Refer to the National Electrical Code® for ambient temperature correction factors.

NUMBER OF CONDUCTORS	COLUMN A — PERCENT OF VALUES IN TABLES AS ADJUSTED FOR AMBIENT TEMPERATURE IF NECESSARY	NUMBER OF CONDUCTORS	COLUMN B** — PERCENT OF VALUES IN TABLES AS ADJUSTED FOR AMBIENT TEMPERATURE IF NECESSARY
4 through 6	80	4 through 6	80
7 through 9	70	7 through 9	70
10 through 24*	70	10 through 20	50
25 through 42*	60	21 through 30	45
43 and above*	50	31 through 40	40
—	—	41 through 60	35

** These factors include the effects of a load diversity of 50 percent.* *** No diversity.*

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OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

SECTION 3: ELECTRICAL COMPONENTS

OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL
OHL ELECTRICAL SYSTEM

SECTION 3: ELECTRICAL COMPONENTS
SUBSECTION 3.1: TRANSFORMER

Hammond Power Solutions Inc.

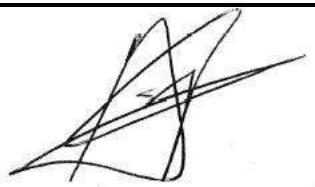
TRANSFORMER PRODUCTION TEST REPORT

This is to certify that this transformer has been tested to IEEE STD. C57.12.91 by Hammond Power Solutions.

DATE: July 9, 2021
CATALOG #:
JOB #: USSO-0337480
PO #: 8068-RL-992830S
CUSTOMER: STUSSER ELECTRIC SUPPLY (CED)
PART No.: XN2A0030KBKF6H
SERIAL #: CB01034392

TRANSFORMER PRODUCTION TEST REPORT		
TEST	**DESCRIPTION**	**RESULT**
APPLIED POTENTIAL DIELECTRIC VOLTAGE TEST (HIPOT TEST)	Primary Winding to Ground - 4000 VAC @ 60 Hz for 1 minute	**PASS**
	Secondary Winding to Ground - 4000 VAC @ 60 Hz for 1 minute	**PASS**
	Primary to Secondary Winding - 4000 VAC @ 60 Hz for 1 minute	**PASS**
INDUCED POTENTIAL DIELECTRIC VOLTAGE TEST (INDUCE TEST)	2 times rated voltage for 7200 cycles	**PASS**
NO LOAD LOSS TEST	Wattmeter Method	**PASS**
EXCITATION CURRENT TEST	Ammeter Method	**PASS**
RATIO TEST	Voltmeter Method	**PASS**
POLARITY TEST	Vector / Voltmeter Method	**PASS**
TERMINATIONS	All terminals are correct size and fully tightened	**PASS**
IDENTIFICATION	All Labels and Nameplate are complete and in correct location.	**PASS**
DIMENSIONS	All Dimensions are correct	**PASS**

TEST DEPARTMENT SUPERVISOR: *Eduardo Gomez C.*



XFMR 42TX6

HPS Titan™ Series

Encapsulated Transformers for Hazardous Locations

power to perform

Hammond Power Solutions

HPS Titan N encapsulated transformers offer an innovative design with technological improvements for industrial and hazardous applications.

The transformer core and coil is completely encapsulated in epoxy and silica, providing excellent protection from airborne contaminants and prevents the ingress of moisture.

HPS Titan N three phase design has a removable hinged door and factory installed grounding lugs, reducing installation time and money.

APPLICATIONS

Petrochemical

Marine

Industrial

Oil & Gas

Mining

Wastewater

APPROVALS

- ANSI/ISA 12.12.10 - File No. E258346 (Class 1, Division 2, Groups A, B, C, D and Class 1, Zone 2, Group IIC, T3 Hazardous Locations) - T3C/T3A Temperature Classification
- UL 5085-1 and UL5085-2 Listed - File No. E258346
- ABS Type Approval (Marine Duty Service and Offshore Applications)

c UL us LISTED

ABS TYPE APPROVAL PROGRAM

*For three phase units only

FEATURES & BENEFITS

Single Phase

- Copper winding
- Electrostatic shield
- Standard wall mounting with keyhole mounting slots
- Front accessible hinged door
- Standard Type 3R enclosure suitable for indoor or outdoor applications

Three Phase

- Higher impedance designs lower inrush and short circuit currents, allowing the use of less costly protective devices
- Completely encapsulated in epoxy and silica to prevent the ingress of moisture
- Standard 10kV BIL rating provides increased reliability and protection against critical equipment failure (including voltage spikes and other line transients)
- Copper winding
- Electrostatic shield
- Improved efficiency level that reduces energy costs
- Standard Type 4 enclosure suitable for indoor or outdoor applications
- Removable hinged door allows for easy access to terminations
- Standard integral floor and wall mounting brackets on select kVA's for faster installation
- Optional breather drains ensure that any moisture build-up due to condensation is easily eliminated without compromising Type 4/12 enclosure integrity

Temperature Code*:

- Class 1, Zone 2, Group IIC, T3
- T3A (115°C rise units) at 40°C ambient
- T3C (80°C & 95°C rise units) at 40°C ambient
- **HPS Titan N 80°C and 95°C rise units are suitable for 50°C ambient**
  80°C rise at 50°C ambient maintains T3C performance
  95°C rise at 50°C ambient maintains T3A performance
  (95°C rise unit only available in three phase)

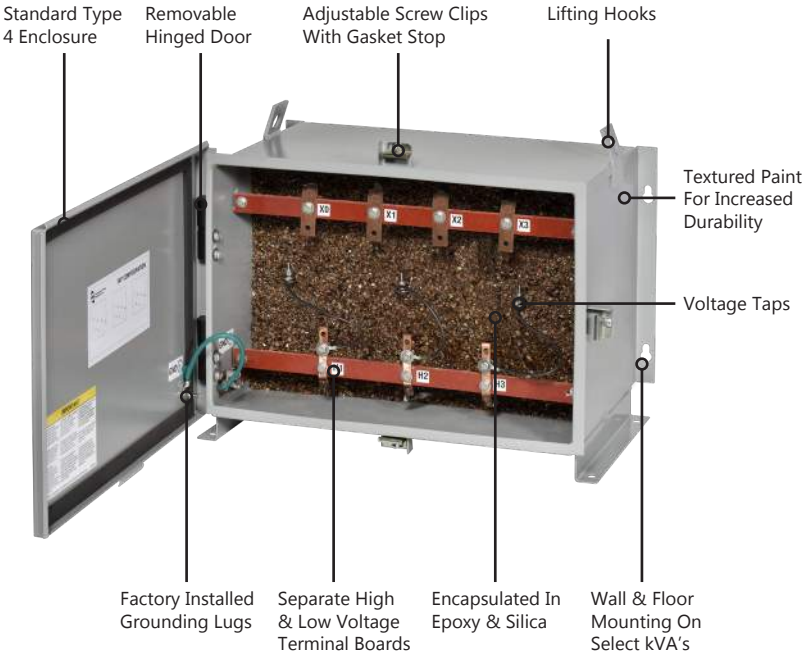
Installation made fast & easy!

The improved three phase enclosure design allows for quick and easy installation. By simply loosening the screw clips on the side of the enclosure, installers are able to access the terminations. The removable hinged door and front accessible terminations allow for easier cable installation in confined spaces.

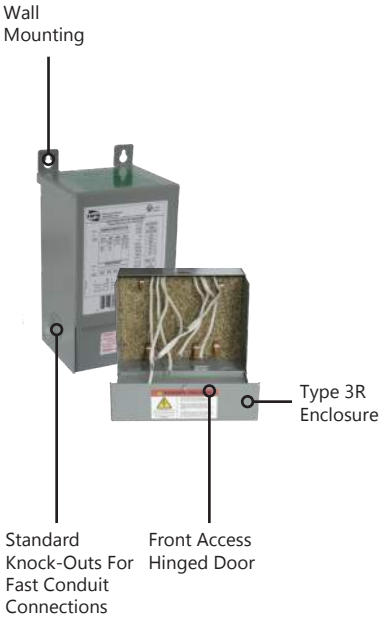
Testing

All HPS transformers are tested at HPS prior to shipment. They must meet very stringent quality criteria prior to release.

Three Phase



Single Phase



Easy access to ground*

Removable hinged door*

Quick access to terminations*

*On three phase units

Specifications & Accessories

Single Phase

STANDARD SPECIFICATIONS

kVA:	Up to 37.5kVA
UL Listed:	File: E258346
Frequency:	60 Hz (50/60Hz options available)
Insulation System:	130°C (80°C rise) up to 1 kVA 180°C (115°C rise) 1.5 to 37.5 kVA optional 180°C (80°C rise) 1.5 to 37.5 kVA
Enclosure Type:	Heavy duty enclosed Type 3R standard [optional Type 4, 12, 4X]
Enclosure Finish:	ANSI 61 Grey
Standard Primary Taps:	Refer to wiring diagrams for details
Termination:	Front accessible separated high and low voltage lead wires or copper tabs
Conduit Entry:	Rear or side entry
Impedance:	Typically 1% to 7%
Mounting:	Standard wall mounting with keyhole mounting slots. Lifting provisions standard from 5 kVA to 37.5 kVA.
Seismic:	Seismically qualified according to the International Building Code (IBC) 2018, and the American Society of Civil Engineers ASCE 7-10 specifications, with the following design parameters: Spectral acceleration: $S_{DS} \leq 2.0$ g Importance factor: $I_p = 1.5$ Attachment/height ratio: z/h =1.0" O.S.H.P.D. California Certified
Sound Level:	Meets NEMA ST-20 standards (optional low noise units available)
Warranty:	10 years

Data subject to change without notice.

Three Phase

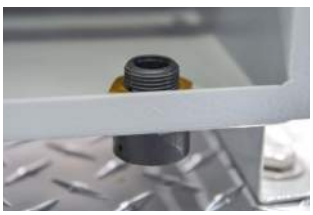
STANDARD SPECIFICATIONS

kVA:	Up to 150kVA
UL Listed:	File: E258346
Frequency:	60 Hz (50/60 Hz available)
Insulation System:	80°C rise (130°C class) - 2 & 3 kVA only 115°C rise (180°C class) optional 80°C & 95°C (180°C class)
BIL Rating:	10 kV
Enclosure Type:	Heavy duty enclosed Type 4 standard (also meets Type 12) [optional Type 4X]
Enclosure Finish:	ANSI 61 Grey, UL50 textured powder coating or stainless steel
Neutral:	Neutral terminal for field connection (on applicable units)
Standard Primary Taps:	Refer to wiring diagrams for details

Termination:	Front accessible separate high and low voltage terminals on select units
Conduit Entry:	Side or bottom enclosure entry (exceptions apply on bottom entry)
Impedance:	Typically 1.8% to 6.5%
Mounting:	Floor or wall/ceiling mounting available Refer to selection tables for details
Seismic:	Seismically qualified according to the International Building Code (IBC) 2018, and the American Society of Civil Engineers ASCE 7-10 specifications, with the following design parameters: Spectral acceleration: $S_{DS} \leq 2.0$ g Importance factor: $I_p = 1.5$ Attachment/height ratio: z/h =1.0" O.S.H.P.D. California Certified
Sound Level:	Meets NEMA ST-20 standards (optional low noise units available)
Warranty:	10 years

Optional Accessories:

- Breather drain for Type 4 and 4X enclosures (Breather drain is recommended for environments when condensation may be present)
  Part number: PLG19000



Data subject to change without notice.

Part Numbering Guide

HPS Titan Single Phase Part Number Guide

	Family	kVA			Primary Voltage	Secondary Voltage	Winding Material/ Electrostatic Shield	Temp. Rise & Insul. Class	Enclosure
Example	Q	0	0	5	L	E	K	B	3

Family:
Q - Titan 1PH

kVA Rating:

0.5 kVA	- C50
0.75 kVA	- C75
1.5 kVA	- 1C5
2 kVA	- 002
3 kVA	- 003
5 kVA	- 005
7.5 kVA	- 007
10 kVA	- 010
15 kVA	- 015
25 kVA	- 025
37.5 kVA	- 037
50 kVA	- 050

Primary Voltage:
1PH
L - 240x480
J - 347/380
P - 600
Y - 208/240/277
X - Export

Secondary Voltage:
1PH
E - 120/240

Winding Material:
C - Copper - 500VA
K - CU + Shield - above 500VA

Temperature Rise & Insulation Class
B - 80°C[1, 3]
F - 115°C[2]

Enclosure:
3 - Type 3R*
4 - Type 4
6 - Type 4X (304SS)
7 - Type 4X (316SS)
5 - Type 12

*Default options - ignore if all following characters are default values.
[1] 80°C rise is standard on units up to and including 1kVA (130°C insulation class, T3C temperature code)
[2] 115°C rise is standard on units 1.5kVA and above (180°C insulation class, T3C temperature code)
[3] 80°C rise is optional on units 1.5kVA and above (180°C insulation class, T3C temperature code)

HPS Titan N Three Phase Part Number Guide

	Family	Appl. Type	Generation	Phase	kVA				Primary Voltage	Secondary Voltage	Winding Material/ Electrostatic Shield	Temp. Rise & Insul. Class	Frequency	Enclosure
Example	T	N	2	A	0	0	4	5	K	B	K	B	6	F

Family:
T - Titan

Type:
N - Hazardous Location
(North America Classification)

Generation:
2 - Current

Phase (Pri-Sec):
A - 3PH Delta-Wye-N
B - 3PH Wye-N-Delta
C - 3PH Delta-Delta/CT
D - 3PH Delta-Delta

kVA Rating:

2 kVA	- 0002
3 kVA	- 0003
6 kVA	- 0006
9 kVA	- 0009
15 kVA	- 0015
30 kVA	- 0030
45 kVA	- 0045
75 kVA	- 0075
112.5 kVA	- 0112
150 kVA	- 0150

Primary Voltage:
3PH
K - 480D
P - 600D, 600Y
Q - 600D, 480D
H - 400D[1]
G - 380D[1]

Secondary Voltage:
3PH
B - 208Y/120
C - 230Y/133
D - 240D, 240Y/139, or 240D/120CT
G - 380Y/220
H - 400Y/231
K - 480Y/277
P - 600Y/347

Winding Material:
K - CU + Shield

Temperature Rise & Insulation Class**
A - 80°C Rise (130°C Class)
B - 80°C Rise (180°C Class)
C - 95°C Rise (180°C Class)
F - 115°C Rise (180°C Class)

Frequency:
5 - 50/60Hz
6 - 60Hz*

Enclosure:
F - Type 4*[2]
G - Type 4X (304SS)
H - Type 4X (316SS)

[1]Units with primary voltage code "G" & "H" come standard as 50/60Hz and are CE marked. All others are 60Hz only.
*Default options are not listed if chosen
**2 & 3 kVA are 130°C Class
[2]Type 4 enclosure is also Type 12.

Data subject to change without notice.

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Baraboo, WI 53913
United States
(608) 356-3921

Quotation

Hammond Power Solutions, Inc.

Quote ID EQDJH000043-1

HPS Reference Russ LaVigne

Line	Label	Qty	UOM	Part Number / Description	Unit	Extended
2		1.0000	EA	Transformer		

TN2A0030KBKF6H: 3ph 30kVA 480V-208Y/120V 60Hz CU

Product Line: Hazardous Location (Titan N)
Duty: General Duty (Suitable For Some Hazardous Locations and Marine ABS Duty)
Phase: 3
Rating: 30kVA
Primary Connection: Delta
Primary Voltage: 480D
Primary BIL: 10kV
Primary FCAN (NPL): 2x2.5%
Primary FCBN (NPL): 4x2.5%
Secondary Connection: Wye-N
Secondary Voltage: 208Y/120
Secondary BIL: 10kV
Material: Copper
Frequency: 60Hz
Vector Configuration: Dyn1 (-30°)
Temperature Rise: 115°C
Insulation Class: 180°C
Efficiency Regulation: No Efficiency Specification
Sound Level: 50dBA (NEMA ST-20)
Impedance (Std): 1.9% - 6.5%
Approval: cULus (Class 1, Division 2, Groups A,B,C,D and Class I, Zone 2, Group IIC, T3 Hazardous Location), ABS
Shield: Single
Seismic Compliance: OSHPD, IBC 2018 (Sds=2.0, z/h=1, Ip=1.5)
Nameplate: HPS Standard
Primary Termination (NPL): Mounting Pads
Secondary Termination (NPL): Mounting Pads
Enclosure Type*: Type 4X / IP66
Enclosure Finish: Stainless Steel 316 Polished
Enclosure PN (NPL): DQT5-N4X
Enclosure Dimensions (H/W/D): 21.88in(H), 25.88in(W), 16.5in(D)
Net Weight: 470 lb

Lead Time: Typically Stocked*
*Note: Inventory availability information is valid only at the time of Quotation.
Inventory cannot be reserved until an order has been received & processed by HPS

Freight: Freight allowed $750

Engineering Drawing (PDF): TN2A0030KBKF6H
Product Configuration (EQv2-Lite): TN2A0030KBKF6H

Hammond Power Solutions Inc.

NO.	DATE	BY	REVISION
1	20/03/17	PP	SEISMIC UPDATE

TITLE: 3PH DISTRIBUTION TRANSFORMER
NAMEPLATE INFORMATION

SCALE: NTS | DATE: 19/01/09 | DES.: PPICASSI

SHEET 1 OF 2

EDB TN2A0030KBKF6H

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HPS Titan® N

Dry Type Encapsulated Transformer
Transformateur de Type Sec Encapsulé

Hammond Power Solutions
Guelph, ONT Baraboo, WI
Compton, CA Monterrey, MX

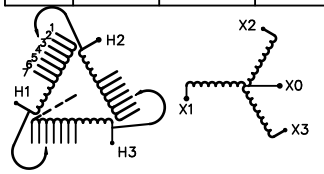
Part No. TN2A0030KBKF6H

c UL us LISTED
31GW E258346
GENERAL PURPOSE TRANSFORMER FOR USE IN HAZARDOUS LOCATIONS

ABS PDA CERTIFICATE 19-HS1854283-PDA

Cust. Ref. / Ref. du Client		Serial No. / No. de Serie	
Phase	3	HV/HT	480V
Type	HZQT	BIL	10 kV
Cooling / Refroidissement	ANC	Term / Bornes	H1 H2 H3
kVA	30	LV/BT	208Y/120V 83.3A
Temp. Rise / Echauffement	115 °C	BIL	10 kV
Temp Class / Classe Temp	180 °C	Term / Bornes	X0 X1 X2 X3
Winding / Enroulement	CU		
Frequency / Frequence Hz	60		
Impedance % @ 135 °C	1.9		
Encl Type / Type De Coffrage	4X		
Wt LBS / Poids en lbs	460		

VOLTS	CURRENT / COURANT	% RATED VOLTAGE / % TENSION NOMINALE	CONNECTION EACH PHASE / CONNEXION PAR PHASE
504	34.4	105	1
492	35.2	102.5	2
480	36.1	100	3
468	37.0	97.5	4
456	38.0	95	5
444	39.0	92.5	6
432	40.1	90	7



HAZARDOUS LOCATIONS CLASS 1, DIV 2
GROUPS A, B, C & D
TEMPERATURE CODE: T3A

HAZARDOUS LOCATIONS CLASS 1, ZONE 2
GROUPS IIC, T3

SPACINGS BETWEEN ANY VENTILATED ENCLOSURE PANEL AND ANY ADJACENT WALL SHALL BE A MINIMUM OF 3 INCHES

ELECTROSTATIC SHIELD

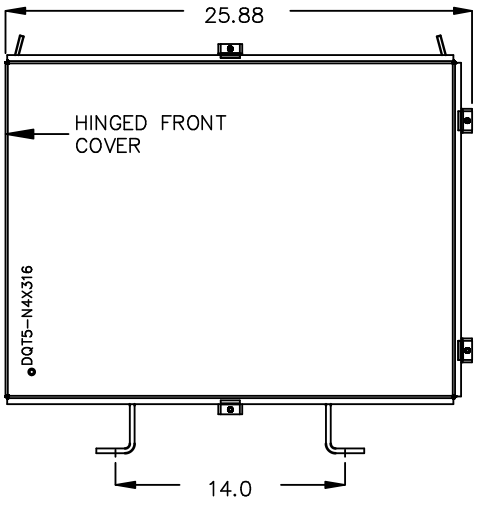
WARNING – EXPLOSION HAZARD. DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS FREE OF IGNITABLE CONCENTRATIONS.

AVERTISSEMENT : RISQUE DêEXPLOSION. NE PAS DÉBRANCHER PENDANT QUE LE CIRCUIT EST SOUS TENSION OU À MOINS QUE LêEMPLACEMENT NE SOIT EXEMPT DE CONCENTRATIONS INFLAMMABLES.

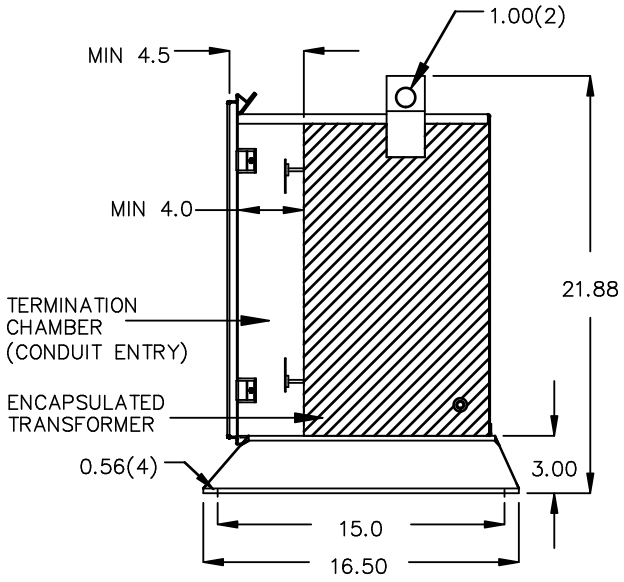
SEISMIC QUALIFICATIONS:
OSP-0136-10/IBC 2018/ASCE 7-16
SDS<=2.0g Z/h=1 Ip=1.5

d0002006a

FRONT VIEW



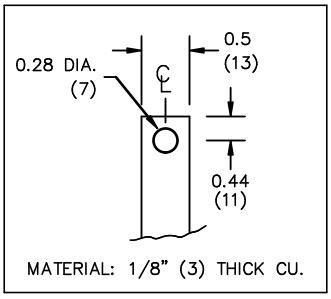
SIDE VIEW



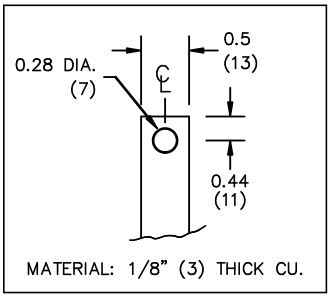
All Dimensions in inches

ENCLOSURE COLOR : 316 STAINLESS STEEL

HV TERMINAL DETAIL



LV TERMINAL DETAIL



CUSTOMER NOTES:

- HV TERMINATED AT BOTTOM FRONT
- LV TERMINATED AT TOP FRONT

Hammond Power Solutions Inc.

TITLE: 3PH DISTRIBUTION TRANSFORMER

NO.	DATE	BY	REVISION
1	20/03/17	PP	SEISMIC UPDATE

DES: PPICASSI
DATE: 19/01/09
SCALE: NTS

SHEET 2 OF 2

EDB TN2A0330KBKF6H

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Installation, Operation, and Maintenance Guide

For indoor/outdoor three-phase encapsulated transformers which utilize DQT type enclosures.

This manual covers the recommendations for the installation, operation and maintenance of three-phase encapsulated low voltage transformers. It is emphasized that these abbreviated instructions should be used in conjunction with all local and National codes and should be referenced accordingly.

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The pictures used in this guide are only a representation and may vary from the actual product.

Disclaimer of Liability
The recommended practices in this manual are for general applications and are supplied without liability for errors or omissions. Technical data are subject to change at any time without notice and any necessary corrections will be included in subsequent editions.
Special requirements should be referenced back to the manufacturer and/or their representative.

*Note: this guide is Trilingual
(English, French, Spanish)

Literature No.: **TIT3IM**
Issue Date: January 2019

WARNINGS

This guide covers the recommendations for the installation, operation and maintenance of encapsulated dry-type transformers which utilize DQT type enclosures. It is emphasized that these abbreviated instructions should be used in conjunction with all standards and local codes covering such work and should be referenced accordingly.

These recommended practices are for general applications and any special requirements should be referenced back to the transformer manufacturer and/or their representative.

It is further recommended that installation work be governed by all applicable National, State and Local codes standards and regulations and ANSI/IEEE C57.94. This is the IEEE recommended practice for Installation, Application, Operation and Maintenance of Dry-type General Purpose Distribution and Power Transformers. All work should be preformed in accordance with NFPA 70E Standard for Electrical Safety in the Workplace and CSA Z462, Workplace Electrical Safety. Always use appropriate personal protective equipment (PPE).

Important Note:

Electrical equipment should be installed, operated, serviced, and maintained,only by qualified personnel. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

This manual contains warnings to observe in order to ensure personal safety and prevent property damage. Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The notices referring to personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger. If more than one degree of danger is present, the warning representing the highest degree of danger will be used.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury, and/or substantial property damage.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury, and/or substantial property damage.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury and/or property damage.

Safety Precautions

Please check resin level before drilling hole for conduit and site conduit properly so it does not come in contact with resin.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Refer to nameplate for ratings and voltages.
This equipment must only be installed and serviced by qualified electrical personnel.
Follow all requirements in NFPA 70E and CSA Z462 for safe work practice and personal protective equipment (PPE).
Turn off all power supplying this equipment before working on or inside equipment.
Always use a properly rated voltage sensing device to confirm power is off.
Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in serious injury or death.

Class 1, Division 2, Hazardous Location Installation Requirements

If this unit is designed for use in Class 1, Division 2, Groups A, B, C & D hazardous locations then also refer to notes below:

(1) Power, input and output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods as per Article 501-10 (b) of the National Electrical Code.

(2) WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

(3) WARNING - EXPLOSION HAZARD - SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

1. Do not lift or move a transformer without proper equipment and properly trained personnel. Ensure that the transformer is only lifted using the listing provisions provided. Always use lifting provisions provided by the manufacturer. Rolling and skidding are recommended only on transformers with a pre-ordered skidding base.
2. Do not off-load the transformer until it has been fully inspected for damages. If any damages are identified the transformer should not be energized and the transformer manufacturer should be contacted immediately.
3. Only use terminals for electrical connections. The transformer terminals are not designed to support the weight of line or load cable.
4. Connections should only be made in accordance with the nameplate diagram or connection drawings and the applicable local codes and standards.
5. Make sure all power (including back-fed control and possible capacitor charge) is disconnected and all windings are grounded before attempting any work on the transformer or inside the enclosure. (zero energy)
6. Make certain all ground connections, line terminals and selected tap connections are completed and tightened before energizing the transformer.
7. Do not attempt to change any primary or secondary connections or taps while the transformer is energized.
8. Do not tamper with control panels, alarms, interlocks, or control circuits if provided.
9. Do not adjust or remove any accessories or cover plates while the transformer is energized.
10. No cables should come in contact with or any live parts except the terminal that it is intended for. Ensure that minimum clearances are maintained at all times.
11. This equipment must only be installed and serviced by qualified electrical personnel.
12. Follow all requirements in NFPA 70E and CSA Z462 for safe work practice and personal protective equipment (PPE).
13. Replace all devices, doors, and covers before turning on power to this equipment.
14. Modifications of any kind to the equipment are not permitted. Besides voiding the warranty such actions may result in hazardous situations of which the person(s) performing the modifications will be solely liable.

General

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Refer to nameplate for ratings and voltages.
This equipment must only be installed and serviced by qualified electrical personnel.
Follow all requirements in NFPA 70E and CSA Z462 for safe work practice and personal protective equipment (PPE).
Turn off all power supplying this equipment before working on or inside equipment.
Always use a properly rated voltage sensing device to confirm power is off.
Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Three-phase encapsulated transformers are manufactured to provide optimum performance for a lifetime of uninterrupted service. Careful attention to the following instructions is recommended for safe and reliable operation.

Installation, operation and maintenance of transformers should be performed by authorized personnel, trained and qualified in the installation, repair and maintenance of electrical equipment.

As any other electrical equipment, transformers must be installed according to the requirements of all applicable national and local electrical codes. ANSI/IEEE C57-94 may also be referred to for recommended installation, application, operation and maintenance of three-phase encapsulated transformers.

Handling

WARNING

Failure to follow lifting procedures can result in death, serious injury, or property damage.

Transformers are palletized and can either be lifted via a forklift truck or hoisted by the lifting lugs provided.

Appropriate lifting equipment should be used relative to the size of each transformer. For safety purposes and to protect the transformer, spreader bars are recommended.

No attempt should be made to lift or move a transformer from any points on the unit other than those indicated. Refer to page 17 (lifting brackets). Avoid subjecting transformer to impact, jolting and other rough handling that may damage the transformer.

Ensure the transformers are transported in upright position - avoid tilting and tipping.

Receiving & Inspection

Immediately after receiving the transformer, it should be inspected for any transit damage and for correctness against the shipping documents.

The unit should be examined for any breaks in its packaging, dented or damaged enclosures or missing parts from the packing list.

If any damage is noted, a claim should be filed immediately with the carrier and a second copy of all pertinent information relative to the order and the circumstances should be immediately communicated to the transformer manufacturers local sales office.

If the examination of the unit takes place outdoors, caution should be exercised to protect the unit against factors that may present further damage.

Storage

WARNING

Failure to follow storage requirements can result in death or serious injury, and property damage.
- Deterioration of product

Transformers that will not be immediately installed and energized, should be stored in a clean dry environment away from any environmental airborne contaminants. Transformers should be stored in such a way not to represent any type of hazard. Stacking transformers one on top of another without proper shelving is not permitted.

It is recommended that transformers be stored in a heated building with uniform temperature and adequate air circulation to prevent condensation with the protective plastic wrap still installed for long term storage. If storage in a heated building is not possible, transformers must be properly protected from contaminants and moisture preferably in a non heated building. We recommend that electric heating be installed inside the transformer to maintain a uniform temperature above the ambient and to prevent condensation. In extreme cases they may be stored in temperatures no lower than -40°C (-40°F). Special care should be given to prevent the formation of condensation inside the stored transformers. Units that are to be energized after being stored at a low temperature or after being stored for a long time must be warmed to -25°C (-13°F) with warm air or radiant heat. Once the unit reaches this temperature and its free of condensation and any other contaminants resulting from the storage process, it is safe to be energized.

Installation

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to follow these Installation instructions and all applicable local and national codes when installing and connecting a transformer will result in death or serious injury and/ or substantial property damage.

Before drilling holes, please ensure proper clearance is allowed to the resin for both conduit and conduit nut.

Indoor/Outdoor Transformers with Type 4, 4X or 12 Enclosures.

All three-phase encapsulated transformers are supplied with standard type 4 enclosure which also meets type 12. Type 4 enclosure offer much greater protection against a variety of elements such as dust, dirt, snow, moisture, rain etc. Units may be installed indoors, or outdoors where applicable.

For any outdoor location, the appropriate applicable codes must be followed including cable installation and hardware suitable for outdoor service. Before outdoor installations, verify that adequate site drainage exists to prevent groundwater from entering the transformers.

Water tight couplings are strongly recommended to be installed for any holes drilled in the enclosure. When drilling holes, note the resin level.

Three-phase encapsulated transformers must be installed in an upright position on walls, floors, posts, beams or other locations capable of supporting their weight with the proper accessories attached.

Installation (*continued)*

Ventilation

WARNING

Failure to follow the ventilation instructions can result in death, serious injury or property damage.

Encapsulated transformers are required to be installed in an area where they can be cooled by means of the free circulation of air where the average ambient temperature is 30°C (86°F) and should not exceed 40°C (104°F) at any time unless low temperature rise designs are selected.

Adequate ventilation is essential for transformers to meet their nameplate kVA capability. Multiple encapsulated transformers should be located at least 2 inches apart on units up to 10kVA and at least 4 inches apart on units over 10kVA, away from any other obstructions to allow free, clean circulation of air.

Accessibility

CAUTION

Failure to follow accessibility instructions can result in injury and/or property damage.

NEC standards require that transformers be accessible for inspection and located accordingly.

However, transformers should not be located in areas where stored items are likely to interfere with either natural air convection or the capability to have them inspected. Passage ways or other areas where people could be exposed to live parts during inspection should also be avoided.

Adequate protection should be provided under any circumstances.

Transformer Sound Levels

Transformers are an electrically energized apparatus and by their nature during normal operation will emit a certain level of sound.

Transformers are required to meet NEMA standards for the maximum sound levels permissible. These sound level standards vary from 40 to 67 dB and as such may be an annoyance if located in close proximity to where people work or reside.

Care should therefore be exercised in selecting sites for transformers particularly in sensitive areas like hospitals, classrooms, medical or office facilities.

The following guidelines may be helpful:

- ➔ Units should be mounted away from corners or reflecting walls or ceilings.
- ➔ Flexible conduit should be considered to make the incoming/ outgoing connections.
- ➔ Depending on the environment, to reduce noise acoustically absorbing materials could be considered for walls and ceilings around the unit.
- ➔ The location of the unit should be as far as practical from areas where sound levels could be considered undesirable.

Cable Connections

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to follow these instructions will result in death, serious injury or property damage.

Never attempt to change connections or taps unless the transformer is de-energized and all windings grounded.

WARNING

Failure to follow lifting procedures can result in death, serious injury, or property damage.

The connecting cable size is determined from the line current rating of the transformers primary and secondary windings and may be selected from the information in appendix A (page 14). Use wire rated for at least 90°C (194°F) and sized on the basis of 75°C (167°F) ampacity. Use with AL9CU-AL-CU lugs. Electrical Connector Lugs, if provided, are to be used with SIW, Class B or Class C cables or wires only.

For three-phase encapsulated transformers, pre-punched knockouts are not provided. Use the appropriate cable connector suitable for the application. Please refer to Appendix D for cable entry locations. If a transformer must be relocated to make the necessary cable connections, all safety requirements and the related lifting procedures must be followed.

Cable Connection Requirements

Side entry of cables is recommended.

- ➔ For standard non-ventilated DQT type 4 enclosures, bottom entry is permitted only in the areas defined in Appendix D.
- ➔ Offset connectors can be used to help with cable connections to terminal pads, to reduce the bending space for the cables

Cable connection lugs of plated copper may be used to connect to the transformer terminals. Terminals should be cleaned and electrical joint compounds are recommended for use on all electrical connections.

Make certain to insulate any unused wire leads with marrette connectors and electrical tapes where applicable.

Refer to the transformer nameplate for primary and secondary voltage connection combinations and primary and/or secondary tap positions as applicable.

Transformers received from the factory will have tap jumpers installed on the nominal, or 100%, voltage position. The taps may still be coated with impregnation material and insulation.

To change taps, it is necessary to gently remove all contaminants and insulation from the surface of the top and bottom of the taps (eye-loop or lugs) by sanding the lugs to the bare metal.

The surface of the tap lead should be clean and coated subsequently with electrical compound on all non-plated contacts between the jumper terminal and the tap. Assemble jumpers to taps as per Appendix D (Drawing 1 for single conductor eye-loops and tap lugs or Drawing 2 for double conductor eye-loop taps).

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

After installation of cables and connectors, the minimum clearance prescribed by the applicable codes and standards for the respective voltage class must be maintained from energized parts to all case parts.
Failure to install cables and connectors as per all applicable codes and standards and the attached guidelines will result in serious personal injury or death and property damage.

The following table may be used as a guideline for minimum clearances at altitudes not exceeding 1000 m (3300 ft.). Above 1000 m (3300 ft.) please consult factory.

Transformer Voltage Class	Minimum Clearance (mm)	Minimum Clearance (in.)
1.2 KV	25	1
2.5 KV	51	2
5.0 KV	102	4
8.7 KV	135	5.3
15 KV	203	8
18 KV	254	10
25 KV	305	12
34.5 KV	406	16

Note: “Some specific component parts of a transformer may require clearances different than those indicated above. For those exceptions, you should comply with the instructions provided in the assembly drawings or installation procedure.”

Grounding

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to properly ground the transformer as per all applicable codes and standards will result in serious personal injury or death.

All core and coil assemblies are solidly grounded to the enclosure internally and accessible to ensure that all conductive metal parts have the same potential.

To ensure the safety in operation, the transformer must be properly grounded before energizing. Most transformers have a main ground location identified accordingly. If a main ground location is not provided, it is the responsibility of the installing contractor to make and verify the necessary ground connections.

This grounding should be in accordance with all national and local electrical codes and standards.

Altering the Transformer

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Misapplication or misuse of this equipment may result in serious personal injury or death and property damage.

The application of this equipment is the responsibility of the customer or their agent. Misapplication or misuse may result in serious personal injury or death and/or property damage.

Any modifications to this equipment need to be compliant with all applicable codes and standards, and certain modifications may jeopardize Warranty terms. It is the responsibility of the individual(s) performing any equipment modifications to (i) ensure that the applicable performance and safety requirements are still met by the modified equipment; and, (ii) confirm that proposed modifications will not void the Manufacturer’s Warranty.

Before Energization

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to install the transformer in accordance with all applicable codes/ standards and the instructions in this booklet will result in serious personal injury or death and property damage.

For the safe and proper operation of the transformer, please check and verify the following:

a) Ensure correct phase connections. Refer to the nameplate vector diagram.

b) The load on a delta secondary winding with a 120 volt center tap should not exceed the normal current rating of the winding. This center tap is designed for a max. of 5% of the nameplate kVA.

c) The enclosure should be grounded with the appropriately sized conductor as per local codes and standards requirements.

d) The total load among all the phases should be balanced as much as possible for optimum performance of the transformers windings. The kVA loading on each phase must not exceed 1/3 of the nameplate kVA rating of the transformer.

e) The appropriate clearance and tightness of all electrical connections should be checked.

f) Following the proper safety precautions, after energizing and before connecting any loads, please measure and verify the output voltage matches nameplate specifications.

g) If there is any reason to suspect that the transformer has been exposed to moisture during transit or storage, it should be checked for dryness before energization. This can be done by performing an insulation resistance test (Megger Test). If any exposure to moisture is suspected, consult factory.

Operation

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to properly operate the transformer as per all applicable codes and standards and the attached instructions will result in serious personal injury or death.

Under full load operating conditions, encapsulated dry-type transformers may appear warm to the touch, particularly on the cover of the unit.

Standards permit the temperatures of the cover to reach 65°C (149°F) over ambient.

Three-phase encapsulated transformers are designed to operate continuously at their full nameplate kVA rating under normal operating conditions.

ANSI C57.96 provides guidelines for loading transformers under different operating conditions including:

➔ Ambient temperatures that differ from the ambient temperatures required for transformer operation. ANSI recommends a maximum ambient of 40ºC.

➔ Short time overload as it relates to time and temperature

WARNING

Failure to identify and correct the root causes for the transformer overheating can result in death or personal injury, property damage or severely reduced transformer life expectancy.

and the corresponding loss of life of the transformer.

- ➔ Overload that results in a reduction of life expectancy of the transformer.

If the transformer is experiencing increased operating temperatures, the following contributing factors should be considered and immediately corrected:

- ➔ Rigorous motor starting loads or other impact type loading. For this type of applications a specific transformer type is required.
- ➔ Over-excitation of unit due to excess supply line voltage or current.
- ➔ Ambient temperatures above standard.
- ➔ Overload beyond ANSI C57.96 guidelines.
- ➔ Harmonic distortions of the supply line voltage and currents.

Three-phase encapsulated transformers may be shut down and stored for extended periods of time without any deterioration. Care must be exercised to clean and dry units prior to energization, as previously outlined. Proper packaging and moisture prevention measures during storing are essential. Perform insulation resistance (megger) before re-energizing.

Maintenance

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to de-energize, isolate and ground the transformer terminals and to verify the ground potential on all terminals before performing any work on the transformer will result in serious personal injury or death.

Inserting any objects through the ventilation openings while the transformer is energized will result in serious personal injury or death.

Under normal operating conditions and environments, three-phase encapsulated transformers require periodic care and inspection. This is essential if the unit is installed in harsh environmental conditions (for ex. outside, environments with high levels of pollutants and dust, etc.).

Internal maintenance must be performed only with the transformer de-energized, isolated and with all the terminals grounded.

Maintenance typically includes internal cleaning, tightening of links and bolted connections to prescribed torque levels, servicing and inspection of auxiliary devices and an infrared scan or thermal image of the transformer.

All bolted connections at terminals must be in good condition. We recommend under scheduled annual maintenance or at shorter regular intervals that connections be checked for proper torque values and any signs or oxidation, arching and improper electrical connection. If any improper connections are identified they must be corrected immediately.

RECOMMENDED TORQUE VALUES FOR BOLTED ELECTRICAL CONNECTIONS			
BOLT SIZE	**CARBON ST.** **GRADE 5** **ft-lbs [Nm] ±5%**	**BRASS** **ALLOY CU270** **ft-lbs [Nm] ±5%**	**S.S STEEL** **B8 OR B8M** **ft-lbs [Nm] ±5%**
1/4-20	7 [10]	3.8 [5]	5 [6]
3/8-16	20 [27]	14 [18]	15 [20]
1/2-13	60 [70]	33 [45]	37 [50]
8 mm	20 [23]	12 [14]	12 [14]
12 mm	60 [70]	33 [45]	37 [50]

***Note: The above torque values are for dry, unlubricated bolts.**

WARNING

Failure to follow storage requirements can result in death or serious injury, and property damage.

The ground connection should also be checked to ensure a low impedance connection.

The door fit and gasket condition should be checked for a proper fit and seal.

Dry-Out of Transformers

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Failure to follow the attached dry-out procedures before energizing transformers previously exposed to moisture will result in serious personal injury or death and property damage.

Transformers that have been exposed to flood conditions, may not be able to be dried out appropriately. The insulation resistance, primary to core, secondary to core and primary to secondary, should be greater than 1kV MEGOHMS. Contact the transformer manufacturer for appropriate action instructions.

Accessories

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

When installing transformers (regardless of the location) the installing contractor is responsible for the proper installation in accordance with the attached instructions and all applicable codes and standards (including Seismic). Failure to do so will result in serious personal injury or death and property damage.

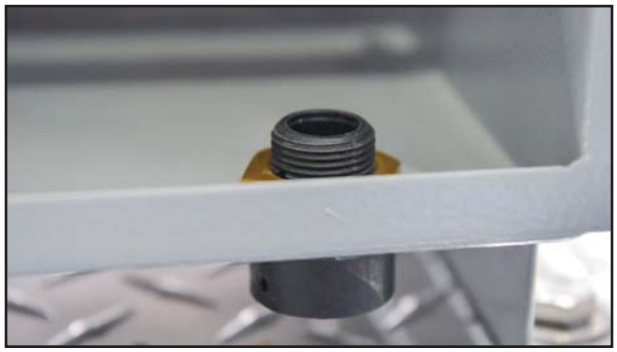
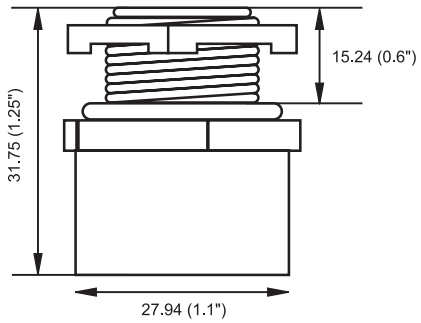


Figure 1.

Encapsulated transformers are available with a number of accessories to facilitate installation. Consult your local distributor for the purchase of any of the items accessories that are stocked in inventory. Some frequently used accessories include:

1) Breather drain plugs are strongly recommended for type 4/4X enclosures when there is temperature variations (i.e. night/day operations) and when condensation may be present.

When breather drain is mounted at the bottom of enclosure, this unique design provides effective drainage of moisture due to condensation from within enclosure without compromising type 4/4X integrity.



***Please ensure the drain plug is installed as per Fig. 1.

Ensure the drain holes are air cleaned from any obstruction before insalling.

2) Connectors (Lugs)

Connectors for the installation of dry-type transformers are readily available. These connectors are suitable for use with either copper or aluminum cables.

Connectors should be sized, installed and connected to cables in accordance with your local electrical code requirements using the best practices to ensure safe and reliable operation. Cable surfaces should be properly cleaned and electrical compound should be used for all connections.

Selecting Connectors

a) Determine the primary current for the required transformer from the Appendix A.

b) Similarly, determine the secondary current rating for the transformer from Appendix A.

APPENDIX A

AMPACITY RATINGS FOR CONNECTIONS

A. For a three phase transformer

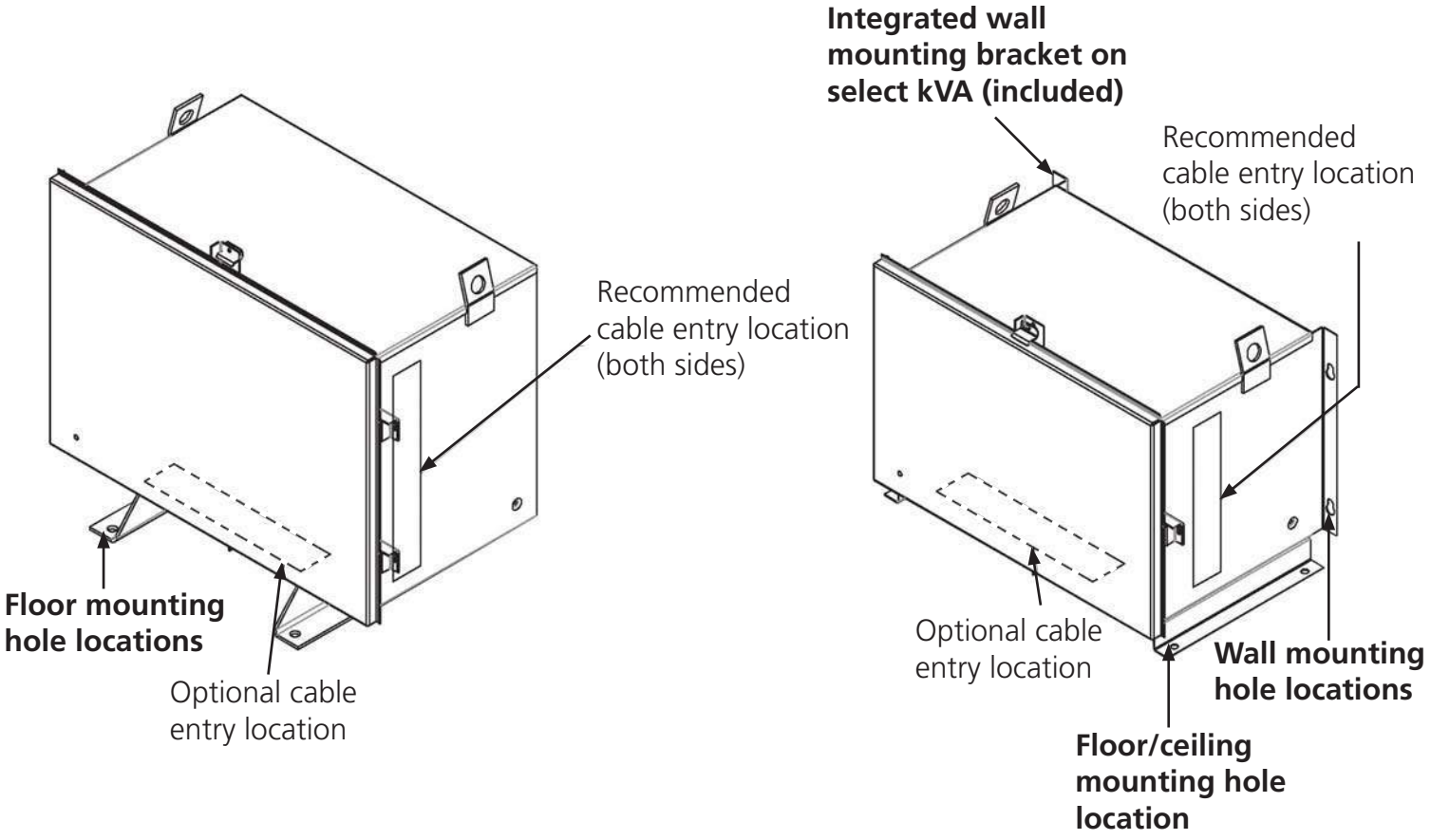
$$\text{Line Amperes} = \frac{\text{Volt Amperes}}{1.732 \times \text{Line Volts}}$$

Full Load Current Table
Three Phase Transformer

kVA	Current in Amperes			
	208V	240V	480V	600V
3	8.33	7.22	3.61	2.89
6	16.7	14.4	7.22	5.77
9	25.0	21.7	10.8	8.66
15	41.6	36.1	18.0	14.4
30	83.3	72.2	36.1	28.9
45	125	108	54.1	43.3
75	208	180	90.2	72.2
100	278	241	120	96.2
112.5	312	271	135	108
150	416	361	180	144

APPENDIX B

LOCATION OF WALL MOUNTING BRACKETS FOR DQT SERIES TYPE 4 ENCLOSURES

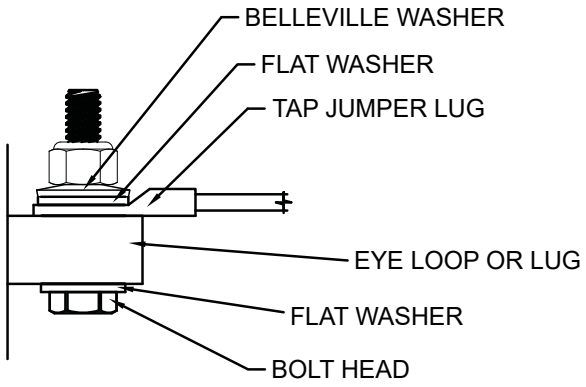


APPENDIX C

Jumper Assembly Drawings

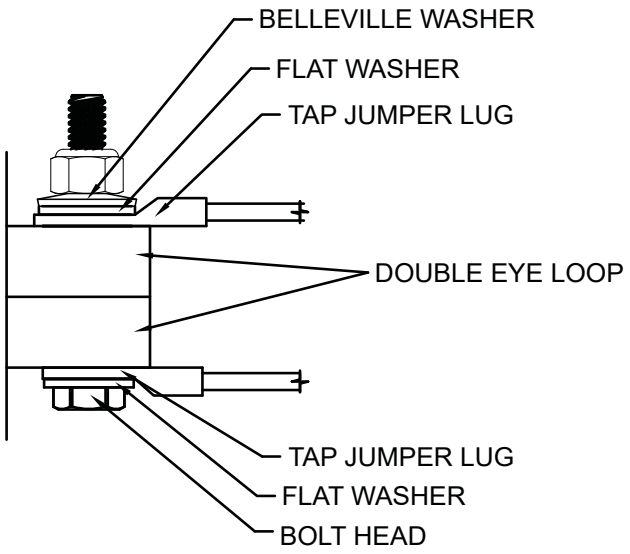
DRAWING 1

Single Conductor Eyeloop Tap Lugs



DRAWING 2

Double Conductor Eyeloop Tap Lugs



APPENDIX D
Recommended Cable Entry Locations

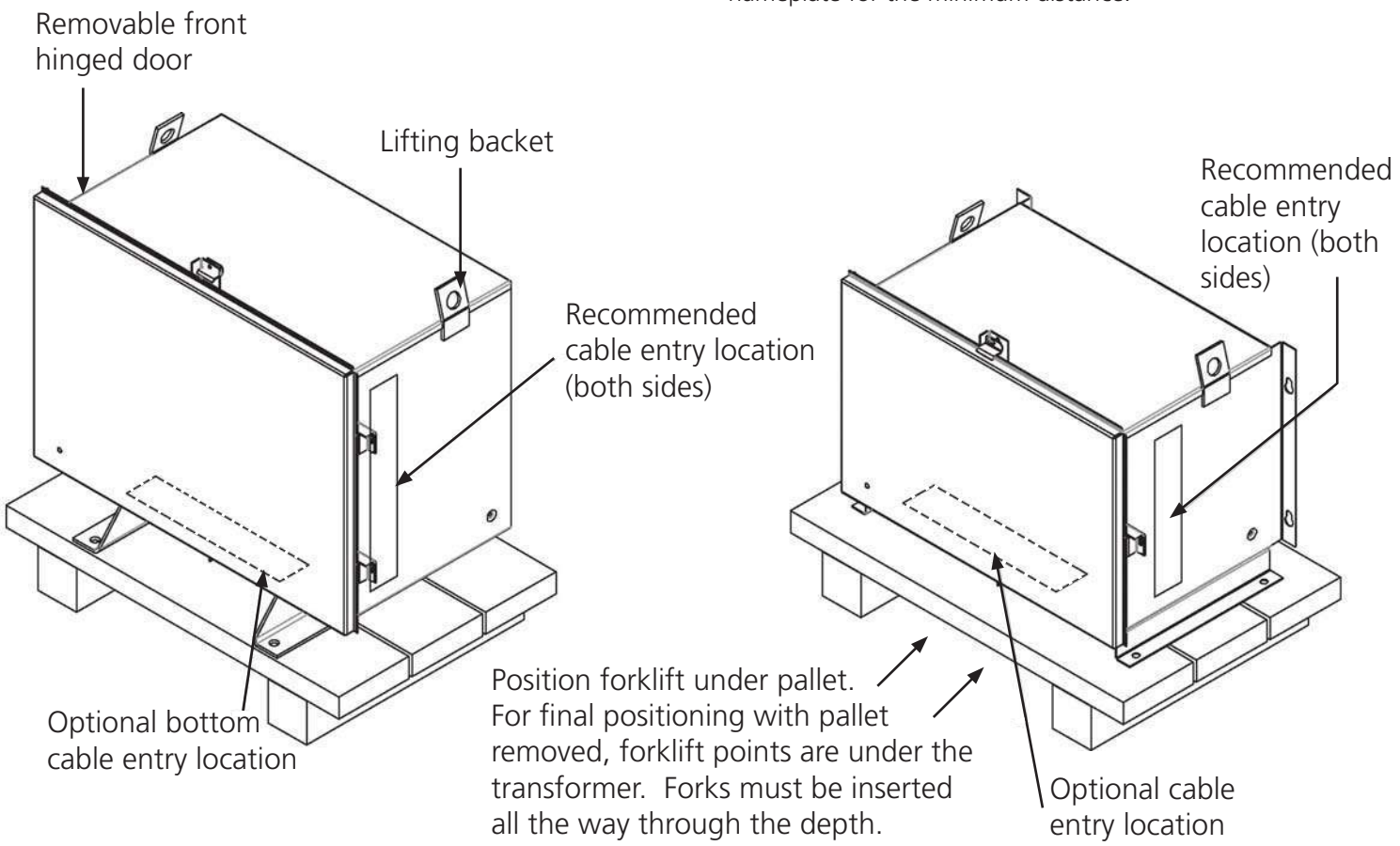
FIGURE 1

Typical Type 4, DQT Non-ventilated Enclosure Assembly for Three Phase.

Notes:

1. Handling - units are designed to be raised by a fork lift from underneath the pallet. Final positioning of the unit with the pallet removed can be via a fork lift under the transformer with the forks between the channels.
2. Shipping - units are shipped on pallets which are to be removed at installation.
3. Installation - This transformer can be installed indoor or outdoor providing a degree of protection against falling rain, sleet and external ice formation.
4. All encapsulated transformers should be located away from any wall or any other obstruction, please refer to the nameplate for the minimum distance.

Before drilling holes, please ensure proper clearance is allowed to the resin for both conduit and conduit nut.



Installation, fonctionnement et entretien

Pour des transformateurs encapsulés triphasés intérieurs/extérieurs utilisant des boîtiers de type DQT.

Ce guide donne des recommandations concernant l'installation, le fonctionnement et l'entretien de transformateurs triphasés encapsulés à basse tension. Il est important de comprendre que ces consignes abrégées doivent être suivies en conformité avec toutes les normes locales et nationales et doivent être vérifiées dans ce contexte.

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Les images utilisées dans ce guide ne sont qu'une représentation et peuvent varier du produit réel.

Exclusion de responsabilité
Les méthodes recommandées dans ce manuel concernent les applications générales et sont données sans responsabilité en cas d'erreur ou d'omission. Les données techniques sont sujettes à modification à tout moment et sans préavis et les corrections nécessaires seront incluses dans les éditions suivantes.
Toute exigence particulière doit être précédée d'une vérification auprès du fabricant ou de son représentant.

*Remarque : Ce guide contient des explications en trois langues (anglais, français, espagnol)

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AVERTISSEMENTS

Ce guide donne des recommandations concernant l'installation, le fonctionnement et l'entretien de transformateurs à sec encapsulés à basse tension utilisant des boîtiers de type DQT. Il est important de comprendre que ces consignes abrégées doivent être suivies en conformité avec les normes et codes locaux relatifs à ce type de travail et doivent être vérifiées dans ce contexte.

Les méthodes recommandées dans ce guide concernent des applications générales. Toute utilisation particulière doit faire l'objet d'une vérification auprès du fabricant du transformateur ou de son représentant.

Il est également recommandé que les travaux d'installation soient régis par toutes les normes et réglementations des codes nationaux, régionaux et locaux applicables, ainsi que par ANSI/IEEE C57.94. Il s'agit de la méthode IEEE recommandée pour l'installation, l'application, le fonctionnement et l'entretien des transformateurs secs d'usage général. Tous les travaux doivent être réalisés conformément à la norme NFPA 70E concernant la sécurité en matière d'électricité au travail et à la norme CSA Z462, concernant la sécurité en matière d'électricité au travail. Assurez-vous de toujours utiliser un équipement de protection individuelle (EPI) approprié.

Remarques importantes :

Le matériel électrique doit être installé, utilisé, entretenu et réparé par du personnel qualifié. Le fabricant n'assume aucune responsabilité pour les conséquences découlant de l'utilisation de ce matériel.

Ce manuel contient des avertissements qui doivent être respectés afin d'assurer la sécurité des personnes et d'éviter les dommages matériels. Lisez attentivement ces instructions et examinez le matériel pour vous familiariser avec l'appareil avant de tenter de l'installer, de le faire fonctionner, de l'entretenir ou de le réparer. Les avis concernant la sécurité des personnes sont mis en évidence dans le manuel par un symbole de sécurité, les avertissements concernant uniquement les dommages matériels n'ont pas de symbole de sécurité. Les avis ci-dessous sont classés en fonction du degré de danger. Si plus d'un degré de danger est présent, l'avertissement représentant le degré de danger le plus élevé sera utilisé.

DANGER

DANGER indique une situation extrêmement dangereuse qui, si elle n'est pas évitée, entraînera la mort ou des blessures graves et/ou des dommages matériels importants.

AVERTISSEMENT

AVERTISSEMENT indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner la mort, des blessures graves et/ou des dommages matériels importants.

ATTENTION

ATTENTION indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées et/ou des dommages matériels.

Consignes de sécurité

Veuillez vérifier le niveau de résine avant de percer le trou et placez le conduit correctement afin qu'il ne soit pas en contact avec la résine.

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Consultez la plaque signalétique pour les valeurs nominales et les tensions.
Cet équipement ne doit être installé et réparé que par du personnel qualifié.
Respectez toutes les exigences des normes NFPA 70E et CSA Z462 en matière de pratiques de travail sécuritaire et équipement de protection individuelle (EPI).
Éteignez l'alimentation de cet équipement avant de travailler sur ou dans l'équipement.
Utilisez toujours un dispositif détecteur de tension électrique correctement calibré pour vous assurer que le courant est coupé.
Remettez en place tous les appareils, les portes et les couvercles avant de mettre cet équipement sous tension.

Le non-respect des instructions entraînera des blessures graves, voire mortelles.

Emplacements dangereux de classe 1, division 2.

Exigences d'installation

Si cette unité est conçue pour des zones dangereuses de classe 1, division 2, groupes A, B, C et D, consultez les remarques ci-dessous :

(1) L'alimentation ainsi que le câblage d'entrée et de sortie (I/O) doivent être conformes avec la classe 1, division 2 selon l'article 501-10 (b) du Code national de l'électricité.

(2) AVERTISSEMENT - RISQUE D'EXPLOSION - NE PAS DÉBRANCHER L'ÉQUIPEMENT LORSQUE LE CIRCUIT EST SOUS TENSION OU SI LA ZONE EST EXEMPTE DE MATÉRIEL INFLAMMABLE.

(3) AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE TOUT ÉLÉMENT PEUT ENTRAVER LES CARACTÉRISTIQUES DE LA CLASSE I, DIVISION 2.

1. Ne levez pas et ne déplacez pas un transformateur sans disposer de l'équipement et du personnel qualifié appropriés. Assurez-vous que le transformateur n'est levé qu'à l'aide des accessoires fournis. Utilisez toujours tous les accessoires de levage fournis par le fabricant. Il est recommandé de faire rouler et glisser les transformateurs équipés à l'origine d'un sabot.
2. Ne déchargez pas le transformateur tant que l'inspection complète n'a pas été effectuée. Si des dommages sont identifiés, le transformateur ne doit pas être mis sous tension et le fabricant du transformateur doit être contacté immédiatement.
3. N'utilisez les bornes que pour les branchements électriques. Les bornes de connexion du transformateur ne sont pas conçues pour supporter le poids d'un câble d'alimentation ou de charge.
4. Les branchements doivent respecter le schéma de la plaque signalétique ou les diagrammes de connexion et les codes et normes locaux applicables.
5. Vérifiez que la source d'alimentation (y compris les commandes rétroalimentées et la charge potentielle du condensateur) est coupée et que tous les enroulements sont mis à la terre avant de commencer tout travail sur le transformateur ou à l'intérieur du boîtier.
6. Vérifiez que toutes les liaisons à la terre, les bornes de lignes et les prises sélectionnées sont complètes et bien serrées avant de mettre le transformateur sous tension.
7. Ne tentez pas de changer des prises (primaires ou secondaires), alors que le transformateur est sous tension.
8. N'altérez pas les panneaux de commande, les alarmes, les verrouillages, ni les circuits de commande, le cas échéant.
9. Ne réglez pas et ne retirez pas les accessoires ou les plaques de recouvrement lorsque le transformateur est sous tension.
10. Aucun câble d'alimentation ne doit entrer en contact avec une pièce sous tension, sauf la borne qui est prévue à cet effet. Veillez à conserver les dégagements minimaux prévus en tout temps.
11. Cet équipement ne doit être installé et réparé que par du personnel qualifié.
12. Respectez toutes les exigences des normes NFPA 70E et CSA Z462 en matière de pratiques de travail sécuritaire et équipement de protection individuelle (EPI).
13. Remettez en place tous les appareils, les portes et les couvercles avant de mettre cet équipement sous tension.
14. Les modifications de cet équipement ne sont pas autorisées. En plus d'annuler la garantie, de telles actions peuvent entraîner des situations dangereuses dont la personne effectuant les modifications sera responsable.

Généralités

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Consultez la plaque signalétique pour les valeurs nominales et les tensions.
Cet équipement ne doit être installé et réparé que par du personnel qualifié.
Respectez toutes les exigences des normes NFPA 70E et CSA Z462 en matière de pratiques de travail sécuritaire et équipement de protection individuelle (EPI).
Éteignez l'alimentation de cet équipement avant de travailler sur ou dans l'équipement.
Utilisez toujours un dispositif détecteur de tension électrique correctement calibré pour vous assurer que le courant est coupé.
Remettez en place tous les appareils, les portes et les couvercles avant de mettre cet équipement sous tension.

Le non-respect de ces exigences peut entraîner des blessures graves, voire mortelles.

Les transformateurs triphasés encapsulés sont fabriqués pour fournir un rendement optimal pendant une durée de vie utile sans interruption. Il est recommandé de porter une attention particulière aux consignes suivantes afin d'obtenir un fonctionnement fiable et sûr.

L'installation, le fonctionnement et l'entretien des transformateurs doivent être effectués par du personnel autorisé formé et qualifié pour l'installation, la réparation et l'entretien des équipements électriques.

Comme pour tout appareil électrique, les transformateurs doivent être installés en conformité avec les codes nationaux et locaux de l'électricité. Veuillez également vous reporter à la norme ANSI/IEEE C57-94 pour des recommandations portant sur l'installation, l'utilisation, le fonctionnement et l'entretien de transformateurs triphasés encapsulés.

Manutention

AVERTISSEMENT

Le non-respect des procédures de levage peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

Les transformateurs sont posés sur palettes pouvant être soulevées à l'aide d'un chariot élévateur à fourche ou levées par les anneaux de levage fournis.

L'équipement de levage doit être adapté à la taille de chaque transformateur. Il est recommandé d'utiliser des barres d'écartement pour les besoins de sécurité et de protection du transformateur.

En aucun cas, un transformateur ne doit être soulevé ou déplacé en utilisant d'autres points d'ancrage que ceux indiqués sur l'appareil. Veuillez consulter la page 17 (supports de levage). Évitez de soumettre le transformateur à des chocs, des secousses et d'autres manipulations brusques qui pourraient l'endommager.

Assurez-vous que les transformateurs sont transportés en position verticale; évitez de les incliner et de les faire basculer.

Réception et inspection

Immédiatement après avoir reçu le transformateur, une inspection doit être effectuée pour vérifier la présence de dommages éventuels survenus durant le transport ainsi que l'exactitude des documents d'expédition.

L'emballage sera examiné afin d'y détecter des bris, de voir si les boîtiers sont bosselés ou abîmés et si des pièces inscrites sur le bordereau de marchandises sont manquantes.

Si des dommages sont constatés, une réclamation doit immédiatement être effectuée avec le transporteur et une deuxième copie des renseignements concernant la commande et les problèmes survenus sera communiquée immédiatement au bureau des ventes locales des fabricants de transformateurs.

Si l'examen de l'unité a lieu à l'extérieur, vous devez prendre des précautions afin de le protéger contre les facteurs susceptibles de causer davantage de dommages.

Entreposage

AVERTISSEMENT

Le non-respect des exigences en matière d'entreposage peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.
- Détérioration du produit

Les transformateurs qui ne sont pas immédiatement installés et mis sous tension doivent être entreposés dans un endroit propre et sec, à l'abri des contaminants atmosphériques environnants. Les transformateurs doivent être entreposés de manière à ne présenter aucun type de danger. Empiler des transformateurs les uns sur les autres sans support approprié n'est pas autorisé.

Il est recommandé d'entreposer les transformateurs dans un immeuble chauffé avec une température uniforme et une circulation d'air adéquate afin d'éviter toute condensation avec la pellicule en plastique toujours installée pour un entreposage à long terme. S'il n'est pas possible de les entreposer dans un bâtiment chauffé, les transformateurs doivent être correctement protégés des contaminants et de l'humidité, de préférence dans un bâtiment non chauffé. Nous recommandons d'installer un chauffage électrique à l'intérieur du transformateur afin de maintenir une température uniforme supérieure à la température ambiante et d'éviter la condensation. Dans des cas extrêmes, ils peuvent être entreposés à des températures de -40 °C (-40 °F) ou plus. Un soin particulier doit être apporté pour empêcher la formation de condensation à l'intérieur des transformateurs entreposés. Les unités devant être mises sous tension après avoir été entreposées à basse température ou après une longue période doivent être chauffées à -25 °C (-13 °F) avec de l'air chaud ou une chaleur provenant d'un appareil de chauffage par rayonnement. Une fois que l'appareil a atteint cette température et qu'il est exempt de condensation et de tout autre contaminant résultant de l'entreposage, il peut être mis sous tension.

Installation

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Le non-respect de ces instructions d'installation et des codes locaux et nationaux applicables lors de l'installation et du raccordement d'un transformateur entraînera la mort ou des blessures graves et/ou des dommages matériels importants.

Avant de percer des trous, veuillez vous assurer qu'il y a un dégagement approprié dans la résine pour le conduit et son écrou.

Transformateurs intérieurs/extérieurs avec boîtiers de type 4, 4X ou 12.

Tous les transformateurs triphasés encapsulés sont dotés d'un boîtier standard de type 4, qui répond également aux exigences du type 12. Les boîtiers de type 4 procurent une protection bien plus grande contre une variété d'éléments, notamment la poussière, la saleté, la neige, l'humidité, la pluie, etc. Les appareils peuvent être installés à l'intérieur ou à l'extérieur, le cas échéant.

Pour les installations à l'extérieur, les codes en vigueur qui s'appliquent à l'installation doivent être respectés, notamment ceux concernant l'installation des câbles et le matériel convenant à une utilisation extérieure. Avant d'effectuer une installation à l'extérieur, assurez-vous que le site est suffisamment drainé pour empêcher l'eau souterraine de pénétrer dans les transformateurs.

Il est fortement recommandé d'installer des couplages étanches à l'eau pour tous les trous percés dans le boîtier. Lors du perçage de trous, notez le niveau de résine.

Il est possible d'installer les transformateurs triphasés encapsulés debout contre un mur, un plancher, un poteau, une poutre ou un autre endroit pouvant supporter leur poids avec les accessoires adéquats fixés.

Installation (*suite)*

Ventilation

AVERTISSEMENT

Le non-respect des procédures de ventilation peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

Les transformateurs encapsulés doivent être installés dans un endroit où ils pourront être refroidis par la circulation de l'air. La température ambiante moyenne doit être de 30 °C (86 °F) et ne jamais excéder 40 °C (104 °F), sauf si les modèles à faible échauffement sont sélectionnés.

Une bonne ventilation est indispensable pour que les transformateurs atteignent la capacité en kVA indiquée sur leur plaque signalétique. Plusieurs transformateurs encapsulés doivent être installés à au moins 5 cm (2 po) l'un de l'autre sur les unités jusqu'à 10 kVA et à au moins 10 cm (4 po) l'un de l'autre pour des unités de plus de 10 kVA, loin des murs ou d'autres obstacles, pour permettre la libre circulation de l'air frais.

Accessibilité

ATTENTION

Le non-respect des procédures d'accessibilité peut entraîner des blessures et des dommages matériels.

Il est prévu par les normes du Code national de l'électricité que les transformateurs soient accessibles pour l'inspection et que l'emplacement de l'installation soit choisi dans cette optique.

Ils ne doivent donc pas être installés dans des locaux renfermant des objets entreposés risquant de faire obstacle à la circulation de l'air et aux inspections. Les passages et les endroits dans lesquels des personnes risquent d'être exposées à des pièces sous tension au cours de l'inspection doivent également être évités.

Une protection adéquate doit être assurée en toutes circonstances.

Niveaux de bruit du transformateur

Les transformateurs sont des appareils alimentés électriquement et de par leur nature, en fonctionnement normal, ils émettent un certain niveau de son.

Les transformateurs doivent respecter les normes NEMA en matière de niveau sonore. Ces normes varient de 40 à 67 dB, ce qui peut constituer une source de gêne pour les personnes qui travaillent ou résident à proximité.

Il faut donc choisir avec soin leur emplacement d'installation et tout particulièrement dans les zones sensibles comme les hôpitaux, les écoles, les établissements médicaux et les bureaux.

Les lignes directrices suivantes pourront se révéler utiles pour déterminer le bon emplacement d'installation :

- ➔ Les unités doivent être installées loin des angles et des murs ou plafonds réfléchissants.
- ➔ Des branchements doivent être envisagés pour établir les connexions entrantes/sortantes.
- ➔ Selon l'environnement, pour réduire le bruit, des matériaux absorbants acoustiquement pourraient être installés sur les murs et les plafonds se trouvant autour du transformateur.
- ➔ L'unité doit se trouver aussi loin que possible des zones où les niveaux sonores pourraient être considérés comme indésirables.

Branchement des câbles

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Le non-respect de ces instructions peut entraîner la mort, des blessures graves ou des dommages matériels.

Ne remplacez jamais des branchements ni des prises, sauf si le transformateur est débranché et que toutes les bobines sont mises à la terre.

AVERTISSEMENT

Le non-respect des procédures de levage peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

La grandeur du câble de branchement dépend du courant nominal des enroulements primaires et secondaires du transformateur et peut être sélectionnée à partir de l'appendice A (page 14). Utilisez des câbles supportant une température d'au moins 90 °C (194 °F) et calibrés pour courant produisant une température de 75 °C (167 °F). Utilisez avec des prises AL9CU-AL-CU. Les prises de connecteur électrique, si fournies, doivent être utilisées uniquement avec des câbles ou des fils SIW, de classe B ou de classe C.

Des alvéoles perforées ne sont pas fournies pour les transformateurs triphasés encapsulés. Utilisez le connecteur de câble approprié pour l'utilisation. Veuillez vous reporter à l'appendice D pour l'emplacement du passage de câble. Si un transformateur doit être déplacé pour effectuer les connexions de câble nécessaires, les exigences de sécurité et les procédures de levage correspondantes doivent être suivies.

Exigences du branchement des câbles

Il est recommandé de passer les câbles sur le côté.

- ➔ Pour les boîtiers standard non ventilés DQT de type 4, l'entrée par le dessous est autorisée uniquement dans les zones définies à l'appendice D.
- ➔ Les connecteurs décalés peuvent être utilisés pour faciliter la connexion des câbles aux bornes, afin de réduire l'espace de flexion des câbles.

Des prises de connexion de câble plaquées cuivre peuvent être utilisées pour brancher les bornes des transformateurs. Les bornes doivent être nettoyées et il est recommandé d'utiliser de la pâte à joints pour application électrique sur tous les branchements.

Veillez à bien isoler les fils inutilisés avec des capuchons de connexion et du ruban isolant, le cas échéant.

Veuillez vous reporter à la plaque signalétique du transformateur pour connaître les combinaisons de tension primaire et/ou secondaire ainsi que l'emplacement des prises primaires, le cas échéant.

Les cavaliers des transformateurs livrés d'usine seront positionnés sur la tension nominale ou 100 %. Les prises seront recouvertes d'un matériel d'imprégnation et d'un isolant.

Pour changer les prises, il est nécessaire de retirer délicatement les contaminants et les isolants de la surface des prises supérieures et inférieures (anneau ou prises) en ponçant les prises sur le métal.

La surface de la prise doit être propre et enduite d'une pâte à joints sur tous les contacts non plaqués entre le cavalier et la prise. Connectez les cavaliers aux prises comme indiqué à l'appendice D (schéma 1 pour les anneaux et les prises ou schéma 2 pour les prises du conducteur double).

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Après l'installation des câbles et des connecteurs, le dégagement minimal prescrit par les codes et les normes applicables pour la classe de tension respective doit être maintenu pour toutes les pièces sous tension.
Ne pas installer les câbles et les connecteurs conformément aux codes et aux normes applicables et aux directives ci-jointes entraînera des blessures graves, voire mortelles, ainsi que des dommages matériels.

Le tableau suivant constitue un guide d'espacement minimum à une altitude maximale de 1 000 m (3 300 pi). Pour les altitudes supérieures à 1 000 m (3 300 pi), consultez le fabricant.

Catégorie de tension du transformateur	Dégagement minimal (en mm)	Dégagement minimal (en po)
1,2 kV	25	1
2,5 kV	51	2
5,0 kV	102	4
8,7 kV	135	5,3
15 kV	203	8
18 kV	254	10
25 kV	305	12
34,5 kV	406	16

Remarque : Certaines pièces du transformateur ont besoin de moins d'espace de dégagement que ce qui est indiqué ci-dessus. Pour ces exceptions, respectez les consignes données dans les schémas ou la procédure d'installation de l'appareil.

Mise à la terre

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Ne pas effectuer une mise à la terre correctement, conformément aux codes et aux normes applicables, entraînera des blessures graves, voire mortelles.

Tous les noyaux d'induit et toutes les bobines sont solidement reliés à la prise de terre et accessibles à l'intérieur du boîtier afin que toutes les pièces conductrices en métal soient sur le même potentiel.

Pour assurer la sécurité du fonctionnement, le transformateur doit être correctement mis à la terre avant d'être mis sous tension. Un emplacement principal de mise à la terre est identifié pour la plupart des transformateurs. Si l'emplacement principal de mise de la terre n'est pas fourni, il incombe à l'installateur d'installer et de vérifier les connexions de mise à la terre nécessaires.

La mise à la terre doit être effectuée en conformité avec les normes et les codes locaux et nationaux.

Modification du transformateur

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Une mauvaise application ou une mauvaise utilisation de cet équipement peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

Le client ou son agent est responsable de l'application de cet équipement. Une mauvaise application ou une mauvaise utilisation peut entraîner des blessures graves, voire mortelles et/ou des dommages matériels.

Toute modification apportée à cet équipement doit être conforme à tous les codes et normes applicables, et certaines modifications peuvent compromettre les conditions de la garantie. Il incombe aux personnes effectuant les modifications de l'équipement de : (i) s'assurer que l'équipement modifié respecte les exigences de fonctionnement et de sécurité applicables; et, (ii) confirmer que les modifications proposées n'annuleront pas la garantie du fabricant.

Avant la mise sous tension

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Ne pas installer le transformateur conformément aux codes et aux normes applicables et aux instructions de ce livret entraînera des blessures graves, voire mortelles, ainsi que des dommages matériels.

Pour un fonctionnement adéquat et sans danger du transformateur, veuillez vérifier ce qui suit :

a) Vérifiez les liaisons du couple de disjoncteurs. Consultez le diagramme vectoriel de la plaque signalétique.

b) La charge de l'enroulement delta secondaire comportant une prise centrale de 120 volts ne doit pas dépasser le courant nominal normal de l'enroulement. La prise centrale est conçue pour recevoir un maximum de 5 % des kVA indiqués.

c) Le boîtier doit être mis à la terre à l'aide d'un conducteur de taille adaptée selon les normes et codes locaux.

d) Dans la mesure du possible, la charge totale de toutes les phases doit être repartie pour une performance optimale des enroulements du transformateur. La charge en kVA de chaque phase ne doit pas dépasser 1/3 de la valeur nominale en kVA du transformateur.

e) Le dégagement et l'étanchéité appropriés de toutes les connexions électriques doivent être vérifiés.

f) En respectant les précautions de sécurité appropriées, après avoir mis l'unité sous tension et avant de connecter des charges, veuillez mesurer et vérifier que la tension de sortie correspond aux spécifications de la plaque signalétique.

g) Si vous pensez que le transformateur a été exposé à l'humidité pendant le transport ou le stockage, vérifiez s'il est sec avant de le mettre sous tension. Cela peut être fait en effectuant un test d'induction de résistance (test avec un mégohmmètre). Si vous suspectez une exposition à l'humidité, consultez l'usine.

Fonctionnement

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Ne pas faire fonctionner le transformateur conformément aux codes et aux normes en vigueur et aux instructions ci-jointes entraînera des blessures graves, voire mortelles.

Lorsqu'il fonctionne en pleine charge, un transformateur à sec encapsulé peut s'avérer très chaud au toucher, particulièrement la partie supérieure de l'appareil.

Les normes permettent que les boîtiers de ce type d'appareil puissent atteindre jusqu'à 65 °C (149 °F) de plus que la température ambiante.

Les transformateurs triphasés encapsulés sont conçus pour fonctionner en permanence selon la pleine capacité de kVA indiquée sur la plaque signalétique, dans des conditions de fonctionnement normales.

Les normes C57.96 de l'ANSI donnent des directives pour le chargement des transformateurs dans différentes conditions de fonctionnement, notamment :

➔ Des températures ambiantes différentes des températures ambiantes requises pour le fonctionnement du transformateur. ANSI recommande une température ambiante maximale de 40 °C.

AVERTISSEMENT

Si les causes profondes de la surchauffe du transformateur ne sont pas identifiées et corrigées, cela peut entraîner la mort ou des blessures, des dégâts matériels ou une réduction considérable de la durée de vie du transformateur.

- ➔ La surcharge brève en fonction du temps et de la température, ainsi que la perte de vie utile du transformateur.
- ➔ La surcharge entraînant une réduction de la durée de vie du transformateur.

Si le transformateur subit une augmentation de la température, les facteurs suivants doivent être immédiatement examinés et corrigés :

- ➔ Démarrage de charge brusque ou autre type de charge par choc. Un type de transformateur spécifique est requis pour ces types d'applications.
- ➔ Surexcitation de l'unité à la suite d'une alimentation excessive en tension ou en courant.
- ➔ Températures ambiantes supérieures à la normale.
- ➔ Surcharge supérieure aux directives C57.96 de l'ANSI.
- ➔ Distorsions harmoniques du voltage de la ligne d'alimentation et des courants.

Les transformateurs triphasés encapsulés peuvent être arrêtés et entreposés pour des périodes prolongées sans subir de détérioration. Vous devez soigneusement nettoyer et sécher les appareils avant de les mettre sous tension, comme indiqué préalablement. Un emballage approprié et des mesures visant à prévenir l'humidité pendant l'entreposage sont essentiels. Effectuez un test d'induction de résistance (mégohmmètre) avant de réactiver l'unité.

Entretien

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Le fait de ne pas mettre hors tension, isoler et mettre à la terre les bornes du transformateur et ne pas vérifier la mise hors tension des bornes avant d'effectuer des travaux sur le transformateur entraînera des blessures graves, voire mortelles.

Insérer des objets dans les ouvertures de ventilation lorsque le transformateur est sous tension peut entraîner des blessures graves voire mortelles.

Dans des conditions de fonctionnement et des environnements normaux, les transformateurs triphasés encapsulés ne nécessitent pas d'entretien et d'inspection. Ceci est essentiel si l'unité est installée dans des conditions environnementales difficiles (par exemple à l'extérieur, dans des environnements fortement pollués et poussiéreux, etc.).

L'entretien interne doit être effectué sur un transformateur éteint, isolé, et dont les bornes sont mises à la terre.

L'entretien comprend généralement le nettoyage interne, le serrage des barrettes et des connexions boulonnées au niveau de couple prescrit, l'entretien et l'inspection des appareils auxiliaires, ainsi qu'un balayage infrarouge ou une image thermique du transformateur.

Toutes les connexions boulonnées aux bornes doivent être en bon état. Nous recommandons, dans le cadre de l'entretien annuel ou à des intervalles réguliers plus rapprochés, de vérifier les couples de serrage, ainsi que les signes de corrosion, d'oxydation, de cambrure et de mauvais raccordement électrique. Si de mauvaises connexions sont identifiées, elles doivent être corrigées immédiatement.

FORCE DE SERRAGE RECOMMANDÉE DES CONNEXIONS ÉLECTRIQUES BOULONNÉES			
TAILLE DU BOULON	**ACIER AU CARBONE** **CATÉGORIE 5** **pi-lb [N.m] ± 5 %**	**LAITON** **ALLIAGE CU270** **pi-lb [N.m] ± 5 %**	**ACIER INOX** **B8 OU B8M** **pi-lb [N.m] ± 5 %**
1/4-20	7 [10]	3,8 [5]	5 [6]
3/8-16	20 [27]	14 [18]	15 [20]
1/2-13	60 [70]	33 [45]	37 [50]
8 mm	20 [23]	12 [14]	12 [14]
12 mm	60 [70]	33 [45]	37 [50]

***Remarque : Les valeurs de couple ci-dessus sont valables pour les boulons secs non lubrifiés.**

AVERTISSEMENT

Le non-respect des exigences en matière d'entreposage peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

Il est nécessaire de vérifier également la liaison à la terre pour garantir que le branchement est de faible impédance.

L'ajustement et l'étanchéité de la porte doivent être vérifiés.

Séchage des transformateurs

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Ne pas suivre les procédures de séchage ci-jointes avant de mettre sous tension les transformateurs précédemment exposés à l'humidité peut entraîner des blessures graves, voire mortelles, ainsi que des dommages matériels.

Il peut être difficile de sécher correctement des transformateurs ayant été soumis à une inondation. La résistance à l'isolation, de l'enroulement primaire à la bobine, de l'enroulement secondaire à la bobine et de l'enroulement primaire à l'enroulement secondaire, doit être supérieure à 1 kV mégohms. Communiquez avec le fabricant du transformateur pour connaître la marche à suivre appropriée.

Accessoires

DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Lors de l'installation de transformateurs (quel que soit l'emplacement), l'entrepreneur chargé de l'installation est responsable de la bonne installation, conformément aux instructions ci-jointes et aux codes et aux normes applicables (y compris sismique). Le non-respect de cette consigne entraînera des blessures graves, voire mortelles, ainsi que des dommages matériels.

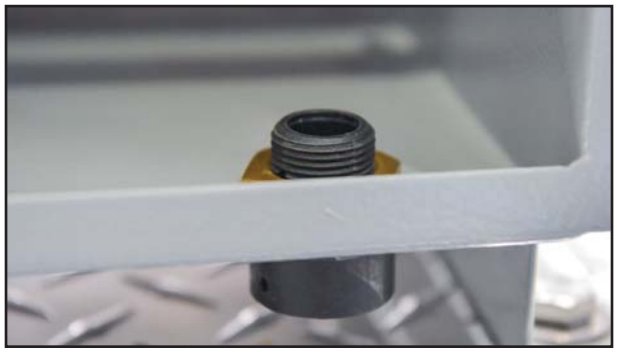
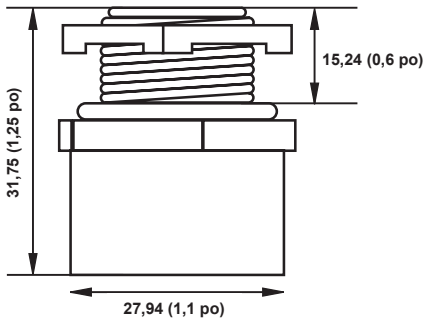


Figure 1.

Les transformateurs encapsulés sont offerts avec plusieurs accessoires afin de faciliter l'installation. Veuillez consulter votre détaillant ou distributeur pour l'achat d'accessoire pouvant être entreposés. Certains accessoires fréquemment utilisés incluent :

1) Des bouchons de mise à l'air libre sont fortement recommandés pour les boîtiers de type 4/4X lorsque des variations de température peuvent se produire (fonctionnement de jours et de nuits) et en cas de formation de condensation.

Lorsque le bouchon de mise à l'air libre est installé sous boîtier, cette conception unique permet d'évacuer de façon efficace l'humidité créée par la condensation de l'intérieur du boîtier sans compromettre l'intégrité du type 4/4X.



***Veuillez vous assurer que le bouchon de mise à l'air libre est installé conformément à la Fig. 1.

Assurez-vous que les orifices de drainage ne sont pas obstrués avant l'installation.

2) Connecteurs (prises)

Les connecteurs pour l'installation de transformateurs à sec sont facilement utilisables. Ces connecteurs conviennent aux câbles en aluminium et en cuivre.

La taille, l'installation et la connexion des connecteurs doivent respecter les exigences du code de l'électricité en appliquant les meilleures pratiques afin d'assurer un fonctionnement fiable et sûr. Les surfaces des câbles doivent être nettoyées et vous devez utiliser une pâte à joints pour application électrique sur toutes les connexions.

Choix des connecteurs

a) Déterminez le courant primaire pour le transformateur requis de l'appendice A.

b) De même, déterminez le courant secondaire pour le transformateur de l'appendice A.

APPENDICE A

COURANT ADMISSIBLE POUR BRANCHEMENTS

A. Pour un transformateur triphasé

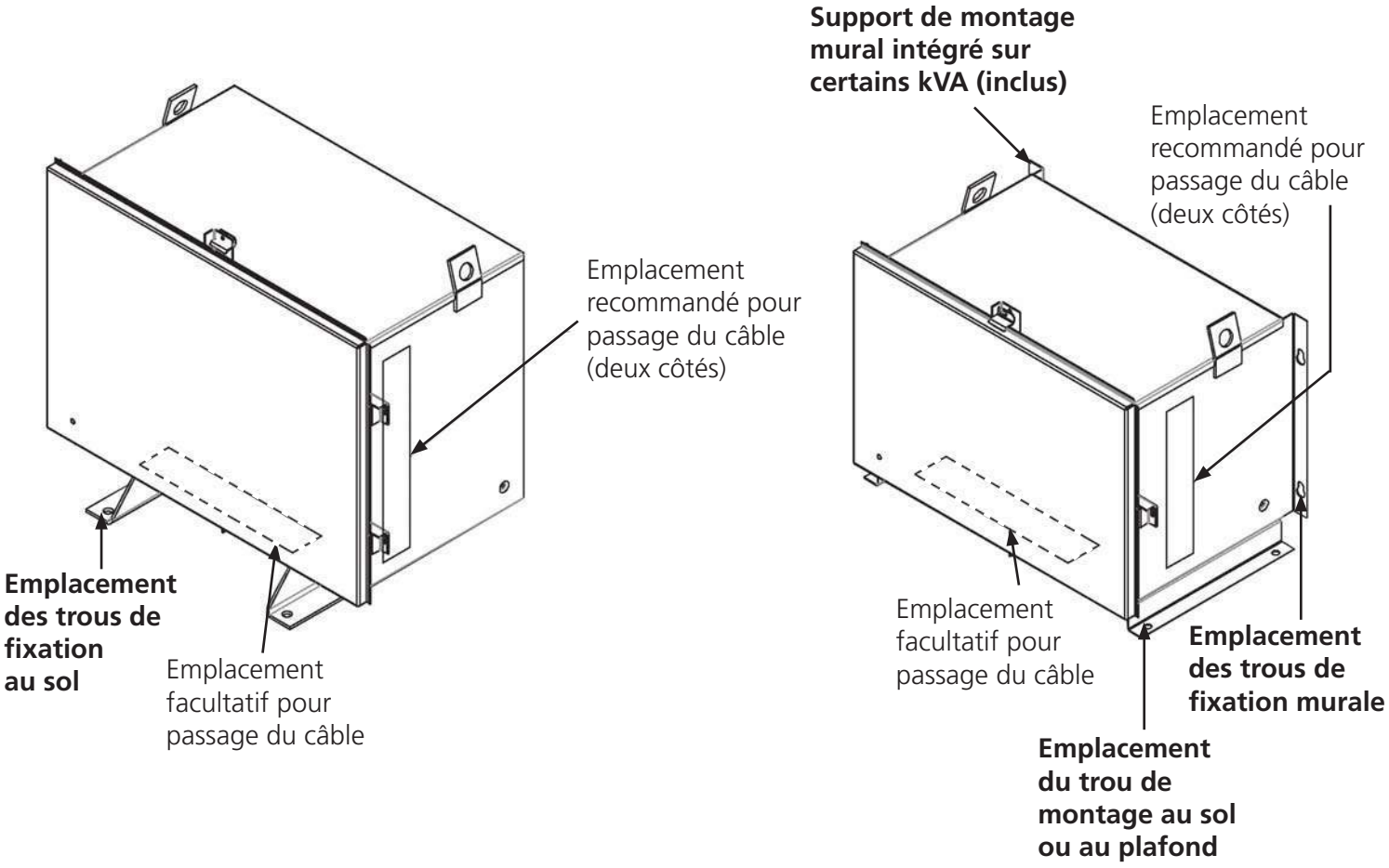
$$\text{Rangée ampères} = \frac{\text{Voltampères}}{1{,}732 \times \text{rangée ampères}}$$

Tableau de courant pleine charge Transformateur triphasé

Puissance	Courant en ampères			
	208 V	240 V	480 V	600 V
3	8,33	7,22	3,61	2,89
6	16,7	14,4	7,22	5,77
9	25,0	21,7	10,8	8,66
15	41,6	36,1	18,0	14,4
30	83,3	72,2	36,1	28,9
45	125	108	54,1	43,3
75	208	180	90,2	72,2
100	278	241	120	96,2
112,5	312	271	135	108
150	416	361	180	144

APPENDICE B

EMPLACEMENT DES SUPPORTS DE MONTAGE MURAL POUR BOÎTIER DE TYPE 4 DE LA SÉRIE DQT



APPENDICE C

Schéma des cavaliers

SCHÉMA 1

Prises d'anneau de conducteur simple

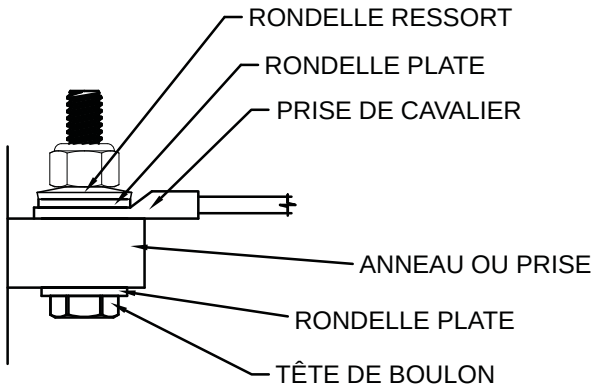
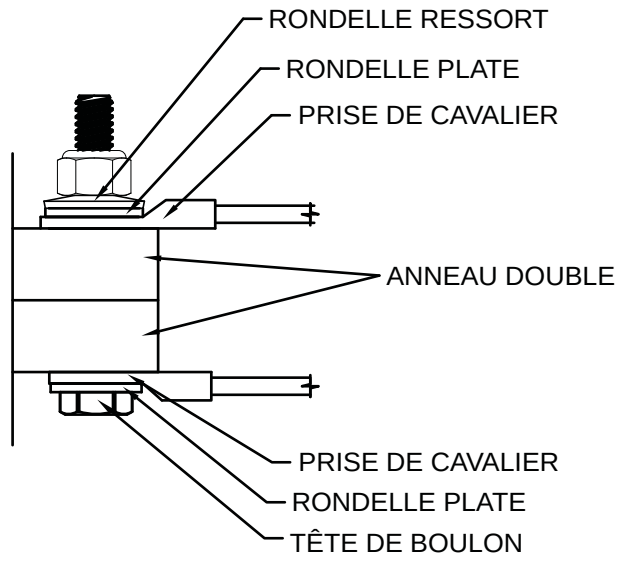


SCHÉMA 2

Prises d'anneau de conducteur double



APPENDICE D

Emplacement recommandé pour passage du câble

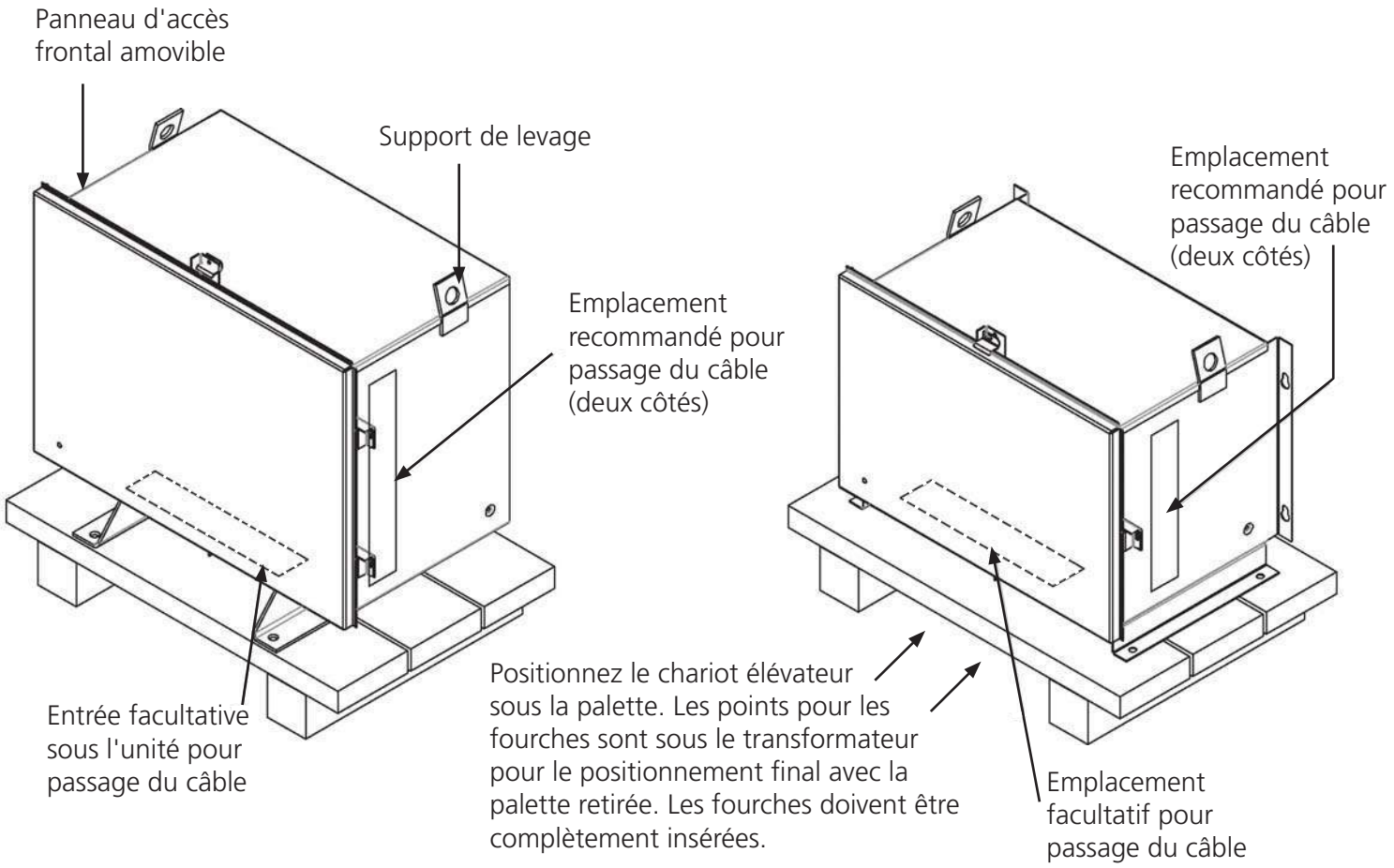
FIGURE 1

Boîtier DQT standard non ventilé de type 4 pour unité triphasée.

Remarques :

1. Manutention - Les appareils sont construits de manière à pouvoir être soulevés par la palette au moyen d'un chariot à fourche. Le positionnement final de l'unité sans les palettes peut se faire avec le chariot à fourche dont les fourches sont glissées entre les canaux du transformateur.
2. Expédition - Les appareils sont transportés sur palettes qui seront retirées au moment de l'installation.
3. Installation - Ce transformateur peut être installé à l'intérieur ou à l'extérieur, offrant un degré de protection contre la pluie, la neige et la formation de glace à l'extérieur de l'unité.
4. Les transformateurs encapsulés doivent être éloignés des murs et de toutes autres obstructions (consultez la plaque signalétique pour le dégagement minimal).

Avant de percer des trous, veuillez vous assurer qu'il y a un dégagement approprié dans la résine pour le conduit et son écrou.



Guía de Instalación, Operación y Mantenimiento

Para transformadores encapsulados trifásicos al aire libre/en interiores que utilizan carcasas tipo DQT.

Este manual contiene recomendaciones para la instalación, operación y mantenimiento de transformadores de bajo voltaje encapsulados trifásicos. Se hace hincapié en que estas instrucciones abreviadas deben utilizarse en conjunto con todos los códigos locales y nacionales, y deben ser referenciados en consecuencia.

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Las imágenes utilizadas en esta guía solo son una representación y pueden variar en comparación con el producto real.

Descargo de responsabilidad
Las prácticas recomendadas en este manual corresponden a aplicaciones generales y se suministran sin responsabilidad alguna por errores u omisiones. Los datos técnicos están sujetos a cambios en cualquier momento y sin previo aviso y las correcciones necesarias se incluirán en las siguientes ediciones.
Los requisitos especiales deben ser referenciados al fabricante o a su representante.

*Nota: esta guía es trilingüe
(inglés, francés, español)

Literatura n.º: **DIM16**
Fecha de emisión: Octubre de 2017

ADVERTENCIAS

Esta guía contiene recomendaciones para la instalación, operación y mantenimiento de transformadores encapsulados de tipo seco que usan carcasas tipo DQT. Se hace hincapié en que estas instrucciones abreviadas deben utilizarse en conjunto con todas las normas y los códigos locales que cubren dicho trabajo, y deben ser referenciados en consecuencia.

Estas prácticas recomendadas son para aplicaciones generales y cualquier requerimiento especial debe referenciarse al fabricante del transformador o su representante.

Además, se recomienda que el trabajo de instalación se rija por todos los códigos, estándares y regulaciones nacionales, estatales y locales aplicables, y ANSI/IEEE C57.94. Esta es la práctica IEEE recomendada para la instalación, aplicación, operación y mantenimiento de transformadores de tipo seco de alimentación y distribución de propósito general. Todo el trabajo debe realizarse de acuerdo con el Estándar para seguridad eléctrica en el lugar de trabajo 70E de la NFPA y CSA Z462, Seguridad eléctrica en el lugar de trabajo. Siempre use el equipo de protección personal (PPE) apropiado.

Nota importante:

La instalación, manipulación, reparación y mantenimiento del equipo eléctrico debe estar a cargo solo de personal calificado. El fabricante no asume responsabilidad alguna de las consecuencias que deriven de la utilización de este material.

Este manual contiene advertencias a considerar a fin de garantizar la seguridad personal y evitar daños materiales. Lea atentamente estas instrucciones y observe el equipo para familiarizarse con el dispositivo antes de instalarlo, manipularlo, revisarlo o realizar su mantenimiento. Los avisos sobre la seguridad personal están resaltados en el manual con un símbolo de alerta de seguridad. Los avisos relativos solo a daños materiales no llevan dicho símbolo. Estos avisos que se muestran a continuación se ordenan de acuerdo con el grado de peligro. Si hay más de un grado de peligro presente, se utilizará la advertencia que represente el grado de peligro más alto.

PELIGRO

PELIGRO: indica una situación de peligro inminente que, de no evitarse, provocará la muerte o lesiones graves, y/o daños materiales considerables.

ADVERTENCIA

ADVERTENCIA: indica una situación potencialmente peligrosa que, de no evitarse, puede provocar la muerte o lesiones graves, y/o daños materiales considerables.

PRECAUCIÓN

PRECAUCIÓN: indica una situación potencialmente peligrosa que, de no evitarse, puede provocar lesiones leves o moderadas, y/o daños materiales.

Precauciones de seguridad

Verifique el nivel de resina antes de perforar un orificio para conductos y ubique el conducto como corresponde de manera tal que no entre en contacto con la resina.

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Consulte la placa de identificación para ver las clasificaciones y los voltajes.
La instalación y el mantenimiento de este equipo deberán ser realizados solamente por personal de equipos eléctricos calificado.
Siga todos los requisitos de la norma NFPA 70E y CSA Z462 sobre la práctica de trabajo seguro y el equipo de protección personal (PPE).
Apague el suministro de alimentación de este equipo antes de realizar cualquier trabajo en o dentro del equipo.
Utilice siempre un dispositivo de detección de tensión adecuado para confirmar que la alimentación esté apagada.
Coloque todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones provocará lesiones graves o la muerte.

Ubicación peligrosa Clase 1, División 2

Requisitos de instalación

Si esta unidad está diseñada para utilizarse en ubicaciones peligrosas Clase 1, División 2, Grupos A, B, C y D, entonces consulte también las notas que se encuentran a continuación:

(1) La electricidad, el cableado de entrada y salida (E/S) debe cumplir con los métodos de cableado Clase 1, División 2 conforme con el Artículo 501-10 (b) del Código Nacional de Electricidad.

(2) ADVERTENCIA - PELIGRO DE EXPLOSIÓN - NO DESCONECTE EL EQUIPO MIENTRAS EL CIRCUITO ESTÉ CONECTADO O A MENOS QUE SEPA QUE EL ÁREA ESTÁ LIBRE DE CONCENTRACIONES INFLAMABLES.

(3) ADVERTENCIA - PELIGRO DE EXPLOSIÓN - LA SUSTITUCIÓN DE CUALQUIER COMPONENTE PUEDE ALTERAR LA IDONEIDAD PARA CLASE I, DIVISIÓN 2.

1. No levante ni mueva el transformador sin contar con el equipo adecuado y personal capacitado apropiadamente. Asegúrese de que el transformador solo se levante conforme a las disposiciones provistas. Siempre use las disposiciones de elevación proporcionadas por el fabricante. El rodamiento y deslizamiento se recomienda solo en los transformadores con una base de deslizamiento solicitada con antelación.
2. No descargue el transformador hasta que haya sido completamente inspeccionado en busca de daños. Si se identifican daños, el transformador no debe ser energizado y se debe contactar al fabricante del transformador de inmediato.
3. Utilice únicamente terminales para las conexiones eléctricas. Los terminales del transformador no están diseñados para soportar el peso del cable de guía o de carga.
4. Las conexiones deben hacerse solo de acuerdo con el diagrama de la placa de identificación o los dibujos de conexión y los códigos y estándares locales aplicables.
5. Asegúrese de que toda la energía (incluido el control de alimentación trasera y la carga posible del condensador) esté desconectada y que todos los bobinados estén conectados a tierra antes de realizar cualquier trabajo en el transformador o en el interior de la carcasa. (energía cero)
6. Asegúrese de que todas las conexiones a tierra, los terminales de línea y las conexiones de toma seleccionadas estén completos y ajustados antes de energizar el transformador.
7. No intente cambiar las conexiones o tomas primarias o secundarias mientras el transformador está energizado.
8. No manipule los paneles de control, las alarmas, los bloqueos internos o los circuitos de control, si vinieran provistos.
9. No ajuste o retire ningún accesorio o placa de cubierta mientras el transformador está energizado.
10. Ningún cable debe entrar en contacto con cualquier parte viva, excepto con la terminal correspondiente. Asegúrese de que se mantengan las distancias mínimas en todo momento.
11. La instalación y el mantenimiento de este equipo deberán ser realizados solamente por personal de equipos eléctricos calificado.
12. Siga todos los requisitos de la norma NFPA 70E y CSA Z462 sobre la práctica de trabajo seguro y el equipo de protección personal (PPE).
13. Coloque todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
14. Está prohibido realizar modificaciones de ningún tipo en el equipo. Aparte de anular la garantía, dichas acciones pueden dar pie a situaciones peligrosas por las que las personas que realizan las modificaciones serán las únicas responsables.

Información general

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Consulte la placa de identificación para ver las clasificaciones y los voltajes.
La instalación y el mantenimiento de este equipo deberán ser realizados solamente por personal de equipos eléctricos calificado.
Siga todos los requisitos de la norma NFPA 70E y CSA Z462 sobre la práctica de trabajo seguro y el equipo de protección personal (PPE).
Apague el suministro de alimentación de este equipo antes de realizar cualquier trabajo en o dentro del equipo.
Utilice siempre un dispositivo de detección de tensión adecuado para confirmar que la alimentación esté apagada.
Coloque todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.

El incumplimiento de estas instrucciones provocará la muerte o lesiones graves.

Los transformadores encapsulados trifásicos están fabricados para proporcionar un óptimo rendimiento durante toda una vida de servicio ininterrumpido. Se recomienda prestar minuciosa atención a estas instrucciones para un funcionamiento seguro y confiable.

La instalación, el funcionamiento y el mantenimiento de los transformadores deben ser realizados por personal autorizado, capacitado y calificado para la instalación, la reparación y el mantenimiento de equipo eléctrico.

Al igual que cualquier otro equipo eléctrico, los transformadores deben instalarse de acuerdo con los requisitos de todos los códigos eléctricos nacionales y locales aplicables. También puede consultarse ANSI/IEEE C57-94 para conocer las recomendaciones de instalación, aplicación, funcionamiento y mantenimiento de los transformadores encapsulados trifásicos.

Manipulación

ADVERTENCIA

El incumplimiento de los procedimientos de levantamiento puede provocar la muerte, lesiones graves o daños materiales.

Los transformadores están en tarimas y pueden levantarse con un montacargas o pueden levantarse con los ganchos proporcionados.

Se debería usar el equipo de levantamiento apropiado en función del tamaño de cada transformador. Para fines de seguridad y para proteger el transformador, se recomienda utilizar barras separadoras.

No debe intentarse levantar ni mover un transformador desde ningún punto de la unidad aparte de los indicados. Consulte la página 17 (soportes de levantamiento). Evite someter al transformador a impactos, sacudidas y otros tipos de manipulación tosca que puedan dañarlo.

Asegúrese de transportar los transformadores en posición vertical. Evite inclinarlos.

Recepción e inspección

Inmediatamente después de recibir el transformador, debe revisarse en busca de daños de tránsito y debe verificarse su estado correcto comparando con los documentos de envío.

La unidad debe examinarse en busca de rupturas en su empaque, abolladuras y daños en la estructura o partes de la lista del empaque que falten.

Si se observa algún daño, se debe presentar una reclamación inmediatamente con el transportista y una segunda copia con toda la información pertinente relativa a la orden y las circunstancias se debe comunicar inmediatamente a la oficina local de ventas de los fabricantes de transformadores.

Si se lleva a cabo el examen de la unidad al aire libre, se debe tener precaución para proteger la unidad contra factores que puedan representar un mayor peligro.

Almacenamiento

ADVERTENCIA

El incumplimiento de los requisitos de almacenamiento puede provocar la muerte o lesiones graves y daños materiales.
- Deterioro del producto

Los transformadores que no sean instalados y alimentados de inmediato deben guardarse en un ambiente seco y limpio lejos de cualquier contaminante ambiental transportado por el aire. Los transformadores deben guardarse de tal manera que no representen ningún tipo de peligro. Está prohibido apilar los transformadores uno sobre otro sin una estantería apropiada.

Se recomienda guardar los transformadores en un edificio calefaccionado, con temperatura uniforme y circulación de aire adecuada para evitar la condensación con la envoltura de plástico protectora aún instalada para un almacenamiento a largo plazo. Si no es posible almacenar los transformadores en un edificio calefaccionado, estos deben protegerse debidamente contra los contaminantes y la humedad, preferentemente en un edificio no calefaccionado. Recomendamos instalar calefacción eléctrica dentro del transformador para mantener una temperatura uniforme superior a la temperatura ambiente y para evitar la condensación. En casos extremos, estos pueden almacenarse a temperaturas de no menos de -40 °C (-40 °F). Se debe prestar especial atención para evitar la formación de condensación dentro de los transformadores almacenados. Las unidades que deben energizarse después de almacenarse a una temperatura baja o después de almacenarse durante un período prolongado deben calentarse a -25 °C (-13 °F) con aire caliente o calor radiante. Una vez que la unidad alcance esta temperatura y esté libre de condensación y cualquier otro contaminante derivado del proceso de almacenamiento, es seguro energizarla.

Instalación

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

El incumplimiento de estas Instrucciones de instalación y todos los códigos locales y nacionales vigentes al momento de instalar y conectar un transformador provocará la muerte o lesiones graves y daños materiales importantes.

Antes de perforar los orificios, asegúrese de dejar el espacio correspondiente para la resina tanto para los conductos como para la tuerca de los conductos.

Transformadores de interior/exterior con carcasas tipo 4, 4X o 12.

Todos los transformadores encapsulados trifásicos se suministran con una carcasa estándar tipo 4 que también cumple con los requisitos de la tipo 12. La carcasa tipo 4 ofrece mucho más protección contra diversos elementos tales como polvo, suciedad, nieve, humedad, lluvia, etc. Las unidades pueden instalarse en el interior o al aire libre, según corresponda.

Para cualquier ubicación al aire libre, deben aplicarse los códigos vigentes y apropiados, incluida la instalación del cable y el uso de hardware adecuado para el servicio al aire libre. Antes de realizar la instalación al aire libre, verifique que haya un drenaje adecuado en el lugar para evitar que ingrese agua subterránea a los transformadores.

Se recomienda firmemente instalar acopladores herméticos en los orificios o cualquier otro agujero perforado en la carcasa. Cuando perfore los orificios, observe el nivel de resina.

Los transformadores encapsulados trifásicos deben instalarse en posición vertical en las paredes, los pisos, los postes, las vigas u otros lugares capaces de soportar el peso con los accesorios correspondientes conectados.

Instalación (*continuación)*

Ventilación

ADVERTENCIA

El incumplimiento de las instrucciones de ventilación puede provocar la muerte, lesiones graves o daños materiales.

Los transformadores encapsulados deben instalarse en un área donde puedan enfriarse mediante la circulación de aire libre con una temperatura ambiente promedio de 30 °C (86 °F) y esta no debe exceder los 40 °C (104 °F) en cualquier momento a menos que se seleccionen diseños con aumento de temperatura baja.

La ventilación adecuada es fundamental para que los transformadores cumplan con su capacidad de kVA indicada en la placa. Cuando sea necesario colocar múltiples transformadores encapsulados, estos deberían ubicarse como mínimo a 2 pulgadas de distancia en unidades de hasta 10 kVA y como mínimo a 4 pulgadas de distancia en unidades de más de 10 kVA, lejos de cualquier otra obstrucción para permitir la circulación libre y limpia de aire.

Accesibilidad

PRECAUCIÓN

El incumplimiento de las instrucciones de accesibilidad puede provocar lesiones o daños materiales.

Los estándares NEC requieren que se pueda acceder a los transformadores para inspeccionarlos y que se ubiquen como corresponda.

Sin embargo, los transformadores no deben estar ubicados en áreas donde sea probable que los objetos almacenados interfieran con la convección de aire natural o con la capacidad de inspeccionarlos. También deben evitarse las vías de paso u otras áreas donde las personas puedan estar expuestas a partes conectadas durante la inspección.

Se debe proporcionar la protección adecuada bajo cualquier circunstancia.

Niveles de ruido del transformador

Los transformadores son aparatos con energía eléctrica y, por su naturaleza, durante el funcionamiento emiten un cierto nivel de sonido.

Los transformadores deben cumplir con los estándares NEMA para el máximo nivel de sonido permitido. Estas normas de nivel de sonido varían de 40 a 67 dB y como tal puede ser molesto si se encuentra cerca del lugar de trabajo o la vivienda de las personas.

Por lo tanto, se debe tener cuidado al seleccionar los lugares para ubicar los transformadores particularmente en áreas sensibles como hospitales, salones de clase, consultorios médicos u oficinas.

Las siguientes pautas pueden ser de ayuda:

- ➔ Las unidades deben montarse lejos de las esquinas o paredes o techos reflectantes.
- ➔ Debe considerarse un conducto flexible para realizar las conexiones entrantes/salientes.
- ➔ Según el ambiente, debe considerarse utilizar materiales de absorción acústica para reducir el ruido en las paredes y los techos alrededor de la unidad.
- ➔ La ubicación de la unidad debe estar lo más lejos posible de áreas donde los niveles de sonido puedan considerarse indeseables.

Conexiones de cable

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

El incumplimiento de estas instrucciones provocará la muerte, lesiones graves o daños materiales.

Nunca intente cambiar las conexiones o tomas a menos que el transformador no esté energizado y todos los devanados estén conectados a tierra.

ADVERTENCIA

El incumplimiento de los procedimientos de levantamiento puede provocar la muerte, lesiones graves o daños materiales.

El tamaño del cable de conexión está determinado por la clasificación de corriente de línea de los devanados primarios y secundarios de los transformadores y puede seleccionarse en la información del apéndice A (página 14). Utilice un cable clasificado para al menos 90 °C (194 °F) y con un tamaño basado en 75 °C (167 °F) de ampacidad. Utilice con agarraderas AL9CU-AL-CU. Las agarraderas del conector eléctrico, si vinieran provistas, se deben utilizar solo con cables SIW, de clase B o de clase C o solo con alambres.

Para los transformadores encapsulados trifásicos, no se proporcionan orificios previamente perforados. Use el conector para cable apropiado para la aplicación. Consulte el Apéndice D para ver las ubicaciones de entrada de los cables. Si es necesario reubicar un transformador para realizar las conexiones de cable necesarias, se deben respetar todos los requisitos de seguridad y los procedimientos de levantamiento relacionados.

Requisitos de las conexiones de cable

Se recomienda la entrada lateral de los cables.

- ➔ En el caso de las carcasas estándares no ventiladas DQT tipo 4, se permite la entrada inferior solo en las áreas definidas en el Apéndice E.
- ➔ Se puede usar conectores acodados que ayudan con las conexiones de cables a las terminales, para reducir el espacio de curva en los cables.

Se pueden utilizar paneles de conexión de cables de cobre enchapado para conectar a las terminales de los transformadores. Las terminales deben limpiarse y se recomienda utilizar compuestos para las juntas eléctricas en todas las conexiones eléctricas.

Asegúrese de aislar todos los cables conductores con conectores Marrette y cintas eléctricas, cuando corresponda.

Consulte la placa del transformador para ver las combinaciones de conexiones de voltaje primarias y secundarias, y las posiciones de toma primarias y secundarias según corresponda.

Los transformadores recibidos de fábrica tendrán cables de toma instalados en la posición de voltaje nominal o de 100 %. Las tomas aún pueden estar recubiertas de material de impregnación y aislamiento.

Para cambiar las tomas, es necesario retirar delicadamente todos los contaminantes y el aislamiento de la superficie de la parte superior e inferior de las tomas (ojo o paneles) lijando los paneles hasta llegar al metal desnudo.

La superficie del cable de toma debe estar limpia y recubierta posteriormente con compuesto eléctrico sobre todos los contactos no enchapados entre el terminal de puente y la toma. Acople los puentes a las tomas según el apéndice D (dibujo 1 para ojos de conductor simple y paneles de toma o dibujo 2 para tomas de ojo del conductor doble).

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Después de la instalación de los cables y los conectores, el espacio mínimo indicado por los códigos y las normas vigentes para la respectiva clase de voltaje debe mantenerse desde las piezas energizadas hasta todas las piezas del estuche.
Si no se instalan los cables y conectores de conformidad con los códigos y las normas vigentes y las pautas adjuntas se producirán lesiones personales o la muerte y daños materiales.

La siguiente tabla puede utilizarse como pauta para los espacios mínimos de altitud que no excedan los 1000 m (3300 pies). Por encima de 1000 m (3300 pies), consulte a la fábrica.

Clase de voltaje del transformador	Espacio mínimo (mm)	Espacio mínimo (pulg.)
1.2 KV	25	1
2.5 KV	51	2
5.0 KV	102	4
8.7 KV	135	5.3
15 KV	203	8
18 KV	254	10
25 KV	305	12
34.5 KV	406	16

Nota: “Algunos componentes específicos de un transformador pueden requerir indicaciones de espacios diferentes de los indicados anteriormente. Para estas excepciones, debe cumplir con las instrucciones que se proporcionan en los planos de ensamblaje o en el procedimiento de instalación”.

Puesta a tierra

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Si el transformador no cuenta con la conexión a tierra apropiada de conformidad con todos los códigos y las normas vigentes, se producirán lesiones personales graves o la muerte.

Todos los conjuntos de núcleo y bobinas están sólidamente puestos a tierra y conectados a la carcasa internamente para asegurar que todas las piezas de metal conductor tengan el mismo potencial.

Para asegurar un funcionamiento seguro, el transformador debe estar correctamente puesto a tierra antes de que sea conectado. La mayoría de los transformadores tienen una ubicación a tierra principal identificada como corresponde. Si no se proporciona una ubicación a tierra principal, es responsabilidad del contratista que instala realizar y verificar las conexiones a tierra necesarias.

Esta puesta a tierra debe guardar conformidad con todos los códigos y estándares eléctricos nacionales y locales.

Modificación del transformador

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

La aplicación incorrecta o el mal uso de este equipo pueden causar heridas graves o la muerte del personal y daños materiales.

La aplicación de este equipo es responsabilidad del cliente o de su agente. La aplicación incorrecta o el mal uso pueden causar heridas graves o la muerte del personal o daños materiales.

Cualquier modificación a este equipo debe cumplir con todos los códigos y estándares aplicables, y ciertas modificaciones pueden poner el riesgo los términos de la garantía. Es responsabilidad del/los individuo(s) que realice(n) cualquier modificación al equipo (i) asegurar que los requisitos de desempeño y seguridad siguen cumpliendo con las modificaciones realizadas al equipo; y, (ii) confirmar que las modificaciones propuestas no invalidarán la garantía del fabricante.

Antes de la energización

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Si el transformador no se instala de conformidad con todos los códigos y las normas vigentes y las instrucciones que aparecen en este manual, se producirán lesiones personales graves o la muerte y daños materiales.

Para un funcionamiento seguro y apropiado del transformador, revise y verifique lo siguiente:

a) Asegure conexiones correctas de fase. Consulte el diagrama del vector de la placa.

b) La carga en un devanado secundario en delta con una toma central de 120 voltios no debe superar la clasificación normal de corriente del devanado. Esta toma central está diseñada para un máximo de 5 % del kVA de la placa.

c) El gabinete debe ser puesto a tierra con el conductor de tamaño apropiado según los requisitos de los códigos y estándares locales.

d) La carga total entre todas las fases debe equilibrarse lo más que se pueda para un rendimiento óptimo de los devanados de los transformadores. La carga kVA en cada fase no debe superar 1/3 de la clasificación kVA de la placa del transformador.

e) Debe verificarse la separación y el ajuste apropiados de todas las conexiones eléctricas.

f) Siguiendo las precauciones de seguridad apropiadas, después de energizar y antes de conectar cualquier carga, mida y verifique que el voltaje de salida coincida con las especificaciones de la placa.

g) Si existe alguna razón para sospechar que el transformador ha estado expuesto a la humedad durante el tránsito o almacenamiento, debe verificarse si está seco antes de conectarse. Esto puede realizarse mediante una prueba de resistencia al aislamiento (Prueba Megger). Si se sospecha que hubo exposición a la humedad, consulte con la fábrica.

Funcionamiento

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Si el transformador no se opera de manera apropiada de conformidad con todos los códigos y las normas vigentes y las instrucciones adjuntas, se producirán lesiones personales graves o la muerte.

Bajo condiciones operativas de carga completa, los transformadores encapsulados tipo seco pueden parecer tibios al tacto, particularmente en la cubierta de la unidad.

Los estándares permiten que las temperaturas de la cubierta alcancen los 65 °C (149 °F) sobre el ambiente.

Los transformadores encapsulados trifásicos están diseñados para funcionar de forma continua según la clasificación de kVA completa indicada en su placa bajo condiciones operativas normales.

ANSI C57.96 brinda pautas para cargar transformadores bajo diferentes condiciones operativas que incluyen las siguientes:

➔ Temperaturas ambiente que difieren de las temperaturas ambiente requeridas para el funcionamiento del transformador. ANSI recomienda una temperatura ambiente máxima de 40 °C.

➔ Sobrecarga de corto tiempo relacionada con el tiempo y la temperatura y la correspondiente pérdida de vida útil del transformador.

ADVERTENCIA

Si no se identifican y corrigen las causas de origen del sobrecalentamiento del transformador se puede producir la muerte o lesiones personales, daños materiales o una reducción importante en la expectativa de vida útil del transformador.

- ➔ Sobrecarga que da lugar a una reducción de la expectativa de vida útil del transformador.

Si el transformador es sometido a temperaturas operativas mayores, deben considerarse y corregirse inmediatamente los siguientes factores que contribuyen a ello:

- ➔ Cargas de arranque del motor rigurosas u otra carga tipo impacto. Para este tipo de aplicaciones se requiere un tipo específico de transformador.
- ➔ Sobreexcitación de la unidad debido a un exceso de voltaje o corriente de la línea de suministro.
- ➔ Temperaturas ambiente por encima del estándar.
- ➔ Sobrecarga más allá de las pautas ANSI C57.96.
- ➔ Distorsiones armónicas del voltaje y corrientes de la línea de suministro.

Los transformadores encapsulados trifásicos pueden apagarse y almacenarse durante períodos prolongados de tiempo sin sufrir ningún deterioro. Se debe ejercer precaución para limpiar y secar las unidades antes de conectarlas a la corriente, como se indicó anteriormente. Es fundamental un empaque adecuado y medidas para prevenir la humedad durante el almacenamiento. Realice la resistencia al aislamiento (Megger) antes de volver a conectarlo.

Mantenimiento

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Si no desconecta la corriente, aísla ni conecta a tierra los terminales del transformador ni verifica el potencial de tierra en todos los terminales antes de realizar cualquier trabajo en el transformador, se producirán lesiones personales graves o la muerte.

Si inserta cualquier objeto a través de las aberturas de ventilación mientras el transformador está conectado a la corriente, se producirán lesiones personales graves o la muerte.

Bajo condiciones y ambientes de operación normales, los transformadores encapsulados trifásicos requieren un cuidado e inspección periódicos. Esto es fundamental si la unidad está instalada en condiciones ambientales difíciles (por ejemplo, afuera, ambientes con altos niveles de contaminantes y polvo, etc.).

Debe realizarse un mantenimiento interno solo con el transformador desconectado de la corriente, aislado y con todos los terminales puestos a tierra.

El mantenimiento normalmente incluye limpieza interna, ajuste de enlaces y conexiones con perno a niveles de torsión prescritos, servicio e inspección de dispositivos auxiliares y un escaneo infrarrojo o imagen térmica del transformador.

Todas las conexiones con perno en los terminales deben estar en buen estado. Recomendamos que bajo un mantenimiento anual programado o a intervalos regulares más cortos, se revisen las conexiones en busca de valores de torsión apropiados y signos de oxidación, arqueamiento y conexión eléctrica inapropiada. Si se identifican conexiones inapropiadas, deben corregirse de inmediato.

VALORES DE TORSIÓN RECOMENDADOS PARA CONEXIONES ELÉCTRICAS CON PERNOS			
TAMAÑO DEL PERNO	**ACERO CARBONO** **GRADO 5** **pies-libras [Nm] ±5%**	**BRONCE** **ALEACIÓN CU270** **pies-libras [Nm] ±5%**	**ACERO INOXIDABLE** **B8 O B8M** **pies-libras [Nm] ±5%**
1/4-20	7 [10]	3.8 [5]	5 [6]
3/8-16	20 [27]	14 [18]	15 [20]
1/2-13	60 [70]	33 [45]	37 [50]
8 mm	20 [23]	12 [14]	12 [14]
12 mm	60 [70]	33 [45]	37 [50]

***Nota: los valores de torsión anteriores son para pernos secos, no lubricados.**

ADVERTENCIA

El incumplimiento de los requisitos de almacenamiento puede provocar la muerte o lesiones graves y daños materiales.

También debe revisarse la conexión a tierra para asegurar una conexión de baja impedancia.

Se debe verificar el calce de la puerta y el estado de la junta para determinar que se ajuste bien y esté bien sellado.

Secado de los transformadores

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

El incumplimiento de los procedimientos de secado adjuntos antes de conectar los transformadores previamente expuestos a la humedad a la electricidad causará lesiones personales graves o la muerte y daños materiales.

Es posible que los transformadores que han estado expuestos a condiciones de inundación no se sequen adecuadamente. La resistencia del aislamiento, núcleo a primario, núcleo a secundario y primario a secundario debe ser mayor a 1 kV MEGAOHMIOS. Comuníquese con el fabricante del transformador para recibir instrucciones apropiadas.

Accesorios

PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O ARCO ELÉCTRICO

Al instalar transformadores (sin importar la ubicación), el contratista que instala es responsable de una instalación correcta de conformidad con las instrucciones adjuntas y todos los códigos y estándares aplicables (incluidos los sísmicos). Si no se cumple con esto, se producirán lesiones personales graves o la muerte, o daños materiales.

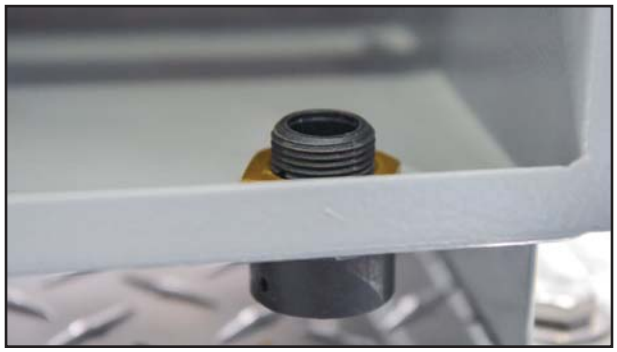
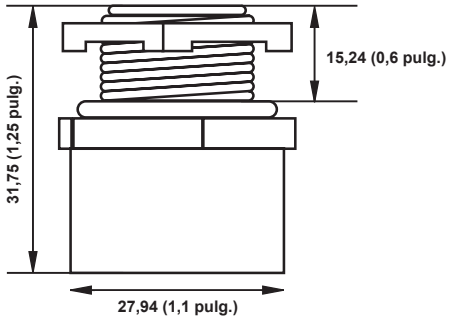


Figura 1.

Los transformadores encapsulados están disponibles con diversos accesorios para facilitar la instalación. Consulte con su distribuidor local para comprar cualquiera de los accesorios del producto que estén en existencias en el inventario. Algunos accesorios de uso frecuente incluyen:

1) Tapones de vaciado de respiradero, muy recomendados para las carcasas tipo 4/4X cuando hay variaciones de temperatura (p. ej., operaciones nocturnas/diurnas) y cuando es posible que haya condensación.

Cuando se coloca un vaciado de respiradero en la parte inferior de la carcasa, este diseño único permite el drenaje efectivo de la humedad que se forma debido a la condensación desde el interior de la carcasa sin comprometer la integridad de la carcasa tipo 4/4X.



***Asegúrese de que el tapón de vaciado esté instalado como se muestra en la Fig. 1.

Asegúrese de que los orificios de vaciado se limpien con aire para eliminar cualquier obstrucción antes de su instalación.

2) Conectores (paneles)

Los conectores para la instalación de transformadores tipo seco están disponibles. Estos conectores son apropiados para utilizarse con cables de cobre o aluminio.

Los conectores deben dimensionarse, instalarse y conectarse a los cables de acuerdo con los requisitos de su código eléctrico local siguiendo las mejores prácticas para asegurar un funcionamiento seguro y confiable. Las superficies de los cables deben limpiarse correctamente y se debe utilizar un compuesto eléctrico para todas las conexiones.

Selección de conectores

a) Determine la corriente primaria para el transformador requerido del Apéndice A.

b) De forma similar, determine la corriente nominal secundaria para el transformador indicada en el Apéndice A.

APÉNDICE A

CLASIFICACIONES DE AMPACIDAD PARA LAS CONEXIONES

A. Para un transformador trifásico

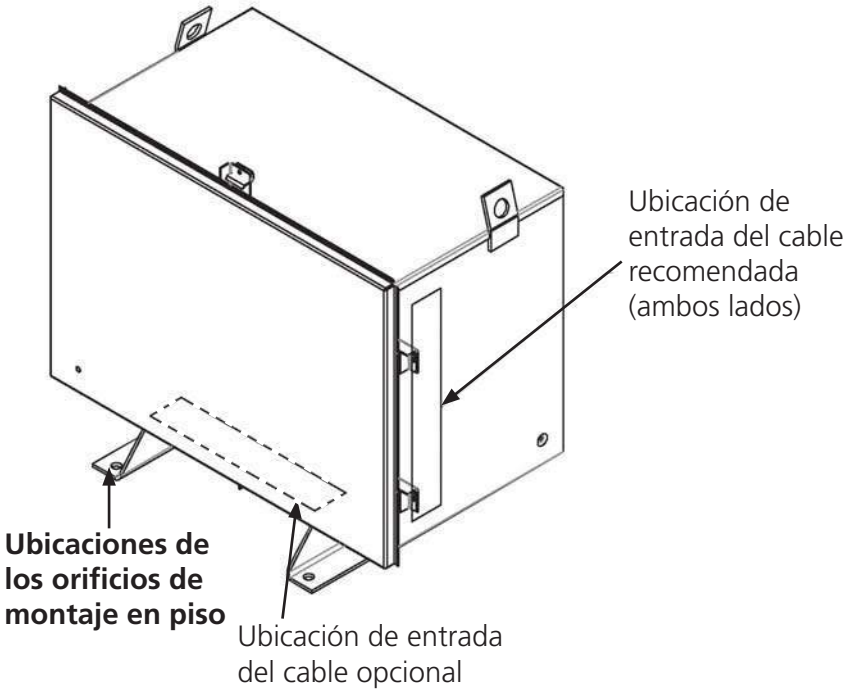
$$\text{Amperes de línea} = \frac{\text{Amperes de voltios}}{1.732 \times \text{Voltios de línea}}$$

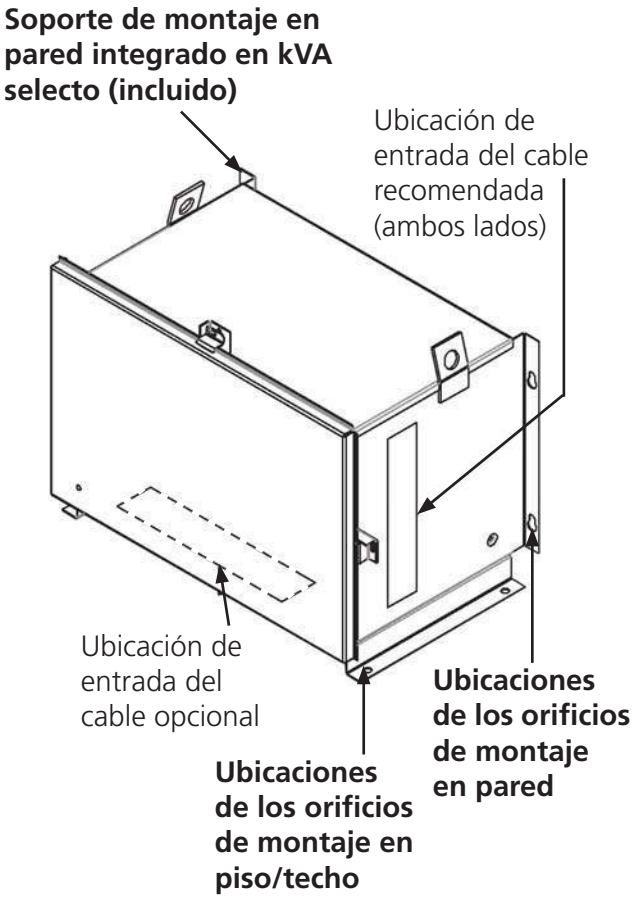
Tabla de corriente de carga plena
Transformador trifásico

kVA	Corriente en amperios			
	208 V	240 V	480 V	600 V
3	8,33	7,22	3,61	2,89
6	16,7	14,4	7,22	5,77
9	25,0	21,7	10,8	8,66
15	41,6	36,1	18,0	14,4
30	83,3	72,2	36,1	28,9
45	125	108	54,1	43,3
75	208	180	90,2	72,2
100	278	241	120	96,2
112,5	312	271	135	108
150	416	361	180	144

APÉNDICE B

UBICACIÓN DE SOPORTES DE MONTAJE EN PARED PARA CARCASAS TIPO 4 DE LA SERIE DQT



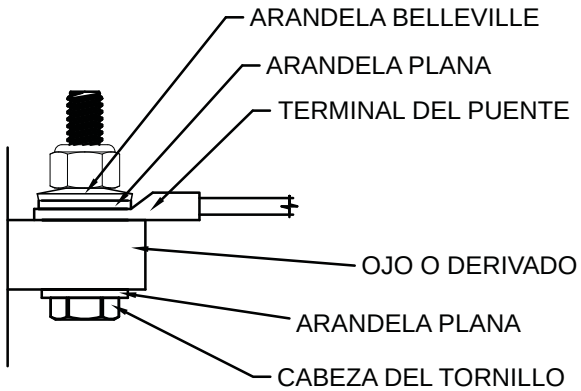


APÉNDICE C

Dibujos del conjunto del puente

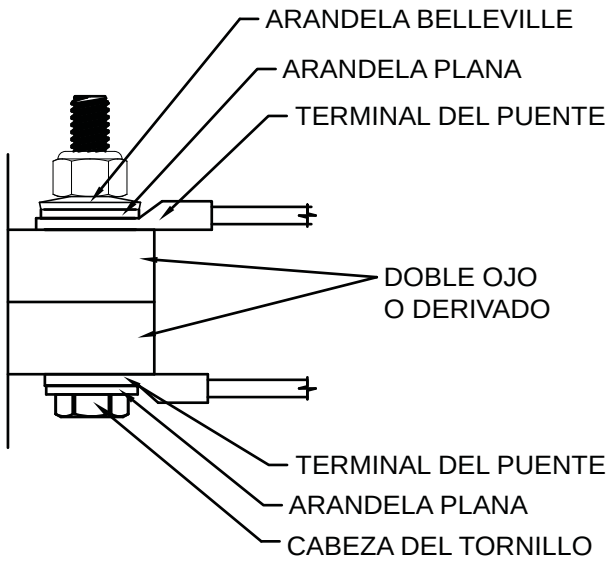
DIBUJO 1

Paneles de toma con ojo de un solo conductor



DIBUJO 2

Paneles de toma con ojo de doble conductor



APÉNDICE D
Ubicaciones de entrada del cable recomendada

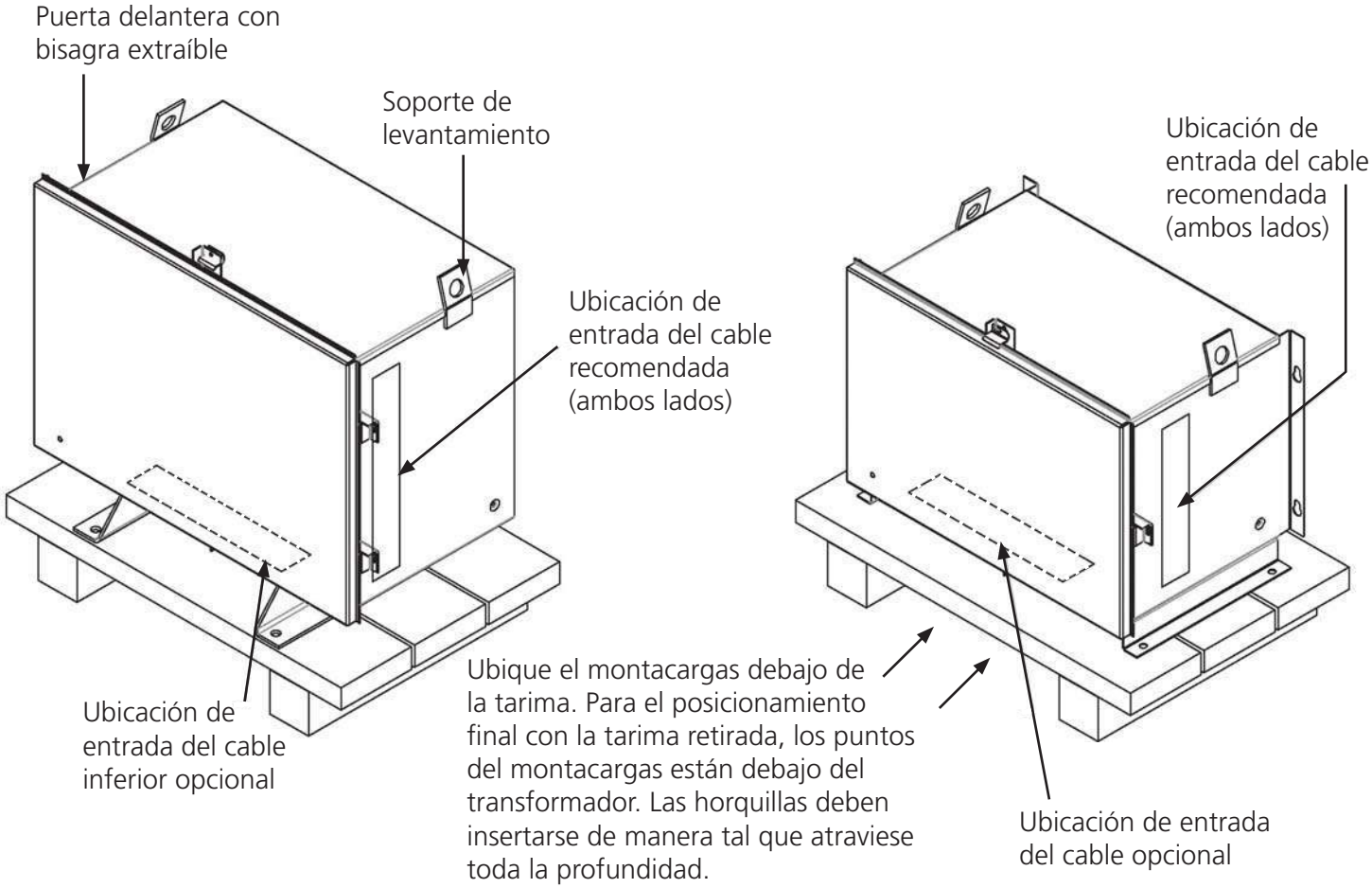
Antes de perforar los orificios, asegúrese de dejar el espacio correspondiente para la resina tanto para los conductos como para la tuerca de los conductos.

FIGURA 1

Conjunto de carcasa no ventilada DQT típico tipo 4 para tres fases

Notas:

1. Manipulación: las unidades están diseñadas para que las levante un montacargas desde debajo de la tarima. El posicionamiento final de la unidad con la tarima extraída puede ser mediante un montacargas debajo del transformador con la horquilla entre los canales.
2. Envío: las unidades se envían sobre tarimas que deben extraerse en la instalación.
3. Instalación: este transformador puede instalarse en interiores o exteriores mientras se ofrezca un grado de protección contra la lluvia, el granizo y la formación externa de hielo.
4. Todos los transformadores encapsulados deben estar ubicados lejos de cualquier pared u otra obstrucción; consulte la placa para conocer la distancia mínima.



OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL
OHL ELECTRICAL SYSTEM

SECTION 3: ELECTRICAL COMPONENTS
SUBSECTION 3.2: PANELBOARDS

Panel 2PX14								
208Y/120V, 3PH, 4W								
100A MCB								
CKT NO	ACCESSORIES	TYPE	RATING AMP/P		RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1	SECURITY PANEL	QOB	30/1		20/1	QOB-GFI	MAINT PLATFORM	2
3	Spare	QOB	20/1		20/1	QOB	Spare	4
5	Spare	QOB	20/1		20/1	QOB	Spare	6
7	Spare	QOB	20/1		20/1	QOB	CAB RECEPTACLES	8
9	Spare	QOB	20/1		20/1	QOB	PREPARED SPACE	10
11	DESK	QOB	20/1		20/1	QOB	CAB HEATER	12
13	DESK	QOB	20/1		20/1	QOB	Spare	14
15	OHL LIGHTING	QOB	20/1		20/1	QOB	PREPARED SPACE	16
17	LTG - GANGWAY	QOB	20/1		20/1	QOB	PREPARED SPACE	18
19	MAINT PLATFORM	QOB	20/1		20/3	QOB	1 PPLC CABINET	20
21	GANGWAY RECEPTACLE	QOB-GFI	20/1					22
23	SPARE	QOB	20/1					24
25	SPARE	QOB	20/1		30/3	QOB	EMERGENCY STARTER / 1PMS1	26
27	PREPARED SPACE	QOB	20/1					28
29	PREPARED SPACE	QOB	20/1					30
31	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	32
33	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	34
35	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	36
37	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	38
39	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	40
41	PREPARED SPACE	QOB	20/1		20/1	QOB	PREPARED SPACE	42

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28
30
32
34
36
38
40
42
10 kA
I/ON
O/OFF
20
30
10 kA
I/ON
O/OFF
20
10 kA
I/ON
O/OFF
20
10 kA
I/ON
O/OFF
20

Panel 4PX4						
480V, 3PH, 3W						
200A MCB						
CKT NO	DESCRIPTION	RATING AMP/P		RATING AMP/P	ACCESSORIES	CKT NO
1	XFMR 42TX6 30KVA	50/3		20/3	OHL EMERGENCY APRON LIFT MOTOR 1PMS1	2
3						4
5						6
7	OHL MOTOR CONTROL PANEL 1PMCP	150/3		20/1	SPACE	8
9				20/1	SPACE	10
11				20/1	SPACE	12
13	SPACE	20/1		20/1	SPACE	14
15	SPACE	20/1		20/1	SPACE	16
17	SPACE	20/1		20/1	SPACE	18
19	SPACE	20/1		20/1	SPACE	20
21	SPACE	20/1		20/1	SPACE	22
23	SPACE	20/1		20/1	SPACE	24
25	SPACE	20/1		20/1	SPACE	26
27	SPACE	20/1		20/1	SPACE	28
29	SPACE	20/1		20/1	SPACE	30

Seq #	Qty	Product Description
3	1	**Designation :** 2PX14

Product Details
1-NQ MB Panel (INTERIOR)-NQ Panelboard
Consisting of
208Y/120V 3Ph 4W 60Hz SCCR: 10kA
Fully Rated
Single Main: 100A/3P QB Circuit Breaker
Incoming Conductors: 1 - #4 - 300 kcmil
Bus: 225A Rated Copper: Silver/Tin Plated
CU Ground Bar
42 Circuit Interior
Type 1,
Incoming: Bottom Trim: Surface - Hinged
Box Cat No: No Box Front Cat No: NC50SHR
Ref. Drawing: PBA707HR
Feeders:
1 - 30A/1P QOB
13 - 20A/1P QOB
2 - 20A/1P QOB-GFI
21 - 20A/1P QOB Prepared Space
1 - 30A/2P QOB
1 - 20A/3P QOB
Optional Features:
No Box,Copper Solid Neutral,Copper Ground Bar
Branch User Placement
1-NC50SHR-PANELBOARD COVER/TRIM NF TYPE 1 S HR 50H

Estimated days to ship, excluding transit: 15 working days after customer release to manufacturer. See Conditions of Sale.

Seq #	Qty	Product Description
4	1	**Designation :** 4PX4

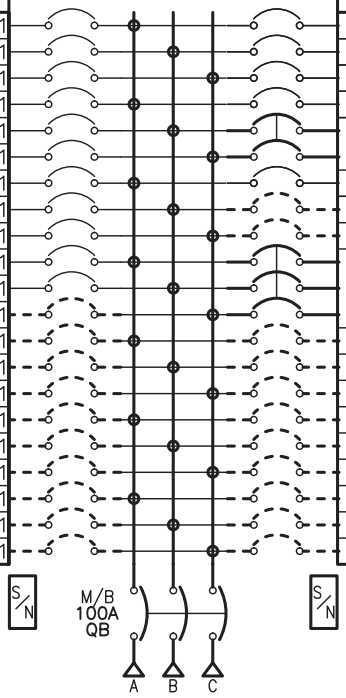
Product Details
1-NF MB Panel (INTERIOR)-NF Panelboard
Consisting of
480Y/277V 3Ph 4W 60Hz SCCR: 35kA
Feeders Series Rated w/ JG Circuit Breaker
Single Main: 200A/3P JG Circuit Breaker
Incoming Conductors: 1 - 3/0 - 350 kcmil
Bus: 250A Rated Copper: Silver/Tin Plated
CU Ground Bar
30 Circuit Interior
Type 1,
Incoming: Bottom Trim: Surface - Hinged
Box Cat No: No Box Front Cat No: NC68SHR
Ref. Drawing: PBA553HR
Feeders:
1 - Sub-Feed One: 150A/3P HG
1 - 50A/3P EDB
24 - 20A/1P EDB Prepared Space
1 - 20A/3P EDB
Optional Features:
No Box,Copper Solid Neutral,Copper Ground Bar
1-NC68SHR-PNLBD COVER/TRIM NF T-1 S 68H 20W

Estimated days to ship, excluding transit: 15 working days after customer release to manufacturer. See Conditions of Sale.

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

CKT NO	ACCESSORIES	TYPE	RATING AMP/P
1		QOB	30/1
3		QOB	20/1
5		QOB	20/1
7		QOB	20/1
9		QOB	20/1
11		QOB	20/1
13		QOB	20/1
15		QOB	20/1
17		QOB	20/1
19		QOB	20/1
21		QOB–GFI	20/1
23	PREPARED SPACE	QOB	20/1
25	PREPARED SPACE	QOB	20/1
27	PREPARED SPACE	QOB	20/1
29	PREPARED SPACE	QOB	20/1
31	PREPARED SPACE	QOB	20/1
33	PREPARED SPACE	QOB	20/1
35	PREPARED SPACE	QOB	20/1
37	PREPARED SPACE	QOB	20/1
39	PREPARED SPACE	QOB	20/1
41	PREPARED SPACE	QOB	20/1

RATING AMP/P	TYPE	ACCESSORIES	CKT NO
20/1	QOB–GFI		2
20/1	QOB		4
20/1	QOB		6
20/1	QOB		8
30/2	QOB		10
			12
20/1	QOB		14
20/1	QOB	PREPARED SPACE	16
20/1	QOB	PREPARED SPACE	18
20/3	QOB		20
			22
			24
20/1	QOB	PREPARED SPACE	26
20/1	QOB	PREPARED SPACE	28
20/1	QOB	PREPARED SPACE	30
20/1	QOB	PREPARED SPACE	32
20/1	QOB	PREPARED SPACE	34
20/1	QOB	PREPARED SPACE	36
20/1	QOB	PREPARED SPACE	38
20/1	QOB	PREPARED SPACE	40
20/1	QOB	PREPARED SPACE	42



PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC50SHR

DIMENSIONS:
50''(1270mm)Hx20"(508mm)Wx5.75''(146mm)D

WIRE BENDING SPACE:
TOP – 5"(127)mm
BOTTOM – 10.47"(267)mm
SIDE – 6.13"(156)mm
PBA: 707HR

BUSSING: 225A RATED COPPER BUS
Silver/Tin Plated

OPTIONAL FEATURES:
BRANCH USER PLACEMENT
Copper GROUND BAR
COPPER SOLID NEUTRAL

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 100A
10kA SYMS. SCCR

MAIN: MAIN BREAKER QB 100A
Bottom FEED
10kA AIR
INCOMING CONDUCTORS(S) PER NEC, CEC, NOM:
Wire Bending Space:
Phase Lugs:1 – #4 – 300 kcmil

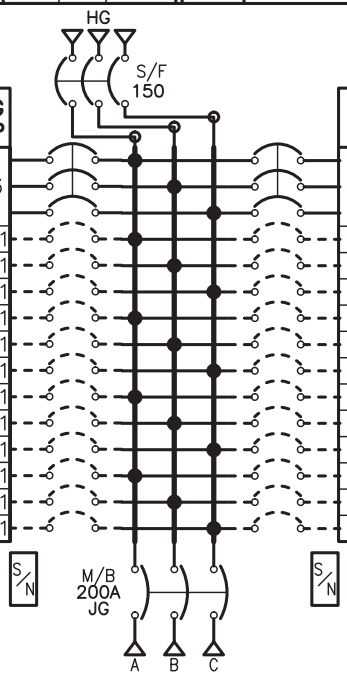
----------BRANCH SUMMATION----------

1 – 30A/1P QOB	13 – 20A/1P QOB
2 – 20A/1P QOB–GFI	21 – 20A/1P–PS QOB
1 – 30A/2P QOB	1 – 20A/3P QOB

JOB NAME:	Mukilteo Ferry Dock	EQUIPMENT DESIGNATION:	2PX14
JOB LOCATION:		EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			SQUARE D by Schneider Electric
DATE:	November 19 2019		
DRAWING STATUS:	QUOTE	DWG# OQ-1354136-35348070-01	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

CKT NO	ACCESSORIES	TYPE	RATING AMP/P
1		EDB	50/3
3			
5			
7	PREPARED SPACE	EDB	20/1
9	PREPARED SPACE	EDB	20/1
11	PREPARED SPACE	EDB	20/1
13	PREPARED SPACE	EDB	20/1
15	PREPARED SPACE	EDB	20/1
17	PREPARED SPACE	EDB	20/1
19	PREPARED SPACE	EDB	20/1
21	PREPARED SPACE	EDB	20/1
23	PREPARED SPACE	EDB	20/1
25	PREPARED SPACE	EDB	20/1
27	PREPARED SPACE	EDB	20/1
29	PREPARED SPACE	EDB	20/1



RATING AMP/P	TYPE	ACCESSORIES	CKT NO
			2
20/3	EDB		4
			6
20/1	EDB	PREPARED SPACE	8
20/1	EDB	PREPARED SPACE	10
20/1	EDB	PREPARED SPACE	12
20/1	EDB	PREPARED SPACE	14
20/1	EDB	PREPARED SPACE	16
20/1	EDB	PREPARED SPACE	18
20/1	EDB	PREPARED SPACE	20
20/1	EDB	PREPARED SPACE	22
20/1	EDB	PREPARED SPACE	24
20/1	EDB	PREPARED SPACE	26
20/1	EDB	PREPARED SPACE	28
20/1	EDB	PREPARED SPACE	30

This is the only way to build this panelboard -- the 150A breaker is too large to go on the bussing -- it needs to be subfeed.

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC68SHR

DIMENSIONS:
68''(1727mm)Hx20"(508mm)Wx5.75''(146mm)D

WIRE BENDING SPACE:
TOP – 5"(127)mm
BOTTOM – 12.75"(325)mm
SIDE – 4.1"(104)mm
PBA: 553HR

BUSSING: 250A RATED COPPER BUS
Silver/Tin Plated

OPTIONAL FEATURES:
Copper GROUND BAR
COPPER SOLID NEUTRAL

ELECTRICAL DATA

SYSTEM: 480Y/277V 3Ph 4W 60Hz
System Ampacity: 200A
35kA SYMS. SCCR

MAIN: MAIN BREAKER JG 200A
Feeders Series Rated w/ JG
Bottom FEED
35kA AIR
INCOMING CONDUCTORS(S) PER NEC, CEC, NOM:
Wire Bending Space:
Phase Lugs:1 – 3/0 – 350 kcmil

----------BRANCH SUMMATION----------

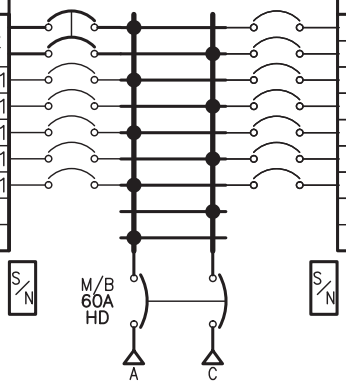
1 – 150A/3P HG
24 – 20A/1P–PS EDB
1 – 50A/3P EDB
1 – 20A/3P EDB

JOB NAME:	Mukilteo Ferry Dock	EQUIPMENT DESIGNATION:	4PX4
JOB LOCATION:		EQUIPMENT TYPE:	NF (Circuit Breaker Type) PANEL 1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			SQUARE D by Schneider Electric
DATE:	November 19 2019		
DRAWING STATUS:	QUOTE	DWG# OQ-1354136-35348495-01	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

CKT NO	ACCESSORIES	TYPE	RATING AMP/P
1		QOB	20/2
3			
5		QOB	20/1
7		QOB	20/1
9		QOB	20/1
11		QOB	20/1
13		QOB–EPD	20/1
15	BLANK		
17	BLANK		

RATING AMP/P	TYPE	ACCESSORIES	CKT NO
20/1	QOB		2
20/1	QOB		4
20/1	QOB		6
20/1	QOB		8
20/1	QOB		10
20/1	QOB		12
20/1	QOB		14
		BLANK	16
		BLANK	18



Mini Power Zone panel drawing

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC38SHR

DIMENSIONS:
38''(965mm)Hx20"(508mm)Wx5.75''(146mm)D

WIRE BENDING SPACE:
TOP – 3.25"(83)mm
BOTTOM – 11.45"(291)mm
SIDE – 6.13"(156)mm
PBA: 705HR

BUSSING: 100A RATED COPPER BUS
Silver/Tin Plated

OPTIONAL FEATURES:
BRANCH USER PLACEMENT
ALUMINUM SOLID NEUTRAL
ALUMINUM GROUND BAR

ELECTRICAL DATA

SYSTEM: 120/240V 1Ph 3W 60Hz
System Ampacity: 60A
10kA SYMS. SCCR

MAIN: MAIN BREAKER HD 60A
Bottom FEED
25kA AIR
INCOMING CONDUCTORS(S) PER NEC, CEC, NOM:
Wire Bending Space:
Phase Lugs:1 – #14 – 3/0 AWG

----------BRANCH SUMMATION----------

1 – 20A/2P QOB
1 – 20A/1P QOB–EPD
11 – 20A/1P QOB

JOB NAME:	Mukilteo Ferry Dock	EQUIPMENT DESIGNATION:	1MPZX1H
JOB LOCATION:		EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	April 07 2020		
DRAWING STATUS:	QUOTE	DWG# OQ-1354136-44184203-01	PG 1 OF 1 REV –

NQ Circuit Breaker Panelboards

Catalog
1640CT0801
2008
Class 1640

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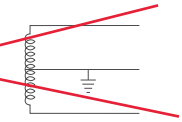
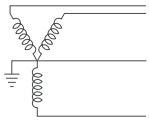
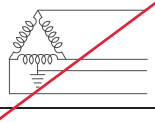
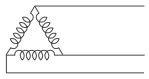
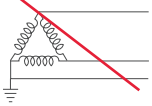
SQUARE D
by Schneider Electric

Standards and Ratings

Voltage	System	System Diagram
120/240 Vac	1ϕ3W	
208Y/120 Vac	3ϕ4W	
240/120 Vac	3ϕ4W Delta	
240 Vac	3ϕ3W Delta	
240 Vac	3ϕ3W Grd. Bϕ Delta	

NQ circuit breaker panelboards meet US and Canadian standards, and are marked cULus. NQ circuit breaker panelboards accept QO® and QOB branch circuit breakers.

Standards

NQ circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- CSA C22.2, No. 29-M1989—Panelboards and Enclosed Panelboards
- CSA C22.2, No. 94-M91—Special Purpose Enclosures
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code® (NEC®)
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards
- 2003 IBC, NFPA 5000, ASCE/SE17 Seismic Qualification

Ratings

- Main Lugs 100–600 A
- Main Circuit Breaker 100–600 A

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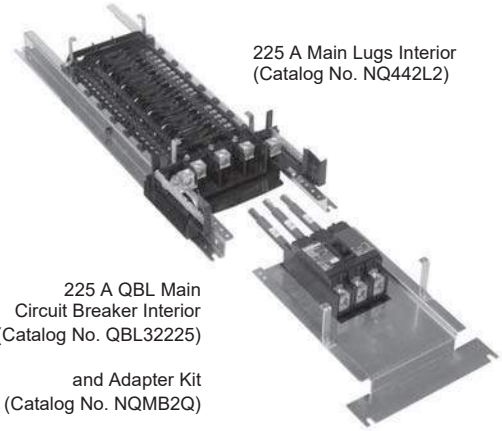
Interiors

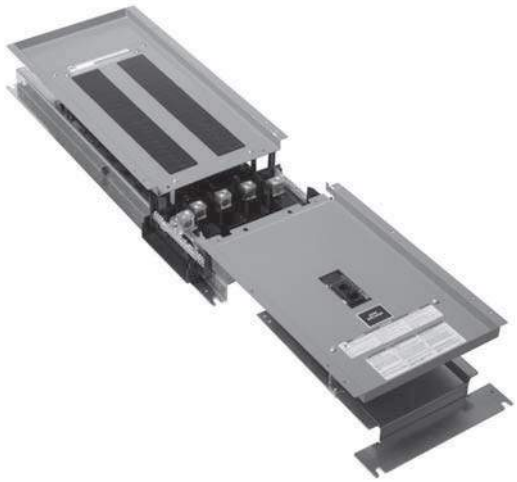


225 A Main Lugs Interior
(Catalog No. NQ442L2)

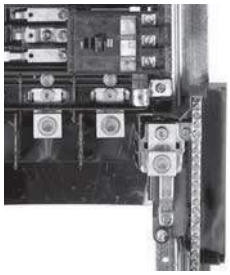
225 A QBL Main
Circuit Breaker Interior
(Catalog No. QBL32225)

and Adapter Kit
(Catalog No. NQMB2Q)

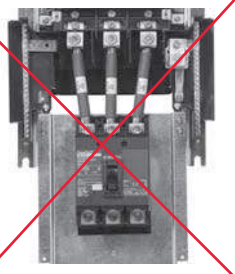
Deadfront Removed



Deadfront Installed



100 A QOB Interior



225 A QBL Interior

Main Circuit Breaker Interiors

- Will accept plug-on or bolt-on branch circuit breakers.
- Merchandised main circuit breaker interiors are suitable for use as service entrance (US only).
- Service entrance barriers are required and available in Canada (factory-assembled only).
- Top- or bottom-feed.
- 65k AIR maximum branch circuit breakers (fully-rated).
- 200k AIR maximum when supplied by I-Limiter circuit breaker (series rated).
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option. Branch connector fingers are all tin-plated copper; silver-plated branch connector fingers are optional.
- 100 A main circuit breaker interiors use a standard main lug interior and an appropriate QOB or QOB-VH main circuit breaker in a branch space; vertical main breaker main breaker interiors are also available.
- 110-225 A main circuit breaker interior consists of:
  - — Standard main lug interior.
  - — Main circuit breaker adaptor kit (NQMB2Q, NQMB2HJ or NQMB2KI).
  - — Appropriate QBL, QDL, QGL, QJL, HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, or KIL circuit breaker.
- 250 A main circuit breaker interiors are factory-assembled only.
- 400 A main circuit breaker interiors consist of:
  - — Standard main lug interior
  - — Main circuit breaker adapter kit (Catalog No. NQMB4LA)
  - — Appropriate LAL or LHL circuit breaker
- 600 A main circuit breaker interiors (factory-assembled only) consist of:
  - — Appropriate LCL or LIL circuit breaker

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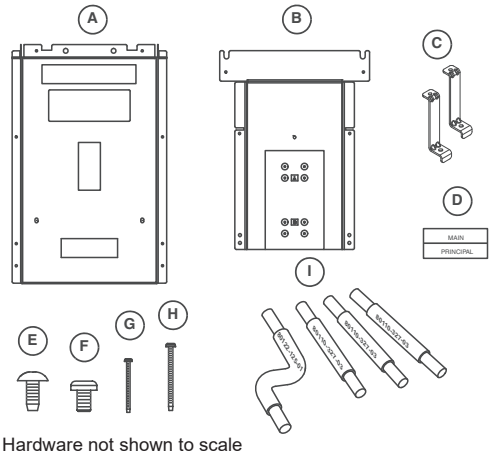
Main Circuit Breaker Adapter Kits
(Order Circuit Breaker Separately)



Hardware not shown to scale

NQMB2Q
Kit Contents

A. Main circuit breaker deadfront cover (1)
B. Main circuit breaker mounting pan (1)
C. Deadfront support brackets (2)
D. "Main" circuit breaker label (1)
E. 10-32 x 7/16-inch tapping screws (2)
F. 10-32 x 5/16-inch tapping screws (6)
G. 8-32 x 2 ¼-inch tapping screws (2)
H. 8-32 x 3 ¼-inch tapping screws (2)
I. Main lug wires (4)

Table 1: Main Circuit Breaker Adapter Kits

Catalog No.	Ampere Rating	Main Circuit Breaker
NQMB2Q	100–225 A	QBL, QDL, QGL, QJL
NQMB2HJ	100–225 A	HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL
NQMB2KI	110–225 A	KIL
NQMB4LA	125–400 A	LAL, LHL

Main circuit breakers are not included in the adapter kits, order separately.

Table 2: Main Circuit Breakers

Max. Amperes	Circuit Breaker Type
100 A	QOB[1], QOB-VH[a], or FIL
150 A	HDL, HGL, HJL, or HLL
225 A	QBL, QDL, QGL, QJL, JDL, JGL, JJL, JLL, or KIL
250 A[2]	JDL, JGL, JJL, JLL, or KIL
400 A	LAL or LHL
	LC/LI/LX/LXI/LE[b]
600 A	LC/LI/LX/LXI/LE[b]

1 Backfed main circuit breaker
2 Factory assembled only

Table 3: Additional Main Circuit Breaker Information

Ampere Rating	Circuit Breaker Type	Circuit Breaker Catalog Section Class
100	QOB	730
	FIL	820
150	HDL, HGL, HJL, HLL	611
225/250	QBL, QDL, QGL, QJL	734
	JDL, JGL, JJL, JLL	611
	KIL	825
400	LAL, LHL	660

Field-Installable Circuit Breaker Accessories

Field-installable shunt trip, alarm switch, and auxiliary contacts are available for LAL 400 A main circuit breaker interiors. Refer to the Square D Digest for additional information.

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Branch Circuit Breakers (Bolt-on)

Table 8: Branch Circuit Breakers (Plug-on or Bolt-on) [1]

10 k AIR	22 k AIR	65 k AIR	10 k AIR (240 Vac)	42 k AIR
QO, QOB	**QO-VH, QOB-VH**	**QH, QHB**	**QO-H, QOB-H**	**QOH**
1-Pole 10–70 A	1-Pole 15–30 A	1-Pole 15–30 A	2-Pole 15–100 A	2-Pole 35–125 A
2-Pole 10–125 A	2-Pole 15–150 A	2-Pole 15–30 A		
3-Pole 10–100 A	3-Pole 15–150 A	3-Pole 15–30 A		

[1] Series ratings are also available. Canada: See the Series Rating Guide (data bulletin #S1600PD0302EP) USA: See Switchboard/Panelboard Short-Circuit Current Ratings (data bulletin #2700DB9901), or the Digest

QOB Branch Circuit Breakers

QO Branch Circuit Breakers

Table 9: Branch Circuit Breaker Interrupting Data

Circuit Breaker Catalog Prefix	Max. Vac Rating	Number of Poles	Ampere Rating	Interrupting Rating— RMS Symmetrical Amperes		
				Vac		
				120	120/240	240
QO, QOB	120/240	1	10-70	—	10k	—
	120/240	2	10-125	—	10k	—
	240	3	10-100	—	—	10k
QO-H, QOB-H	240	2	15–125	—	—	10k
QO-VH	120/240	1	15–30	—	22k	—
	120/240	2	15–125	—	22k	—
	240	3	15–100	—	—	22k
QOB-VH	120/240	1	15–30	—	22k	—
	120/240	2	15–150	—	22k	—
	240	3	15–150	—	—	22k
QOH-QOHB	120/240	2	35–125	—	42k	—
QH QHB	120/240	1	15–30	—	65k	—
	120/240	2	15–30	—	65k	—
	240	3	15–30	—	—	65k

Table 10: Additional Branch Circuit Breaker Information

Circuit Breaker Type	Circuit Breaker Catalog Class
QO, QOB	730
QO-AFCI	760
QO-GFI, QOB-GFI	910

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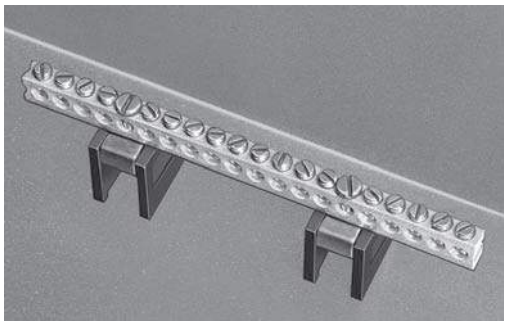
Ground Bar Kits

- Field-installable in all panelboards.
- Suitable for copper or aluminum wire.
- Provisions for mounting up to four ground bar kits per panel.

Equipment Ground Bar



Ground Bar with Insulator Kit

Ground Bar Insulator Kit (Catalog No. PKGTAB)

The insulator kit is field installable and may be used with equipment ground bar kits. NQ panelboard enclosures have equipment ground bar mounting provisions in all four corners.

Technical Information

All PK equipment grounding kits are supplied with mounting screws, necessary installation instructions, and an “Equipment Grounding Terminal” self-adhesive label.

Table 15: Ground Bar Kit Technical Information

Catalog Number	Total Qty	Terminals		Approximate Overall Length in (mm)	Distance Between Mounting Holes in (mm)
		Qty Each Size (For Wire Range see Table 16:)			
		I	II		
PK23GTAL	24	23	1	9.125 (232)	3.125 (79)
PK27GTA	27	27	—	9.125 (232)	3.125 (79)
PK27GTACU	27	27	—	9.125 (232)	3.125 (79)

Table 16: Ground Bar Kit Wire Ranges

Size	Cu	Al
I	(1) #14 to #4 or (2) #14 or #12	(1) #12 to #4 or (2) #12 or #10
II	(1) #1 to 4/0	(1) #1 to 4/0

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NF Circuit Breaker Panelboards

Catalog
1670CT0701

2008
Class 1670

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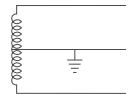
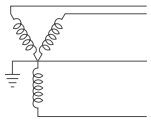
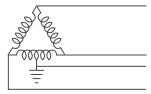
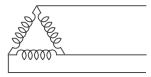
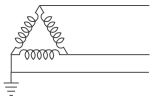
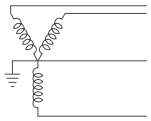
Standards and Ratings

NF circuit breaker panelboards are for use on ac systems. They are UL® Listed under File E33139 and marked cULus. NF circuit breaker panelboards accept EDB, EGB, and EJB branch circuit breakers.

Voltage	System	System Diagram
120/240 Vac	1ϕ3W	
208Y/120 Vac	3ϕ4W	
240/120 Vac	3ϕ4W Delta	
240 Vac	3ϕ3W Delta	
240 Vac	3ϕ3W Grounded Bϕ Delta	
480Y/277 Vac	3ϕ4W	
600Y/347 Vac	3ϕ4W	

Standards

NF circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- UL Listed Class CTL panelboard
- CSA C22.2, No. 29-M1989—Panelboards and Enclosed Panelboards
- CSA C22.2, No. 94-M91—Special Purpose Enclosures
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code® (NEC®)
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards
- 2003 IBC, NFPA 5000, ASCE/SE17—Seismic Qualification

Ratings

- Main lugs: 125–800 A
- Main circuit breaker: 125–600 A

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Main Circuit Breakers

HDL

- 125 A maximum field-installable EDB, EGB, or EJB (110 A max at 600Y/347 Vac)
- 100 A maximum field-installable FI
- 125 A maximum field-installable HDL, HGL, HJL, or HLL
- 250 A maximum field-installable JDL, JGL, JJL, or JLL
- 400 A maximum field-installable LAL or LHL
- 400 A or 600 A maximum factory-installed LCL or LIL (LCL is 480Y/277 Vac maximum)

Factory-Installed Circuit Breaker Accessories

FIL, HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, and KIL circuit breakers are available with shunt trip, ground fault shunt trip, undervoltage trip, time delay, auxiliary switches, and alarm switches.

JDL

Table 1: Main Circuit Breaker Adapter Kits (Circuit Breaker Not Included)

Adapter Kit Catalog Number	Ampere Rating	Main Circuit Breaker[1]
N100MFI	20–100 A	FIL
N150MH[2]	15–125 A[3]	HDL, HGL, HJL, HLL
N250MJ	150–250 A	JDL, JGL, JJL, JLL
N250MKC	110–250 A	KIL
N400M	125–400 A	LAL, LHL

1 Main circuit breakers are not included in the adapter kits. Order them separately.

2 For single phase applications of HDL and HGL, select a 3-pole main circuit breaker. For single-phase applications of HJL and HLL, select a 2-pole main circuit breaker.

3 RTI kit accepts maximum 125 A H-frame circuit breaker.

NOTE: See “Main Circuit Breaker Terminal Data” on page 18.

Field-Installable Circuit Breaker Accessories

LAL

Field-installable undervoltage release, alarm switch, shunt trip, and auxiliary contacts are available for LAL, LHL, LCL, and LIL 400 A main circuit breaker interiors.

NOTE: See Supplemental Digest for additional accessories.

N250MJ Main Circuit Breaker Kit

N400M Main Circuit Breaker Kit

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Branch Circuit Breakers (Bolt-on)

Table 2: Standard Branches, 600Y/347 Vac Maximum

Branch Prefix	Availability			Short Circuit Current Rating[1]	
	1-Pole	2-Pole	3-Pole	at 480Y/277 Vac	at 600Y/347 Vac
EDB	15-70 A	15-125 A[2]	15-125 A[2]	18,000 A	14,000 A
EGB	15-70 A	15-125 A[2]	15-125 A[2]	35,000 A	18,000 A
EJB	15-70 A	15-125 A[2]	15-125 A[2]	65,000 A	25,000 A

1 Series ratings are also available.
In **Canada**: See Series Rating Guide (Data Bulletin #S1600PD0302EP).
In **USA**: See Switchboard/Panelboard Short Circuit Current Ratings (Data Bulletin #2700DB9901) or the Digest.

2 600Y/347 Vac is 110 A maximum.

Table 3: EPD Branches – 30 mA Ground Fault Equipment Protection Devices, 277 Vac Maximum

Branch Prefix	Availability 1-Pole[1]	Short Circuit Current Rating[2] at 277 Vac
EDB-EPD	15-70A	18,000 A
EGB-EPD	15-70A	35,000 A
EJB-EPD	15-70A	65,000 A

1 EPD branches are single-pole only, and require two pole spaces in the panelboard.

2 Also available with series ratings.

EDB Branch Circuit Breakers

Table 4: Standard and EPD Branches – Terminal Lug Data

Branch Circuit Breaker Prefix	Ampere Rating	Wire Size	
		Aluminum	Copper
EDB, EGB, EJB, EDB-EPD, EGB-EPD, EJB-EPD	15-30 A	#12 - #6	#14 - #6
	35-125 A	#12 - 2/0	#14 – 2/0

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Interiors

250 A Maximum Main Lugs Interior (Deadfronts Installed)

Main Lug Interiors

- Will accept bolt-on branch circuit breakers
- Top or bottom feed
- 65,000 A Short Circuit Current Rating (SCCR) maximum branch circuit breakers at 480Y/277 Vac
- 25,000 A SCCR maximum branch circuit breakers at 600Y/347 Vac
- Series rated to 200,000 A SCCR maximum when supplied by remote I-Limiter® circuit breaker at 480Y/277 Vac
- Series rated to 65,000 A SCCR maximum when supplied by remote I-Limiter circuit breaker at 600Y/347 Vac
- 125 A and 250 A interiors are suitable for use as cULus service entrance with back-fed EDB, EGB, or EJB circuit breakers
- Factory-installed main lugs on all interiors
- 125–400 A main lug interiors are convertible to main circuit breaker interiors by adding a main circuit breaker adapter kit and a main circuit breaker
- Several bus options:
  - — Silver-plated copper or tin-plated aluminum bus (aluminum is standard)
  - — Tin-plated copper bus is available as an option
  - — 600 A and 800 A only available with copper
- Branch connector fingers are tin-plated copper
  - — Silver-plated branch connector fingers are optional
- Line lugs are suitable for 75° C copper or aluminum wire

Factory-Installed Options for Main Lugs and Main Breaker Interiors

- Sub-Feed Lugs (on the Main)

  NOTE: Only available on 1ϕ or 3ϕ, 125–800 A main lug interiors
- Feed-Through Lugs

  NOTE: Available on 1ϕ or 3ϕ, 125–800 A main lug or 100–600 A main circuit breaker interiors
- Sub-Feed Circuit Breakers

  NOTE: Available on 1ϕ or 3ϕ, 125–800 A main lug or 100–600 A main circuit breaker interiors
  - — One sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JJL, or JLL circuit breaker per 250 A panelboard
  - — Two sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JJL, or JLL circuit breakers per 400 A panelboard
  - — One sub-feed LA, LH, LC, or LI circuit breaker (400 A maximum) and one HDL, HGL, HJL, HLL, JDL, JGL, JJL, or JLL circuit breaker, or two sub-feed HDL, HGL, HJL, HLL, JDL, JGL, JJL, or JLL circuit breakers per 600 A or 800 A panelboard

    NOTE: LC/LI circuit breakers cannot be combined with JJL or JLL circuit breakers
- Split bus
- Lighting contactors
- Compression lugs

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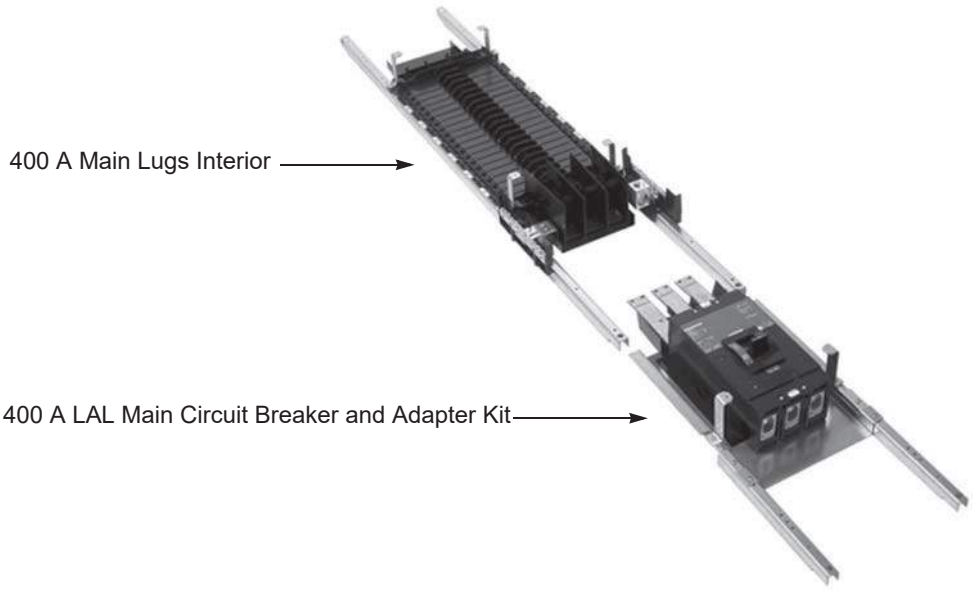
Main Circuit Breaker Interiors

400 A LAL Main Circuit Breaker Interior

- Will accept bolt-on branch circuit breakers
- Suitable for use as UL service entrance (statement found on wiring label on back of deadfront); meets local electrical codes (CSA type service entrance available factory-assembled)
- Top or bottom feed
- 65 k AIR maximum branch circuit breakers at 480Y/277 Vac
- 25 K AIR maximum branch circuit breakers at 600Y/347 Vac
- Series rated to 200 k AIR maximum when supplied by remote I-Limiter circuit breaker at 480Y/277 Vac
- Series rated to 65 k AIR maximum when supplied by remote I-Limiter circuit breaker at 600Y/347 Vac
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option; 600 A only available with copper
- Branch connector fingers are tin-plated copper; silver-plated branch connector fingers are optional
- 125 A at 480Y/277 Vac (110 A at 600Y/347 Vac) main circuit breaker interiors contain back-fed EDB, EGB, or EJB main circuit breakers
- 100–250 A main circuit breaker panelboards consist of:
  - — Standard main lug interiors
  - — Main circuit breaker adapter kit (N150MH, N100MFI, N250MKC, N250MJ)
  - — Appropriate FIL, HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, or KIL circuit breakers
  - — Line lugs are suitable for 75° C copper or aluminum wire
- 400 A main circuit breaker panelboard consists of:
  - — Standard main lug interior
  - — Main circuit breaker adapter kit (N400M)
  - — Appropriate LAL or LHL circuit breaker
  - — Factory-installed LCL or LIL main circuit breaker with 8 in. (203 mm) deep enclosure (Type 1 only)
- 600 A main circuit breaker panelboard:
  - — Factory-assembled only
  - — Use LCL, LIL main circuit breakers
  - — 8.75 in. (223 mm) deep enclosure (Type 1 only)



400 A Main Lugs Interior with 400 A Main Circuit Breaker and Adapter Kit

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400 A Main Lug Interior with Sub-Feed Lugs

400 A Sub-Feed Main Lug Kits

Compression Lugs

Field-Installable Options

- Feed-Through Lug Kits
  - — NF125FTL, NF250FTL, NF400FTL available for 125–400 A, 1ϕ or 3ϕ interiors
- Sub-Feed Circuit Breaker Kits
  - — NF250SFBH allows a single sub-feed HDL, HGL, HJL, or HLL circuit breaker on 250 A interiors
  - — NF250SFBJ allows a single sub-feed JDL, JGL, JJL, or JLL circuit breaker on 250 A interiors
  - — NF600SFBH allows twin sub-feed HDL, HGL, HJL OR HLL circuit breaker on 400 A main lug or main circuit breaker interiors and 600A main lug interiors
  - — N600SFBJ allows twin sub-feed JDL, JGL, JJL, or JLL circuit breakers on 400 A main lug or main circuit breaker interiors and 600 A main lug interiors
- Sub-Feed Lug Kits

Amperes	Catalog Number
125 A	NF125SFL
250 A	NF250SFL
400 A	NF400SFL

- 200% Neutral Kits

Amperes	Catalog Number
100 A	NFNL1
125 A	NFNL1
250 A	NFNL2
400 A	NFNL4[1]

[1] 200% neutrals not available with FTL, SFL, or SFB.

- Copper 100% Kits

Copper 100% Amperes	Copper Neutral Kits Catalog Number
125 A	NFN1CU
250 A	NFN2CU
400 A	NFN6CU
600 A	NFN6CU[1]

[1] Not to be used with SFL, FTL, or SFB. These combinations are factory-assembled only.

Compression Lugs

Compression lugs are available for 125–600 A main lug interiors and 100–400 A main circuit breaker interiors.

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Neutrals

Neutral Assembly

- All lugs are suitable for copper or aluminum wire
- 125–250 A interiors have a split neutral located on the same end as the mains
- 400–800 A interior neutrals can be located on either end depending on the configuration
- Neutral may be bonded for use as a UL service entrance
- Branch terminals are suitable for #14-2/0 copper or aluminum and #14-#6 copper or aluminum
- Provisions for larger branch terminal lug kits are available as options
- Suitable lug provided on neutrals for termination of the grounding conductor
- All unused neutral terminals may be used to terminate equipment grounding conductors when the panelboard is used as UL service equipment
- 100% rated neutrals are standard; one neutral termination provided per circuit in the panelboard
- 200% rated neutrals are optional see, “200% Neutral Kits” below

Neutral Bonding Provisions

125–250 A Neutral Bonding Provisions

The bonding strap may be field installed for UL service equipment requirements on 125–800 A interiors. Not applicable for CSA service entrance panels in Canada.

Table 5: Copper 100% Neutral Kits for Use with Single or Three Phase 125-600 A Interiors

Amperage	125 A	250 A	400 A	600 A	800 A
Catalog Number	NFN1CU	NFN2CU	NFN6CU	NFN6CU[1]	Kit not available, Factory-assembled only

[1] Not to be used with SFL, FTL or SFB. These combinations are factory-assembled only.

200% Neutral Kits

Table 6: 200% Neutral Kits for Use with Single or Three Phase 125-400 A Interiors

Amperage	125 A	250 A	400 A	600 A	800 A
Catalog Number	NFNL1	NFNL2	NFNL4[1]	Kit not available, Factory-assembled only	

[1] Not to be used with SFL, FTL or SFB. These combinations are factory-assembled only.

NFNL2

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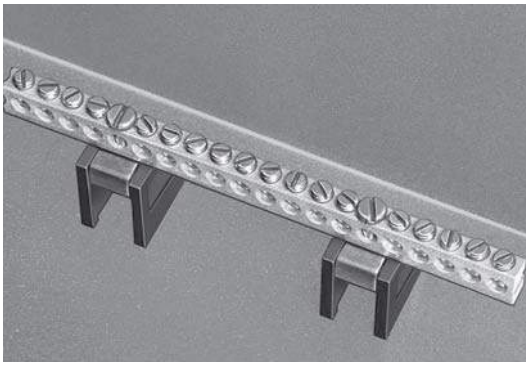
Ground Bar Kits

Ground Bar Kit



Ground Bar with Insulator Kit

- Field installable in all panelboards
- Wire size of terminals (refer to the technical information below)

Table 7: Ground Bar Kits

Catalog Number	Terminals	Material
PK23GTAL	23	AL
PK27GTA	25[1]	CU
PK27GTACU	27	AL

1 24 small terminals and 1 large terminal

- Order enough ground bar kits to accommodate all the ground conductors used in the panel

Ground Bar Insulator Kits (Catalog No. PKGTAB)

- The insulator kit isolates the standard panelboard ground bar from the panelboard
- The insulator kit is field installable, and panelboard enclosures have ground bar mounting provisions in all four corners

Technical Information

All PK equipment grounding kits are supplied with mounting screws, installation instructions, and an “Equipment Grounding Terminal” self-adhesive label.

Table 8: Technical Information

Catalog Number	Terminals			Approximate Overall Length Inches (mm)	Distance Between Mounting Holes Inches (mm)
	Number of Terminals	Quantity Available for Each Size			
		Material	I / II[1]		
PK23GTAL	24	AL	23 / 1	9.125 (232)	3.125 (79)
PK27GTA	27	AL	24 / 1	9.125 (232)	3.125 (79)
PK27GTACU	27	CU	27 / 0	9.125 (232)	3.125 (79)

1 See wire range table below.

Table 9: Wire Range

Size	Cu	Al
I	(1) #14 to #4 or (2) #14 or #12	(1) #12 to #4 or (2) #12 or #10
II	(1) #1 to 4/0	(1) #1 to 4/0

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Enclosures

Enclosure Types

Mono-Flat Type 1 Enclosure for 100–250 A Interiors

Type	Environment	Protects Against
Type 1	Indoor	Contact with the enclosed equipment, falling dirt
Type 2	Indoor	Type 1, plus • Dripping and light splashing of non-corrosive liquids
Type 3R	Outdoor	Type 2, plus • Rain, snow, and sleet
Type 4	Indoor/outdoor	Type 3R, plus • Circulating dust, lint, fibers and flyings • Settling airborne dust, lint, fibers and flyings • Windblown dust • Hosedown and splashing water
Type 4X	Indoor/outdoor	Type 4, plus • Corrosive agents
Type 5	Indoor	Type 2, plus • Settling airborne dust, lint, fibers, and flyings
Type 12	Indoor	Type 2, plus • Circulating dust, lint, fibers, and flyings • Settling airborne dust, lint, fibers, and flyings • Oil and coolant seepage

Indoor Enclosures (Types 1 and 2)

Type 1 Enclosure for 400–800 A Interiors

MH type Box

- Standard boxes are 20 in. (508 mm) wide by 5.75 in. (223 mm) deep
- NF interiors with an LC or LI main circuit breaker or with an 800 A MLO interior require an 8.75 in. (223 mm) deep box — therefore, they are available factory-assembled and fully-assembled only
- Boxes are galvanized steel with removable endwalls. On standard 5 3/4 inch depth boxes, one endwall is provided with knockouts, and the other endwall is blank. On deeper boxes, both are blank. Endwalls are removable and interchangeable
- Box and interior mounting instructions are included in the documentation shipped with the interior
- Keyhole slots are located in the box backwall to ease installation

  NOTE: Interiors mount directly to studs in MH boxes. No interior mounting brackets are required.

  NOTE: 800 A interiors and interiors that have LC/LI main circuit breakers require elevating brackets, due to the requirement of an 8.75 in. (223 mm) deep box.
- Type 2 boxes include a drip hood (available with surface mounted trim only)

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Enclosures

Type 1 and 2 Trim Fronts

- Finished with gray-baked enamel electrodeposited over cleaned, phosphatized steel (ANSI 49)
- Order flush or surface mounted
- Door with flush lock; uses NSR-251 key
- Directory card located on the inside of the door
- Mono-Flat® fronts on 100–250 A interiors mount to the interior trim with trim screws. Both trim mounting screws and door hinges are concealed; fronts are not removable with the door closed and locked
- Fronts for 400–800 A interiors are ventilated and mount to the enclosure with trim screws; door hinges are concealed
- Fronts 56 in. (1422 mm) high or more on 250 A interiors or 74 in. (1880 mm) high or more on 600 A and 800 A interiors have two flush locks
- Fronts 68 in. (1727 mm) high or more on interiors with LC/LI main circuit breakers or LC sub-feed circuit breakers use a sliding vault lock with 3-point latching

Key NSR-251
(Catalog No. LP9618)

Concealed Hinge for 100–800 A Trim Fronts

Interiors Mount Directly to Enclosure Studs

Standard Flush Lock
(Catalog No. PK4FL)

Optional Sliding Vault Lock (Catalog No. PK5FL)

MH Box

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Type 3R, 5, and 12 Enclosures

Rainproof (Type 3R) Dust tight (Type 5 and 12)

- Finished with gray-baked enamel electrodeposited over cleaned, phosphatized galvanized steel (ANSI 49)
- Gasketed door with lockable vault handle (PK4NVL); uses NSR-251 key
- Directory card located on the inside of the door
- No knockouts in endwalls
- Trim kit included for end and side gutters
- Provisions for two ground bars
- 125 A, 250 A, 400 A main lug and main circuit breaker interiors
- 600 A and 800 A main lug only

Vault Handle with Lock
(Catalog No. PK4NLV)

Type 4X Enclosure

Corrosion-Resistant Fiberglass-Reinforced Polyester (Type 4X)

- Watertight and dust-tight
- Gasketed door with trunk latches
- Directory card located on the inside of the door

Stainless Steel (Type 4 and 4x)

- Water and dust tight
- Gasketed door
- Directory card located on inside of door

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Terminal Data

Main Lugs Terminal Data

Table 17: Standard Aluminum and Copper Lugs

Amperes	Aluminum				Copper			
	Aluminum Mechanical		Aluminum Compression		Copper Mechanical		Copper Compression	
	Cat. #	Lug Wire Range	Cat. #	Lug Wire Range	Cat. #	Lug Wire Range	Cat. #	Lug Wire Range
125	NFALM1	(1) #6 - 2/0[1]	NFALV1	(1) #4-300 kcmil	NFCUM1	(1) #6 - 350 kcmil	NFCUV 1	(1) #6 - 1/0
250	NFAML2	(1) #6 - 350 kcmil	NFALV2	(1) 250-350 kcmil	NFCUM2	(1) #6 - 350 kcmil	NFCUV 2	(1) 2/0 - 300 kcmil
400	NFALM4	(1) 1/0-750 kcmil or (2) 1/0-350 kcmil	NFALV4	(2) 2/0-500 kcmil	NFCUM4	(1) 1/0-750 kcmil or (2) 1/0-350 kcmil	NFCUV 4	(1) 400-750 kcmil
600	NFALM6	(2) 1/0-600 kcmil	NFALV6	(2) 2/0-500 kcmil	NFCUM6	(2) 1/0-750 kcmil	NFCUV 6	(2) 250-750 kcmil
800	Contact the Technical Applications Group (TAG)							

1 Neutral accepts #6-2/0 Al/Cu.

Main Circuit Breaker Terminal Data

See Digest section 7 for copper lugs.

Table 18: Standard Aluminum Mechanical Lugs

Panelboard Type	Ampere Rating	Circuit Breaker Type	Lug Wire Range
NF	100 A	FIL	(1) #14-1/0 Cu or (1) #12-1/0 Al
	125 A[1]	EDB, EGB, EJB	(1) #14-2/0 Al/Cu
	150 A	HDL, HGL, HJL, HLL	(1) #14-3/0 Al/Cu
	250 A	JDL, JGL, JJL, JLL, KI	(1) 3/0-350 kcmil Al/Cu
	400 A	LAL, LHL	(1) #1-600 kcmil Al/Cu or (2) #1-250 kcmil Al/Cu
	600 A	LCL, LIL, LEL, LXL LXIL	(2) 4/0-500 kcmil Al/Cu
	800 A	800 A main breaker panelboard not available.	

1 110 A maximum at 600Y/347 Vac.

Table 19: Aluminum Compression Lugs

Panelboard Type	Ampere Rating	Circuit Breaker Type	Catalog No.	Lug Wire Range
NF	100 A	FC, FI	VC100FA	(1) #8-1/0 Al/Cu
	125 A[1]	ED, EG, EJ	VC100FD	(1) #8-1/0 Al/Cu
	150 A	HDL, HGL, HJL, HLL	YA150HD	(1) #1–4/0 Al/Cu
	250 A	JDL, JGL, JJL, JLL	YA250J35	(1) 3/0–350 kcmil Al/Cu
	250 A	KI	VC250KA3	(1) #4-300 kcmil Al/Cu
	400 A	LA, LH	VC400LA5[2]	(1) 2/0-500 kcmil Al/Cu
	600 A	LC, LI, LE, LX, LXI	—	—
	800 A	800 A main breaker panelboard not available.		

1 110 A maximum at 600Y/347 Vac.

2 Other lug sizes available.

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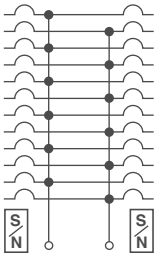
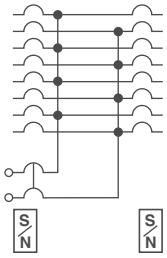
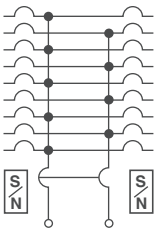
Typical Wiring Diagrams



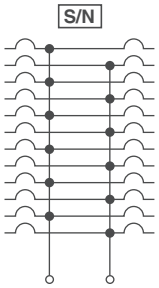
125–250 A Main Lugs



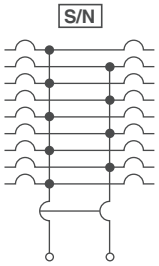
125 A EDB Main Circuit Breaker
(110 A max. at 600/347 Vac)



100–250 A Main Circuit Breaker
Types FIL, HDL, HGL, HJL, HLL,
JDL, JGL, JJL, JLL, KIL

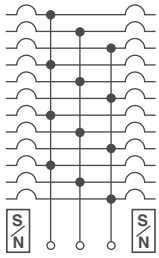


400–800 A Main Lugs

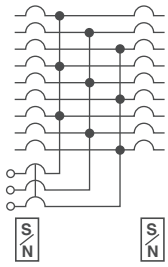


400–600 A Main Circuit Breaker
Types LAL, LHL, LCL, LIL

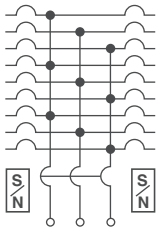
1-Phase, 3-Wire



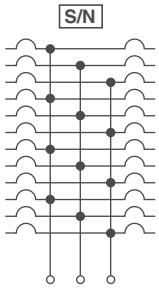
125–250 A Main Lugs



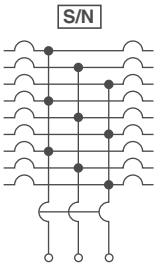
125 A EDB Main Circuit Breaker
(110 A max. at 600/347 Vac)



100–250 A Main Circuit Breaker
Types FIL, HDL, HGL, HJL, HLL,
JDL, JGL, JJL, JLL, KIL



400–800 A Main Lugs



400–600 A Main Circuit Breaker
Types LAL, LHL, LCL, LIL

3-Phase, 4-Wire

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EDB-EPD, EGB-EPD and EJB-EPD (Equipment Protection Device) Circuit Breakers for Ground Fault Protection in NF Panelboards

One-pole EDB-EPD with optional alarm switch

Square D® EDB-EPD, EGB-EPD and EJB-EPD (Equipment Protection Device) Circuit Breakers are 1-pole thermal-magnetic circuit breakers with integral equipment ground fault protection. The ground fault protection level is fixed at 30 milliamperes per UL1053 and is designed to protect equipment from damage. Like standard branch breakers, these EPDs also provide branch circuit overload and short-circuit protection per UL 489 at 277 Vac. The EDB-EPD, EGB-EPD and EJB-EPD Circuit Breakers mount in NF circuit breaker panelboards and interiors, each circuit breaker occupying two poles of space.

Benefits of EDB-EPD, EGB-EPD and EJB-EPDs

More than 90% of short circuits initially involve ground faults (also called earth leakage or residual current). Detecting ground faults before they reach hazardous levels helps to avoid damage to critical equipment. This allows preventive maintenance to be scheduled before damage occurs, thus minimizing costly downtime.

Benefits to the Equipment User

- Protects expensive electrical equipment from damage due to ground faults
- Reduces equipment and employee downtime by preventing damage from ground faults
- Provides warning that the equipment needs preventive maintenance
- Reduced potential for hazards associated with ground fault-related fires and equipment malfunction

Benefits for OEMs

- Provides a more reliable machine for your customers – a competitive advantage
- Reduces warranty expense by limiting damage to equipment that might have otherwise occurred during the warranty period

EDB-EPD, EGB-EPD and EJB-EPD (Equipment Protection Device) Circuit Breakers for ground fault Protection in NF Panelboards

Applications

The NEC permits the use of an EPD for heat trace as a means of preventing freezing of pipes, rain gutters, etc. Other applications include protection of well pumps and other electrical equipment.

- Oil & gas/chemical
- Pharmaceuticals
- Water and waste treatment
- Food & beverage
- Other applications that require 30 mA ground fault protection

Key Features

- Designed for 30 mA equipment protection in commercial and industrial applications. Ideal for use with heat trace, pumps, etc.
- Can be installed in any Square D® NF Circuit Breaker Panelboard (each EPD occupies two pole spaces)
- Provides equipment protection at 30 mA
- One pole at 277 Vac
- Continuous current ratings of 15 A, 20 A, 30 A, 40 A and 50 A available
- Push-to-test button to test ground fault protection circuitry
- A wide range of interrupting ratings (AIR): EDB = 18kA; EGB = 35kA; EJB = 65kA
- Thermal-magnetic trip curve identical to equivalent circuit breaker without ground fault protection
- Optional alarm switch with one normally open contact
- All amperages are UL Listed as HID (high intensity discharge); 15 A and 20 A are UL Listed as SWD (switching duty rated)
- ground fault protection meets UL 1053 and CSA C22.2 No. 144-M91 standards
- Overload and short circuit protection meets UL489 and CSA C22.2 No. 5-02

How EPDs Operate

An EPD compares outgoing load currents with returning currents to determine if there is leakage of current to ground. If it detects a ground fault greater than 30 mA, the EPD will trip and display the “red flag” of the Visi-Trip® indicator.

NOTE: Unlike residential GFCIs (ground fault circuit interrupters), EPDs are not designed for people protection (UL943 Class A calls for protection above 6 mA). EPDs are designed to meet the UL1053 standard for equipment protection. Although not designed for people protection, they do create a safer environment by reducing the potential for hazards associated with ground faults including fires, and equipment malfunction.

These Square D® EPDs are also designed to minimize nuisance tripping in an environment with electrical noise or harmonics.

An optional factory-installed alarm switch provides a set of contacts to remotely indicate if the EPD is in the tripped position. The alarm switch does not distinguish between ground fault, thermal, or magnetic trip.

Testing

EPD Circuit Breakers include a black test button to test the ground fault circuitry, as required by UL 1053. Pushing the test button causes the circuit breaker to trip, placing the handle into the tripped (middle) position. When the breaker is tripped (by ground fault, short-circuit, or overload conditions), the Visi-Trip trip indication (red flag) appears in a window on the front of the circuit breaker case.

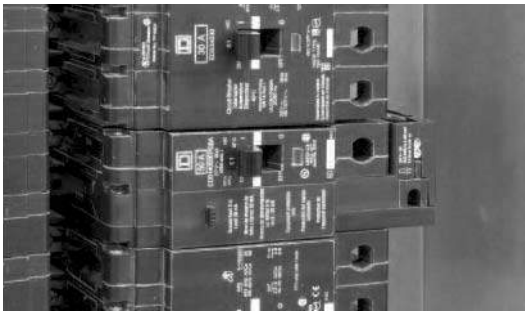
Catalog Numbers for EDB-EPD, EGB-EPD and EJB-EPDs

Continuous Current Rating @ 40 C	AC Magnetic Trip (Amps @277V)		Catalog Numbers			Terminal Wire Range (AWG)
	Trip	Hold	EDB (18kA)	EGB (35kA)	EJB (65kA)	
15	270	875	EDB14015EPD	EGB14015EPD	EJB14015EPD	#6 - #14 AWG CU
20			EDB14020EPD	EGB14020EPD	EJB14020EPD	or
30			EDB14030EPD	EGB14030EPD	EJB14030EPD	#4 - #12 AWG AL
40	630	1800	EDB14040EPD	EGB14040EPD	EJB14040EPD	
50			EDB14050EPD	EGB14050EPD	EJB14050EPD	

Accessories

- Optional alarm switch (bell alarm), Factory-installed only – Add BA suffix; (Cable with #12-#22 AWG CU wire only)
- No other electrical accessories are available
- HPAFD handle padlock attachment (locks ON or OFF)

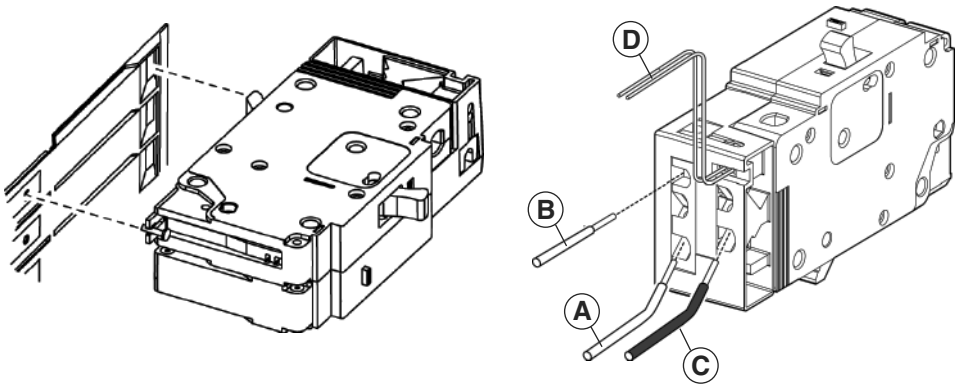
EDB-EPD, EGB-EPD and EJB-EPD (Equipment Protection Device) Circuit Breakers for ground fault Protection in NF Panelboards



Installation

The EDB-EPD, EGB-EPD and EJB-EPDs occupy two pole positions in NF Circuit Breaker Panelboards. They are approximately one inch longer than the EDB, EGB, or EJB breakers, yet still allow wire bending space in the gutter of the panelboard.

See Instruction Bulletin 48840-522-01 for installation details.



A. Panel Neutral

B. Load Neutral

C. Load Power

D. Optional Alarm Switch

A Complete Range of Ground Fault Protection Equipment

Schneider Electric provides ground fault protection products for a wide range of applications, from QO® GFCIs and EPDs to large Masterpact® Circuit Breakers with Micrologic® Trip Units.

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Schneider Electric North American Operating Division

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QO® and QOB Miniature Circuit Breakers

Catalog
0730CT9801R1/08
2008
Class 730

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General Information

QO® and QOB Circuit Breakers

QO® (plug-on) and QOB (bolt-on) one-, two- and three-pole thermal-magnetic circuit breakers provide overcurrent protection and switching on ac and dc systems. Plug-on QO circuit breakers are for use in QO load centers, NQ and NQOD panelboards, OEM mounting bases, and Speed-D® switchboard distribution panels. Bolt-on QOB circuit breakers are for use in NQO and NQOD panelboards.

Operating mechanism

QO Circuit Breakers

QO and QOB circuit breakers have an overcenter, trip-free toggle mechanism with quick-make, quick-break action and positive handle indication. The tripping mechanisms in two-and three-pole circuit breakers operate such that an overcurrent on any pole of the circuit breaker will cause all poles of the circuit breaker to open simultaneously. Each pole has an individual thermal-magnetic trip element calibrated for 40°C ambient temperature.

Trip Indication

QO and QOB circuit breakers have Visi-Trip® trip indication, which provides a visual indication that the circuit breaker has tripped and interrupted the circuit. When the circuit breaker has tripped, the handle assumes a center position and the red Visi-Trip indicator appears in a window in the circuit breaker case. The Visi-Trip indicator is only visible when the circuit breaker has tripped. Trip indication immediately distinguishes the circuit from any other circuit which is merely in the on or off position. The circuit breaker can be reset by pushing the handle to OFF and then to ON.

Construction Standards

QO and QOB circuit breakers are built to comply with UL Standard 489, CSA 22.2 No. 5, NOM/ANCE and NEMA Standard AB1 and to meet Federal Specification W-C-375B/GEN. QO circuit breakers are UL Listed under UL File E84967 and are CSA Certified under CSA Master Contract 153555.

QO Circuit Breaker	UL Type
QO280–QO210	QOA, QOB
~~QO2110–QO2125~~	~~QOC, QOCB~~
~~QO2150–QO2200~~	~~QOC (no bolt-on version)~~

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Ratings

When designing an electrical distribution system, overcurrent protective devices are generally selected based on performance requirements. Factors influencing this selection include system voltage, continuous current, interrupting rating, and frequency.

Voltage Rating

The circuit breaker must have a voltage rating greater than, or equal to, the system voltage. When a circuit breaker clears an overcurrent, it is done in two steps. First, the current sensing system identifies the overcurrent and releases the tripping mechanism. This results in a parting of the contacts. The circuit breaker must then extinguish the voltage arc across the contacts. If the circuit breaker has the correct voltage rating, it can efficiently extinguish this voltage arc. QO and QOB circuit breakers are rated for use in the following voltage systems:

- 120 Vac
- 208/120 Vac
- 120/240 Vac
- 240 Vac
- 48 Vdc (10–70 A for 1 and 2 pole circuit breakers, 10–60 A for 3 pole circuit breakers)

Continuous Current Rating

The continuous current rating of a circuit breaker is the maximum current in amperes (dc or rms ac at rated frequency) which a device will carry continuously without exceeding the specified allowable temperature rise. Sometimes referred to as the ampere rating or handle rating of the circuit breaker, the continuous current rating relates to the system current flow under normal conditions.

UL and CSA require that circuit breakers must be able to carry their continuous current rating indefinitely at 40°C in free air in order to achieve a UL Listing/CSA Certification. The National Electrical Code (NEC) and the Canadian Electrical Code (CEC) recognize that devices applied in end-use equipment can be affected by heat build up during normal operating conditions. For this reason, the codes require that circuit breakers be selected based on the characteristics of the load (particularly, the portion of the load which will be on continuously for three hours or more at a time).

Frequency Rating

The standard rated frequency for circuit breakers is 60 Hz. Circuit breakers are also rated for dc applications as shown in Table 1. Many Square D circuit breakers can also be applied on 50 Hz systems without derating. GFCI, AFCI and EPD devices are rated for 60 Hz operation only. Frequencies can affect the thermal, magnetic and short-circuit characteristics of circuit breakers. See Data Bulletin 0100DB0101 *Determining Current Carrying Capacity in Special Applications*. Contact the Field Sales office before applying circuit breakers on systems at frequencies other than 50/60 Hz.

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Interrupting Rating

The interrupting rating of a circuit breaker is the highest current at rated voltage that the circuit breaker is intended to interrupt under standard test conditions. A circuit breaker must be chosen so that the interrupting rating is equal to or greater than the maximum available short-circuit current at the point where the circuit breaker is applied in the system.

Table 1: Interrupting Ratings

Circuit Breaker Type	Number of Poles	Ampere Rating	UL Listed Interrupting Rating[1]			
			120 Vac	120/240 Vac	240 Vac	48 Vdc[2]
QO	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110–200 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QOB	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110–125 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QO-H, QOB-H	2	15–100 A	10 kA[3]	10 kA[3]	10 kA[3]	—
QO-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–200 A	22 kA	22 kA	—	—
	3	15–100 A	22 kA	22 kA	22 kA	—
QOB-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–125 A	22 kA	22 kA	—	—
	3	15–150 A	22 kA	22 kA	22 kA	—
QOH	1	40–125 A	42 kA	42 kA	—	—
QH, QHB	1	15–30 A	65 kA	65 kA	—	—
	2	15–30 A	65 kA	65 kA	—	—
	3	15–30 A	65 kA	65 kA	65 kA	—
QO-GFI, QOB-GFI	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-VHGFI, QOB-GFI	1	15–30 A	22 kA	—	—	—
QO-AFI, QOB-AFI	1	15–30 A	10 kA	—	—	—
QO-CAFI, QOB-CAFI	1	15–30 A	10 kA	—	—	—
QO-VHCAFI, QOB-VHCAFI	1	15–30 A	22 kA	—	—	—
QO-EPD, QOB-EPD	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-PL	1	15–30 A	10 kA	10 kA	10 kA	—
	2	15–30 A	10 kA	10 kA	10 kA	—
	3	15–30 A	10 kA	10 kA	10 kA	—

1 10 kA and 5 kA are 1Ø-3Ø.

2 DC ratings do not apply to circuit breakers rated 10 A.

3 UL Listed 5,000 AIR on 3Ø grounded B-Phase Delta system.

DC Voltage Rating

QO and QOB circuit breakers are available with a UL Listed 48 Vdc rating. See Table 1. Refer to Square D Data Bulletin 0601DB0401 for additional information on dc-rated circuit breakers.

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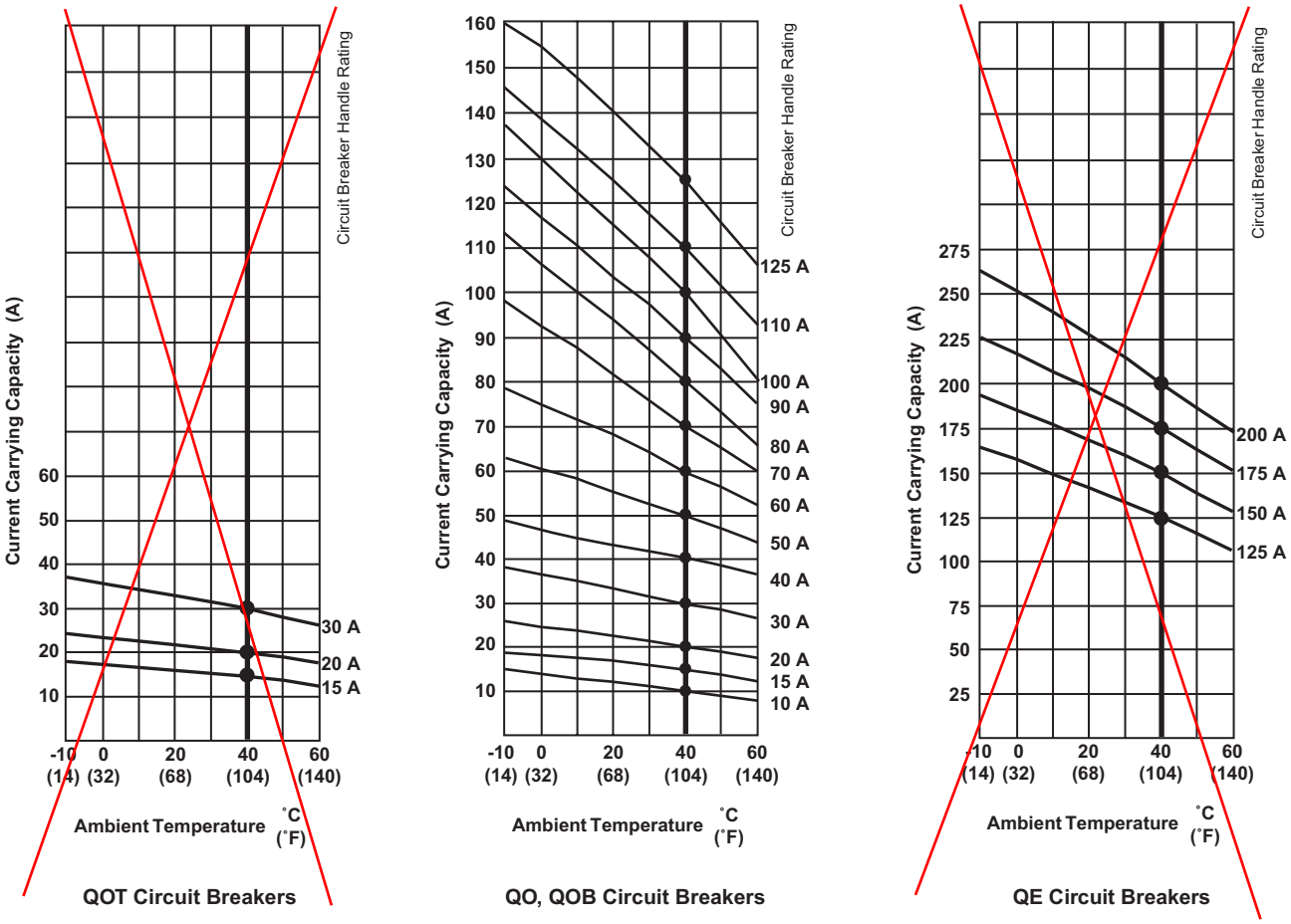
Temperature Rating

To meet the requirements of Underwriters Laboratories Standard 489, molded case circuit breakers are designed, built, and calibrated for us on 60 Hz ac systems in 40°C (104°F) ambient temperature. When applied at ambient temperatures other than 40°C, the current-carrying capacity and/or trip charasteristics of the circuit breaker may vary.

Figure 1: Ambient Rerating Curves



IEC Rating

IEC rated QO circuit breakers are available. For further information contact the Field Sales office.

Terminology

HACR

HACR is a term used to designate circuit breakers which have been certified to be used on multi-motor and combination loads such as are found in heating, air conditioning and refrigeration equipment. QO circuit breakers meet the UL requirements for HACR circuit breakers and are suitable for group motor applications requiring HACR listing.

This means that QO and QOB circuit breakers meet the code requirements that HACR circuit breaker must be of the inverse time type and be approved for group installation. QO and QOB circuit breakers, except for GFI, AFI and EPD, are Listed with UL as HACR Type and are labeled accordingly.

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Accessories

Most QO and QOB circuit breakers can be supplied with electrical accessories factory-installed on one-, two- or three-pole circuit breakers. Electrical accessories are not available on AFCI circuit breakers.

Handle accessories are also available for field installation on QO and QOB circuit breakers. All field-installed handle accessories must be ordered separately.

Electrical Accessories

Only one electrical accessory can be installed per circuit breaker, and are factory-installed only. All electrical accessories occupy one additional pole space. The proper suffix number must be added to the circuit breaker catalog number to order an accessory. No field modification or field installation is possible on electrical accessories.

Table 5: Factory-Installed Electrical Accessory Suffix Numbers

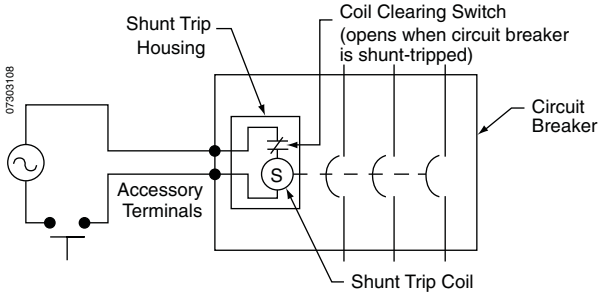
Accessory	Description	Voltage	Coil Burden	Max. Load	Catalog Suffix
Shunt Trip	Trips the circuit breaker from a remote location by means of a trip coil energized from a separate circuit. All shunt trips will operate at 75% or more of rated voltage. • For use with momentary or maintained push button. • Not available on QO-GF or QO-EPD circuit breakers. • Shunt trip terminals accept (2) 14–12 AWG Cu leads.	12 Vac/dc 24 Vac/dc	60 VA 168 VA	—	1042
		120 Vac 208 Vac 240 Vac	72 VA 228 VA 288 VA	—	1021
Auxiliary Switch “A” Contact	Circuit breaker open—One contact only, opens when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1200
Auxiliary Switch “B” Contact	Circuit breaker open—One contact only, closed when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1201
Alarm Switch	Used with control circuits and is actuated only when the circuit breaker has tripped. Standard construction includes a normally-open contact. • Alarm switch terminals accept (2) 14–12 AWG Cu leads.	120 Vac	—	5 A	2100

Shunt Trip

The shunt trip is used to trip the circuit breaker from a remote location by using a tripping coil energized from a separate circuit. When energized by a push-button or other pilot device, the shunt trip caused the circuit breaker to trip. The handle moves to the tripped position and the Visi-Trip® indicator appears. The trip coil has a coil clearing contact to break the coil circuit when the circuit breaker trips.

Shunt trips are available for QO and QOB circuit breakers only with standard control voltage ratings up to 240 Vac or 24 Vdc. (Shunt trips are not available on QO and QOB GFCI, AFCI, EPD and miniature switches.) Shunt trips operate at 75% or more of rated voltage.

Figure 5: Shunt Trip Wiring Diagram



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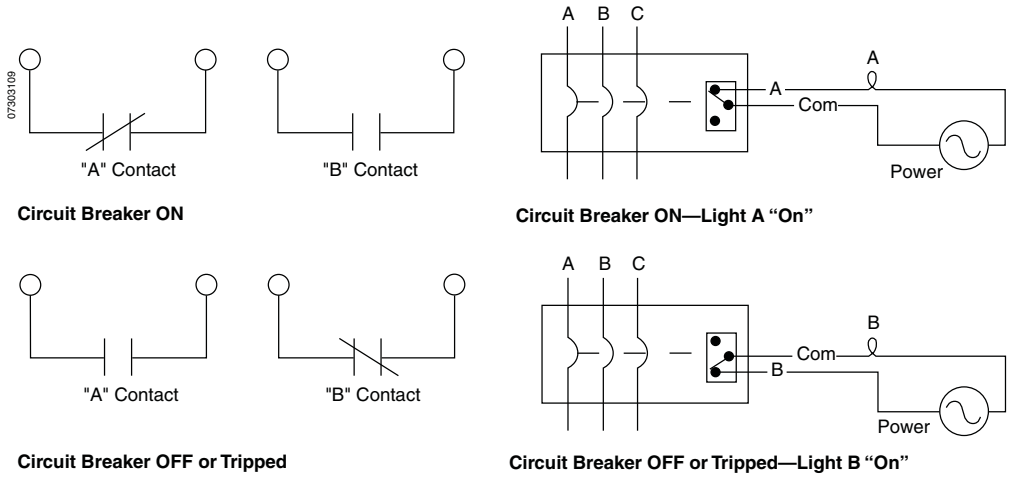
Auxiliary Switch

The auxiliary switch accessory monitors the circuit breaker contact status and provides a remote signal indicating whether the circuit breaker contacts are open or closed. When the circuit breaker is off or tripped, the auxiliary switch with an “A” contact is open and the auxiliary switch with a “B” contact is closed. When the circuit breaker is on, the auxiliary switch with an “A” contact is closed and the auxiliary switch with a “B” contact is open.

Auxiliary switches are available for QO and QOB circuit breakers and miniature switches. (Auxiliary switches are not available on QO and QOB AFI and CAFI products.)

Figure 6: Auxiliary Switch Wiring Diagrams



Circuit Breaker ON

Circuit Breaker ON—Light A “On”

Circuit Breaker OFF or Tripped

Circuit Breaker OFF or Tripped—Light B “On”

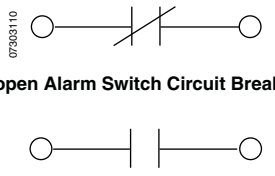
Alarm Switch

The alarm switch accessory monitors the circuit breaker trip status and is used to provide a remote warning signal indicating that the circuit breaker has tripped. This signal can be used in conjunction with a horn, pilot light, or some other indicator.

The contact on the standard alarm switch is open when the circuit breaker is in the off or on position and is closed when the circuit breaker is in the tripped position.

Alarm switches are actuated when the circuit breaker has tripped as a result of an overload, short circuit or shunt trip operation. Alarm switches are available for QO and QOB circuit breakers and miniature switches. (Alarm switches are not available on QO and QOB AFI and CAFI products.)

Figure 7: Alarm Switch Wiring Diagram



Normally-open Alarm Switch Circuit Breaker Tripped

Circuit Breaker OFF or ON

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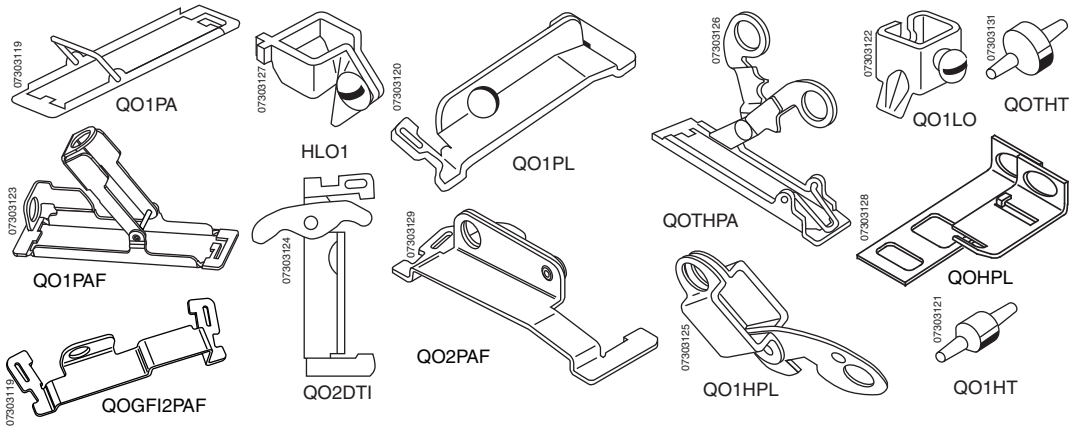
Handle Accessories

Field-installed handle accessories are also available.

Table 6: Field-Installable Handle Accessories

Accessory	Description	Catalog Number
Handle Tie	Converts any two adjacent 120/240 Vac 1P QO circuit breakers to independent trip 2P.	QO1HT
	Converts any two adjacent 120/240 Vac 1P side-by-side QOT circuit breakers to independent trip 2P.	QOTHT
Handle Clamp	Clamp for holding QO 1P handle in ON or OFF position.	QO1LO
	Clamp for holding QO or Q1 (1P, 2P, or 3P) circuit breaker handle in ON or OFF position.	HLO1
Handle Padlock Attachment for Padlocking in ON or OFF Position	Loose attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QOHPL
	Fixed attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QO1PA
	Attachment for padlocking 1P side-by-side QOT circuit breaker in ON or OFF position.	QOTHPA
	Fixed attachment for padlocking 2P QO-GFI circuit breaker in ON or OFF position.	GF12PA
	Loose attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1HPL
	Fixed attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1PL
Handle Padlock Attachment for Padlocking in OFF Position	Fixed attachment for padlocking 1P QO circuit breaker in OFF position only.	QO1PAF
	Fixed attachment for padlocking 2P and 3P QO circuit breakers in OFF position only.	QO2PAF
	Fixed attachment for padlocking 1P QO-GFI, QO-AFCI and QO-EPD circuit breakers in OFF position only.	QOGFI1PAF
	Fixed attachment for padlocking 2P QO-GFI and QO-EPD circuit breakers in OFF position only.	QOGFI12PAF
Sub-Feed Lugs	60 A 2P plug-on—2 spaces required (6–2 Al/Cu)	QO60SL
	125 A 2P plug-on—2 spaces required (12–2/0 Al/Cu)	QO2125SL
	225 A 2P plug-on—4 spaces required (4–300 Al/Cu)	QO2225SL
	125 A 3P plug-on—3 spaces required (12–2/0 Al/Cu)	QO3125SL
Mechanical Interlock Attachment	For interlocking the handles of two 2P or one 2P and one 1P QO and Q1 circuit breaker mounted side-by-side so that only one circuit breaker can be ON at a time (Not for QOU)	QO2DTI
Mechanical Interlock with Retaining Kit	For securing two adjacent back-fed circuit breakers in dual power supply applications. Can be used with two 2P or one 2P and one 1P QO circuit breaker in QO816L100 load center.	QO2DTIM

Figure 8: Handle Accessories



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Handle Tie

The handle tie accessory converts any two adjacent one-pole QO circuit breakers to one independent trip multi-pole circuit breaker.

Handle Lock-Off (Clamp)

The handle lock-off accessories fasten the handle in the ON or OFF position. These handle lock-offs cannot be padlocked.

Handle Padlock Attachment

The handle padlock attachment allows padlocking the circuit breaker handles in either the ON or OFF position or in the OFF only position. Handle padlock attachments are available in two styles: removable and fixed.

The removable style is intended to be a temporary device. Once work on the circuit breaker has been completed, the attachment can be removed from the circuit breaker to resume normal operation.

The fixed style is intended to be a permanent device. Once the work on the circuit has been completed, the padlock can be removed for the circuit breaker to resume normal operation, but the attachment stays in place.

Mechanical Interlock Attachment

The mechanical interlock attachment locks the handles of two adjacent circuit breakers to prevent both circuit breakers from being on at the same time. Both circuit breakers may be switched to the off position with the mechanical interlock in place.

Mechanical Interlock Attachment with Retaining Kit

The mechanical interlock attachment locks the handles of two adjacent back-fed circuit breakers in dual power supply applications.

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Dimensions

Figure 10: Type QO Plug-On Circuit Breaker

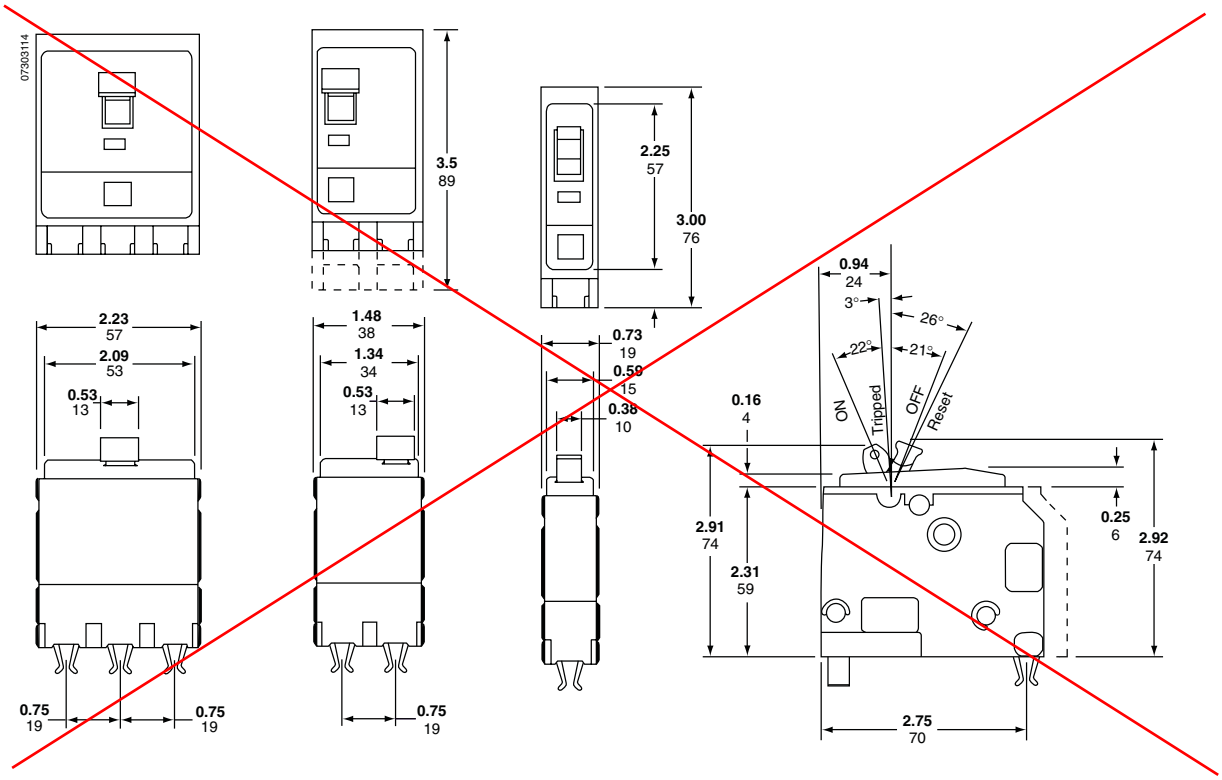

Figure 11: Type QOB Bolt-On Circuit Breaker

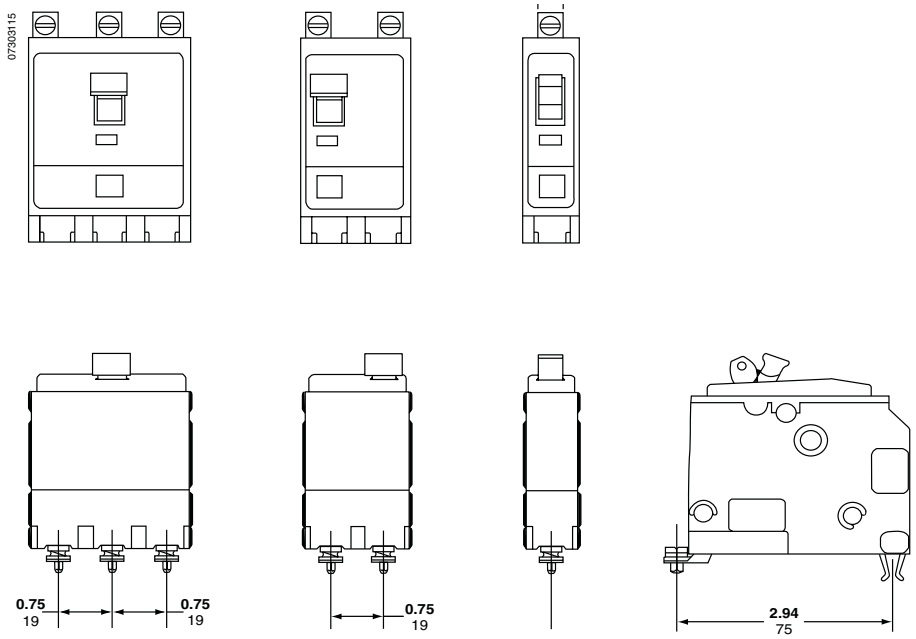

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Figure 12: Type QO-GFI Circuit Breaker

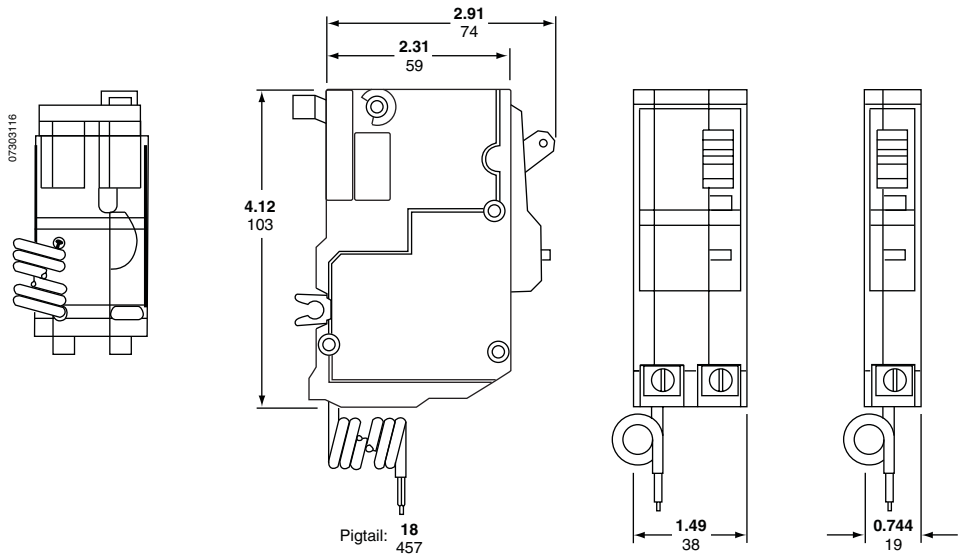

Figure 13: Type QO-AFI and QO-AFCI Circuit Breakers

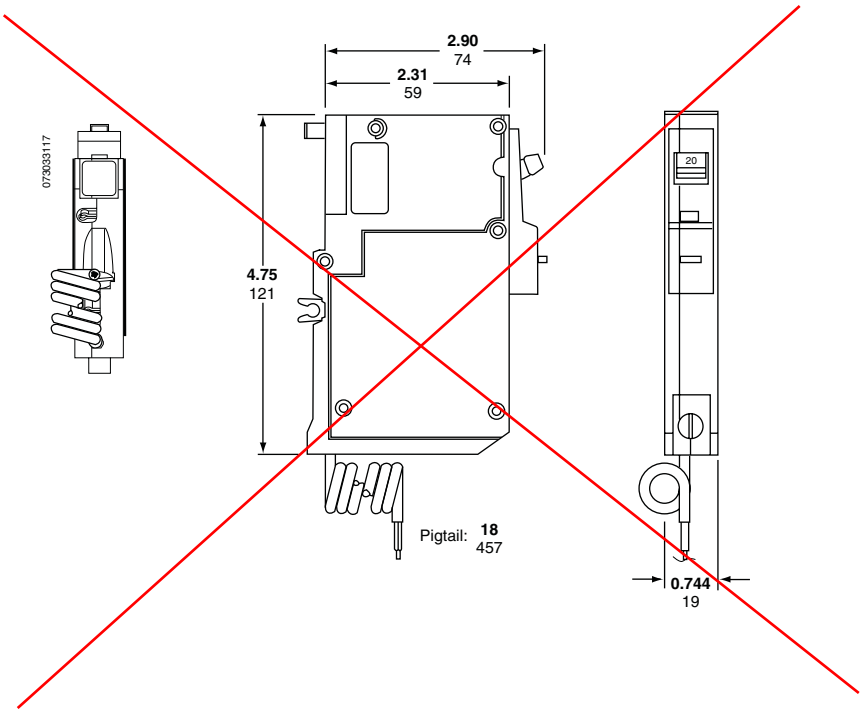

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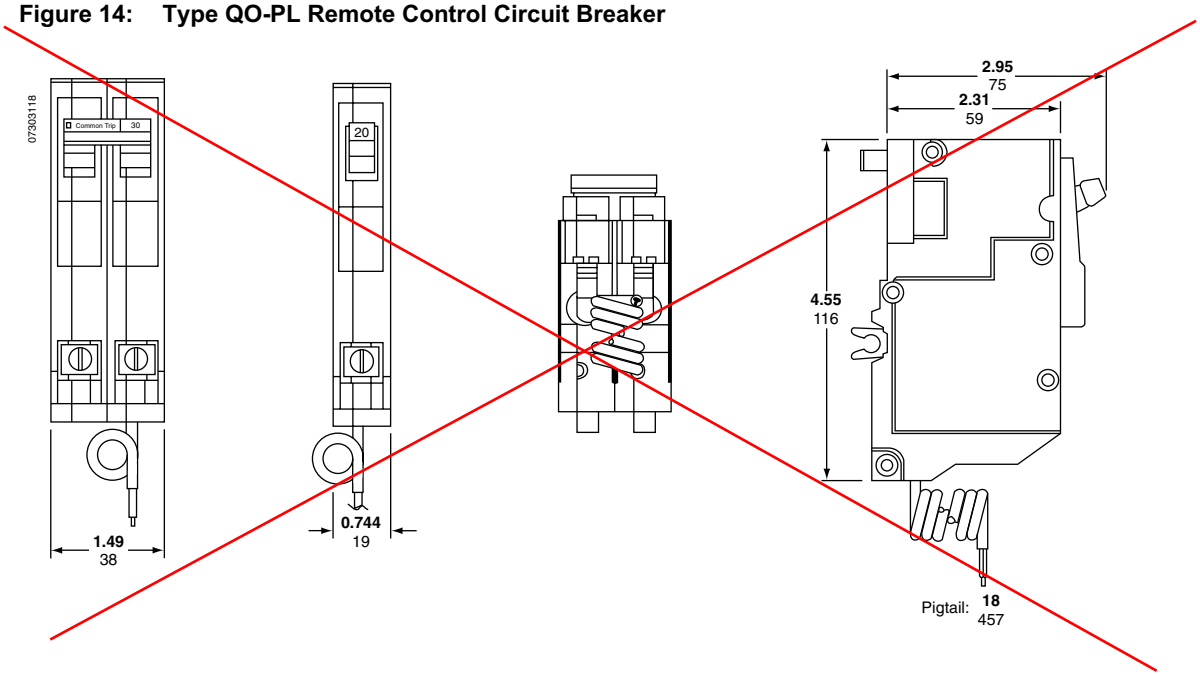
Figure 14: Type QO-PL Remote Control Circuit Breaker



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OPERATION & MAINTENANCE MANUAL MUKILTEO FERRY TERMINAL OHL ELECTRICAL SYSTEM

SECTION 4: WARRANTY

Square D Conditions of Sale

Coordinated Projects

NOTE: *The following Conditions of Sale are subject to change. All transactions for all products sold by Square D Company, including Square D brand products and all Schneider Electric brand products, such as Merlin Gerin, Modicon and Telemecanique brand products, are subject to the latest published Conditions of Sale of the Square D Company and to any Special Conditions of Sale which may be contained in applicable Square D quotations and acknowledgments.*

Square D Standard conditions of Sale will apply in all transactions between customers and Square D, unless Square D elects to use the Standard Coordinated Project Conditions of Sale. The Coordinated Project Conditions of Sale will be used on appropriate project jobs only.

GOVERNING PROVISIONS AND ACCEPTANCE: All quotations are subject to these conditions of sale. Acceptance of an order by Square D shall be expressly conditioned on Purchaser's assent to these conditions. Purchaser's direction to proceed with engineering, manufacture or shipment by Square D shall be deemed evidence of this assent. No modified or other conditions will be applicable unless those conditions are so stated in Square D's proposal or are specifically agreed to in writing and signed by an authorized official of Square D. Failure to object to provisions contained in any Purchase Order or other communication from the Purchaser (including, without limitation, penalty clauses of any kind) shall not be construed as a waiver of these Conditions nor an acceptance of any other provisions. These terms are a complete statement of the parties' agreement and may only be modified in writing signed by both parties. These terms may not be modified by course of dealing, course of performance or usage of trade. These terms supersede all previous written or oral quotations, statements or agreements. Any contract for sale by and between the parties shall be governed by and construed according to the laws of the State of Illinois without regard to its rules on the conflict of laws. The Convention on the International Sale of Goods is expressly excluded.

QUOTATIONS: Quotations shall be valid for no more than thirty (30) days from their date, unless otherwise stated in the quotation. All quotations are subject to change by Square D Company at any time upon notice to Purchaser. Quotations are made based on Square D's interpretation of the plans and specifications submitted to Square D by the Purchaser. It is Purchaser's obligation to review the quotation carefully and to immediately advise Square D of any differing interpretation Purchaser has so any necessary change can be made.

ORDER ENTRY: A complete, signed purchase order must be received before entry of an order into Square D's system. Considerable detail is involved in the manufacture of power equipment. To facilitate timely shipment, complete details and information, including Purchaser's requested on-site dates must be provided at the time of order entry. Shipment dates are approximate and are based upon timely receipt of all necessary information from the Purchaser. Lack of complete information may result in delays of drawings or manufacture. Such delays shall relieve Square D from compliance with the quoted delivery dates and may lead to price escalation. Failure to provide a complete signed purchase order within twenty (20) days of notification of award may result in renegotiation of price or shipment dates.

APPROVAL DRAWINGS: When required by a specific Purchase Order, drawings will be submitted for approval per agreed upon schedules to assure Square D has designed the equipment as described in Purchaser's specifications, as modified by Square D's quotation. If at time of drawing approval Square D has not designed the equipment to meet the specifications, as modified by Square D's quotation, Square D will make the appropriate changes at no charge to Purchaser. Where the Purchaser's specification is not definitive, Square D shall have the right to design the product in line with good commercial practice, without further obligation to Purchaser. If at drawing approval, Purchaser makes changes outside the design as stated in the specifications, such changes shall be treated as a change order as provided below.

PRICE POLICY: Quoted prices are firm provided: A) The order is received with complete engineering details and is released for manufacture within thirty (30) calendar days from the originally anticipated release date. B) All required approval drawings are returned and equipment released by Purchaser no later than thirty (30) calendar days from the original date of mailing of approval drawings by Square D. The returned drawings must be released for manufacture for shipment on the agreed date. Drawing re-submittals which are required for any reason other than to correct Square D errors will not extend the thirty (30) day deadline. If the Purchaser causes delay of shipment in any way or returns approval drawings beyond the time stated above, Purchaser may be subject to charges which shall not exceed 1% of the purchase order price for each full month or fraction thereof that shipment is delayed, as compensation to Square D for expenses created by such delay and not as a penalty. If shipment is delayed through the fault of Purchaser for more than 12 months from the originally anticipated release date, the price must be renegotiated

PRICING-PURCHASER CHANGES: All prices cover a bill of material as described in Square D specifications or quotations to be designed and manufactured to Square D standard designs, unless otherwise agreed in writing between the parties. Purchaser may make minor changes not affecting the time or cost of performance without charge prior to the start of manufacture. If any changes are requested by the Purchaser after submission of the original Purchase Order which affect the cost or time of performance, additional billing will be made with the amount of price adder dependent on the change and status of the order when the change is made. Changes may also result in an extension of time for shipment. All changes will be agreed to by the parties, in writing, prior to implementation. Purchaser's rescheduling shipment will be considered a change. All expenses incurred by Square D in connection with the storage of equipment, including demurrage, packing, storage charges, insurance and handling charges by Square D will be paid by the Purchaser upon submission of invoices by Square D. Square D will issue price changes for any change requested by the Purchaser that affects modification of equipment, changes the bills of material, engineering or drawings or delivery schedule as follows: A) If Purchaser makes a change to an order prior to being released to engineering, the net price will be adjusted by re-pricing the equipment with prices in effect at the time of the change. A commensurate delay in the shipping date will be based on the changes involved. B) For changes made after the order is released to engineering, the net price and ship date will be adjusted as described in paragraph A above. An additional charge based on Square D standard engineering billing charges and cost of parts ($250 minimum) will be made to cover any extra engineering and drafting, scrap or rework of parts, or cost of modification. C) If during the drawing approval process, the Purchaser makes changes outside the design covered by the specifications, Square D will be reimbursed as described in paragraph A and B above, plus any additional charges for any extra cost incurred as a direct result of the changes and allowed a commensurate delay in shipping date based on the changes involved. Changes to the order can not be processed until a formal change order is received from the Purchaser.

SUBSTITUTION: Square D may furnish suitable substitutes for material unobtainable because of priorities or regulations established by governmental authority or non-availability of materials from suppliers, provided such substitutions do not adversely affect the technical soundness of the equipment. Square D assumes no liability for deviation from published dimensions and descriptive information not essential to proper performance of the product.

TAXES: Any manufacturer's tax, retailer's tax, occupation tax, use tax, sales tax, excise tax, (except federal excise tax on vehicles), duty, customs, inspecting or testing fee, or other tax, fee or charge of any nature whatsoever, imposed by any governmental authority or measured by any transaction between Square D and Purchaser, shall be paid by the Purchaser in addition to the prices quoted or invoiced, and such charges will appear as a separate line item on the invoice. In the event Square D will be required to pay any such tax, fee, or charge, Purchaser shall reimburse Square D or, in lieu of such payment, Purchaser shall supply Square D at the time the order is submitted with an exemption certificate or other document acceptable to the tax authority. Purchase Orders must state the existence and amount of any such tax, fee or charge for which Purchaser claims an exemption.

TERMS OF PAYMENT: Acceptance of all Purchase Orders is subject to Purchaser meeting Square D credit standards. Terms are subject to change for failure to meet such standards. Terms are net thirty (30) days from date of invoice of each shipment, unless otherwise stated in Square D's quotation. For an authorized distributor or authorized reseller order, applicable terms of payment are stated in the quotation or applicable discount schedule. Square D reserves the right at any time to demand full or partial payment before proceeding with a contract of sale if, in its sole judgment, as a result of changes in the financial condition of the Purchaser the terms of payment originally specified are no longer justified.

PAYMENTS: If delivery is delayed or deferred by the Purchaser beyond the scheduled date, payment shall be due in full when Square D is prepared to ship. The equipment may be stored at the risk and expense of the Purchaser. If the Purchaser defaults when any payment is due, then the whole contract price shall become due and payable upon demand, or Square D at its option, without prejudice to other lawful remedies, may defer delivery or cancel the contract for sale. If Purchaser become insolvent, or bankrupt or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily under the bankruptcy or any insolvency law, Square D may cancel any order then outstanding at any time and recover its proper cancellation charges from the Purchaser or the Purchaser's estate.

DELIVERY:

F.O.B. POINT OF SHIPMENT: When the Square D quotation is based on delivery F.O.B. point of shipment, freight prepaid and allowed for delivery within the continental United States, Product is sold F.O.B. point of shipment, freight prepaid and allowed for orders over $2000 net. Delivery by Square D to the point of shipment constitutes delivery to the Purchaser; and title and all risk of loss or damage in transit shall pass to the Purchaser at time of delivery at the F.O.B. point. Square D is not responsible for breakage or delays by carrier after having received “in good order” receipts from the carrier. Purchaser is responsible for pursuing any damage claims with the carrier. For orders under $2000 net the above terms apply except freight is prepaid not allowed. No allowance will be made in lieu of transportation if the Purchaser accepts shipment at factory, warehouse or freight station or otherwise supplies its own transportation. Freight prepaid is defined as: a) Shipments to destinations within the continental United States to the accessible common carrier point nearest the first destination. b) Shipments to U.S. destinations outside the continental United States shall be to the common carrier free delivery point in the United States nearest the original port of embarkation. All charges associated with F.A.S., C.I.F., or other charges such as pier transfer, lift, ocean freight, and marine or war insurance shall be paid by the Purchaser, unless otherwise specifically agreed in a specific Purchase Order. In no event will Square D be responsible for demurrage or detention charges.

DELIVERY: F.O.B. DESTINATION: When the Square D quotation is based on delivery F.O.B. Destination, for shipments for delivery within the continental United States, Square D will retain title and all risk of loss or damage in transit to the common carrier free delivery point in the United States nearest the first destination for a price addition of 2% of the net price. If the Purchaser elects this Option, Purchaser's obligations shall be as follows: a) Purchaser shall have the responsibility of inspecting the equipment for apparent loss or damage immediately upon its arrival at the free delivery point. b) In the event of apparent shipping loss or damage, Purchaser shall make written notation of the loss on the carrier's delivery receipt and, within 72 hours of delivery shall notify the Square D Customer Information Center. Purchaser shall not remove product from the point of examination and shall retain the shipping container and packing material. Purchaser shall request the carrier to make an inspection and send Square D a copy of the carrier's inspection report. c) In the event of concealed damage which occurred during transit and is discovered by the Purchaser after delivery, Purchaser shall report such damage immediately, but in no event later than 15 days after delivery, to the delivering carrier, and within 72 hours of discovery, shall notify the local Square D field office. If such notification is not made, Square D shall not be liable for loss or damage in transit.

SHIPMENT AND ROUTING: Square D shall select the point of origin of shipment, the method of transportation and the routing of the shipment. Purchasers that request expedited or special modes of transportation or routing involving air, premium or any other non-standard Square D shipping shall be assessed additional charges for shipping, handling, freight and expediting. Any rebates, allowances, discounts, or incentives received by Square D from its carriers shall be retained by Square D. All prices include domestic packaging only. When other than domestic packaging is required, contact your local Square D field office. Purchaser specified packaging and marking may be subject to additional charges.

SHORTAGES: Claims for shortages or errors must be submitted to Square D within 30 days after invoice date, and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by the Purchaser.

INSTALLMENTS: Square D reserves the right to make shipments in installments, unless otherwise expressly stipulated in a specific Purchase Order; and all such installments when separately invoiced shall be paid for when due per invoice without regard to subsequent shipments. Delay in shipment of any installment shall not relieve Purchaser of its obligation to accept remaining shipments.

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FORCE MAJEURE: Square D shall not be liable for any damages as a result of any delays due to any causes beyond Square D's control, including, without limitation, an act of God; act of Purchaser or Square D supplier; embargo or other governmental act, regulation or request; fire; accident; strike; slowdown; flood; fuel or energy shortage; sabotage; war; riot; delay in transportation and inability to obtain necessary labor, materials or manufacturing facilities from usual sources. In the event of any such delay, the date of delivery shall be extended for a period of time reasonably necessary to overcome the effect of such delay.

STANDARD WARRANTY: Square D warrants equipment manufactured by it and sold through authorized sales channels to be free from defects in materials and workmanship for eighteen (18) months from date of invoice by Square D or its authorized sales channel. If within such period, any such equipment shall be proved to Square D's satisfaction to be non-conforming, such equipment shall be repaired or replaced at Square D's option. This warranty shall not apply (a) to equipment not manufactured by Square D, (b) to equipment that has been repaired or altered by other than Square D so as, in its judgment, to affect the same adversely, or (c) to equipment that has been subjected to negligence, accident, or damage by circumstances beyond Square D's control, or improper operation, maintenance or storage, or to other than normal use or service. With respect to equipment not manufactured by Square D, the warranty obligations of Square D shall in all respects conform and be limited to the warranty actually extended to Square D by its supplier. Non-conforming products must be returned at Square D's expense for evaluation unless this is waived in writing. Replacement products may be new or reconditioned. The foregoing warranties do not cover reimbursement for labor, transportation, removal, installation, temporary power, or any other expenses that may be incurred in connection with repair or replacement.

OPTIONAL WARRANTIES: (Only available on equipment to be located in the U.S.) Option 1-Extended-2 or 3 years from Shipment. If requested by the Purchaser and specifically accepted in writing by Square D, the standard warranty will be extended to two (2) years from date of invoice for a price addition of 1% of the net face value of the Purchase Order or will be extended for three (3) years from date of invoice for a price addition of 3% of the net face value of the Purchase Order. Option 2-Special Warranty: If requested by the Purchaser and specifically accepted in writing by Square D, the standard warranty will be extended, for a price addition of 3% of the net face value of the Purchase Order, to cover reimbursement of the direct costs of: a) Removal of non-conforming equipment or part thereof; b) Transporting equipment or parts to and from the place of repair; c) Off-loading of truck and reinstallation at the original site. Such special warranty, which may be chosen to cover a period not exceeding that of the standard or extended warranty (see above) selected, will not include the cost of providing temporary power or removing or replacing other apparatus or structures, or costs of transportation beyond a common carrier free delivery point in the continental United States. Further, the obligation of Square D for expenses and costs arising under this special warranty coverage will not exceed 50% of the net invoice price on the equipment being repaired. This warranty does not change or affect the allocation of risk or loss during shipment. Option 3-Extended Warranty-Preventative Maintenance Agreements: If requested by the Purchaser, and specifically accepted by Square D, a Preventative Maintenance Agreement is available to provide preventative maintenance on equipment covered by the agreement. Terms of the preventative maintenance agreement shall be as defined in a separate Services Agreement agreed to by the parties.

SOFTWARE: Any software or computer information, in whatever form, provided with equipment manufactured by Square D is licensed to Purchaser solely pursuant to standard licenses of Square D or its supplier of such software or computer information, which licenses are, hereby incorporated by reference. Square D does not warrant that such software or computer information will operate error free or without interruption, and warrants only that during the warranty period applicable to the equipment that the software will perform its essential functions. If such software or computer information fails to conform to such warranty, Square D will, at its option, provide an update to correct the non-conformance or replace the software or computer information with the latest available version containing a correction. Square D shall have no other obligation to provide updates or revisions.

LIMITATIONS: These disclaimers and limitations of remedies apply to all warranties offered to Purchaser and to all Purchase Orders. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Except as may be expressly provided in an authorized writing by Square D, Square D shall not be subject to any other obligations or liabilities whatsoever other than as stated above with respect to equipment sold or services rendered by Square D. Notwithstanding anything to the contrary herein contained SQUARE D COMPANY, ITS CONTRACTORS AND SUPPLIERS OF ANY TIER, SHALL NOT BE LIABLE IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE FOR LOST TIME, LOST PROFITS, OR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. The remedies of the Purchaser are exclusive and the total cumulative liability of Square D, its contractors and suppliers of any tier, with respect to this contract or anything done in connection therewith, such as the use of any product covered by or furnished under the contract, whether in contract, in tort (including negligence or strict liability) or otherwise, shall not exceed the price of the product, part, or service on which such liability is based.

INTELLECTUAL PROPERTY: As to equipment proposed and furnished by Square D, Square D shall defend any suit or proceeding brought against Purchaser so far as based on a claim that such equipment constitutes an infringement of any copyright, trademark or patent of the United States. This obligation shall be effective only if Purchaser shall have made all payments then due hereunder and if Square D is notified promptly in writing and given authority, information, and assistance at Square D's expense for the defense of the same. In the event the use of such equipment by Purchaser is enjoined in such a suit, Square D shall, at its expense, and at its sole option, either (a) procure for the Purchaser the right to continue using such equipment (b) modify such equipment to render it non-infringing (c) replace such equipment with non-infringing equipment, or (d) refund the purchase price (less depreciation) and the transportation and installation costs of such equipment. Square D will not be responsible for any compromise or settlement made without its written consent. The foregoing states the entire liability of Square D for patent, trademark or copyright infringement, and in no event shall Square D be liable if any infringement charge is based on the use of Square D equipment for a purpose other than that for which it was sold by Square D. As to any equipment furnished by Square D to Purchaser and manufactured in accordance with designs proposed by Purchaser, the Purchaser shall indemnify Square D against any award made against Square D for patent, trademark, or copyright infringements.

WITNESS OF TESTS AND FACTORY INSPECTIONS: Normal production schedules do not provide the opportunity for Purchaser to witness routine factory tests on equipment or make factory inspections. Witnessing of tests or factory inspections by the Purchaser may result in delays of production for which Square D will not be responsible. Witness testing and factory inspections must be requested at time of quotation and confirmed at order entry. Standard Square D factory testing and inspection will apply. Square D will notify Purchaser fourteen (14) calendar days prior to scheduled witness testing or inspection. In the event Purchaser is unable to attend, the Parties may mutually agree on a rescheduled date. However, Square D, at its sole option, may consider the witness tests and/or inspection waived, and ship and invoice the Products. Purchaser will be responsible for paying for all scheduled witness testing, whether or not Purchaser attends.

RETURN OF EQUIPMENT: NO EQUIPMENT MAY BE RETURNED WITHOUT FIRST OBTAINING SQUARE D'S WRITTEN PERMISSION AND A RETURNED MATERIAL IDENTIFICATION TAG. Returned equipment must be of current manufacture, in the original packaging, unused, undamaged and in saleable condition, securely packed to reach Square D without damage and labeled with the return authorization number. Any cost incurred by Square D to put equipment in first class condition will be charged to the Purchaser. Returns will be credited at price invoiced by Square D less a restocking fee of 25% invoice price. Special Order and Custom equipment is not returnable. Square D shall bear the cost of returns resulting from Square D error, and method and route of return will be at the discretion of Square D. Costs incurred by failure to follow Square D direction will be borne by the Purchaser.

NUCLEAR APPLICATIONS TERMS AND CONDITIONS: Unless otherwise agreed in writing by a duly authorized representative of Square D, products sold hereunder are not intended for use in or in connection with any nuclear facility or activity. If so used, Square D disclaims all liability for any damage, injury or contamination; and Purchaser shall indemnify Square D against any such liability, whether arising as a result of breach of contract, warranty or tort (including negligence) or otherwise.

PATTERNS AND TOOLS: Notice will be given if special patterns or tools are required to complete any order. Charges for such patterns or tools do not convey title thereto or the right to remove them from Square D's plant. If patterns or tools are not used for a period of two years, Square D shall have the right to scrap them without notice.

PRODUCT NOTICES: Purchaser shall promptly supply the user (including its employees) of the product with all Square D supplied product notices, warnings, instructions, recommendations and similar materials.

ERRORS: Square D reserves the right to correct errors or omissions in quotations, acknowledgments, invoices, or other documents.

OSHA COMPLIANCE: Compliance with OSHA or similar federal, state or local laws during the operation or use of the product(s) is the sole responsibility of the Purchaser.

TERMINATION: Any order may be terminated by the Purchaser only upon written notice to Square D and upon payment of reasonable and proper termination charges based on the price of the terminated order and reimbursement of all direct costs and expenses associated with the order caused by such termination and shall include a reasonable profit. Special or custom ordered equipment is not cancelable after commencement of manufacturing.

CANCELLATION: Square D shall have the right to cancel any order or contract at any time by written notice for any material breach of the contract by the Purchaser, including material delays in releasing equipment for manufacture or approval drawings and excessive changes to specifications or drawings.

0100PL0043R3/07 March 31, 2007

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Exclusive Warranty
Hammond Power Solutions Inc. ("HPS"), warrants to the original purchaser of the standard transformers listed here:

The transformer(s), will be free from defects in materials and workmanship for a period commencing on the date of purchase of the Products, and expiring at the end of the period specified below in Exhibit A (the "Warranty Period"). This warranty is exclusive and is in lieu of any other warranty express or implied, including but not limited to any implied warranty or merchantability or fitness for a particular purpose.

Warranty Exclusions - Limitation of Damages and Claims Procedure
The above stated warranty does not cover: workmanship of installation; dissatisfaction or damage due to improper installation, vandalism, misuse, accident, excessive wear and tear, unauthorized repair, abnormal use, lack of maintenance, or other cause(s) not within HPS's control and HPS will not be liable, under any circumstances, for consequential or incidental damages, including but not limited to labor costs or lost profits resulting from the use of or inability to use the goods or from the goods being incorporated in or becoming a component or any other product. Without limiting the generality of the foregoing, HPS will not be responsible for labor costs involved in the removal of Goods or the installation of replacement Goods.

HPS's liability and the Buyer's exclusive remedy hereunder will be limited to repair or replacement of those Goods found in HPS's reasonable judgment to be defective. HPS reserves the right to accept or reject any claim in whole or in part. HPS will not accept the return of any Goods without its prior written approval. Please consult HPS for instructions on the Return Authorization procedure.

Transfer of Warranty: Hammond Power Solutions, Inc. hereby acknowledges, agrees to, and consents to, the assignment and transfer of this Warranty by the original purchaser of the goods to the end-user of the Goods.

Exhibit A

Product Warranty Periods:

Industrial Control Transformers	
HPS Imperator®	Lifetime Warranty
HPS Spartan®	15 Years
Other Catalog Control	10 Years
HPS Fusion™ General Purpose Enclosed Transformers	15 Years
HPS Universal™ Buck-Boost/Low Voltage Lighting Transformers	10 Years
HPS Centurion™ Line Reactors and DV/DT Filters	10 Years
HPS Tribune™ and Standard Drive Isolation Transformers	10 Years
Motor Starting Auto Transformers	1 Year
HPS Sentinel™ Series Energy Efficient Distribution Transformers	10 Years
Encapsulated Titan™ series and Fortress™ Dry-Type Distribution Transformers xxxxxxxxx	10 Years
Three-Phase Autotransformers	10 Years
HPS PowerPlus™ Mini Power Center (transformer only)	15 Years
HPS PowerPlus™ Mini Power Center (Primary disconnect and panel board.)	1 Year
HPS Millennium™ Medium Voltage Power Transformers	1 Year
HPS EnduraCoil™ Medium Voltage Power Transformers	1 Year
HPS TruWave™ Active Harmonic Filter: **18 months from date of shipment, or one year** from verified date of startup, whichever comes first)	
All HPS six digit Special and Custom Transformers	1 Year