

E1 Plus Overload Relay Specifications

Bulletin Numbers 193, 592



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Summary of Changes

This publication includes information that relates to Bulletin 100-E/300-E contactors.



Product Overview

		
Bulletin	193-ED	193/592-EE
Type	E1 Plus™ Electronic Overload Relay	E1 Plus Electronic Overload Relay
Rated Current (Range)	0.1...45 A	0.1...800 A
NEMA Operating Voltage, Nominal	—	600V
IEC Operating Voltage, Nominal	690V	690/1000V
Overload Type	Electronic Overload	Electronic Overload
Trip Class (Fixed)	10	—
Trip Class (Adjustable)	—	10, 15, 20, 30
Ambient Temperature Compensated		
Reset Type	Manual Only	Automatic and Manual
Adjustment Range	5:1	5:1
Phase Loss	3 s	3 s
Ground (Earth) Fault	—	Optional
Overcurrent (Jam) Detection	—	Optional
Stall Detection	—	—
Underload Detection	—	—
Current Imbalance	—	—
PTC Thermistor Monitoring	—	Optional
Warning Settings	—	—
N.C. Trip Contact		
N.O. Alarm Contact		
No. of Outputs	—	—
No. of Inputs	—	—
ODVA (DeviceNet) Conformance	—	Optional
Variable Frequency Drive (VFD) Compatible	—	—

Standards Compliance and Certifications

Standards Compliance
EN 60947-4-1
EN 60947-5-1
CSA 22.2, No. 14
UL 508

Certifications
c-UL-us Listed
CE Marked
RCM
C-Tick

Features

Accurate, Reliable Performance

Current measurement-based protection

While electromechanical overload relays pass motor current through heating elements to provide an indirect simulation of motor heating, the E1 Plus Overload Relay directly measures motor current. Current measurement-based overload protection more accurately models a motor's thermal condition. Furthermore, ambient temperature does not impact the performance of current measurement-based designs over the specified temperature operating range.

Electronic design

Thermal modeling is performed electronically with precision solid-state components, where at the heart of the E1 Plus Overload Relay is an application-specific integrated circuit (ASIC). The ASIC continually processes motor current data to accurately maintain the time-current status of the motor thermal capacity utilization value.

Thermal memory

A thermal memory circuit allows the E1 Plus Overload Relay to model the heating and cooling effects of motor on and off periods. This achieves accurate protection for both hot and cold motors.

Enhanced phase loss protection

A separate phase loss detection circuit that is incorporated into the E1 Plus Overload Relay allows it to respond quickly to phase loss conditions; typical reaction time is 3 seconds.

Easy to Select and Apply

Straightforward installation

The self-powered design means that the E1 Plus Overload Relay installs in the same manner as traditional overload relays. Set up the device by dialing the setting potentiometer to the motor FLA rating. The low energy consumption of the electronic design minimizes temperature rise issues inside control cabinets.

Wide adjustment range

A wide 5:1 adjustment range requires half as many catalog numbers as the bimetallic alternative to cover the same current range. This helps to reduce inventory carrying costs and affords greater installation flexibility for dual-voltage machines. Evenly spaced setting tick marks enhance the ease of installation setup.

Rugged Construction

Over-molded power connections

The unique line-side over-molded power connections make for a sturdy two-component starter assembly that is unmatched in the industry. The pre-formed power connections allow easy starter assembly—every time.

Current transformers

The current transformers are secured separately in the overload housing to deliver the greatest degree of resistance to shock and vibration conditions. Varnished laminations deliver consistent performance and provide additional protection against corrosion.

Latching relay

The robust design of the bi-polar latching relay provides reliable trip and reset performance for the most demanding of applications. The self-enclosed relay offers additional environmental protection for use in industrial applications.

Application Flexibility

Isolated Contacts

The isolated contact configuration allows the N.C. and N.O. contacts to be applied in circuits operating at different voltage levels and without polarity restrictions. The B600 contact rating affords application in circuits that are rated to 600V.

DIP Switch settings

193-EE devices offer DIP Switch settings to select the trip class (10, 15, 20 or 30) and the reset mode (manual or automatic), making these devices versatile.

Pass-thru Option

The E1 Plus Pass-thru consumes 48% less panel space than a standard E1 Plus mounted in a panel mount adapter. The design provides an integrated DIN Rail mount and panel mounting holes and is intended for the following applications: DIN Rail and Panel Mount Applications, Bulletin 100-K mini contactor, external current transformers, and for use with non Allen-Bradley contactors. The E1 Plus Pass-thru Electronic Overload Relay provides the same expandable protection and communication capabilities as a standard E1 Plus, but does not require a separate panel mount adapter, which saves money and valuable panel space.

Side-mount Expansion Modules

By using optional side-mount expansion modules, you can expand the functionality of the E1 Plus overload relays cost effectively and enhance machine operation and protection. Direct mounting to the left side of the 193-EE and 592-EE E1 Plus overload relays means that only 18 mm is added to the overall product width. The side-mounted accessory modules electronically interface with the E1 Plus overload relay so that all control circuit connections are made at the E1 Plus overload relay terminals.

E1 Plus DeviceNet™ Communication Module

The 193-EDN DeviceNet Communication Side-Mount Module provides a cost-effective, seamless deployment of motor starters onto the Integrated Architecture® as an accessory for the E1 Plus electronic overload relay. The DeviceNet module provides Integrated I/O (two inputs and one output), providing local connection of motor starter-related I/O. The DeviceNet module offers expanded protective functions that include overload warning, jam protection, and underload warning. The DeviceNet module also allows access to average motor current (percentage of FLA setting), percentage of thermal capacity usage, device status, trip and warning identification, and trip history, allowing continual monitoring of motor performance.

E1 Plus remote reset module

The 193-ERR Remote Reset Module is available for applications that require remote reset of the E1 Plus overload relays after a trip occurs.

E1 Plus jam protection module with remote reset

The 193-EJM Jam Protection Module provides front-accessible DIP switches that offer flexibility to provide jam protection to match application requirements. Selections are available to enable or disable the jam protection function and remote reset operation. Jam trip level settings are available at 150%, 200%, 300%, and 400% of full load current setting. Trip delay settings of 1/2, 1, 2, and 4 seconds are available to minimize nuisance tripping in applications where intermittent short-duration overloading is permissible.

E1 Plus ground fault module with remote reset

The 193-EGF Ground Fault Protection Module offers front-accessible DIP switches providing flexibility to configure ground fault protection to match application requirements. Selections are available for enabling or disabling the ground fault protection function and remote reset operation. Ground fault trip level settings are available in four ranges: 20...100 mA (resistive loads only; for motor loads, consult your local Rockwell Automation sales office or Allen-Bradley distributor), 100...500 mA, 0.2...1 A, and 1...5 A. Within each range, the specific ground fault trip level can be set (20%, 35%, 50%, 65%, 80%, 90%, or 100% of the maximum ground fault setting). Trip delay is fixed at 50 ms ± 20 ms.

E1 Plus ground fault/jam module with remote reset

The 193-EGJ Ground Fault/Jam Protection Module offers front-accessible DIP switches to provide flexibility to configure ground fault and jam protection to match application requirements. The ground fault selections are the same as the 193-EGF Ground Fault Protection Module. In addition to ground fault, this module offers selectable fixed jam protection. The user can enable or disable jam protection from the DIP switches. The jam protection is fixed at 400% of the full load current setting with a 0.5 second trip delay.

E1 Plus PTC module with remote reset

The 193-EPT PTC Side-mount Module provides two terminals for the connection of positive temperature coefficient (PTC) thermistor sensors. PTC sensors are commonly embedded in the motor stator windings to monitor winding temperature. PTC sensors react to actual temperature, so enhanced motor protection can be provided to address conditions like obstructed cooling and high ambient temperature.

E1 Plus EtherNet/IP™ module

The 193-ETN EtherNet/IP network communication module delivers seamless control and direct access to motor performance and diagnostic data on an Ethernet-based network. It supports I/O and explicit messaging for data access by a programmable automation controller, and contains predefined ControlLogix® style tags for direct software access. The integrated web and email server contains a web server to allow users to read information and configure parameters via a web browser. The device also uses a simple mail transfer protocol (SMTP) server to send email or text messages in a warning or trip condition.

E1 Plus PROFIBUS™ module

The 193-EPRB PROFIBUS network communication module delivers direct access to motor performance and diagnostic data on a field bus-based network and seamless control. The PROFIBUS communication module supports both PROFIBUS DP-V0 and DP-V1. Protective functions include overload warning, jam protection, and underload warning. The PROFIBUS network communication module monitors the motor current by electronically interfacing to the E1 Plus overload relay's current-sensing circuit. As a result, the side-mount module is able to identify the cause of the trip and provides warnings for overload, underload, phase loss, and jam. The module continuously monitors the motor's performance for average motor current, thermal capacity usage, and device status, and also provides a trip history for the five previous trips. Integrated I/O provides convenient local termination of motor-related inputs and outputs, simplifying the control architecture.

Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations produce a valid catalog number.

$\frac{193}{a} - \frac{EE}{b} \frac{C}{c} \frac{B}{d}$

a	
Bulletin Number	
Code	Description
193	IEC Three-phase
193S	IEC Single-phase
592	NEMA Three-phase
592S	NEMA Single-phase

b	
Type	
Code	Description
ED1 ⁽¹⁾	Fixed Trip Class 10
EE	Selectable Trip Class

c			
Adjustment Range			
Three-phase		Single-phase	
Code	Description	Code	Description
A	0.1...0.5	P	1.0...5.0
B	0.2...1.0	R	3.2...16
C	1.0...5.0	S	5.4...27
D	3.2...16	T	9...45
E	5.4...27	U	18...90
F	9...45	V	60...120
G	18...90	—	—
H	30...150	—	—
J	40...200	—	—
K	60...300	—	—
L	100...500	—	—
M	120...600	—	—
N	160...800	—	—
M	120...600		
N	160...800		
W	80...400		
Q	11...55		

d	
Bulletin 100 IEC Contactor Size	
Code	Description
B	C09...C23
D	C30...C43
E	C60...C97
F	D115...D180
G	D210...D420
H	D630...D860
J	E116...E205
Bulletin 500 NEMA Contactor Size	
Code	Description
T	Size 00
C	Size 0...2
D	Size 3
E	Size 4
F	Size 5
G	Size 6
Panel/DIN rail mount	
Code	Description
P	Integrated panel mount and passthrough wiring
Z	Panel mount with external current transformers

(1) Bulletin 193 overload relays only

Product Selection

Bulletin 193-ED – Three-phase Devices

- Fixed Trip Class 10
- Manual Reset
- Screw-type Control Terminals

Mounts to Contactor	Adjustment Range [A]	Cat. No.
100-C09...100-C23	0.1...0.5	193-ED1AB
	0.2...1.0	193-ED1BB
	1.0...5.0	193-ED1CB
	3.2...16	193-ED1DB
	5.4...27	193-ED1EB
Integrated panel/DIN Rail mount and pass-thru wiring	1.0...5.0	193-ED1CP
	3.2...16	193-ED1DP
	5.4...27	193-ED1EP

Bulletin 193S-EE – Single-phase Devices

- Selectable Trip Class (10, 15, 20, 30)
- Selectable Manual/Auto-Manual Reset
- Screw-type Control Terminals

Mounts to Contactor	Adjustment Range [A]	Cat. No.
100-C09...100-C23	1.0...5.0	193S-EEPB
	3.2...16	193S-EERB
	5.4...27.0	193S-EESB
100-C30...100-C43	9...45	193S-EETD
100-C60...100-C85	18...90	193S-EEUE
Integrated panel/DIN Rail mount and pass-thru wiring	1.0...5.0	193-EEPP
	3.2...16	193-EERP
	5.4...27	193-EESP

Bulletin 193-EE – Three-phase Devices

- Selectable Trip Class (10, 15, 20, 30)
- Selectable Manual/Auto-Manual Reset
- Screw-type Control Terminals

Mounts to Contactor	Adjustment Range [A]	Cat. No.
100-C09...100-C23	0.1...0.5	193-EEAB
	0.2...1.0	193-EEBB
	1.0...5.0	193-EECB
	3.2...16	193-EEDB
	5.4...27	193-EEEB
100-C30...100-C55	1.0...5.0	193-EECD
	3.2...16	193-EEDD
	5.4...27	193-EEED
	9...45	193-EEFD
100-C60...100-C97	11...55	193-EEQD
	5.4...27	193-EEEE
	18...90	193-EEGE
100-E116...E146	30...150	193-EEHF ⁽¹⁾
100-E190...E205	40...200	193-EEJF ⁽¹⁾
100-D115...100-D180	30...150	193-EEHF ⁽¹⁾
	40...200	193-EEJF ⁽¹⁾
100-D210...100-D420	40...200	193-EEJG ⁽¹⁾
	60...300	193-EEKG ⁽¹⁾
	100...500	193-EELG ⁽¹⁾
100-D630...100-D860	120...600	193-EEMH ⁽¹⁾
	160...800	193-EENH ⁽¹⁾
Integrated panel/DIN Rail mount and pass-thru wiring	1.0...5.0	193-EECP
	3.2...16	193-EEDP
	5.4...27	193-EEEP

(1) Does not include terminal lugs. See [page 7](#).

Bulletin 193 Panel Mount Devices for use with External Current Transformers

- Selectable Trip Class (10, 15, 20, 30)
- Selectable Manual/Auto Manual Reset

CT Ratio ⁽¹⁾	Adjustment Range [A]	Cat. No. ⁽²⁾
150:5	30...150	193-EEHZ
200:5	40...200	193-EEJZ
300:5	60...300	193-EEKZ
400:5	80...400	193-EEWZ
500:5	100...500	193-EELZ
600:5	120...600	193-EEMZ
800:5	160...800	193-EENZ

(1) Current Transformers are supplied by customer, refer to page 11 for proper current transformer selection.

(2) Order panel adapter, Cat. No. 193-EPB, separately.

Bulletin 592-EE – Three Phase Devices

- Selectable Trip Class (10, 15, 20, 30)
- Selectable Manual/Auto-Manual Reset






Mounts to Contactor Size	Adjustment Range [A]	Cat. No.
00	0.1...0.5 A	592-EEAT
	0.2...1.0 A	592-EEBT
	1.0...5.0 A	592-EECT
	3.2...16 A	592-EEDT
0...2	0.2...1.0 A	592-EEBC
	1.0...5.0 A	592-EECC
	3.2...16 A	592-EEDC
	5.4...27 A	592-EEEC
	9...45 A	592-EEFC
3	9...45 A	592-EEFD
	18...90 A	592-EEGD
4	30...150	592-EEHE
5	60...300	592-EEKF
6	120...600	592-EEMG


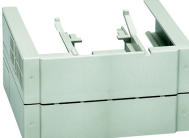

Bulletin 592S-EE – Single-phase Devices





- Selectable Trip Class (10, 15, 20, 30)
- Selectable Manual/Auto-Manual Reset


Mounts to Contactor Size	Adjustment Range [A]	Cat. No.
00	1.0...5.0 A	592S-EEPT
	3.2...16 A	592S-EERT
	5.4...27 A	592S-EEST
0...2	1.0...5.0 A	592S-EEPC
	3.2...16 A	592S-EERC
	5.4...27 A	592S-EESC
	9...45 A	592S-EETC
3	18...90 A	592S-EEUD

Accessories

	Description	For Use With	Pkg. Quantity	Cat. No.
	DIN Rail/Panel Adapter • For separate mounting – can be mounted to top-hat rail EN 50 02-35.	193-ED1_B, 193-EE_B	1	193-EPB
		193-EE_D		193-EPD
		193-EE_E		193-EPE
	Current Adjustment Shield • Prevents inadvertent adjustment of the current setting • Must be ordered in multiples of package quantities	193-ED (all) 193-EE (all) 592-EE (all)	10	193-BC8
	External Reset Adapter • For enclosed, through-the-door reset applications. Use with External Reset Button.	193-ED (all) 193-EE_B, 193-EE_D, 193-EE_E	1	193-ERA
	External Reset Button for Enclosed Devices	193-E all	1	800FM-R611 (Button)
				800F-ATR08 (Rod)
	Terminal Lugs	100-D140, 100-D180, 100-D95E...D180E, 193-EC_F, 193-EE_F	1	100-DTB180
		100-D210...100-D420, 193-EC_G, 193-EF2C, 193-EE_G	1	100-DTB420
		Standard on 100-E116_L contactors	2	100-ECL146

	Description	For Use With	Pkg. Quantity	Cat. No.	
	Terminal Lugs (UL/CSA)	100-D95E, 100-D110E, 193-EC_F, 193-EE_F	1	100-DLE110	
		100-D210...100-D420, 193-EC_G, 193-EF_B, 193-EE_G	1	100-DL180	
		100-D630, 100-D860, 193-EC_H, 193-EE_H	1	100-DL630	
			1	100-DL860	
		100-E190...E205	3	100-ETL205	
	Terminal Covers • Protection class IP20 per IEC 60529 and DIN 40 050 For direct-on-line, reversing, two-speed, and wye- delta/star-delta assemblies	100-D95...100-D180, 193-EC_F, 193-EE_F	1	100-DTC180	
		100-D210...100-D420, 193-EC_G, 193-EE_G	1	100-DTC420	
		100-D630...100-D860, 193-EC_H, 193-EE_H	1	100-DTC860	
	DeviceNet Configuration Terminal • Used to interface with objects on a DeviceNet network • Includes 1 m communications cable (193-CB1).	193-EDN, 193-EC (all)	1	193-DNCT	
		1 meter communication cable, color-coded bare leads	193-DNCT	1	193-CB1
		1 meter communication cable, microconnector (male)	193-DNCT	1	193-CM1
		Panel Mount Adapter/Door Mount Bezel Kit	193-DNCT	1	193-DNCT-BZ1

	Description	Size	For Use With	Pkg. Quantity	Cat. No.
	Core Balanced Ground Fault Sensor • Required when using either an E1 Plus Ground Fault Protection or Ground Fault/Jam Module • Required for ground fault protection with the Cat. No. 193-EC3 and -EC5 overload relays	20 mm (0.79 in.)	100-C09...100-C37 NEMA size 00...2	1	193-CBCT1
		40 mm (1.57 in.)	100-C09...100-C97 NEMA size 00...3	1	193-CBCT2
		63 mm (2.5 in.)	100-C09...100-C97, 100-D105...100-D180 NEMA size 00...4	1	193-CBCT3
		82 mm (3.25 in.)	100-C09...100-C97, 100-D105...100-D420 NEMA size 00...5	1	193-CBCT4

	Description	For Use With	Cat. No.	
	Remote Reset Solenoid	E1 Plus (Series C and later)	24V AC, 50/60 Hz	193-EMRJ
			110/120V AC, 50/60 Hz	193-EMRD
			220/240V AC, 50/60 Hz	193-EMRA
			24V DC	193-EMRZ24
			48V DC	193-EMRZ48
			115V DC	193-EMRZ01

Expansion Modules

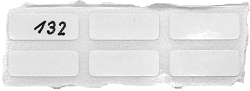

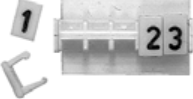
- Only one module per device at a time

	Description	For Use With	Pkg. Quantity	Cat. No.
	DeviceNet Communications Module <ul style="list-style-type: none"> Integrated I/O allows simplification of the network architecture, providing local connection of motor starter related inputs and outputs 2 Inputs – 24V DC rated, module supplied 1 Output – B300 rated 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EDN
	E1 Plus EtherNet/IP and Protection Module <ul style="list-style-type: none"> Communicates motor diagnostic data via EtherNet/IP Includes additional I/O Provides enhanced motor protection options 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-ETN
	E1 Plus PROFIBUS and Protection Module <ul style="list-style-type: none"> Communicates motor diagnostic data via PROFIBUS Includes additional I/O Provides enhanced motor protection options 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EPRB
	Jam/Remote Module <ul style="list-style-type: none"> Side-mount module with trip level settings of 150, 200, 300, and 400% FLA, and delay time settings of 0.5, 1.0, 2.0, and 4 seconds For remote resetting of a trip condition Supply voltage required 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EJM
	E1 Plus Ground Fault Module <ul style="list-style-type: none"> Provides adjustable 20 mA . . . 5 A ground fault protection Provides an input to allow remote reset of a trip 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EGF ⁽¹⁾
	E1 Plus Ground Fault/Jam Module <ul style="list-style-type: none"> Provides adjustable 20 mA . . . 5 A ground fault and fixed jam protection Provides an input to allow remote reset of a trip 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EGJ ⁽¹⁾
	E1 Plus PTC Module <ul style="list-style-type: none"> Provides terminals for connection up to six PTC thermistor sensors Sensors react to actual temperature and therefore provide enhanced motor protection Provides an input to allow remote reset of a trip 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-EPT
	E1 Plus Remote Reset Module <ul style="list-style-type: none"> Provides an input to allow remote reset of a trip 	193-EE (all), 592-EE (all), 193S-EE (all), 592S-EE (all)	1	193-ERR
	E1 Plus Remote Indicator Display <ul style="list-style-type: none"> Displays the status of an E1 Plus from the front of a panel and features a reset button Mounts in a standard 22 mm push button cutout 	193-EGF, 193-EJM, 193-EGJ, 193-PTC, 193-ERR (Ser. B or later)	1	193-ERID
	Module Adjustment Cover <ul style="list-style-type: none"> Prevents inadvertent adjustment of setting. Must be ordered in multiples of package quantity 	193-EJM	25	193-EMC

(1) Requires use of an external ground fault sensor (Cat. No. 193-CBCT_).

Marking Systems







- Uniform labeling materials for contactors, motor starting equipment, timing relays, and circuit breakers

	Description	Pkg. Qty. ⁽¹⁾	Cat. No.
	Label Sheet <ul style="list-style-type: none"> 10 sheets with 105 self-adhesive paper labels each, 6 x 17 mm 	10	100-FMS
	Marking Tag Sheet <ul style="list-style-type: none"> 10 sheets with 160 perforated paper labels each, 6 x 17 mm To be used with a transparent cover 	10	100-FMP
	Transparent Cover <ul style="list-style-type: none"> 100 each To be used with marking tag sheets 	100	100-FMC
	Marking Tag Adapters <ul style="list-style-type: none"> 100 each To be used with marking tag 	100	100-FMA2

(1) Must be ordered in multiples of package quantities.

Specifications

Technical Specifications

		Cat. No. 193- ED1_B, 193-EE_B, 592-EE_T	Cat. No. 193- EE_D, and 592- EE_C	Cat. No. 193- EE_E, and 592- EE_D	Cat. No. 193-EE_F ⁽¹⁾	Cat. No. 193- EE_G	Cat. No. 193- EE_H
Main Circuits							
Rated Insulation Voltage (U _i)		690V AC			1000V AC		
Rated Impulse Strength (U _{imp})		6 kV AC			6 kV AC		
Rated Operating Voltage (U _e) IEC/UL		690V AC/600V AC			1000V AC/600V AC		
Rated Operating Frequency		50/60 Hz (sinusoidal)			50/60 Hz (sinusoidal)		
Terminal Cross Sections	Terminal Type						
	Terminal Screws	M5		M8	Lug		
Flexible-stranded with Ferrule	Single-conductor Torque	2.5...16 mm ² , 2.5 N·m	2.5...16 mm ² , 2.5 N·m	4...35 mm ² , 24 N·m	—	—	—
	Two-conductor Torque	2.5...10 mm ²⁽²⁾ , 3.4 N·m	2.5...10 mm ²⁽²⁾ , 3.4 N·m	4...25 mm ² , 4 N·m	—	—	—
Coarse-stranded/ Solid	Single-conductor Torque	2.5...25 mm ² , 2.5 N·m	2.5...25 mm ² , 2.5 N·m	4...50 mm ² , 4 N·m	16...150 mm ² , 28 N·m	—	—
	Two-conductor Torque	6...16 mm ²⁽²⁾ , 3.4 N·m	6...16 mm ²⁽²⁾ , 3.4 N·m	4...35 mm ² , 4 N·m	—	25...185 mm ² , 28 N·m	70...240 mm ² , 45 N·m
	Four-Conductor Torque	6...16 mm ²⁽²⁾ , 3.4 N·m	6...16 mm ²⁽²⁾ , 3.4 N·m	4...35 mm ² , 4 N·m	—	—	70...240 mm ² , 45 N·m
Stranded/Solid	Single-conductor Torque	14...6 AWG, 22 lb·in	14...6 AWG, 22 lb·in	12...1 AWG, 35 lb·in	6...300 MCM, 250 lb·in	—	—
	Two-conductor Torque	14...6 AWG ⁽²⁾ , 30 lb·in	14...6 AWG ⁽²⁾ , 30 lb·in	6...2 AWG, 35 lb·in	—	4...350 MCM, 250 lb·in	2/0...500 MCM, 400 lb·in
	Four-Conductor Torque	14...6 AWG ⁽²⁾ , 30 lb·in	14...6 AWG ⁽²⁾ , 30 lb·in	6...2 AWG, 35 lb·in	—	—	2/0...500 MCM, 400 lb·in
Poizidriv Screwdriver Size		2	2	—	—	—	—
Slotted Screwdriver (mm)		1 x 6	1 x 6	—	—	—	—
Hexagon Socket Size (mm)		—	—	4	8	8	8
Control Circuits							
Rated Insulation Voltage (U _i)		690V AC					
Rated Impulse Strength (U _{imp})		6 kV AC					
Rated Operating Voltage (U _e) IEC/UL		690V AC / 600V AC					
Rating Designation		B600					
Rated Operating Current I _e		N.O./N.C.					
AC-15	12...120V	3/2					
	220...240V	1.5/1.5					
	380...480V	0.75/0.75					
	500...600V	0.6/0.6					
Thermal Current I _{the}		5 A					
Contact Reliability		17V, 5 mA					
Screw Terminal Cross Sections	Terminal Screw	M3					
Flexible-stranded with Ferrule	Single-conductor Torque	0.5...2.5 mm ² , 0.55 N·m					
	Two-conductor Torque	0.25...1.5 mm ² , 0.55 N·m			0.2...0.75 mm ² , 0.55 N·m		
Coarse-stranded/ Solid	Single-conductor Torque	0.5...4 mm ² 0.55 N·m					
	Two-conductor Torque	0.2...2.5 mm ² , 0.55 N·m			0.2...1.5 mm ² , 0.55 N·m		
Stranded/Solid	Single-conductor Torque	24...10 AWG, 5 lb·in					
	Two-conductor Torque	24...12 AWG, 5 lb·in			22...16 AWG, 5 lb·in		
Screwdriver Size (mm)		#1 Poizidriv/0.6 x 3.5 slotted					
Cage Clamp Cross Sections							
Flexible-stranded with Ferrule		0.25...1 mm ²					
Coarse-stranded/Solid		0.2...1.5 mm ²					
Stranded/Solid		24...14 AWG					

(1) Cat. Nos. 193-EEGF and 193-EEVF follow Cat. No. 193-EE_E specifications.

(2) For multiple conductor applications, the same style and size of wire must be used.

Environmental Specifications

Attribute		Description
Ambient Temperature	Storage	-40...+85 °C (-40...+185 °F)
	Operating	-20...+60 °C (-4...+140 °F)
Humidity	Operating	5...95% Non-condensing
	Damp Heat	per IEC 68-2-3 and IEC68-2-30
Vibration (per IEC 68-2-6)		3 G
Shock (per IEC 68-2-27)		30 G
Max. Altitude		2000 m
Pollution Environment		Pollution Degree 3
Degree of Protection		IP20
Protection		
Type of Relay		Ambient Compensated, Time Delay, Phase Loss Sensitive
Nature of Relay		Solid-state
Trip Rating		120% FLA
Trip Class	Type ED	10
	Type EE	10, 15, 20, 30
Reset Mode	Type ED	Manual
	Type EE	Automatic or Manual
Electromagnetic Compatibility		
Electrostatic Discharge Immunity	Test Level	8 kV Air Discharge, 6 kV Contact Discharge
	Performance Level	1 ⁽¹⁾ (2)
RF Immunity	Test Level	10 V/m
	Performance Level	1 ⁽¹⁾ (2)
Electrical Fast Transient/Burst Immunity	Test Level	4 kV
	Performance Level	1 ⁽¹⁾ (2)
Surge Immunity	Test Level	2 kV (L-E), 1 kV (L-L)
	Performance Level	1 ⁽¹⁾ (2)

- (1) Performance Criteria 1 require the device under test (DUT) to experience no degradation or loss of performance.
 (2) Environment 2.

Certifications

	Cat. No. 193-ED1_B, 193-EE_B	Cat. No. 193-EE_D	Cat. No. 193-EE_E
Standards	UL508, CSA C22.2 No. 14, NEMA ICS 2-1993 Part 4, EN 60947-4-1, EN 60947-5-1		
Certifications	CE, c-UL-us, RCM, CCC		
Approximate Weights (unpackaged)	0.25 kg (0.55 lb)	0.25 kg (0.55 lb)	0.52 kg (1.06 lb)

Accessory Specifications

Expansion Modules

Function		E1 Plus ⁽¹⁾ (Cat. No. 193-592-EE_)	E1 Plus w/ Jam Module (Cat. No. 193-EJM)	E1 Plus w/ Ground Fault Module ⁽²⁾ (Cat. No. 193-EGF)	E1 Plus w/ Ground Fault/Jam Module ⁽²⁾ (Cat. No. 193-EGJ)	E1 Plus w/ PTC Module (Cat. No. 193-EPT)	E1 Plus w/ Remote Reset Module (Cat. No. 193-ERR)	E1 Plus w/ DeviceNet Module (Cat. No. 193-EDN)	E1 Plus w/ EtherNet/IP Module (Cat. No. 193-ETN)	E1 Plus w/ PROFIBUS Module (Cat. No. 193-EPRB)	
Manual/Automatic Reset		X	X	X	X	X	X	X	X	X	
Selectable Trip Class		10	X	X	X	X	X	X	X	X	
		15	X	X	X	X	X	X	X	X	
		20	X	X	X	X	X	X	X	X	X
		30	X	X	X	X	X	X	X	X	X
Jam Protection		On or Off	—	X	—	X	—	—	X	X	
		Trip Level	—	Adjustable 150/200/300/400%	—	Fixed @ 400%	—	—	Adjustable 150...600% FLA	Adjustable 150...600% FLA	Adjustable 150...600% FLA
		Trip Delay	—	Adjustable 0.5/1.0/2.0/4.0 s	—	Fixed @ 0.5 s	—	—	Adjustable 0.5...25 s	Adjustable 0.5...25 s	Adjustable 0.5...25 s
		Inhibit	—	Dynamic Inhibit ⁽¹⁾	—	Dynamic Inhibit ⁽¹⁾	—	—	Dynamic Inhibit ⁽¹⁾	Dynamic Inhibit ⁽¹⁾	Dynamic Inhibit ⁽¹⁾
Ground Fault Protection		Type	—	—	Core-balanced Ground Fault Protection ⁽²⁾	Core-balanced Ground Fault Protection ⁽²⁾	—	—	—	—	
		On or Off	—	—	X	X	—	—	—	—	—
		Trip Level	—	—	Adjustable 20 mA...5 A ⁽³⁾	Adjustable 20 mA...5 A ⁽³⁾	—	—	—	—	—
		Trip Delay	—	—	Fixed @ 50 ms ± 20 ms	Fixed @ 50 ms ± 20 ms	—	—	—	—	—
		Inhibit	—	—	Dynamic Inhibit ⁽¹⁾	Dynamic Inhibit ⁽¹⁾	—	—	—	—	—
PTC Protection		PTC Open Circuit	—	—	—	—	X	—	—	—	
		PTC Short Circuit	—	—	—	—	—	X	—	—	—
Remote Reset Capability		—	X	X	X	X	X	X	X	X	
Fault Indication		—	—	X	X	X	—	X	X	X	

(1) Dynamic Inhibit: Protective function is enabled after the motor current goes above 150% and then falls to below 125%.

(2) Requires use of an external ground fault sensor, Cat. No. 193-CBCT_.

(3) From 20...100 mA for resistive loads only.

3-Pole Terminal Blocks

Cat. No. 100-DTB180	Cat. No. 100-DTB420	Cat. No. 100-ECL146
(A) 6...1/0 AWG, 16...50 mm ² (B) 6 AWG...250 MCM, 16...120 mm ² 90...110 lb-in, 10...12 N-m	(2) 4 AWG...600 MCM, 25...240 mm ² 180...220 lb-in, 20...25 N-m	2 x 6...3/0 AWG 71 lb-in., 8 N-m Set of 2
for use with 100-C contactors	for use with 100-C contactors	for use with 100-E contactors

Terminal Lug Kits

	Cat. No. 100-DLE110	Cat. No. 100-DL180	Cat. No. 100-DL420	Cat. No. 100-DL630	Cat. No. 100-DL860	Cat. No. 100-ETL205
Lug	6...2/0 AWG 16...70 mm ² 90...110 lb-in 10...12 N-m	6 AWG...250 MCM, 16...120 mm ² 90...110 lb-in 10...12 N-m	2 AWG...350MCM, 375 lb-in 42 N-m	2/0 AWG...500 MCM, 70...240 mm ² 400 lb-in 45 N-m	2/0 AWG...500 MCM, 70...240 mm ² 400 lb-in 45 N-m	6...300 MCM 16...120 mm ² 18 N-m Set of 3
Terminal	13/32 in., 10 mm 150 lb-in, 17 N-m	1/2 in., 13 mm 275 lb-in, 16 N-m	11/16 in., 17 mm 140 lb-in, 16 N-m	3/4 in., 19 mm 600 lb-in, 68 N-m	3/4 in., 19 mm 600 lb-in, 68 N-m	—
For use with	100-C contactors	100-C contactors	100-C contactors	100-C contactors	100-C contactors	100-E contactors

DIN Rail / Panel Adapter - Terminal Cross Sections

Description		Cat. No. 193-EPB ⁽¹⁾	Cat. No. 193-EPD ⁽¹⁾	Cat. No. 193-EPE
Flexible-stranded with Ferrule	Single Conductor	1.0...4.0 mm ²	2.5...16 mm ²	4.0...35 mm ²
	Torque	1.8 N•m	2.3 N•m	4.0 N•m
	Two Conductor	1.0...4.0 mm ²	2.5...10 mm ²	4.0...25 mm ²
	Torque	1.8 N•m	2.3 N•m	4.0 N•m
Coarse-stranded/Solid	Single Conductor	1.5...6.0 mm ²	2.5...25 mm ²	4.0...50 mm ²
	Torque	1.8 N•m	2.3 N•m	4.0 N•m
	Two Conductor	1.5...6.0 mm ²	2.5...16 mm ²	4.0...35 mm ²
	Torque	1.8 N•m	2.3 N•m	4.0 N•m
Stranded/Solid	Single Conductor	14...8 AWG	16...6 AWG	12...1 AWG
	Torque	16 lb•in	20 lb•in	35 lb•in
	Two Conductor	14...10 AWG	16...6 AWG	12...2 AWG
	Torque	16 lb•in	20 lb•in	35 lb•in

(1) For multiple-conductor applications, the same size and style wire must be used.

External Current Transformers (for use with cat. nos. 193-EE_Z)

You must provide one current transformer (CT) for each motor phase, and connect the secondary leads of the CT to the appropriate E1 Plus overload relay power terminals, as shown in the current transformer's wiring diagrams. Make sure that the CT has the appropriate ratio (refer to the product nameplate or product description). Verify that the CT can provide the required VA to the secondary load, which includes the E1 Plus overload relay burden at the rated secondary current and the wiring burden. The CT must be rated for protective relaying to accommodate the high inrush currents associated with motor startup, and must be accurate to within $\pm 2\%$ over its normal operating range. Typical CT ratings include (Instrument Transformers, Inc. — Model #23 or equivalent):

ANSI (USA)	Class C5B0.1
CSA (Canada)	Class 10L5
IEC (Europe)	5VA Class 5P10

Wiring Schematics

Figure 1 - Typical Wiring for 1-Phase IEC Applications

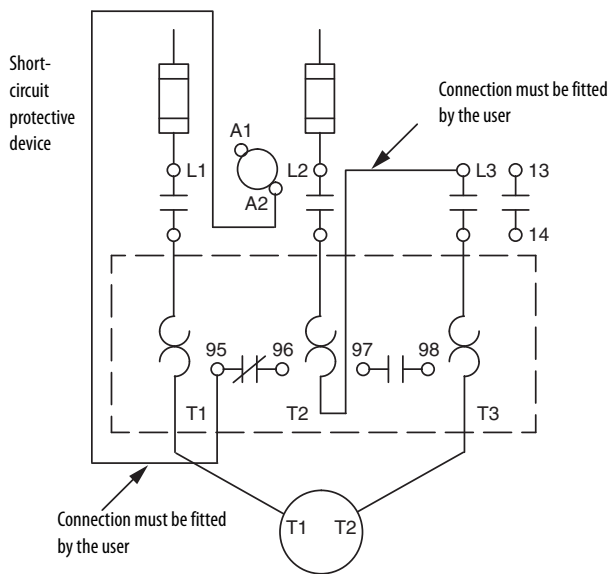


Figure 2 - Typical Wiring for 3-Phase IEC Applications

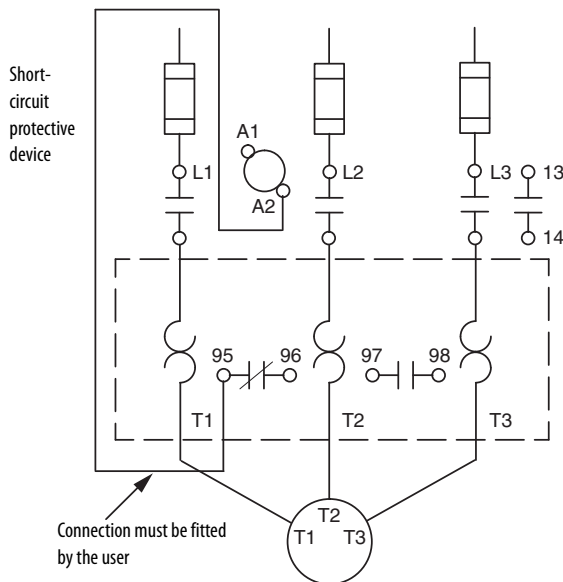
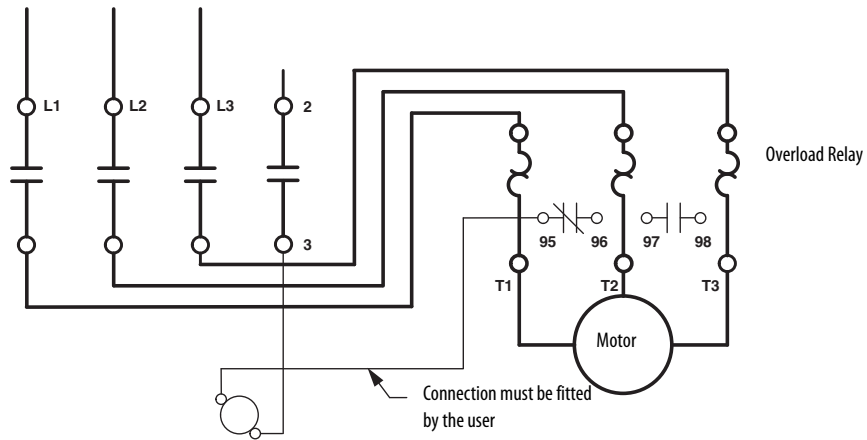


Figure 3 - Typical Wiring for NEMA Applications



Trip Curves

Typical reset time for 193-EE devices set to automatic reset mode is 120 seconds.

Figure 4 - Trip Class 10

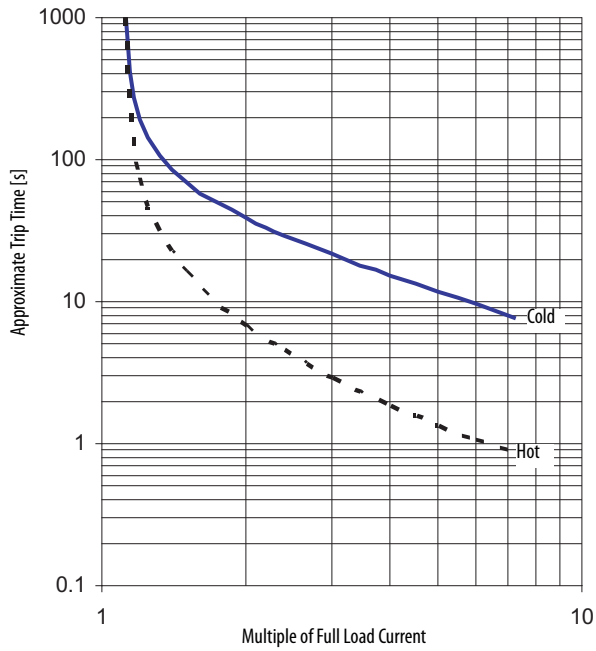


Figure 5 - Trip Class 15

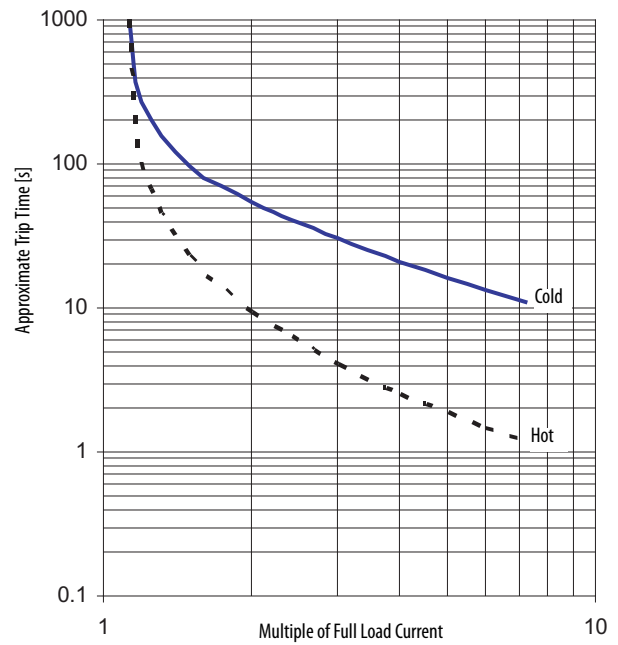


Figure 6 - Trip Class 20

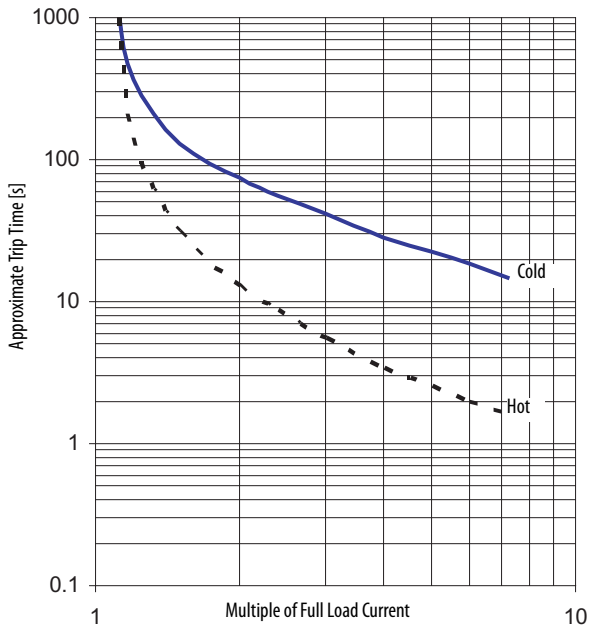
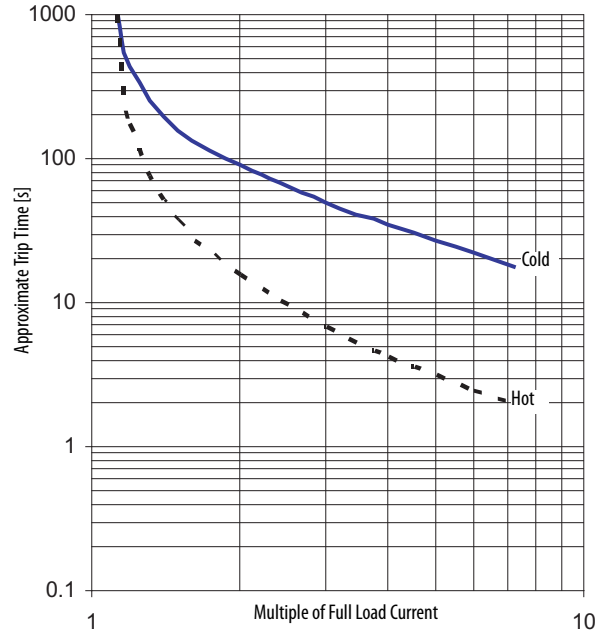


Figure 7 - Trip Class 30



Approximate Dimensions

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

Figure 8 - E1 Plus Pass-thru Style

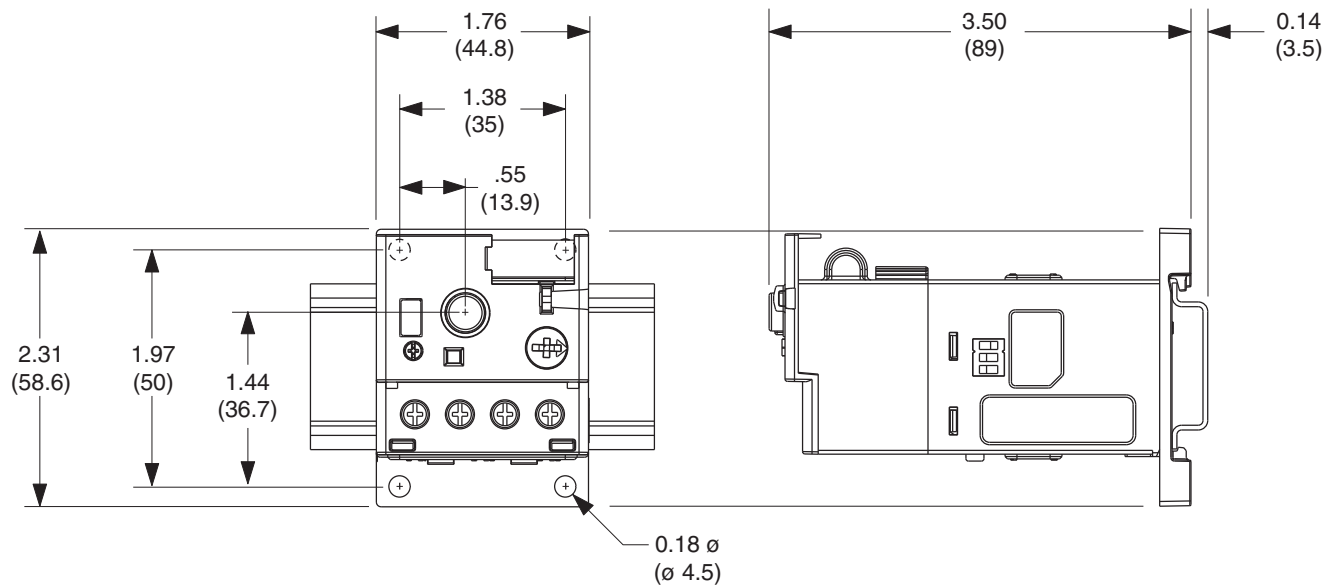
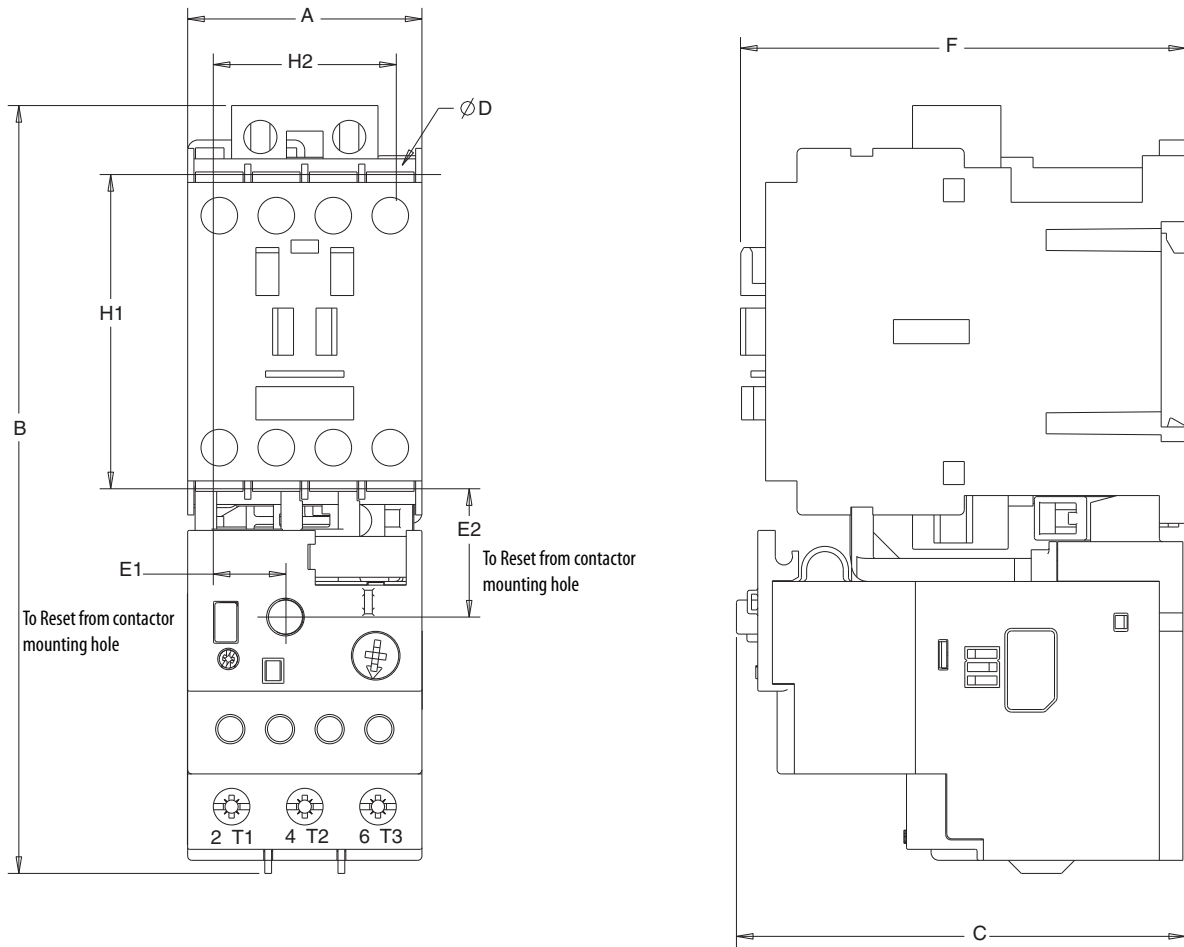
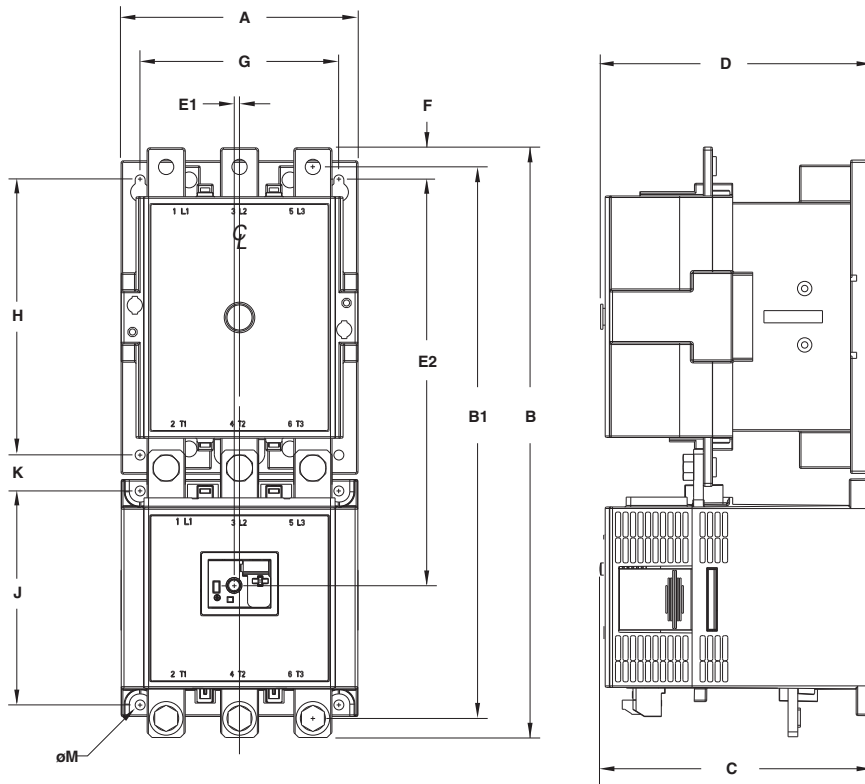


Figure 9 - Bulletin 100-C Contactor Mounted



Overload Cat. No.	Contactor Cat. No.	Width A	Height B	Depth C	D	E1	E2	F	H1	H2
193-ED B 193-EE B 193R-EE B 193S-EE B	100-C09, -C12, -C16, -C23	45 (1-25/32)	146.6 (5-25/32)	85.2 (3-23/64)	4.5 (3/16)	13.9 (35/64)	24.5 (31/32)	86.5 (3-13/32)	60 (2-23/64)	35 (1-3/8)
193-EE D 193R-EE D 193S-EE D	100-C30, -C37	45 (1-25/32)	146.6 (5-25/32)	101.2 (3-63/64)	4.5 (3/16)	13.9 (35/64)	24.5 (31/32)	104 (4-3/32)	60 (2-23/64)	35 (1-3/8)
193-EE D 193R-EE D 193S-EE D	100-C43	54 (2-1/8)	146.6 (5-25/32)	101.2 (3-63/64)	4.5 (3/16)	18.9 (3/4)	24.5 (31/32)	104 (4-3/32)	60 (2-23/64)	45 (1-25/32)
193-EE E 193R-EE E 193S-EE E	100-C60, -C72, -C85	72 (2-53/64)	192.3 (7-37/64)	120.4 (4-3/4)	5.4 (7/32)	23.8 (15/16)	29 (1-9/64)	125.5 (4-15/16)	100 (3-15/16)	55 (2-11/64)

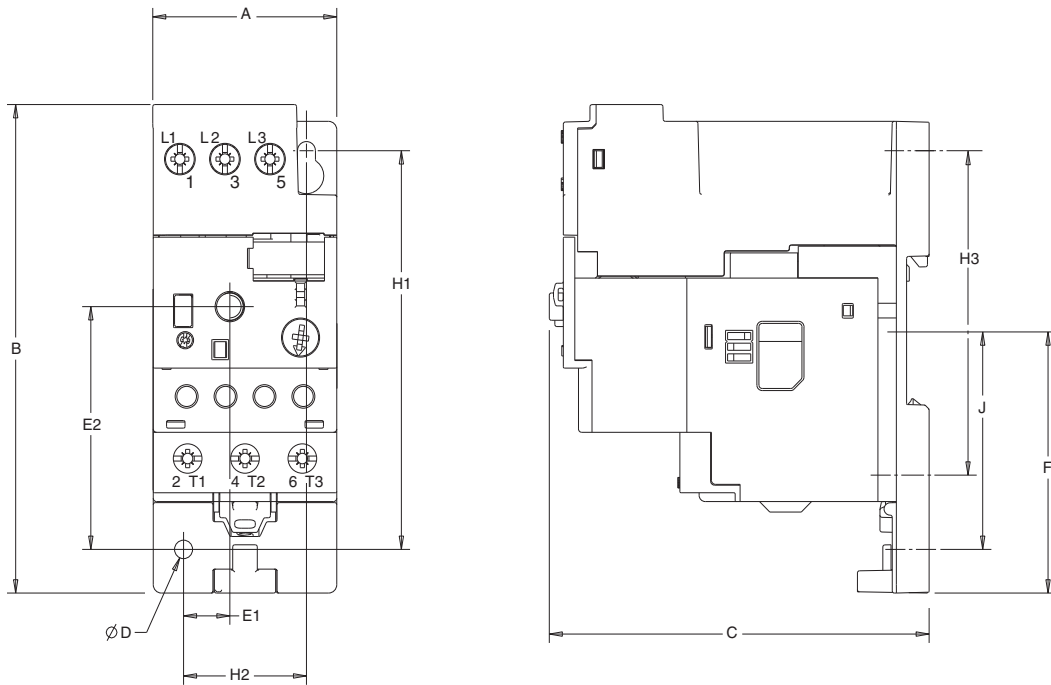
Figure 10 - Bulletin 100-D Contactor Mounted



Overload Cat. No.	Contactor Cat. No.	Width A	Height B		Height B1	Depth C	D	E1	E2
			Without Terminal Covers	With Terminal Covers		(Reset)			
193-EE F	100-D95, -D110	120 (4.72)	336.3 (13.24)	418 (16.46)	311.8 (12.27)	152.7 (6.01)	156 (6.14)	3.6 (0.14)	226.3 (8.91)
193-EE F	100-D140, -D180	120 (4.72)	339.8 (13.38)	418 (16.46)	317.8 (12.51)	152.7 (6.01)	156 (6.14)	3.6 (0.14)	226.3 (8.91)
193-EE G	100-D210, -D250, -D300, -D420	155 (6.10)	385.8 (15.19)	487.4 (19.19)	360.8 (14.2)	176.5 (6.95)	180 (7.09)	3.6 (0.14)	265.2 (10.44)
193-EE H	100-D630, -D860	255 (10.04)	552 (21.73)	915 (36.02)	508 (20)	269.3 (10.6)	270.7 (10.66)	3.6 (0.14)	384.1 (15.12)

Overload Cat. No.	Contactor Cat. No.	F	G	H	J	K	øM
193-EE F	100-D95, -D110	45 (1-25/32)	100 (3.94)	145 (5.71)	135 (5.31)	22.3 (0.88)	8...5.6 (8... 0.22)
193-EE F	100-D140, -D180	45 (1-25/32)	100 (3.94)	145 (5.71)	135 (5.31)	22.3 (0.88)	8...5.6 (8... 0.22)
193-EE G	100-D210, -D250, -D300, -D420	54 (2-1/8)	130 (5.12)	180 (7.09)	140 (5.51)	23.5 (0.93)	8...6.5 (8... 0.26)
193-EE H	100-D630, -D860	52.5 (2.07)	226 (8.90)	230 (9.06)	108 (4.25)	109 (4.29)	8...13 (8... 0.51)

Figure 11 - Panel Adapter Mounted



Panel Adapter Cat. No.	Overload Cat. No.	Width A	Height B	Depth C	D	E1	E2	F	H1	H2	H3	J
193-EPB	193-ED B 193-EE B 193R-EE B 193S-EE B	45 (1-25/32)	116.5 (4-19/16)	92.7 (3-21/32)	4.4 (11/64)	11.4 (0.45)	57.9 (2-9/32)	62.5 (2-15/32)	95 (3-3/4)	30 (1-3/16)	75 (2-31/32)	52.1 (2-3/64)
193-EPD	193-EE D 193R-EE D 193S-EE D	45 (1-25/32)	112.4 (4-7/16)	108.7 (4-9/32)	4.4 (11/64)	11.4 (0.45)	57.9 (2-9/32)	62.5 (2-15/32)	95 (3-3/4)	30 (1-3/16)	75 (2-31/32)	52.1 (2-3/64)
193-EPE	193-EE E 193R-EE E 193S-EE E	72 (2-53/64)	107.4 (4-15/64)	127 (5/32)	5.5 (5/32)	26.4 (1-1/32)	54.5 (2-9/64)	48.3 (1-29/32)	90 (3-23/64)	60 (2-23/64)	—	43.3 (1-45/64)

Figure 12 - E1 Plus with Bulletin 100-E116 and 100-E146 Contactors

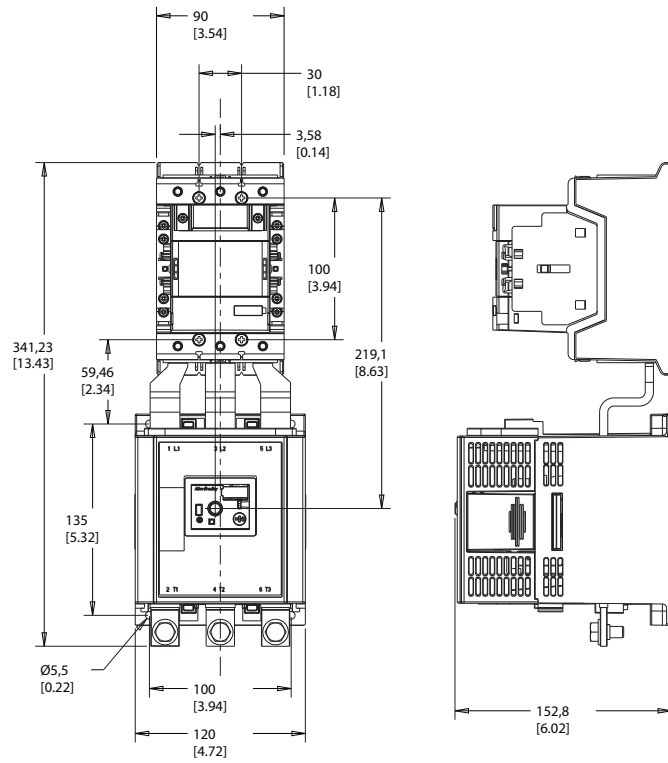
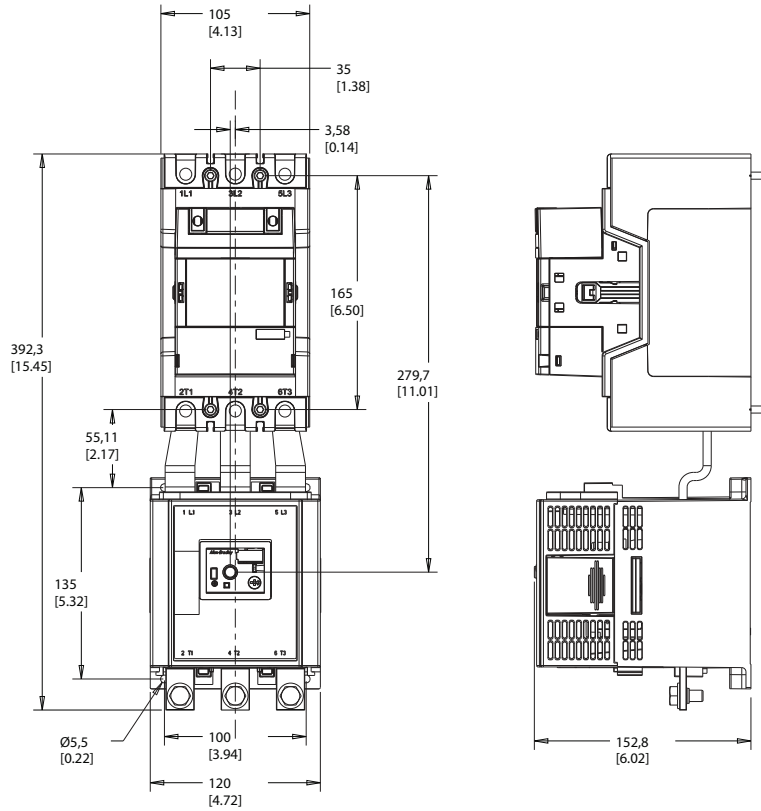


Figure 13 - E1 Plus with Bulletin 100-E190 and 100-E205 Contactors



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.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.

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
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