C440/*XT* Electronic Overload Relay

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Product Description

Eaton's new electronic overload relay (EOL) is the most compact, high-featured, economical product in its class. Designed on a global platform, the new EOL covers the entire power control spectrum including NEMA, IEC and DP contactors. The NEMA and DP versions are offered with the *C440* designation while the IEC offering has the ***XT*** designation. The electronic design provides reliable, accurate and value driven protection and communications capabilities in a single compact device. It is the flexible choice for any application requiring easy-to-use, reliable protection.

Eaton has a long history of innovations and product development in motor control and protection, including both traditional NEMA, as well as IEC control. It was from this experience that the C440 was developed, delivering new solutions to meet today's demands.

C440 is a self-powered electronic overload relay available up to 100A as a self contained unit. With external CTs, C440 can protect motor up to 1500 FLA. Available add-on accessories include remote reset capability and communication modules with I/O for DeviceNet, PROFIBUS, and Modbus.

Features and Benefits

Features

- Reliable, accurate, electronic motor protection
- Easy to select, install and maintain
- Compact size
- Flexible, intelligent design
- Global product offering—available with NEMA, IEC and DP power control

Size/Range

- Broad FLA range (0.33–1500A)
- Selectable trip class (10A, 10, 20, 30)
- Direct mounting to NEMA, IEC and DP contactors
- Most compact electronic overload in its class

Motor Control

- Two B600 alarm (NO) and fault (NC) contacts
- Test/Trip button

Motor Protection

- Thermal overload
- Phase loss
- Selectable (ON/OFF) phase unbalance
- Selectable (ON/OFF) ground fault

User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase unbalance and ground fault
- Selectable Auto/Manual reset

Feature Options

- Remote reset
  - 120 Vac
  - 24 Vac
  - 24 Vdc
- Tamper-proof cover
- Communications modules
  - Modbus RTU RS-485
  - DeviceNet with I/O
  - PROFIBUS with I/O
  - Modbus RTU with I/O (Q4 2010)
  - Ethernet IP (planned)
  - Smartwire (planned)

Benefits

Reliability and Improved Uptime

- C440 provides the users with a peace of mind knowing that their assets are protected with the highest level of motor protection and communication capability in its class
- Extends the life of your plant assets with selectable motor protection features such as trip class, phase unbalance and ground fault
- Protects against unnecessary downtime by discovering changes in your system (line/load) with remote monitoring capabilities
- Status LED provides added assurance that your valuable assets are protected by indicating the overload operational status

Flexibility

- Available with NEMA, IEC and DP contactors
- Improves your return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- Patented design incorporates built-in ground fault protection thus eliminating the need for separate CTs and modules
- Flexible communication with optional I/O enables easy integration into plant management systems for remote monitoring and control
- Available as an open component and in enclosed control and motor control center assemblies

Monitoring Capabilities

- Individual phase currents rms
- Average three-phase current rms
- Thermal memory
- Fault indication (overload, phase loss, phase unbalance, ground fault)

Safety

- IP 20 rated terminal blocks
- Available in Eaton's industry leading FlashGard MCCs
- Tested to the highest industry standards such as UL, CSA, CE and IEC
- RoHS compliant

Standards and Certifications

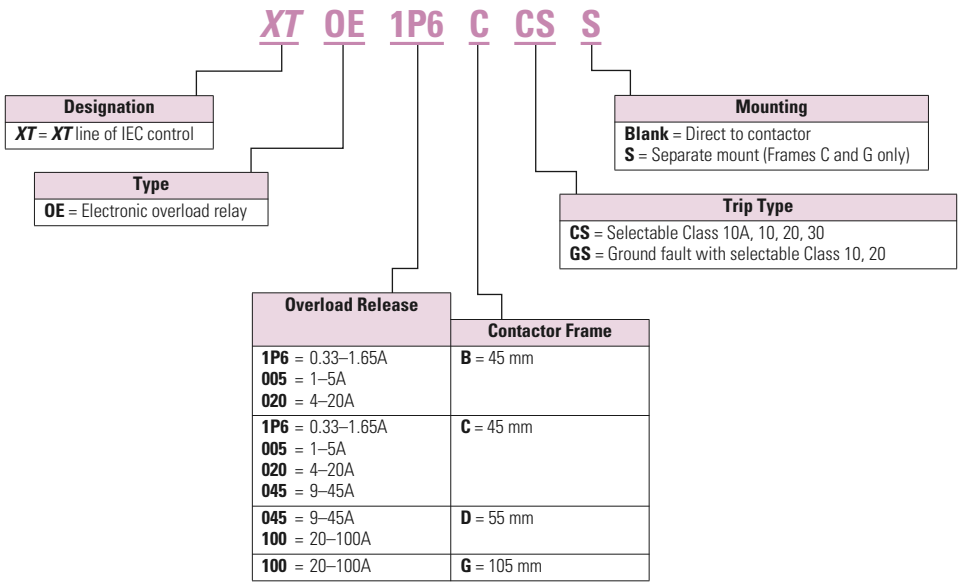
- UL
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2

Electronic Overload Education

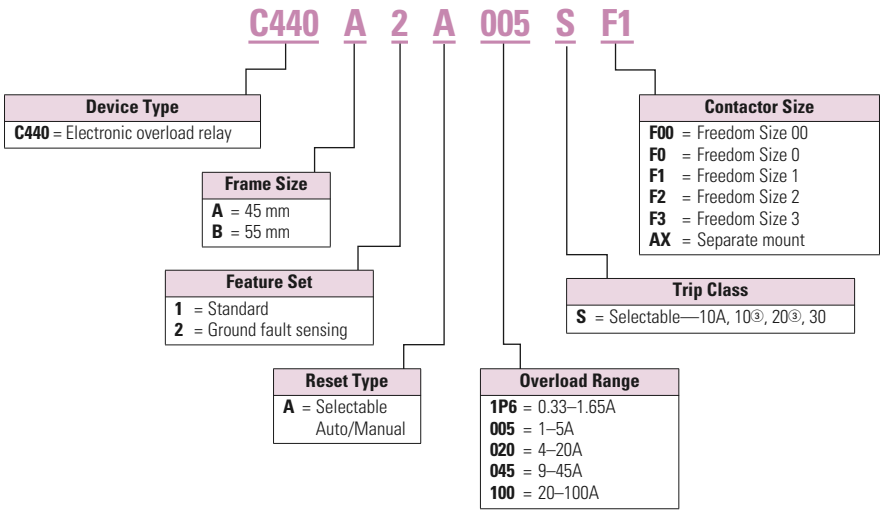
Description	Definition	Cause	Effect if not Protected	C440/*XT* Protection
Motor Protection				
Thermal overload	Overload is a condition in which current draw exceeds 115% of the full load amperage rating for an inductive motor.	• An increase in the load or torque that is being driven by the motor. • A low voltage supply to the motor causes the current to go high to maintain the power needed. • A poor power factor causing above normal current draw.	• Increase in current draw leads to heat and insulation breakdown, which can cause system failure. • Increase in current can increase power consumption and waste valuable energy.	• Thermal trip behavior is defined by UL, CSA and IEC standards. • Trip class is settable from 10A, 10, 20, 30
Ground fault	A line to ground fault.	A current leakage path to ground.	An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure, not to mention risk to equipment or personnel	Fixed protective setting that takes the starter offline if ground fault current exceeds 50% of the FLA dial setting, i.e., if the FLA dial is set to 12A, the overload relay will trip if the ground current exceeds 6A.
Unbalanced phases (voltage and current)	Uneven voltage or current between phases in a three-phase system.	When a three-phase load is powered with a poor quality line, the voltage per phase may be unbalanced.	Unbalanced voltage causes large unbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life.	Fixed protective setting that takes the starter offline if a phase drops below 50% of the other two phases.
Phase loss—current (single-phasing)	One of the three-phase voltages is not present.	Multiple causes, loose wire, improper wiring, grounded phase, open fuse, etc.	Single-phasing can lead to unwanted motor vibrations in addition to the results of unbalanced phases as listed above.	Fixed protective setting that takes the starter offline if a phase drops below 50% of the other two phases.

Catalog Number Selection

XT Electronic Overload Relay—IEC ①



C440 Electronic Overload Relay—NEMA ②



Notes

① See **Page 6** for Product Selection.
② See **Page 8** for Product Selection.
③ On GF version only.

Freedom Series NEMA Starters with C440 Electronic Overload Relays ①

A N 1 9 A N 0 A 5E 005

Device Type
A = Starter

Standard
N = NEMA

Device Assembly Configuration
1 = Non-reversing
5 = Reversing

OLR Type
9 = Starter w/C440 EOLR

Contactor Frame Size

	NEMA Size	Continuous Amperes
A =	00	9
B =	0	18
D =	1	27
G =	2	45
K =	3	90
N =	4	135
S =	5	270

NEMA Enclosure
N = Open

For Starters

Starter Mounting Option
0 = Horizontal

C440 OLR Designation (FVNR and FVR only)
5E = Standard feature set
SEL Reset, SEL Class (10A, 10, 20, 30)
5G = Ground fault feature set
SEL Reset, SEL Class (10, 20)

AC Coil Suffix

Suffix	Volts and Hertz
A =	120/60 or 110/50
B =	240/60 or 220/50
C =	480/60 or 440/50
D =	600/60 or 550/50
E =	208/60
H =	277/60
J =	208–240/60 ②
K =	240/50
L =	380–415/50
N =	550/50
T =	24/60, 24/50 ③
U =	24/50
V =	32/50
W =	48/60
Y =	48/50

C440 FLA Range (FVNR and FVR only)

NEMA Size 00
1P6 = 0.33–1.65A
005 = 1–5A
020 = 4–20A

NEMA Size 0
1P6 = 0.33–1.65A
005 = 1–5A
020 = 4–20A

NEMA Size 1
1P6 = 0.33–1.65A
005 = 1–5A
020 = 4–20A
045 = 9–45A

NEMA Size 2
005 = 1–5A
020 = 4–20A
045 = 9–45A

NEMA Size 3
100 = 20–100A

NEMA Size 4 ④
300 = 60–300A

NEMA Size 5 ④
300 = 60–300A

Notes

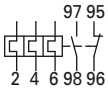
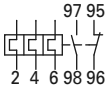
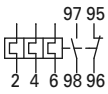
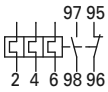
① See **Page 9** for Product Selection.
② NEMA Sizes 00 and 0 only.
③ NEMA Sizes 00 and 0 only. Sizes 1–3 are 24/60 only.
④ NEMA Sizes 4 and 5 require the use of CTs with 1–5A OL relay. Size 4 starters are not shipped as an assembled unit.

Product Selection

XT Electronic Overload Relays

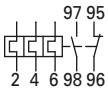
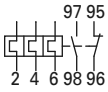
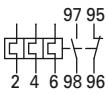
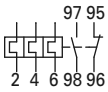
45 mm *XT* for Direct Mount

XT Electronic Overload Relays for Direct Mount to *XT* Contactors

For Use with *XT* Contactor Frame	For Use with Contactor	Overload Range (Amps)	Contact Sequence	Frame Size	Auxiliary Contact Configuration	Type	Catalog Number
B	XTCE007B…, XTCE009B…, XTCE012B…, XTCE015B…	0.33–1.65		45 mm	NO-NC	ZEB12-1,65	**XTOE1P6BCS**
		1–5				ZEB12-5	**XTOE005BCS**
		4–20				ZEB12-20	**XTOE020BCS**
C	XTCE018C…, XTCE025C…, XTCE032C	0.33–1.65		45 mm	NO-NC	ZEB32-1,65	**XTOE1P6CCS**
		1–5				ZEB32-5	**XTOE005CCS**
		4–20				ZEB32-20	**XTOE020CCS**
		9–45				ZEB32-45	**XTOE045CCS**
D	XTCE040D…, XTCE050D…, XTCE065D…, XTCE072D…	9–45		45 mm	NO-NC	ZEB65-45	**XTOE045DCS**
		20–100		55 mm		ZEB65-100	**XTOE100DCS**
F, G	XTCE080F…, XTCE095F…, XTCE115G…, XTCE150G…, XTCE170G…	20–100		55 mm	NO-NC	ZEB150-100	**XTOE100GCS**

45 mm *XT* for Direct Mount with Ground Fault

XT Electronic Overload Relays with Ground Fault for Direct Mount to *XT* Contactors

For Use with *XT* Contactor Frame	For Use with Contactor	Overload Range (Amps)	Contact Sequence	Frame Size	Auxiliary Contact Configuration	Type	Catalog Number
B	XTCE007B…, XTCE009B…, XTCE012B…, XTCE015B…	0.33–1.65		45 mm	NO-NC	ZEB12-1,65-GF	**XTOE1P6BGS**
		1–5				ZEB12-5-GF	**XTOE005BGS**
		4–20				ZEB12-20-GF	**XTOE020BGS**
C	XTCE018C…, XTCE025C…, XTCE032C	0.33–1.65		45 mm	NO-NC	ZEB32-1,65-GF	**XTOE1P6CGS**
		1–5				ZEB32-5-GF	**XTOE005CGS**
		4–20				ZEB32-20-GF	**XTOE020CGS**
		9–45				ZEB32-45-GF	**XTOE045CGS**
D	XTCE040D…, XTCE050D…, XTCE065D…, XTCE072D…	9–45		45 mm	NO-NC	ZEB65-45-GF	**XTOE045DGS**
		20–100		55 mm		ZEB65-100-GF	**XTOE100DGS**
F, G	XTCE080F…, XTCE095F…, XTCE115G…, XTCE150G…, XTCE170G…	20–100		55 mm	NO-NC	ZEB150-100-GF	**XTOE100GGS**

1–5A OL with CTs

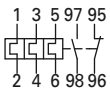
XT Electronic Overload Relays for use with Large Frame *XT* Contactors (L–R)

Use CTs and 1-5A ***XT*** overload relay. CT kit does not include overload relay (order separately).

XT Contactor Frame	For Use with IEC Contactor Amp Range (AC-3)	CT Range (Amps)	Description	CT Kit Catalog Number	Terminal Size	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
L, M	185–500A	60-300	300: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT300**	750 kcmil (2) 250 kcmil 3/0 Cu/Al	**XTOE005CCSS**	**XTOE005CGSS**
M, N	300–820A	120-600	600: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT600**	(2) 750 kcmil 3/0 Cu/Al	**XTOE005CCSS**	**XTOE005CGSS**
N	580–1000A	200-1000	1000: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT1000**	(3) 750 kcmil 3/0 Cu/Al	**XTOE005CCSS**	**XTOE005CGSS**
R	1600A	300-1500	1500: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT1500**	(4) 750 kcmil 1/0 Cu/Al	**XTOE005CCSS**	**XTOE005CGSS**

45 mm *XT* for Separate Mount

XT Electronic Overload Relays for Separate Mount

Overload Range (Amps)	Frame Size	Contact Sequence	Type	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
Overload Relay					
0.33–1.65	45 mm		ZEB32-1,65/KK	**XTOE1P6CCSS**	**XTOE1P6CGSS**
1–5			ZEB32-5/KK	**XTOE005CCSS**	**XTOE005CGSS**
4–20			ZEB32-20/KK	**XTOE020CCSS**	**XTOE020CGSS**
9–45			ZEB32-45/KK	**XTOE045CCSS**	**XTOE045CGSS**
20–100	55 mm		ZEB150-100/KK	**XTOE100GCSS**	**XTOE100GGSS**

C440 Electronic Overload Relays

45 mm C440 for Direct Mount

C440 Electronic Overload Relays for Direct Mount to Freedom Series Contactors

For Use with Freedom NEMA Contactor Size	For Use with Contactor ①	Overload Range (Amps)	Standard Feature Set Catalog Number	Standard Feature Set with Ground Fault Catalog Number
00	CN15AN3_B	0.33–1.65	**C440A1A1P6SF00**	**C440A2A1P6SF00**
		1–5	**C440A1A005SF00**	**C440A2A005SF00**
		4–20	**C440A1A020SF00**	**C440A2A020SF00**
0	CN15BN3_B	0.33–1.65	**C440A1A1P6SF0**	**C440A2A1P6SF0**
		1–5	**C440A1A005SF0**	**C440A2A005SF0**
		4–20	**C440A1A020SF0**	**C440A2A020SF0**
1	CN15DN3_B	0.33–1.65	**C440A1A1P6SF1**	**C440A2A1P6SF1**
		1–5	**C440A1A005SF1**	**C440A2A005SF1**
		4–20	**C440A1A020SF1**	**C440A2A020SF1**
		9–45	**C440A1A045SF1**	**C440A2A045SF1**
2	CN15GN3_B	1–5	**C440A1A005SF2**	**C440A2A005SF2**
		4–20	**C440A1A020SF2**	**C440A2A020SF2**
		9–45	**C440A1A045SF2**	**C440A2A045SF2**
3	CN15KN3_	20–100	**C440B1A100SF3**	**C440B2A100SF3**

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1–5A OL with CTs

C440 Electronic Overload Relays for use with NEMA Contactors Sizes 4–8

Use CTs and 1-5A C440 overload relay. CT kit does not include overload relay (order separately).

For Use with NEMA Contactor Size	CT Range (Amps)	Description	CT Kit Catalog Number	Terminal Size	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
4 and 5	60-300	300: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT300**	750 kcmil (2) 250 kcmil 3/0 Cu/Al	**C440A1A005SAX**	**C440A2A005SAX**
6	120-600	600: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT600**	(2) 750 kcmil 3/0 Cu/Al	**C440A1A005SAX**	**C440A2A005SAX**
7	200-1000	1000: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT1000**	(3) 750 kcmil 3/0 Cu/Al	**C440A1A005SAX**	**C440A2A005SAX**
8	300-1500	1500: Five panel-mount CT kit with integrated, pass through holes	**ZEB-XCT1500**	(4) 750 kcmil 1/0 Cu/Al	**C440A1A005SAX**	**C440A2A005SAX**

45 mm C440 for Separate Mount

C440 Electronic Overload Relays for Separate Mount

Overload Range	Frame Size	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
0.33–1.65	45 mm	**C440A1A1P6SAX**	**C440A2A1P6SAX**
1–5		**C440A1A005SAX**	**C440A2A005SAX**
4–20		**C440A1A020SAX**	**C440A2A020SAX**
9–45		**C440A1A045SAX**	**C440A2A045SAX**
20–100	55 mm	**C440B1A100SAX**	**C440B2A100SAX**

Notes

① CN15 contactor listed is non-reversing with a 120 Vac coil. For more options, see **Tab 33** in the Controls Catalog.

② Starters available with 60–300A CTs and C440A1A005SAX overload relay.

Type AN19/59 Freedom Series Starters

Type AN19/59 Freedom Series Starters with C440 Electronic Overload Relays

NEMA Starter

Non-Reversing and Reversing

NEMA Size	Continuous Ampere Rating	Service Limit Current Rating (Amps)	Maximum UL Horsepower Single-Phase 115V	Single-Phase 230V	Three-Phase 208V	Three-Phase 240V	Three-Phase 480V	Three-Phase 600V	Three-Pole Non-Reversing ①② Catalog Number	Three-Pole Reversing ①② Catalog Number
00	9	11	1/3	1	1-1/2	1-1/2	2	2	**AN19AN0_ 5E _**	**AN59AN0_ 5E _**
0	18	21	1	2	3	3	5	5	**AN19BN0_ 5E _**	**AN59BN0_ 5E _**
1	27	32	2	3	7-1/2	7-1/2	10	10	**AN19DN0_ 5E _**	**AN59DN0_ 5E _**
2	45	52	3	7-1/2	10	15	25	25	**AN19GN0_ 5E _**	**AN59GN0_ 5E _**
3	90	104	—	—	25	30	50	50	**AN19KN0_ 5E _**	**AN59KN0_ 5E _**
4 ③④	135	156	—	—	40	50	100	100	④	④
5 ③	270	311	—	—	75	100	200	200	**AN19SN0_ 5E _**	**AN59SN0_ 5E _**

Type AN19/59 Freedom Series Starters with C440 with Ground Fault Electronic Overload Relays

NEMA Starter with Ground Fault

Non-Reversing and Reversing

NEMA Size	Continuous Ampere Rating	Service Limit Current Rating (Amps)	Maximum UL Horsepower Single-Phase 115V	Single-Phase 230V	Three-Phase 208V	Three-Phase 240V	Three-Phase 480V	Three-Phase 600V	Three-Pole Non-Reversing ①② Catalog Number	Three-Pole Reversing ①② Catalog Number
00	9	11	1/3	1	1-1/2	1-1/2	2	2	**AN19AN0_ 5G _**	**AN59AN0_ 5G _**
0	18	21	1	2	3	3	5	5	**AN19BN0_ 5G _**	**AN59BN0_ 5G _**
1	27	32	2	3	7-1/2	7-1/2	10	10	**AN19DN0_ 5G _**	**AN59DN0_ 5G _**
2	45	52	3	7-1/2	10	15	25	25	**AN19GN0_ 5G _**	**AN59GN0_ 5G _**
3	90	104	—	—	25	30	50	50	**AN19KN0_ 5G _**	**AN59KN0_ 5G _**
4 ③④	135	156	—	—	40	50	100	100	④	④
5 ③	270	311	—	—	75	100	200	200	**AN19SN0_ 5G _**	**AN59SN0_ 5G _**

Coil Suffix Codes

Suffix	Coil Volts and Hertz	Suffix	Coil Volts and Hertz
A	120/60 or 110/50	**L**	380–415/50
B	240/60 or 220/50	**N**	550/50
C	480/60 or 440/50	**T**	24/60, 24/50
D	600/60 or 550/50	**U**	24/50
E	208/60	**V**	32/50
H	277/60	**W**	48/60
J	208–240/60	**Y**	48/50
K	240/50		

C440 FLA Range (FVNR and FVR Starters Only)

NEMA Size	OLR Code	FLA Range	OLR Code	FLA Rating
00	**1P6**	0.33–1.65A	**020**	4.0–20A
	005	1.0–5.0A	—	—
0	**1P6**	0.33–1.65A	**020**	4.0–20A
	005	1.0–5.0A	—	—
1	**1P6**	0.33–1.65A	**020**	4.0–20A
	005	1.0–5.0A	**045**	9.0–45A
2	**005**	1.0–5.0A	**045**	9.0–45A
	020	4.0–20A	—	—
3	**100**	20–100A	—	—
4 ③	**300**	—	—	60–300A
5 ③	**300**	60–300A	—	—

Notes

① Underscore (_) indicates coils suffix required, see Coil Suffix table above.
② Underscore (_) indicates OLR designation required, see C440 FLA Range table above.
③ Size 4 and 5 starters available with 60–300A panel mounted CTs. Please use (1–5A) overload relays with these CTs. Starters are not shipped as assembled units.
④ Order NEMA Size 4, contactor (CN15NN3A) plus CT Kit (ZEB-XTC300) and 1–5A OL relay (C440A1A005SAX or C440A2A005SAX).

Accessories

CT Kits

Accessories

Description	Catalog Number
Safety Cover	
Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed.	**ZEB-XSC**
Reset Bar	
Assembles to the top of the overload to provide a larger target for door mounted reset operators.	**ZEB-XRB**
Remote Reset	
Remote reset module (24 Vdc) ①	**C440-XCOM**
Remote reset module (120 Vac) ①	**ZEB-XRR-120**
Remote reset module (24 Vac) ①	**ZEB-XRR-24**

Safety Cover

Reset Bar

Remote Reset

Communication

The C440 is provided with two levels of communication capability.

Basic Communication via Expansion Module—Monitoring Only

Basic communication on the C440 is accomplished using an expansion module. The expansion module plugs into the expansion bay on the C440 overload relay. The customer can then communicate with the overload via their Modbus RTU (RS-485) network. No additional parts are required. See figure below.

Basic Communication—Modbus

Advanced Communication—Monitoring and Control

C440 also has the ability to communicate on industrial protocols such as DeviceNet, PROFIBUS, Modbus RTU and Modbus TCP, and Ethernet (planned) while providing control capability using I/O.

An expansion module (mentioned earlier) combined with a communication adapter and a communication module allows easy integration onto the customer's network. See figure below.

Advanced Communication—Communication Adapter with Communication Module

The communication adapter comes standard with four inputs and two outputs (24 Vdc or 120 Vac) while providing the customer with flexible mounting options (DIN rail or panel). See figure below

Note

① Customer can wire remote mounted button to reset module (i.e., 22 mm pushbutton, catalog number M22-D-B-GB14-K10).

The following information can be viewed using the communication option:

- Motor status—running, stopped, tripped or resetting
- Individual rms phase currents (A, B, C)
- Average of three-phase rms current
- Percent thermal capacity
- Fault codes (only available prior to reset)
- Percent phase unbalance
- Ground fault current and percent
- Overload relay settings—trip class, DIP switch selections, reset selections
- Modbus address (can be set over the network)

Communication Accessories

	Description	Catalog Number
Expansion Module 	Expansion module (Remote Reset/Modbus RTU, RS-485 Communication)	**C440-XCOM**
Communication Adapter 	Communication adapter kit (DIN C Panel mounted adapter, required for advance communication option)	**C440-COM-ADP**
	DeviceNet communication module kit—120V I/O (consists of C440-XCOM + C441K + C440-COM-ADP)	**C440-DN-120**
	DeviceNet communication module kit—24 Vdc I/O (consists of C440-XCOM + C441L + C440-COM-ADP)	**C440-DN-24**
	PROFIBUS communication module kit—120V I/O (consists of C440-XCOM + C441S + C440-COM-ADP)	**C440-DP-120**
	PROFIBUS communication module kit—24V I/O (consists of C440-XCOM + C441Q + C440-COM-ADP)	**C440-DP-24**
	Modbus communication module kit—120V I/O (consists of C440-XCOM + C441N + C440-COM-ADP)	**C440-MOD-120**
	Modbus communication module kit—24 Vdc I/O (consists of C440-XCOM + C441P + C440-COM-ADP)	**C440-MOD-24**
	Ethernet IP communication module kit—120V I/O (consists of C440-XCOM + C441R + C440-COM-ADP)	**C440-EIP-120**

Modbus Communication Module

The Modbus module combined with an expansion module and a communication adapter provide Modbus communication capability to the C440 electronic overload relay.

Modbus Communication Module

Features and Benefits

- The Modbus communication module is capable of baud rates up to 115K
- The Modbus address and baud rate configuration can be easily changed using the HMi user interface
- Modbus address and baud rate are set via convenient DIP switches; LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

DeviceNet Communication Modules

The DeviceNet Communication Module provides monitoring and control for the C440 overload relay from a single DeviceNet node. These modules also offer convenient I/O in two voltage options, 24 Vdc and 120 Vac.

DeviceNet Communication Module

Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
  - DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
  - Advanced configuration available using common DeviceNet tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF
- Combined status LED

PROFIBUS Communication Modules

The PROFIBUS module combined with an expansion module and a communication adapter provide Modbus communication capability to the C440 electronic overload relay.

PROFIBUS Communication Module

Features and Benefits

- The PROFIBUS communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches; LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
  - Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
  - Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
  - 4IN/2OUT
  - Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

Technical Data and Specifications

Electronic Overload Relays up to 1500A

Description	Specification 45 mm	55 mm
Electrical Ratings	**Range**	**Range**
Operating voltage (three-phase) and frequency	690 Vac (60/50 Hz)	690 Vac (60/50 Hz)
FLA Range		
	0.33–1.65A 1–5A 4–20A 9–45A	 20–100A
Use with Contactors		
XT IEC frames	B, C, D	F, G
Freedom NEMA sizes	00, 0, 1, 2	3
Trip Class		
	10A, 10, 20, 30 Selectable	10A, 10, 20, 30 Selectable
Motor Protection		
Thermal overload setting	1.05 x FLA: does not trip 1.15 x FLA: overload trip	1.05 x FLA: does not trip 1.15 x FLA: overload trip
Feature	**Range**	**Range**
Phase loss	Fixed threshold 50%	Fixed threshold 50%
Phase unbalance (selectable: enable/disable)	Fixed threshold 50%	Fixed threshold 50%
Ground fault (selectable: enable/disable)	50% of FLA dial setting >150% = 2 sec >250% = 1 sec	50% of FLA dial setting >150% = 2 sec >250% = 1 sec
Reset	Manual/automatic	Manual/automatic
Indicators		
Trip status	Orange flag	Orange flag
Mode LED	One flash: Overload operating properly Two flashes: Current is above FLA dial setting—pending trip	One flash: Overload operating properly Two flashes: Current is above FLA dial setting—pending trip
Options		
Remote reset	Yes	Yes
Reset bar	Yes	Yes
Communication expansion module	Yes	Yes
Communication adapter	Yes	Yes
Capacity		
Load terminals		
Terminal capacity	12–10 AWG (4–6 mm^2) 8–6 AWG (6–16 mm^2)	6–1 AWG (16–50 mm^2)
Tightening torque	20–25 lb-in (2.3–2.8 Nm) 25–30 lb-in (2.8–3.4 Nm)	25–30 lb-in (2.8–3.4 Nm)
Input, auxiliary contact and remote reset terminals		
Terminal capacity	2 x (18–12) AWG	2 x (18–12) AWG
Tightening torque	5.3 lb-in (0.8–1.2 Nm)	5.3 lb-in (0.8–1.2 Nm)
Voltages		
Insulation voltage U_i (three-phase)	690 Vac	690 Vac
Insulation voltage U_i (control)	500 Vac	500 Vac
Rated impulse withstand voltage	6000 Vac	6000 Vac
Overvoltage category/pollution degree	III/3	III/3

Electronic Overload Relays up to 1500A, continued

Description	Specification 45 mm	55 mm
Auxiliary and Control Circuit Ratings		
Conventional thermal continuous current	5A	5A
Rated operational current—IEC AC-15		
Make contact (1800 VA)		
120V	15A	15A
240V	15A	15A
415V	0.5A	0.5A
500V	0.5A	0.5A
Break contact (180 VA)		
120V	1.5A	1.5A
240V	1.5A	1.5A
415V	0.9A	0.9A
500V	0.8A	0.8A
IEC DC-13 (L/R F 15 ms1)		
0–250V	1.0A	1.0A
Rated operational current—UL B600		
Make contact (3600 VA)		
120V	30A	30A
240V	15A	15A
480V	7.5A	7.5A
600V	6A	6A
Break contact (360 VA)		
120V	3A	3A
240V	1.5A	1.5A
480V	0.75A	0.75A
600V	0.6A	0.6A
R300—Vdc ratings (28 VA)		
0–120V	0.22A	0.22A
250V	0.11A	0.11A
Short-Circuit Rating without Welding		
Maximum fuse	6A gG/gL	6A gG/gL
Environmental Ratings		
Ambient temperature (operating)	–13°F to 149°F (–25°C to 65°C)	–13°F to 149°F (–25°C to 65°C)
Ambient temperature (storage)	–40°F to 185°F (–40°C to 85°C)	–40°F to 185°F (–40°C to 85°C)
Operating humidity UL 991 (H3)	5% to 95% non-condensing	5% to 95% non-condensing
Altitude (no derating) NEMA ICS1	2000m	2000m
Shock (IEC 600068-2-27)	15g any direction	15g any direction
Vibration (IEC 60068-2-6)	3g any direction	3g any direction
Pollution degree per IEC 60947-4-1	3 for product (2 for pcb)	3 for product (2 for pcb)
Ingress protection	IP20	IP20
Protection against direct contact when actuated from front (IEC 536)	Finger- and back-of-hand proof	Finger- and back-of-hand proof
Mounting position	Any	Any
Climatic proofing	Damp heat, constant to IEC 60068-2-30	Damp heat, constant to IEC 60068-2-30

Electronic Overload Relays up to 1500A, continued

Description	Specification 45 mm	55 mm
Electrical/EMC		
Radiated emissions IEC 60947-4-1-Table 15 EN 55011 (CISPIR 11) Group 1, Class A, ISM	30 mHz to 1000 mHz	30 mHz to 1000 mHz
Conducted emissions IEC 60947-4-1-Table 14 EN 55011 (CISPIR 11) Group 1; Class ISM	0.15 mHz to 30 mHz	0.15 mHz to 30 mHz
ESD immunity IEC 60947-4-1 (Table 13)	±8 kV air, ±6 kV contact	±8 kV air, ±6 kV contact
Radiated immunity IEC 60947-4-1 IEC 61000-4-3	10 V/m 80 mHz–1000 mHz 3 V/m from 1.4 to 2.7 gHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80 mHz–1000 mHz 3 V/m from 1.4 to 2.7 gHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1, IEC 61000-4-6	140 dub (10V rms) 150 kHz–100 mHz	140 dub (10V rms) 150 kHz–100 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±4 kV using direct method with accessory installed in expansion bay ±2 kV using direct method	±4 kV using direct method with accessory installed in expansion bay ±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 a Class 4	Three-phase power inputs: ±4 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±4 kV line-to-line (DM) ±4 kV line-to-ground (CM)
	With accessory installed in expansion bay: ±2 kV line-to-line (DM) –>1.2/50 us; 2 kV line-to-earth, 1 kV line-to-line ±4 kV line-to-ground (CM)	With accessory installed in expansion bay: ±2 kV line-to-line (DM) –>1.2/50 us; 2 kV line-to-earth, 1 kV line-to-line ±4 kV line-to-ground (CM)
Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8	30 A/m, 50 Hz	30 A/m, 50 Hz
Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3	10 V/m	10 V/m
Distortion IEEE 519	5% THD max., 5th harmonic 3% max.	5% THD max., 5th harmonic 3% max.
Electrostatic discharge (ESD) IEC 61000-4-2, EN 61131-2	4 kV contact 8 kV air discharge	4 kV contact 8 kV air discharge
Electrical fast transient (EFT) IEC 61000-4-4, EN 61131-2	±2 kV using direct method	±2 kV using direct method
Surge immunity IEC 61000-4-5, EN 61131-2	±2 kV line-to-ground (CM)	±2 kV line-to-ground (CM)

Communication Modules

Description	Modbus	DeviceNet	PROFIBUS
Electrical/EMC			
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 mHz	30–1000 mHz	30–1000 mHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 mHz	0.15–30 mHz	0.15–30 mHz
ESD immunity IEC 60947-4-1 (Table 13)	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave	10 V/m 80–1000 mHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz	140 dBuV (10V rms) 150 kHz–80 mHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 6100-4-4	±2 kV using direct method	±2 kV supply and control, ±1 kV communication	±2 kV supply and control, ±1 kV communication
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 3	User IO and communication lines ①: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	User IO and communication lines: ±0.5 kV line-to-line (DM) ±1 kV line-to-ground (CM)	User IO and communication lines: ±0.5 kV line-to-line (DM) ±1 kV line-to-ground (CM)
Electromagnetic field ① IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m	10 V/m	10 V/m
Environmental Ratings			
Ambient temperature (operating)	–4°F to 122°F (–20°C to 50°C)	–13°F to 122°F (–25°C to 50°C)	–13°F to 122°F (–25°C to 50°C)
Ambient temperature (storage)	–40°F to 185°F (–40°C to 85°C)	–40°F to 185°F (–40°C to 85°C)	–40°F to 185°F (–40°C to 85°C)
Operating humidity	5–95% noncondensing	5–95% noncondensing	5–95% noncondensing
Altitude (no derating)	2000m	2000m	2000m
Shock (IEC 600068-2-27)	15G any direction	15G any direction	15G any direction
Vibration (IEC 60068-2-6)	3G any direction	3G any direction	3G any direction
Pollution degree per IEC 60947-1	3	3	3
Degree of protection	IP20	IP20	IP20
Overvoltage category per UL 508	III	III	III
DeviceNet			
DeviceNet connections	—	Group 2, polling, bit strobe, explicit, no UCMM	—
DeviceNet baud rate	—	125K, 250K, 500K	—
PROFIBUS			
PROFIBUS connections	—	—	Group 2, polling, bit strobe, explicit, no UCMM
PROFIBUS baud rate	—	—	9.6K, 19.2K, 45.45K, 93.75K, 187.5K, 500K, 1.5M, 3M, 6M, 12M
C441_ 24 Vdc Input			
Nominal input voltage	24 Vdc	24 Vdc	24 Vdc
Operating voltage	18–30 Vdc	18–30 Vdc	18–30 Vdc
Number of inputs	4	4	4
Signal delay	5 ms (programmable to 65 sec)	5 ms (programmable to 65 sec)	5 ms (programmable to 65 sec)
OFF-state voltage	<6 Vdc	<6 Vdc	<6 Vdc
ON-state voltage	>18 Vdc	>18 Vdc	>10 Vdc
Nominal input current	5 mA	5 mA	5 mA
Isolation	1500V	1500V	1500V
Terminal screw torque	7–9 in-lb	7–9 in-lb	7–9 in-lb
24V source current	50 mA	50 mA	50 mA

Note

① Relates to C441M only.

Communication Modules, continued

Description	Modbus	DeviceNet	PROFIBUS
Operating Voltage Range—DC Input Modules			
OFF state	0–6 Vdc	0–6 Vdc	0–6 Vdc
Transition region	6–18 Vdc	6–18 Vdc	6–18 Vdc
ON state	18–30 Vdc	18–30 Vdc	18–30 Vdc
C441_ 120 Vac Input			
Nominal input voltage	120 Vac	120 Vac	120 Vac
Operating voltage	80–140 Vac	80–140 Vac	80–140 Vac
Number of inputs	4	4	4
OFF-state voltage	<30 Vac	<30 Vac	<20 Vac
ON-state voltage	>80 Vac	>80 Vac	>70 Vac
Nominal input current	15 mA	15 mA	15 mA
Signal delay	1/2 cycle	1/2 cycle	1/2 cycle
Isolation	1500V	1500V	1500V
Terminal screw torque	7–9 in-lb	7–9 in-lb	7–9 in-lb
Operating Voltage Range—AC Input Modules			
OFF state	0–30 Vac	0–30 Vac	0–30 Vac
Transition region	30–80 Vac	30–80 Vac	30–80 Vac
ON state	80–140 Vac	80–140 Vac	80–140 Vac
Output Modules			
Nominal voltage	120 Vac 24 Vdc	120 Vac 24 Vdc	120 Vac 24 Vdc
Number of outputs	(2) 1NO Form A 1NO/NC Form C	(2) 1NO Form A 1NO/NC Form C	(2) 1NO Form A 1NO/NC Form C
Relay OFF time	3 ms	3 ms	3 ms
Relay ON time	7 ms	7 ms	7 ms
Max. current per point ①	5A (B300 rated)	5A (B300 rated)	5A (B300 rated)
Electrical life	100,000 cycles	100,000 cycles	100,000 cycles
Mechanical life	1,000,000 cycles	1,000,000 cycles	1,000,000 cycles

Note

① Resistive current at 55°C ambient.

Short Circuit Ratings (North America CSA, cUL)

Changes to UL 508A and NEC in recent years have brought a focus to control panel safety with regard to short-circuit current ratings (SCCR). Eaton's C440 electronic overload relays combined with ***XT*** series IEC and Freedom Series NEMA contactors provide a wide variety of SCCR solutions needed for a variety of applications. The SCCR data in this document reflects the latest information as of April 2010.

C440/*XT* Standalone Overload Relays (*XT*, C440)

		Standard-Fault Short Circuit Data			High-Fault Short Circuit Data					
					Fuses (RK5, J, CC)			Thermal-Magnetic Circuit Breakers		
Overload FLA Range	Maximum Operating Voltage	600V (kA)	Maximum Fuse Size (A) (RK5)	Maximum Breaker Size (A)	480V (kA)	600V (kA)	Maximum Fuse Size	480V (kA)	600V (kA)	Maximum Breaker Size
0.33–1.65A	600 Vac	1	6	15	—	—	—	—	—	—
1–5A	600 Vac	5	20	20	100	100	30	100	35	20
4–20A	600 Vac	5	80	80	100	100	100	100	35	80
9–45A	600 Vac	5	175	175	100	100	100	100	35	100/175 (480/600)
20–100A	600 Vac	10	400	400	100	100	200	150	35	250/400 (480/600)

NEMA Freedom Series Starters with C440 Electronic Overload Relays

		High-Fault Short Circuit Data			Thermal-Magnetic Circuit Breakers		
		Fuses (RK5, J, CC)					
NEMA Size	Maximum Operating Voltage	480V	600V	Maximum Fuse Size	480V	600V	Maximum Breaker Size
00	0.33–1.65A	100	100	30	—	—	—
	1–5A	100	100	30	100	35	35
	4–20A	100	100	30	100	35	35
0	0.33–1.65A	100	100	60	—	—	—
	1–5A	100	100	60	100	35	70
	4–20A	100	100	60	100	35	70
1	0.33–1.65A	100	100	100	—	—	—
	1–5A	100	100	100	100	35	100
	4–20A	100	100	100	100	35	100
	9–45A	100	100	100	100	35	100
2	1–5A	100	100	100	100	35	175
	4–20A	100	100	100	100	35	175
	9–45A	100	100	100	100	35	175
3	20–100A	100	100	200	50	50	250

IEC *XT* Starters with *XT* Electronic Overload Relays

		High-Fault Short Circuit Data			Thermal-Magnetic Circuit Breakers		
		Fuses (RK5, J, CC)					
Contactor Frame Size	Maximum Operating Voltage	480V	600V	Maximum Fuse Size	480V	600V	Maximum Breaker Size
B	1–5A	100	100	30	—	—	—
	4–20A	100	100	30	—	—	—
C	1–5A	100	100	60	—	—	—
	4–20A	100	100	60	—	—	—
	9–45A	100	100	60	—	—	—
D	9–45A	100	100	200	65	35	175
	20–100A	100	100	200	65	35	175
F	20–100A	100	100	200	65	65	350
G	20–100A	100	100	200	65	65	350

Dimensions

Approximate Dimensions in Inches (mm)

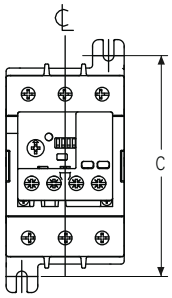
45 mm C440/*XT* Electronic Overload Relays

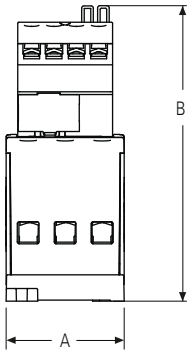
Dimensions

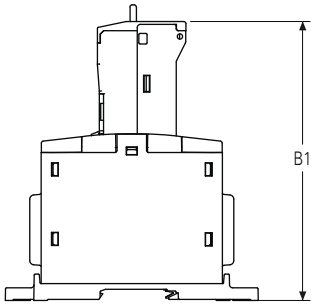
	Width A	Height B	B1	B2	B3	Depth C
NEMA Starter Size						
00–2	1.80 (45.7)	4.60 (116.8)	4.30 (109.2)	3.80 (96.5)	1.00 (25.4)	Need to Get From CAD File
***XT* IEC Frame Size**						
B, C, D	1.80 (45.7)	4.30 (109.2)	4.00 (101.6)	3.50 (88.9)	0.70 (17.8)	Need to Get From CAD File
Standalone						
0.35–45A	1.80 (45.7)	4.60 (116.8)	4.30 (109.2)	3.80 (96.5)	1.00 (25.4)	Need to Get From CAD File

Approximate Dimensions in Inches (mm)

55 mm C440/*XT* Electronic Overload Relays







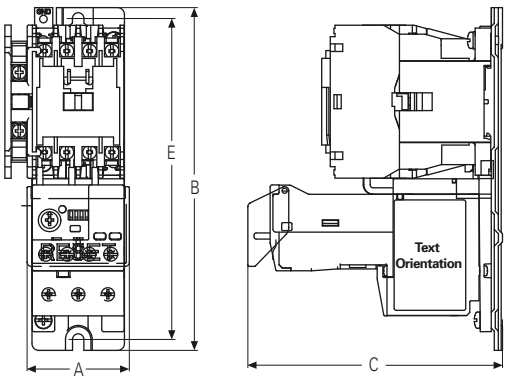
Dimensions

	Width A	Height To Reset B	B1	Mounting Depth C
NEMA Starter Size				
3	2.21 (56.0)	5.52 (140.2)	5.21 (132.4)	4.13 (104.8)
***XT* IEC Frame Size**				
D, F, G	2.21 (56.0)	5.52 (140.2)	5.21 (132.4)	4.13 (104.8)
Standalone				
20–100A	2.21 (56.0)	5.52 (140.2)	5.21 (132.4)	4.13 (104.8)

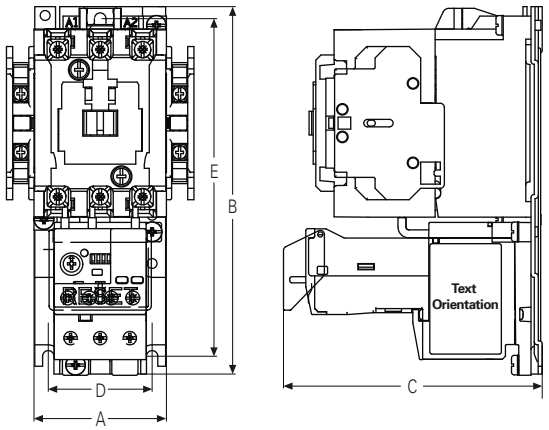
Approximate Dimensions in Inches (mm)

NEMA Starters

Full Voltage Non-Reversing Starters



Sizes 00, 0



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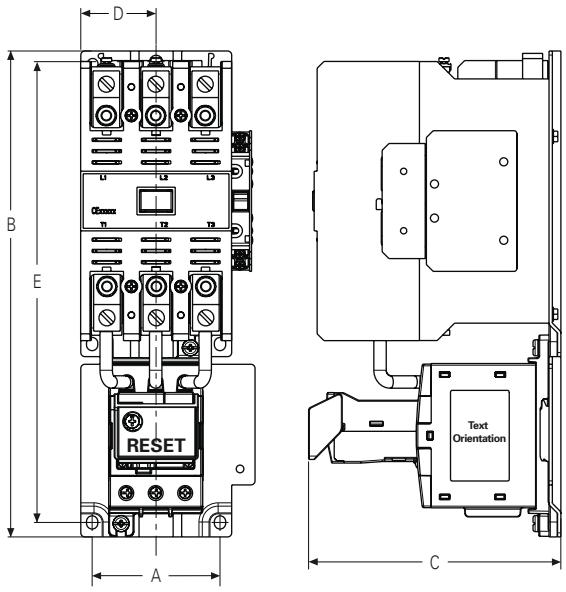
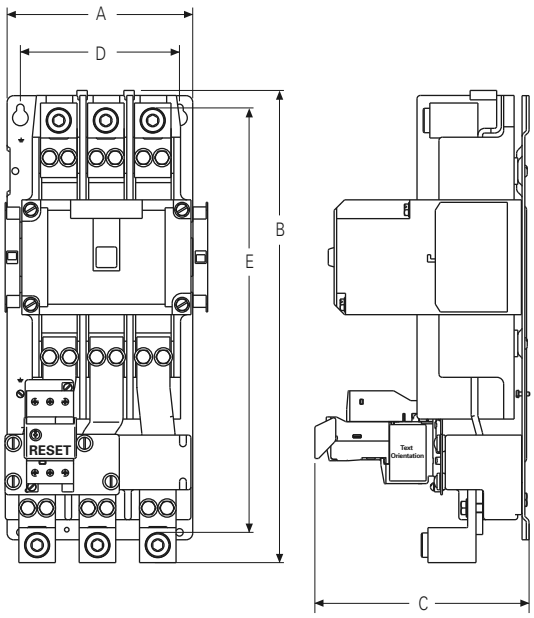


Size 3



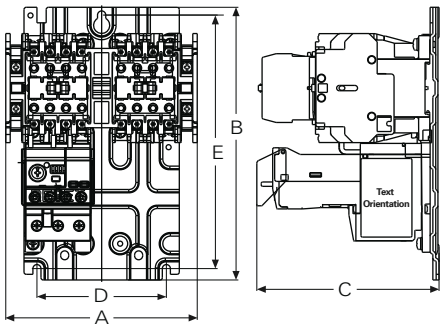
Size 5

Dimensions

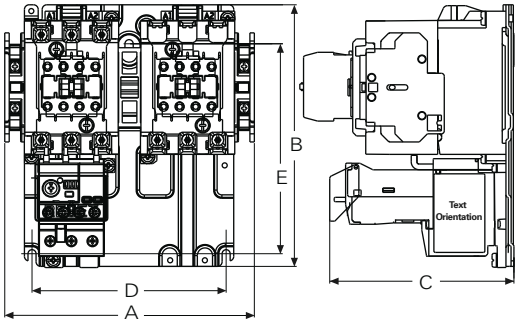
NEMA Size	A	B	C	D	E
00, 0	1.97 (50.0)	6.60 (167.6)	4.90 (124.5)	2.30 (58.5)	6.18 (157.0)
1, 2	2.60 (65.0)	7.10 (180.0)	4.98 (126.5)	2.00 (50.8)	6.50 (165.0)
3	4.09 (103.8)	11.40 (289.6)	5.92 (150.3)	1.77 (44.9)	10.81 (274.6)
5	7.00 (177.8)	17.81 (452.3)	8.08 (205.2)	6.00 (152.4)	16.01 (406.6)

Approximate Dimensions in Inches (mm)

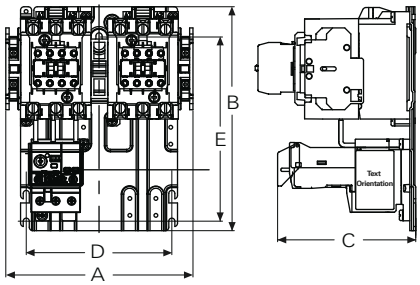
Full Voltage Reversing Starters



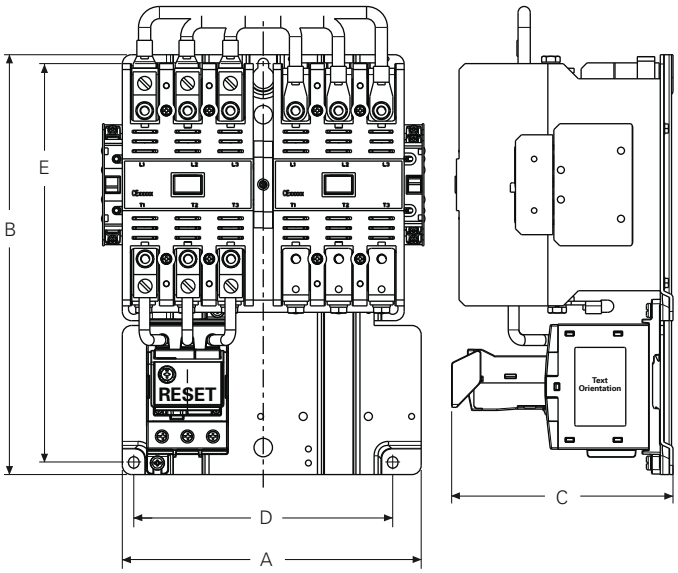
Sizes 00, 0



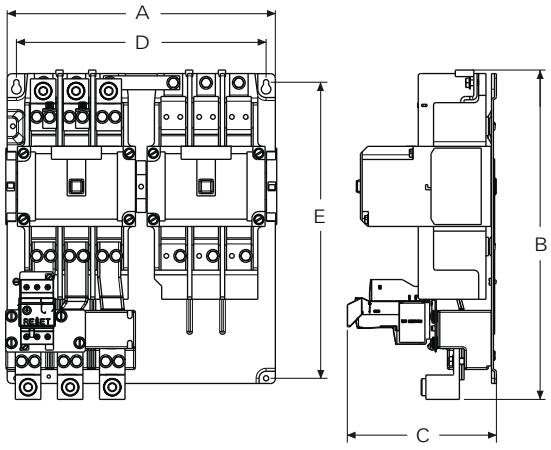
Size 1



Size 2



Size 3



Size 5

Dimensions

NEMA Size	A	B	C	D	E
00, 0	5.20 (132.0)	7.40 (187.0)	4.90 (125.0)	3.50 (89.0)	6.90 (174.0)
1	6.70 (171.0)	7.10 (180.0)	4.98 (126.5)	5.20 (133.0)	5.70 (144.0)
2	6.70 (171.0)	8.10 (205.0)	4.98 (126.5)	5.30 (133.0)	6.70 (170.0)
3	8.08 (205.2)	11.35 (288.3)	6.00 (152.0)	7.00 (177.8)	10.77 (273.6)
5	14.50 (368.3)	17.81 (452.3)	8.06 (204.8)	13.50 (342.9)	16.00 (406.6)