

NEMA Size 1—BN15DN0AB



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Starters—Single-Phase Non-Reversing, Full Voltage, Bi-Metallic Overload

Product Description

Single-phase, full voltage magnetic starters connect the motor directly across the line, allowing it to draw full inrush current during start-up. These starters are most commonly used for control of self-starting single-phase motors up to 15 hp at 230V. They consist of a two-pole electromagnetic contactor to make and break the motor power circuit and an overload relay to provide running overload protection. Starters listed in the table include:

- Two-pole Freedom Series contactor with long life twin break, silver cadmium oxide contacts. Generously sized for low resistance and cool operation. Designed to 3 million electrical operations at maximum hp and 30 million mechanical operations to Size 0, 10 million operations to Size 2 and 6 million operations to Size 3
- Three-pole Freedom Series overload with poles two and three wired in series for motor overload protection. This overload is ambient compensated, selectable manual or automatic reset, interchangeable Class 10 or 20 heater packs, 1.0 or 1.15 service factor selectability, overload trip indication and electrically isolated NO-NC contacts (pull RESET button to test)
- Holding circuit NO auxiliary contact supplied as standard. On Size 00, the contact occupies the 4th power pole position. Sizes 0–3 have the NO auxiliary mounted on the right side of the contactor
- Steel mounting plate as standard on all open type starters. Wired for separate or common control

2.1

NEMA Contactors and Starters

Freedom Series

C440 Electronic Overload Relays

2

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
4	CN15NN3_	28–140	C440C1A140SF4	C440C2A140SF4

1–5 A OL with CTs



C440 Electronic Overload Relays for use with NEMA Contactors Sizes 5–8

Use CTs and 1–5 A 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 ^②	Terminal Size	Overload Relay Catalog Number
5	60–300	300: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT300	750 kcmil (2) 250 kcmil 3/0 Cu/Al	C440A1A005SAX
6	120–600	600: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT600	(2) 750 kcmil 3/0 Cu/Al	C440A1A005SAX
7	200–1000	1000: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1000	(3) 750 kcmil 3/0 Cu/Al	C440A1A005SAX
8	300–1500	1500: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1500	(4) 750 kcmil 1/0 Cu/Al	C440A1A005SAX

Notes

^① CN15 contactor listed is non-reversing with a 120 Vac coil. For more options, see Tab 2 in this volume, section 2.1.

^② ZEB kits are not recommended for use with C440 overload relays with ground fault option.

C440/XT Electronic Overload Relay



C440/XT Electronic Overload Relay

Product Description

Eaton's C440/XT electronic overload relay is the most compact, high-featured, economical product in its class. Designed on a global platform, it 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.

C440 is a self-powered electronic overload relay available up to 175 A 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 for Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, EtherNet/IP and HTTP web services all with I/O options.

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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 (0.33–1500 A)
- 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 imbalance
- Selectable (ON/OFF) ground fault

User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase imbalance 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
 - Ethernet IP with I/O
 - Modbus TCP with I/O

Benefits**Reliability and Improved Uptime**

- C440 provides the users with 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 plant assets with selectable motor protection features such as trip class, phase imbalance 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 valuable assets are protected by indicating the overload operational status

Flexibility

- Available with NEMA, IEC and DP contactors
- Improves return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- 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 imbalance, 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

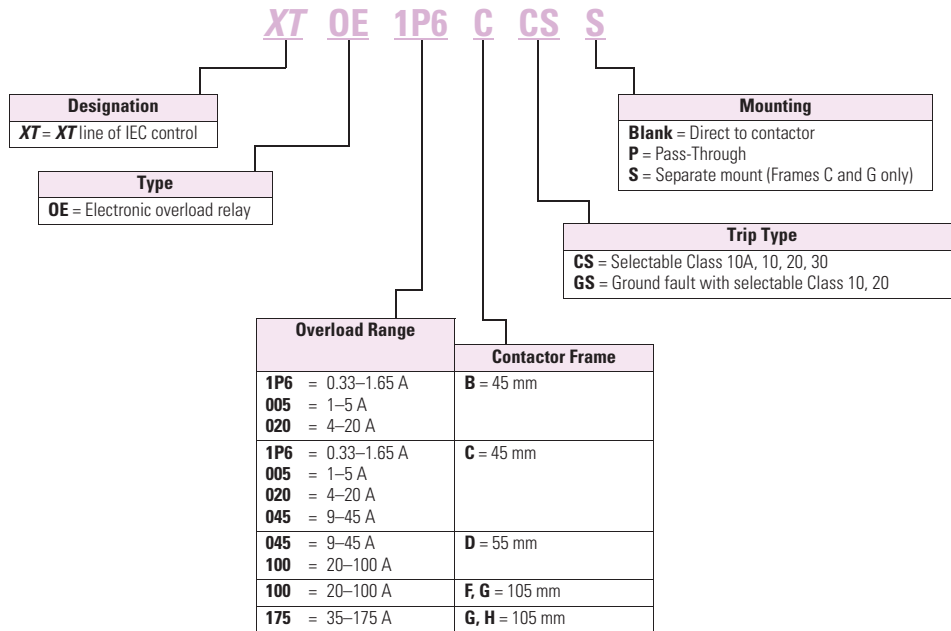
- UL
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO® 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2

**Electronic Overload Education**

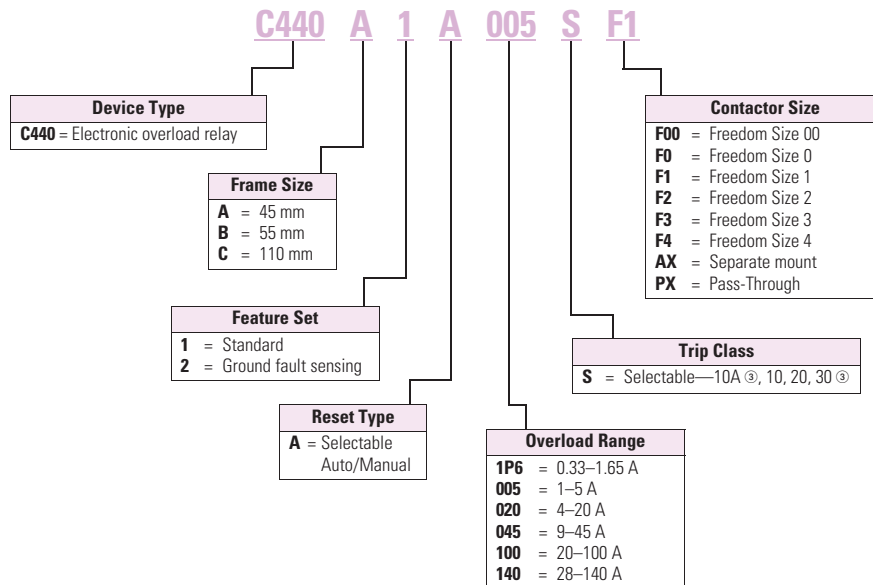
Description	Definition	Cause	Effect if not Protected	C440/XT Protection
Motor Protection				
Thermal overload	Overload is a condition in which current draw exceeds 115% of the full load amperage rating for an inductive motor.	• An increase in the load or torque that is being driven by the motor. • A 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, that is, if the FLA dial is set to 12A, the overload relay will trip if the ground current exceeds 6A.
Imbalanced 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 imbalanced.	Imbalanced voltage causes large imbalanced 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, and so on.	Single-phasing can lead to unwanted motor vibrations in addition to the results of imbalanced 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

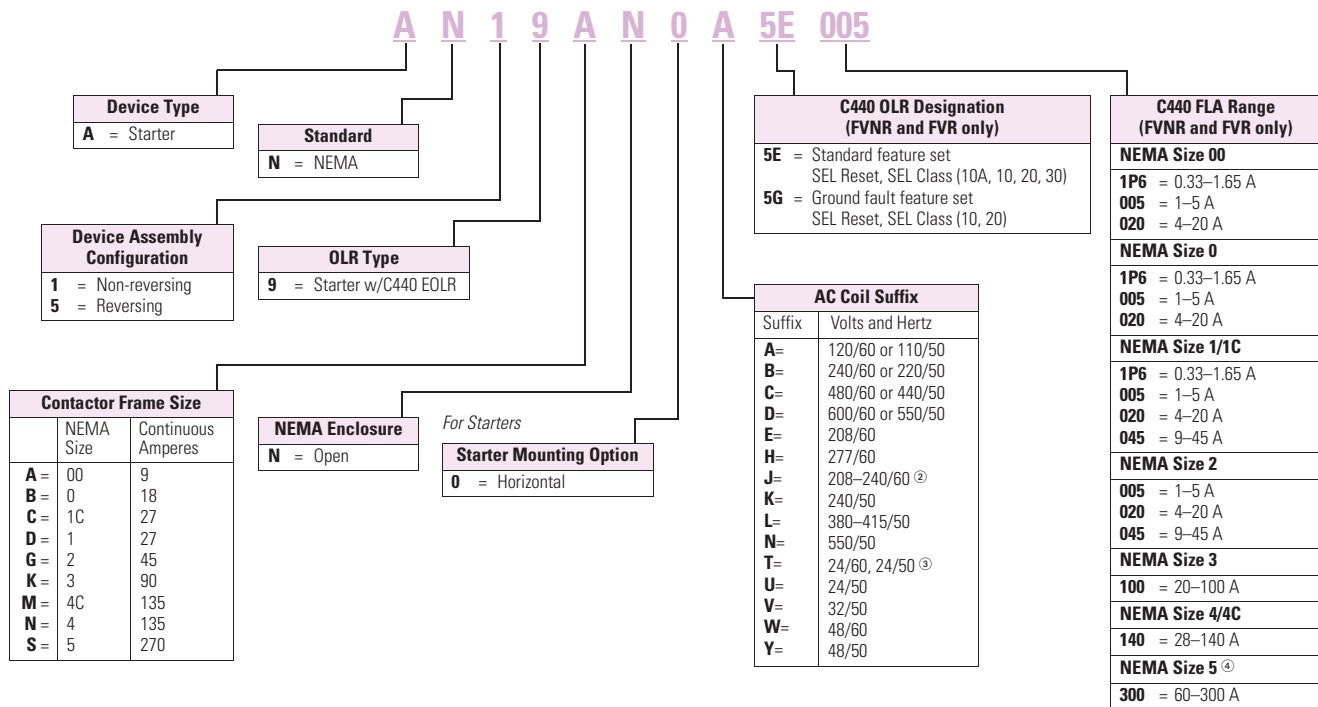


C440 Electronic Overload Relay—NEMA ②



Notes

- ① See **Page V5-T5-51** for Product Selection.
 ② See **Page V5-T5-53** for Product Selection.
 ③ On non-GF version only.

Freedom Series NEMA Starters with C440 Electronic Overload Relays ^①**Notes**

- ^① See **Page V5-T5-54** 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 Size 5 starter available with 60–300 A panel mounted CTs. Starter shipped as an assembled unit with 1–5 A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

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	XTCE080F..., XTCE095F..., XTCE115G..., XTCE150G..., XTCE170G...	20–100		55 mm	NO-NC	ZEB150-100	XTOE100GCS
G	XTCE115G..., XTCE150G..., XTCE170G...	20–100		55 mm	NO-NC	ZEB150-100	XTOE100GCS
		35–175		110 mm		ZEB150-175	XTOE175GCS
H	XTCE185H...	35–175		110 mm	NO-NC	ZEB225-175	XTOE175HCS

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	XTCE080F..., XTCE095F..., XTCE115G..., XTCE150G..., XTCE170G...	20–100		55 mm	NO-NC	ZEB150-100-GF	XTOE100GGS
G	XTCE115G..., XTCE150G..., XTCE170G...	20–100		55 mm	NO-NC	ZEB150-100-GF	XTOE100GGS
		35–175		110 mm		ZEB150-175-GF	XTOE175GGS
H	XTCE185H...	35–175		110 mm	NO-NC	ZEB225-175-GF	XTOE175HGS

1–6 A OL with CTs

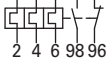
**XT Electronic Overload Relays for use with Large Frame XT Contactors (L–R)** ^①

Use CTs and 1–5 A **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
L, M	185–500 A	60-300	300: 5 panel-mount CT kit with integrated lugs	ZEB-XCT300	750 kcmil (2) 250 kcmil 3/0 Cu/Al	XTOE005CCSS
M, N	300–820 A	120-600	600: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT600	(2) 750 kcmil 3/0 Cu/Al	XTOE005CCSS
N	580–1000 A	200-1000	1000: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1000	(3) 750 kcmil 3/0 Cu/Al	XTOE005CCSS
R	1600 A	300-1500	1500: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1500	(4) 750 kcmil 1/0 Cu/Al	XTOE005CCSS

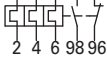
45 mm XT for Separate Mount

**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
0.33–1.65	45 mm	1 3 5 97 95	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
35–175	110 mm		ZEB150-175/KK	XTOE175GCSS	XTOE175GGSS

XT Electronic Overload Relay for Pass-Through Design

Pass-through design does not include any lugs to land wires. Terminate motor leads directly on contactor.

Overload Range (Amps)	Frame Size	Contact Sequence	Type	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
35–175	110 mm	1 3 5 97 95 	ZEB150-175/PT	XTOE175GCSP	XTOE175GGSP

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
4	CN15NN3_	28–140	C440C1A140SF4	C440C2A140SF4

1–5 A OL with CTs**C440 Electronic Overload Relays for use with NEMA Contactors Sizes 5–8**

Use CTs and 1–5 A 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 ②	Terminal Size	Overload Relay Catalog Number
5	60–300	300: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT300	750 kcmil (2) 250 kcmil 3/0 Cu/Al	C440A1A005SAX
6	120–600	600: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT600	(2) 750 kcmil 3/0 Cu/Al	C440A1A005SAX
7	200–1000	1000: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1000	(3) 750 kcmil 3/0 Cu/Al	C440A1A005SAX
8	300–1500	1500: 5 panel-mount CT kit with integrated, pass through holes	ZEB-XCT1500	(4) 750 kcmil 1/0 Cu/Al	C440A1A005SAX

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
28–140	110 mm	C440C1A140SAX	C440C2A140SAX

C440 Electronic Overload Relays for Pass-Through Design

Overload Range	Frame Size	Overload Relay Catalog Number	Overload Relay with Ground Fault Catalog Number
28–140	110 mm	C440C1A140SPX	C440C2A140SPX
35–175		XT0E175GCSP	XT0E175GGSP

Notes

① CN15 contactor listed is non-reversing with a 120 Vac coil. For more options, see Tab 2 in this volume, section 2.1.

② ZEB kits are not recommended for use with C440 overload relays with ground fault option.

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						Three-Pole Non-Reversing ^{①②}	Three-Pole Reversing ^{①②}
			Single-Phase		Three-Phase		480 V	600 V		
			115 V	230 V	208 V	240 V			Catalog Number	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	135	156	—	—	40	50	100	100	AN19NN0_5E _	AN59NN0_5E _
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						Three-Pole Non-Reversing ^{①②}	Three-Pole Reversing ^{①②}
			Single-Phase		Three-Phase		480 V	600 V		
			115 V	230 V	208 V	240 V			Catalog Number	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	135	156	—	—	40	50	100	100	AN19NN0_5G _	AN59NN0_5G _
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	0.33–1.65 A	020	4.0–20 A
	005	1.0–5.0 A	—	—
0	1P6	0.33–1.65 A	020	4.0–20 A
	005	1.0–5.0 A	—	—
1	1P6	0.33–1.65 A	020	4.0–20 A
	005	1.0–5.0 A	045	9.0–45 A
2	005	1.0–5.0 A	045	9.0–45 A
	020	4.0–20 A	—	—
3	100	20–100 A	—	—
4	140	28–140 A	—	—
5 ^③	300	60–300 A	—	—

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 NEMA Size 5 starter available with 60–300 A panel mounted CTs. Starter shipped as an assembled unit with 1–5 A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

Compact NEMA Size 1 and 4 Starters

New Compact NEMA Size 1 and 4 starters—available with electronic overload relay **only**.

Non-Reversing

NEMA Size	Continuous Ampere Rating	Service Limit Current Rating (Amps)	Maximum UL Horsepower						Three-Pole Non-Reversing Catalog Number
			Single-Phase		Three-Phase		480 V	600 V	
			115 V	230 V	208 V	240 V			
Standard Fault Overload									
1C	27	32	2	3	7.5	7.5	10	10	AN19CN0_5E_
4C	135	156	—	—	40	50	100	100	AN19MN0_5E_
Ground Fault Overload									
1C	27	32	2	3	7.5	7.5	10	10	AN19CN0_5G_
4C	135	156	—	—	40	50	100	100	AN19MN0_5G_

Electrical Life at Rated Continuous Current

NEMA Size	Rated Current (Amperage)	Operations
	AC3/AC4	
1C	27/150	2,500,000/40,000
1	27/153	5,000,000/110,000
4C	135/516	500,000/40,000
4	135/822	800,000/70,000

Accessories

CT Kits

Accessories

	Description	Catalog Number
Safety Cover	Safety Cover	
	Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed.	ZEB-XSC
Reset Bar	Reset Bar	
	Assembles to the top of the overload to provide a larger target area for door mounted reset operators.	ZEB-XRB
Remote Reset	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

Communication

The C440/XTOE 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 (C440-XCOM). The expansion module plugs into the expansion bay on the C440 overload relay, enabling communications with the overload via their Modbus RTU (RS-485) network. No additional cards or modules 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 Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, and EtherNet/IP while providing control capability using I/O.

An expansion module (C440-XCOM) combined with a communication module allows easy integration onto the customer's network. See figure below.



Advanced Communication—Communication Module

C440 communication modules, wired to the C440-XCOM give C440 control capability via communications. The communication modules offer flexible mounting options (DIN rail or panel) along with four inputs (24 Vdc or 120 Vac) and two outputs as standard.

Note

① Customer can wire remote mounted button to reset module (that is, 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)

Features and Benefits

Ethernet modules

- Single device supports both EtherNet/IP, Modbus TCP
- Internal switch with two Ethernet ports allows linear or ring network configurations
- Embedded web-services for easy configuration and monitoring with Internet Explorer

DeviceNet

- I/O assemblies with the same size and layout as the legacy Advantage (WPONIDNA) and **IT** (DSNAP) Starter platforms for seamless upgrades to C441 technology with no program changes
- Communication uses only one DeviceNet MAC ID

PROFIBUS

- Capable of baud rates up to 12 Mb
- Intuitive configuration with common PROFIBUS tools

Modbus

- Modbus address and baud rate can be changed easily with C441's user interface (C441M only)

Terminals

- Unique locking mechanism provides easy removal of terminal block with field wiring installed
- Marked terminals for ease of wiring and troubleshooting

On-board I/O assemblies

- Modules offer 4 IN / 2 OUT of network programmable I/O
- 24 Vdc or 120 Vac signal options
- Optical isolation protects the I/O and communication circuits from possible damage due to transients and ground loops
- Inputs feature user-definable debounce, which limits the effects of transients and electrical noise
- Outputs feature a user-definable state for loss of communication: hold last state, ON or OFF

Communication Accessories

Communication modules mount on their own to be used as stand-alone network based I/O or be wired to the C440-XCOM. Parts are available for purchase individually (see "consists of" below) or as part of a kit for C440 communications.

Description

Catalog Number

Expansion Module



Expansion Module

Expansion module (Remote Reset/Modbus RTU, RS-485 Communication)

C440-XCOM

Ethernet with I/O Module



Communication Modules

DeviceNet communication module kit—120 V I/O (consists of C440-XCOM + C441KS)	C440-DN-120
DeviceNet communication module kit—24 Vdc I/O (consists of C440-XCOM + C441LS)	C440-DN-24
PROFIBUS communication module kit—120 V I/O (consists of C440-XCOM + C441SS)	C440-DP-120
PROFIBUS communication module kit—24 V I/O (consists of C440-XCOM + C441QS)	C440-DP-24
Modbus communication module kit—120 V I/O (consists of C440-XCOM + C441NS)	C440-MOD-120
Modbus communication module kit—24 Vdc I/O (consists of C440-XCOM + C441PS)	C440-MOD-24
Modbus TCP/Ethernet IP communication module kit—120 V I/O (consists of C440-XCOM + C441U)	C440-ET-120
Modbus TCP/Ethernet IP communication module kit—24 V I/O (consists of C440-XCOM + C441V)	C440-ET-24

Technical Data and Specifications

Electronic Overload Relays up to 1500 A

Description	Specification 45 mm	55 mm	110 mm
Electrical Ratings	Range	Range	Range
Operating voltage (three-phase) and frequency	690 Vac (60/50 Hz)	690 Vac (60/50 Hz)	690 Vac (60/50 Hz)
FLA Range			
	0.33–1.65 A 1–5 A 4–20 A 9–45 A	20–100 A	28–140 A (NEMA) 35–175 A (IEC)
Use with Contactors			
X7 IEC frames	B, C, D	F, G	G, H
Freedom NEMA sizes	00, 0, 1, 2	3	4
Trip Class			
	10A, 10, 20, 30 Selectable	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	1.05 x FLA: does not trip 1.15 x FLA: overload trip
Feature	Range	Range	Range
Phase loss	Fixed threshold 50%	Fixed threshold 50%	Fixed threshold 50%
Phase unbalance (selectable: enable/disable)	Fixed threshold 50%	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	50% of FLA dial setting >150% = 2 sec >250% = 1 sec
Reset	Manual/automatic	Manual/automatic	Manual/automatic
Indicators			
Trip status	Orange flag	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	One flash: Overload operating properly Two flashes: Current is above FLA dial setting—pending trip
Options			
Remote reset	Yes	Yes	Yes
Reset bar	Yes	Yes	Yes
Communication expansion module	Yes	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)	8–4/0 AWG (10–95 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)	124 lb-in (14 Nm)
Input, auxiliary contact and remote reset terminals			
Terminal capacity	2 x (18–12) AWG	2 x (18–12) AWG	2 x (18–12) AWG
Tightening torque	7–11 lb-in (0.8–1.2 Nm)	7–11 lb-in (0.8–1.2 Nm)	7–11 lb-in (0.8–1.2 Nm)
Voltages			
Insulation voltage U_i (three-phase)	690 Vac	690 Vac	690 Vac
Insulation voltage U_i (control)	500 Vac	500 Vac	500 Vac
Rated impulse withstand voltage	6000 Vac	6000 Vac	6000 Vac
Overvoltage category/pollution degree	III/3	III/3	III/3

Electronic Overload Relays up to 1500 A, continued

Description	Specification		
	45 mm	55 mm	110 mm
Auxiliary and Control Circuit Ratings			
Conventional thermal continuous current	5 A	5 A	5 A
Rated operational current—IEC AC-15			
Make contact (1800 VA)			
120 V	15 A	15 A	15 A
240 V	15 A	15 A	15 A
415 V	0.5 A	0.5 A	0.5 A
500 V	0.5 A	0.5 A	0.5 A
Break contact (180 VA)			
120 V	1.5 A	1.5 A	1.5 A
240 V	1.5 A	1.5 A	1.5 A
415 V	0.9 A	0.9 A	0.9 A
500 V	0.8 A	0.8 A	0.8 A
IEC DC-13 (L/R F 15 ms1)			
0–250 V	1.0 A	1.0 A	1.0 A
Rated operational current—UL B600			
Make contact (3600 VA)			
120 V	30 A	30 A	30 A
240 V	15 A	15 A	15 A
480 V	7.5 A	7.5 A	7.5 A
600 V	6 A	6 A	6 A
Break contact (360 VA)			
120 V	3 A	3 A	3 A
240 V	1.5 A	1.5 A	1.5 A
480 V	0.75 A	0.75 A	0.75 A
600 V	0.6 A	0.6 A	0.6 A
R300—Vdc ratings (28 VA)			
0–120 V	0.22 A	0.22 A	0.22 A
250 V	0.11 A	0.11 A	0.11 A
Short-Circuit Rating without Welding			
Maximum fuse	6 A gG/gL	6 A gG/gL	6 A gG/gL
Environmental Ratings			
Ambient temperature (operating)	–13 to 149 °F (–25 to 65 °C)	–13 to 149 °F (–25 to 65 °C)	–13 to 149 °F (–25 to 65 °C)
Ambient temperature (storage)	–40 to 185 °F (–40 to 85 °C)	–40 to 185 °F (–40 to 85 °C)	–40 to 185 °F (–40 to 85 °C)
Operating humidity UL 991 (H3)	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing
Altitude (no derating) NEMA ICS1	2000 m	2000 m	2000 m
Shock (IEC 60068-2-27)	15 g any direction	15 g any direction	15 g any direction
Vibration (IEC 60068-2-6)	3 g any direction	3 g any direction	3 g any direction
Pollution degree per IEC 60947-4-1	3 for product (2 for pcb)	3 for product (2 for pcb)	3 for product (2 for pcb)
Ingress protection	IP20	IP20	IP20
Protection against direct contact when actuated from front (IEC 536)	Finger- and back-of-hand proof	Finger- and back-of-hand proof	Finger- and back-of-hand proof
Mounting position	Any	Any	Any
Climatic proofing	Damp heat, constant to IEC 60068-2-30	Damp heat, constant to IEC 60068-2-30	Damp heat, constant to IEC 60068-2-30

Electronic Overload Relays up to 1500 A, continued

Description	Specification		
	45 mm	55 mm	110 mm
Electrical/EMC			
Radiated emissions IEC 60947-4-1-Table 15 EN 55011 (CISPR 11) Group 1, Class A, ISM	30 MHz to 1000 MHz	30 MHz to 1000 MHz	30 MHz to 1000 MHz
Conducted emissions IEC 60947-4-1-Table 14 EN 55011 (CISPR 11) Group 1; Class ISM	0.15 MHz to 30 MHz	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	±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	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 (10 V rms) 150 kHz–100 MHz	140 dub (10 V rms) 150 kHz–100 MHz	140 dub (10 V 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	±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) 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)	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)	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)
Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8	30 A/m, 50 Hz	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	10 V/m
Distortion IEEE 519	5% THD max., 5th harmonic 3% max.	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	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	±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)	±2 kV line-to-ground (CM)