Motor Insight Overload and Monitoring Relay

Contents

C441 Overload Relays

Product Description

Eaton's Motor Insight overload relay offers configurable motor, load and line protection. The addition of power monitoring and protection detects under-loaded conditions like a dead-headed pump. With a simple user interface for setup and monitoring and just two part numbers covering 1–90 A applications, C441 is ideal for stand-alone pump or fan panels used in industries such as mining and irrigation. C441 is also offered in complete pump panel designs as part of Eaton's Enclosed Control offering. See Volume 10—Enclosed Control, CA08100012E, Tab 6 for more information.

Motor Insight is available in either a line-powered or 120 Vac control powered design, capable of monitoring voltages up to 660 Vac. Each of these units is available in a 1–9 amp or a 5–90 amp FLA model. With external CTs, Motor Insight can protect motors up to 540 amps FLA. Available add-on accessories include communication modules for Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, EtherNet/IP and HTTP web services all with I/O options. For ease-of-use and operator safety, Motor Insight offers a remote display that mounts easily with two 30 mm knockouts.

The Motor Insight family also offers a high voltage relay option, capable of providing overload and current protection on systems up to 1200 Vac.

Features and Benefits

Features

Size/Range
- Broad FLA range of 1–540 A
- Selectable trip class (5–30)
- Four operating voltage options
  - Line-powered from 240 Vac, 480 Vac, 600 Vac
  - Control-powered from 120 Vac

Motor Control
- Two output relays
  - One B300 Form C fault relay and one B300 ground fault shunt relay
  - Other relay configurations are available, including one Form A and one Form B SPST (fault and auxiliary relays) allowing programmable isolated relay behavior and unique voltages
- One external remote reset terminal
- Trip status indicator

Motor Protection
- Thermal overload
- Jam protection
- Current imbalance
- Current phase loss
- Ground fault
- Phase reversal

Load Protection
- Under current
- Low power (kW)
- High power (kW)

Line Protection
- Over voltage
- Under voltage
- Voltage imbalance
- Voltage phase loss

Monitoring Capabilities
- Current—average and phase rms
- Voltage—average and phase rms
- Power—motor kW
- Power factor
- Frequency
- Thermal capacity
- Run hours
- Ground fault current
- Current imbalance %
- Voltage imbalance %
- Motor starts
- Motor run hours

Options
- Type 1, 12 remote display
- Type 3R remote display kit
- Communication modules
  - Modbus
  - Modbus with I/O
  - DeviceNet with I/O
  - PROFIBUS with I/O
  - Modbus TCP with I/O
  - EtherNet/IP with I/O

Benefits

Reliability and Improved Uptime
- Advanced diagnostics allows for quick and accurate identification of the root source of a motor, pump or power quality fault; reducing trouble-shooting time and the loss of productivity, reducing repeat faults due to misdiagnosis, and increasing process output and profitability
- Provides superior protection of motors and pumps before catastrophic failure occurs
- Increases profitability with greater process uptime and throughput, reduced costs per repair, reduced energy consumption and extended equipment life
- Adjustments to overload configuration can be made at any time

Safety
- IP20 rated terminal blocks
- Terminal blocks are set back from the display to reduce operator shock hazard
- Remote display (optional) does not require that the operator open the panel to configure the device

Flexibility
- Communications modules
  - Offered in a variety of configurations
  - External snap-on modules provide support for multiple communications protocols
- Advanced power, voltage and current monitoring capabilities
- Communications modules and remote display can be used simultaneously
- Highly configurable fault and reset characteristics for numerous applications
- Fully programmable isolated fault and auxiliary relays

Ease of Use
- Bright LED display with easy-to-understand setting and references
- Powered from line voltage or 120 Vac control power
- Remote display powered from base unit
- Full word descriptions and units on user interface

Standards and Certifications
- cULus listed NKCR, NKCR7, 508
- UL® 1053 applicable sections for ground fault detection
- CSA® certified (Class 3211-02)
- CE
- NEMA®
- IEC EN 60947-4-1
- RoHS

Catalog Number Selection

Motor Insight Overload Relays

C441 B A NOUI

Device Type
C441 = Motor Insight overload relay

Overload Relay Power Source Voltage
B = 240 Vac (170–264 Vac)
C = 480 Vac (323–528 Vac)
D = 600 Vac (487–660 Vac)
Blank = 120 Vac control power (170–660 Vac)

Overload Relay Current Rating
A = 1–9 A (1–540 A refer to **Page V5-T5-72**)
B = 5–90 A (5–90 A refer to **Page V5-T5-72**)
0109 = 120 Vac control power (0–660 Vac, 1–9 A)
0590 = 120 Vac control power (0–660 Vac, 5–90 A)

Internal User Interface
Blank = With user interface (line powered models)
NOUI = Without user interface (120 Vac control models)

Motor Insight High Voltage Overload Relays

C441 P3309 NOUI HVR

Device Type
C441 = Motor Insight overload relay

Current Rating and Power Source
P3309 = 0.33–9 A (120 Vac control power)
0590 = 5–90 A (120 Vac control power)

Internal User Interface
NOUI = Without user interface

Line Voltage Rating
HVR = 0–1200 Vac ①

Motor Insight Overload Relays—Communications Modules and Accessory Types

C441 K

Device Type
C441 = Motor Insight overload relay

Communication Module
K = DeviceNet module 4IN/2OUT 120 Vac
L = DeviceNet module 4IN/2OUT 24 Vdc
M = Modbus RTU module
N = Modbus RTU module 4IN/2OUT 120 Vac
P = Modbus RTU module 4IN/2OUT 24 Vdc
Q = PROFIBUS module 4IN/2OUT 24 Vdc
R = Modbus TCP / EtherNet/IP module 4IN/2OUT 120 Vac
S = PROFIBUS module 4IN/2OUT 120 Vac
T = Modbus TCP / EtherNet/IP module 4IN/2OUT 24 Vdc

Accessory Type
1 = Type 1 and 12 remote mounted display
3 = Type 3R kit for remote display
CMP1 = Conversion plate

Note

① The C441 High Voltage Relay (-HVR models) can be used on systems up to 1200 Vac to provide overload and current based protections. Voltage and power based protections and monitoring listed in this catalog for C441 Motor Insight are not available in -HVR models. Please consult IL04209007E-HVR for technical information on -HVR models.

Product Selection

Motor Insight

Motor Insight

Power Source	Monitoring Range	Current Range	Catalog Number
240 Vac (170–264)	170–264 Vac	1–9 A	**C441BA**
		5–90 A	**C441BB**
480 Vac (323–528)	323–528 Vac	1–9 A	**C441CA**
		5–90 A	**C441CB**
600 Vac (489–660)	489–660 Vac	1–9 A	**C441DA**
		5–90 A	**C441DB**
120 Vac (93.5–132)	170–660 Vac	1–9 A	**C4410109NOUI**
		5–90 A	**C4410590NOUI**
120 Vac (93.5–132)	0–1200 Vac ①	0.33–9 A	**C441P3309NOUI-HVR**
		5–90 A	**C4410590NOUI-HVR**

Note

① Rating only—does not provide voltage monitoring/protection.

Motor Insight CT Multiplier and Wire Wrap Schedule

Catalog Number ①	Motor FLA	Number of Loops	Number of Conductors Through CT Primary	CT Multiplier Setting	External CT Kit Catalog Number ②
Current Range: 5–90 A					
C441_B and C4410590NOUI	5–22.5 A	3	4	4	—
	6.67–30 A	2	3	3	—
	10–45 A	1	2	2	—
	20–90 A	0	1	1	—
Current Range: 1–9 A					
C441_A and C4410109NOUI	1–5 A	1	2	2	—
	2–9 A	0	1	1	—
	60–135 A	0	1	150–(150:5)	**C441CTKIT150**
	120–270 A	0	1	300–(300:5)	**C441CTKIT300**
	240–540 A	0	1	600–(600:5)	**C441CTKIT600**
Current Range: 5–90A					
C4410590NOUI-HVR	5–22.5 A	3	4	4	—
	6.67–30 A	2	3	3	—
	10–45 A	1	2	2	—
	20–90 A	0	1	1	—
Current Range: 0.33–9 A					
C441P3309NOUI-HVR	0.33–1.5 A	5	6	6	—
	0.4–1.8 A	4	5	5	—
	0.5–2.25 A	3	4	4	—
	0.67–3.0 A	2	3	3	—
	1–5 A	1	2	2	—
	2–9 A	0	1	1	—
	60–135 A	0	1	150–(150:5)	**C441CTKIT150**
	120–270 A	0	1	300–(300:5)	**C441CTKIT300**
	240–270 A	0	1	600–(600: 5)	**C441CTKIT600**

Notes

① Underscore indicates Operating Voltage Code required.
Operating Voltage Codes:

Code	Voltage
B	240 Vac
C	480 Vac
D	600 Vac
<empty>	120 Vac Control Power

② Any manufacturer's CTs may be used.

Accessories

Communication Modules

Motor Insight Communication Modules mount to the side of the device to provide communication, monitoring and control over a variety of networks.

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 (all modules)

- 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 Modules

Communications Modules

Description	I/O	Catalog Number
Ethernet		
Modbus TCP / EtherNet/IP Communication Module 4IN/2OUT	120 Vac	**C441R**
Modbus TCP / EtherNet/IP Communication Module 4IN/2OUT	24 Vdc	**C441T**
DeviceNet		
DeviceNet Communication Module	120 Vac	**C441K**
DeviceNet Communication Module	24 Vdc	**C441L**
PROFIBUS		
PROFIBUS Communication Module 4IN/2OUT	120 Vac	**C441S**
PROFIBUS Communication Module 4IN/2OUT	24 Vdc	**C441Q**
Modbus		
Modbus Communication Module	None	**C441M**
Modbus Communication Module 4IN/2OUT	120 Vac	**C441N**
Modbus Communication Module 4IN/2OUT	24 Vdc	**C441P**

Type 3R Kit with Remote Display Mounted Inside

Motor Insight offers several accessories for the customer's ease of use and safety:

- Types 1 and 12 remote display
- Type 3R remote display kit
- Conversion mounting plate for upgrading from the legacy Eaton 777 model with no new holes required

Features and Benefits

- Remote display unit:
  - Same user interface as the overload relay
  - Enhanced operator safety—operator can configure the overload without opening the enclosure door
- Type 3R kit mounts with standard 30 mm holes
- Mounting plate for retrofit in existing installations

Type 3R Kit with Remote Display Mounted Inside

	Description	Catalog Number
C4411 	Remote display Types 1 and 12 (UL 508)	**C4411**
C4413 	Type 3R kit for remote display (UL 508)	**C4413**
	Conversion mounting plate (not shown)	**C441CMP1**

Communication Cables

The Remote Display requires a communication cable to connect to the Motor Insight overload relay:

Communication Cable Lengths

Length in Inches (meters)	Catalog Number
9.8 (0.25)	**D77E-QPIP25**
39.4 (1.0)	**D77E-QPIP100**
78.7 (2.0)	**D77E-QPIP200**
118.1 (3.0)	**D77E-QPIP300**

Current Transformer Kits

Description	Catalog Number
Three 150:5 CTs to be used with Motor Insight	**C441CTKIT150**
Three 300:5 CTs to be used with Motor Insight	**C441CTKIT300**
Three 600:5 CTs to be used with Motor Insight	**C441CTKIT600**

Technical Data and Specifications

Motor Insight

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI	
Electrical Ratings					
Feature	**Range**				
Operating voltage (three-phase) and frequency	170–264 Vac 50/60 Hz	323–528 Vac 50/60 Hz	489–660 Vac 50/60 Hz	170–660 Vac 50/60 Hz	
Trip Class					
5–30	Selectable	Selectable	Selectable	Selectable	
FLA Range					
C441_A and C4410109NOUI	1–9 A	Up to 540 A with external CTs Refer to **Page V5-T5-72** for CT multiplier and wire wrap schedule.	Up to 540 A with external CTs Refer to **Page V5-T5-72** for CT multiplier and wire wrap schedule.	Up to 540 A with external CTs Refer to **Page V5-T5-72** for CT multiplier and wire wrap schedule.	
C441_B and C4410590NOUI	5–90 A				
Monitoring Capabilities					
Feature	**Value**				
Current	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%) Ground fault current, 10% accuracy	
Voltage	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	Per phase rms (1A, 1B, 1C), 2% accuracy Average rms, 2% accuracy Imbalance percent (0–100%)	
Power	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	Motor kW, 5% accuracy Motor power factor, inductive 0–1.0, 1% accuracy	
Thermal capacity	0% cold, 100% trip	0% cold, 100% trip	0% cold, 100% trip	0% cold, 100% trip	
Motor run hours	0–65,535 hours	0–65,535 hours	0–65,535 hours	0–65,535 hours	
Frequency	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	47–63 Hz, 1% accuracy	
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	1.05 x FLA: Does not trip 1.15 x FLA: Overload trip	
Feature	**Range**				**Fault Delay Setting**
Jam	150–400% of motor FLA, OFF	150–400% of motor FLA, OFF	150–400% of motor FLA, OFF	50–400% of motor FLA, OFF	1–20 seconds
Current imbalance	1–30%, OFF	1–30%, OFF	1–30%, OFF	1–30%, OFF	1–20 seconds
Current phase loss	Fixed threshold 60%	Fixed threshold 60%	Fixed threshold 60%	Fixed threshold 60%	1–20 seconds
Ground fault current					
C441_A and C4410109NOUI 1–9 A	0.3–2.0 A with one pass through the CTs ①	0.3–2.0 A with one pass through the CTs ①	0.3–2.0 A with one pass through the CTs ①	0.3–2.0 A with one pass through the CTs ①	<150%, 1–60 seconds >150%, 2 seconds >250%, 1 second
C441_B and C4410590NOUI 5–90 A	3.0–20 A with one pass through the CTs ①	3.0–20 A with one pass through the CTs ①	3.0–20 A with one pass through the CTs ①	3.0–20 A with one pass through the CTs ①	<150%, 1–60 seconds >150%, 2 seconds >250%, 1 second
Phase reversal	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	OFF = Ignore, 1 = ACB, 2 = ABC	
Fault reset delay	2–500 minutes, auto ②	2–500 minutes, auto ②	2–500 minutes, auto ②	2–500 minutes, auto ②	
Fault reset attempts	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	0–4 restarts allowed or automatic reset ②	

Notes

① Lower levels are achievable with multiple passes.

② Motor fault reset characteristics can be programmed as a group or for motor overloads only. Reference the user manual for more detailed information.

Motor Insight, continued

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI	
Load Protection					
Feature	**Range**				**Fault Delay Setting**
Under current	50–90% of motor FLA	50–90% of motor FLA	50–90% of motor FLA	50–90% of motor FLA	1–60 seconds
Low power (kW)	20–80% of rated kW	20–80% of rated kW	20–80% of rated kW	20–80% of rated kW	1–60 seconds
High power (kW)	50–110% of rated kW	50–110% of rated kW	50–110% of rated kW	50–110% of rated kW	1–60 seconds
Load reset delay	2–500 minutes, auto	2–500 minutes, auto	2–500 minutes, auto	2–500 minutes, auto	
Load reset attempts	0–4, auto	0–4, auto	0–4, auto	0–4, auto	
Supply Protection					
Feature	**Range**				**Fault Delay Setting**
Over voltage	170–264 Vac	323–528 Vac	489–660 Vac	0–660 Vac	1–20 seconds
Under voltage	170–264 Vac	323–528 Vac	489–660 Vac	0–660 Vac	1–20 seconds
Voltage imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance	1–20% imbalance
Restart delay setting	1–500 seconds	1–500 seconds	1–500 seconds	1–500 seconds	1–500 seconds
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	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	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	±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	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 (10 V rms) 150 kHz–80 MHz	140 dBuV (10 V rms) 150 kHz–80 MHz	140 dBuV (10 V rms) 150 kHz–80 MHz	140 dBuV (10 V rms) 150 kHz–80 MHz	140 dBuV (10 V rms) 150 kHz–80 MHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)	Three-phase power inputs: ±2 kV line-to-line (DM) ±4 kV line-to-ground (CM)
	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)	IEC 61000-4-5 Class 3 User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Voltage variations immunity IEC 60947-4-1	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms	30% dip, at 100 ms 60% dip at 10 ms >95% interrupt at 5 ms
Electromagnetic field IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m	10 V/m	10 V/m	10 V/m	10 V/m
Ground fault	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27	UL 508, UL 1053 Sections 21 and 27

Motor Insight, continued

Description	Specification C441B_	C441C_	C441D_	C441_ _ _ _NOUI
Environmental Ratings				
Feature	**Range**			
Ambient temperature (operating)	–4 to 122 °F (–20 to 50 °C)	–4 to 122 °F (–20 to 50 °C)	–4 to 122 °F (–20 to 50 °C)	–4 to 122 °F (–20 to 50 °C)
Ambient temperature (storage)	–40 to 85 °C	–40 to 85 °C	–40 to 85 °C	–40 to 85 °C
Operating humidity	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing
Altitude (no derating)	2000 m	2000 m	2000 m	2000 m
Shock (IEC 60068-2-27)	15 G any direction	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	3 G any direction
Pollution degree per IEC 60947-1	3	3	3	3
Ingress protection	IP20	IP20	IP20	IP20
Capacity				
Input, auxiliary contact and external reset terminals				
Terminal capacity	18–12 AWG	18–12 AWG	18–12 AWG	18–12 AWG
Tightening torque	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)	5.3 lb-in (0.6 Nm)
Voltages				
Monitoring voltage	170–264 Vac 50/60Hz	323–528 Vac 50/60Hz	489–660 Vac 60Hz	0–660 Vac 50/60Hz
Insulation voltage U_i (three-phase voltage)	600 Vac	600 Vac	600 Vac	600 Vac
Insulation voltage U_i (control)	240 Vac	240 Vac	240 Vac	240 Vac
Impulse withstand U_{imp} (main/control)	6 kV	6 kV	6 kV	6 kV
Expected Life				
Mechanical/electrical	10 years	10 years	10 years	10 years
Output Contact Ratings				
Two output relays One Form C SPDT (fault relay) One Form A SPST (ground fault relay) C441_ _ _ _NOUI models: One Form A SPST One Form B SPST	B300 pilot duty 5 A thermal continuous current 30 A make 3.00 A break at 120 Vac and 15 A make 1.50 A break at 240 Vac	B300 pilot duty 5 A thermal continuous current 30 A make 3.00 A break at 120 Vac and 15 A make 1.50 A break at 240 Vac	B300 pilot duty 5 A thermal continuous current 30 A make 3.00 A break at 120 Vac and 15 A make 1.50 A break at 240 Vac	B300 pilot duty 5 A thermal continuous current 30 A make 3.00 A break at 120 Vac and 30 A make 1.50 A break at 240 Vac ①
External remote reset terminal	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1	Isolated 120 Vac digital input IEC 61131-2 Section 5 Type 1
Indications				
Trip	Fault	Fault	Fault	Fault
Reset	Ready	Ready	Ready	Ready
Autoreset	Trip faulted/Ready flashing	Trip faulted/Ready flashing	Trip faulted/Ready flashing	Trip faulted/Ready flashing
Power Consumption				
Maximum	5W	5W	5W	5W
Options				
Remote display	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit	Type 1, 12 and Type 3R kit
Communications modules	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O	Modbus, DeviceNet and PROFIBUS with I/O

Note

① In this model, there are two isolated relays: one Form A and one Form B SPST. One is the fault relay, and one is a programmable auxiliary relay.

Motor Insight Short Circuit Ratings (North America CSA and UL)

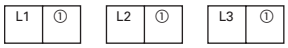
		Standard-Fault Short Circuit Data						
Overload FLA Range	**Maximum Operating Voltage**	**Withstand Rating**	**Maximum Fuse (RK5)**	**Maximum Thermal-Magnetic Circuit Breaker**	**Maximum Withstand Rating**	**Maximum Fuse (RK5)**	**Eaton Thermal-Magnetic Circuit Breaker**	**Catalog Number**
1–9 A	264 Vac	5000 A at 240 Vac	35 A	35 A	100 kA at 240 Vac	35 A	—	**C441BA**
					100 kA at 240 Vac	—	FDC3035L	
1–9 A	528 Vac	5000 A at 480 Vac	35 A	35 A	100 kA at 480 Vac	35 A	—	**C441CA**
					100 kA at 480 Vac	—	FDC3035L	
1–9 A	660 Vac	5000 A at 600 Vac	35 A	35 A	100 kA at 600 Vac	35 A	—	**C441DA**
					35 kA at 600 Vac	—	FDC3035L	
1–9 A	660 Vac	5000 A at 600 Vac	35 A	35 A	100 kA at 240 Vac 100 kA at 240 Vac 100 kA at 480 Vac 100 kA at 480 Vac 100 kA at 600 Vac 35 kA at 600 Vac	35 A — 35 A — 35 A —	— FDC3035L — FDC3035L — FDC3035L	**C4410109NOUI**
5–90 A	264 Vac	10,000 A at 240 Vac	350 A	350 A	100 kA at 240 Vac	350 A	—	**C441BB**
					100 kA at 240 Vac	—	KDC3350	
5–90 A	528 Vac	10,000 A at 480 Vac	350 A	350 A	100 kA at 480 Vac	350 A	—	**C441CB**
					100 kA at 480 Vac	—	KDC3350	
5–90 A	660 Vac	10,000 A at 600 Vac	350 A	350 A	100 kA at 600 Vac	350 A	—	**C441DB**
					65 kA at 600 Vac	—	KDC3350	
5–90 A	660 Vac	10,000 A at 600 Vac	350 A	350 A	100 kA at 240 Vac 100 kA at 240 Vac 100 kA at 480 Vac 100 kA at 480 Vac 100 kA at 600 Vac 35 kA at 600 Vac	350 A — 350 A — 350 A —	— KDC3350 — KDC3350 — KDC3350	**C4410590NOUI**

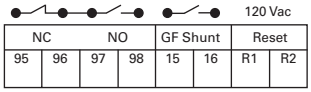
Line Powered Models

Terminal Connection Diagram

Use 75C CU wire only

18–12 AWG; Torque 5.3 lb-in/0.6 Nm
B300 Pilot Duty Only





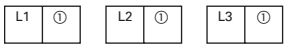
For C441BA, BB, CA, CB, DA and DB

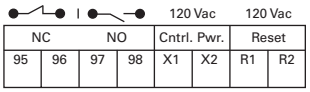
Terminal Connection Specifications

Name	Designation	Input	Description
Line voltage	L1, L2, L3	Line voltage	Three-phase line voltage input L1, L2, L3 connections must correspond to the respective CT1, CT2, CT3 current leads
Fault relay	95/96 96/97 (common) 97/98	B300 UL 508	Form C contact: 95/96 Contact opens when the unit is faulted or unpowered 97/98 Contact closes when the unit is faulted or unpowered
GF shunt	15 16	B300 UL 508	Form A contact: Contact closes when a ground fault is active
Reset input	R1, R2	120 Vac	Fault reset input IEC 61131-2 Type 1

Control Powered Models

Terminal Connection Diagram





For C4410109NOUI and C441059NOUI

Terminal Connection Specifications

Name	Designation	Input	Description
Line voltage	L1, L2, L3	Line voltage	Three-phase line voltage input L1, L2, L3 connections must correspond to the respective CT1, CT2, CT3 current leads Terminal provided for wiring control power transformer (9A maximum capacity)
Control power	X1, X2	110–120 Vac 50–60Hz (+10/–15%)	Control power option for C441_ _ _ _NOUI
Fault relay For C441_ _ _ _NOUI, the fault relay and auxiliary relay are isolated and do not share a common. By default they will behave like a Form C, but they can be programmed to act independently from one another.	95/96 96/97 (isolated) 97/98	B300 UL 508	Form C contact: 95/96 Contact opens when the unit is faulted or unpowered 97/98 Contact closes when the unit is faulted or unpowered Can be programmed to act independently of the 95/96 only in the C441_ _ _ _NOUI models
GF shunt This relay does not exist on the C441_ _ _ _NOUI models. Instead, this functionality is available in the fully programmable 97/98 auxiliary relay.	97/98	B300 UL 508	Form A contact: Contact closes when a ground fault is active Separate GF control can still be achieved by programming auxiliary relay 97/98 to act independently of the 95/96 relay
Reset input	R1, R2	120 Vac	Fault reset input IEC 61131-2 Type 1

Note

① No motor loads, 9 A maximum.

Modbus Communication Modules

Description	Specification	
Electrical/EMC		
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 MHz	
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 MHz	
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±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	
Conducted immunity IEC 60947-4-1	140 dBuV (10 V rms) 150 kHz–80 MHz	
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method	
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)	
Electromagnetic field ① IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m	
Environmental Ratings		
Ambient temperature (operating)	–20 to 50 °C	
Ambient temperature (storage)	–40 to 85 °C	
Operating humidity	5 to 95% noncondensing	
Altitude (no derating)	2000 m	
Shock (IEC 60068-2-27)	15 G any direction	
Vibration (IEC 60068-2-6)	3 G any direction	
Pollution degree per IEC 60947-1	3	
Degree of protection	IP20	
Over voltage category per UL 508	III	
C441P 24 Vdc Input		
Nominal input voltage	24 Vdc	
Operating voltage	18–30 Vdc	
Number of inputs	4	
Signal delay	5 ms (programmable to 65 sec)	
OFF-state voltage	<6 Vdc	
ON-state voltage	>18 Vdc	
Nominal input current	5 mA	
Isolation	1500 V	
Terminal screw torque	7–9 in-lb	
24 Vdc source current	50 mA	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441N 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500 V	
Terminal screw torque	7–9 in-lb	

Note

① Relates to C441M only.

Modbus Communication Modules, continued

Description	Specification	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5 A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

DeviceNet Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 MHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 MHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±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
Conducted immunity IEC 60947-4-1	140 dBuV (10 V rms) 150 kHz–80 MHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3	10 V/m
Environmental Ratings	
Ambient temperature (operating)	–20 to 50 °C
Ambient temperature (storage)	–40 to 85 °C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000 m
Shock (IEC 60068-2-27)	15 G any direction
Vibration (IEC 60068-2-6)	3 G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
DeviceNet	
DeviceNet connections	Group 2, polling, bit strobe, explicit, no UCMM
DeviceNet baud rate	125 K, 250 K, 500 K

Note

① Resistive current at 55 °C ambient.

DeviceNet Communication Modules, continued

Description	Specification	
C441L 24 Vdc Input		
Nominal input voltage	24 Vdc	
Operating voltage	18–30 Vdc	
Number of inputs	4	
Signal delay	5 ms (programmable to 65 sec)	
OFF-state voltage	<6 Vdc	
ON-state voltage	>18 Vdc	
Nominal input current	5 mA	
Isolation	250 V	
Terminal screw torque	7–9 in-lb	
24 V source current	50 mA	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441K 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	250 V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5 A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

Note

① Resistive current at 55 °C ambient.

PROFIBUS Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 MHz
Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 MHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1 Table 13, IEC 61000-4-3	10 V/m 80–1000 MHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10 V rms) 150 kHz–80 MHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Environmental Ratings	
Ambient temperature (operating)	–20 to 50 °C
Ambient temperature (storage)	–40 to 85 °C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000 m
Shock (IEC 60068-2-27)	15 G any direction
Vibration (IEC 60068-2-6)	3 G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
PROFIBUS	
PROFIBUS connections	Group 2, polling, bit strobe, explicit, no UCMM
PROFIBUS baud rate	9.6 K, 19.2 K, 45.45 K, 93.75 K, 187.5 K, 500 K, 1.5 M, 3 M, 6 M, 12 M
C441Q 24 Vdc Input	
Nominal input voltage	24 Vdc
Operating voltage	18–30 Vdc
Number of inputs	4
Signal delay	5 ms (programmable to 65 sec)
OFF-state voltage	<6 Vdc
ON-state voltage	>10 Vdc
Nominal input current	5 mA
Isolation	1500 V
Terminal screw torque	7–9 in-lb
24 V source current	50 mA

PROFIBUS Communication Modules, continued

Description	Specification	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441S 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<20 Vac	
ON-state voltage	>70 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500 V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Output Modules		
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Max. current per point ①	5 A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

Note

① Resistive current at 55 °C ambient.

Ethernet (Modbus TCP / EtherNet/IP) Communication Modules

Description	Specification
Electrical/EMC	
Radiated emissions IEC 60947-4-1, Table 15, EN 55011 (CISPIR 11) Group 1, Class A	30–1000 MHz
Conducted emissions IEC 60947-4-1, Table 15, EN 55011 (CISPIR 11) Group 1, Class A	0.15–30 MHz
ESD immunity IEC 60947-4-1 (Table 13) IEC 61000-4-2	±8 kV air, ±4 kV contact
Radiated immunity IEC 60947-4-1 (Table 13) IEC 61000-4-3	10 V/m 80–1000 MHz 80% amplitude modulated 1 kHz sine wave
Conducted immunity IEC 60947-4-1	140 dBuV (10 V rms) 150 kHz to 80 MHz
Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4	±2 kV using direct method
Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 2	User IO and communication lines: ±1 kV line-to-line (DM) ±2 kV line-to-ground (CM)
Environmental Ratings	
Ambient temperature (operating)	–20 to 50 °C
Ambient temperature (storage)	–40 to 85 °C
Operating humidity	5–95% noncondensing
Altitude (no derating)	2000 m
Shock (IEC 60068-2-27)	15 G any direction
Vibration (IEC 60068-2-6)	3 G any direction
Pollution degree per IEC 60947-1	3
Degree of protection	IP20
Ethernet	
Ethernet connections	Integrated two-port switch with dual RJ45 Ethernet connections
Ethernet type	Ethernet 10/100 Mbs, AutoMDX, Auto Negotiation
C441T 24 Vdc Input	
Nominal input voltage	24 Vdc
Operating voltage	18–30 Vdc
Number of inputs	4
Signal delay	5 ms (programmable to 65 sec)
OFF-state voltage	<6 Vdc
ON-state voltage	>18 Vdc
Nominal input current	5 mA
Isolation	1500 V
Terminal screw torque	7–9 in-lb
24 V source current	50 mA

Ethernet (Modbus TCP / EtherNet/IP) Communication Modules, continued

Description	Specification	
Operating Voltage Range—DC Input Modules		
OFF State	**Transition Region**	**ON State**
0–6 Vdc	6–18 Vdc	18–30 Vdc
C441R 120 Vac Input		
Nominal input voltage	120 Vac	
Operating voltage	80–140 Vac	
Number of inputs	4	
OFF-state voltage	<30 Vac	
ON-state voltage	>80 Vac	
Nominal input current	15 mA	
Signal delay	1/2 cycle	
Isolation	1500 V	
Terminal screw torque	7–9 in-lb	
Operating Voltage Range—AC Input Modules		
OFF State	**Transition Region**	**ON State**
0–30 Vac	30–80 Vac	80–140 Vac
Nominal voltage	120 Vac 24 Vdc	
Number of outputs	(2) 1NO Form A 1NO/NC Form C	
Relay OFF time	3 ms	
Relay ON time	7 ms	
Maximum current per point ①	5 A (B300 rated)	
Electrical life	100,000 cycles	
Mechanical life	1,000,000 cycles	

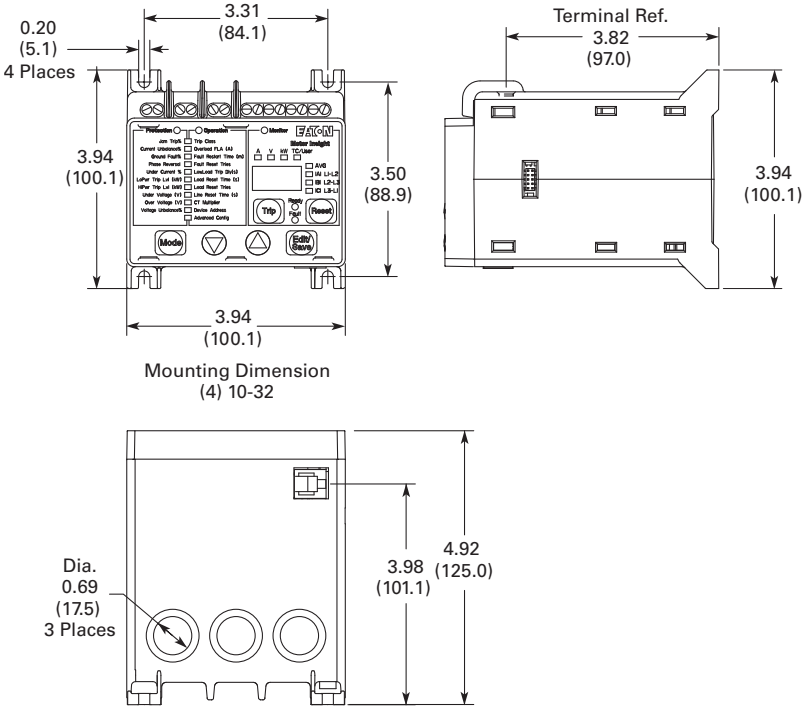
Note

① Resistive current at 55 °C ambient.

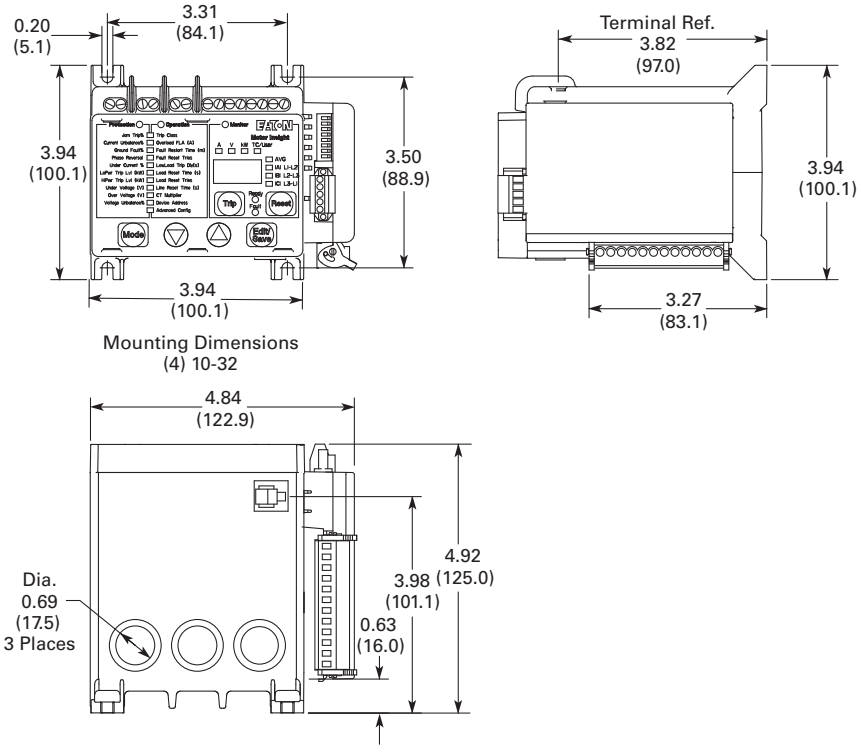
Dimensions

Approximate Dimensions in Inches (mm)

Motor Insight Overload Relay

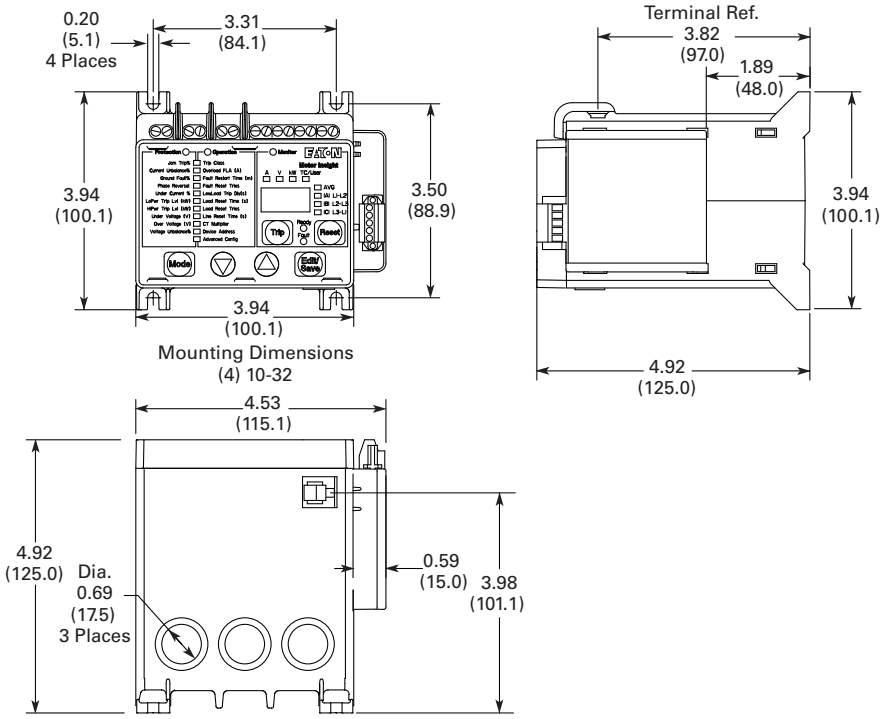


Motor Insight with Mounted DeviceNet, PROFIBUS or Modbus with I/O Communication Module

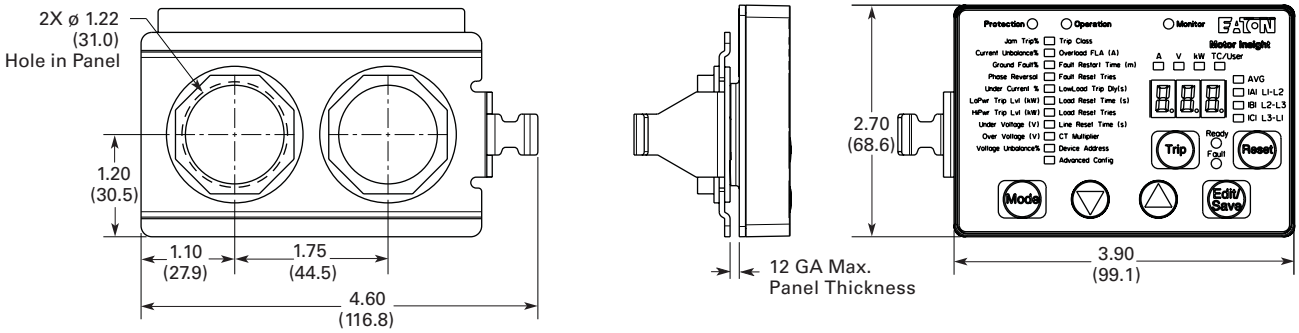


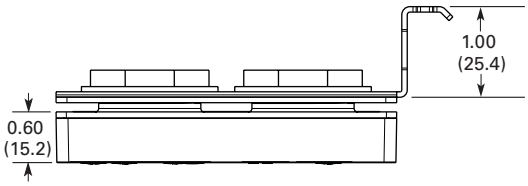
Approximate Dimensions in Inches (mm)

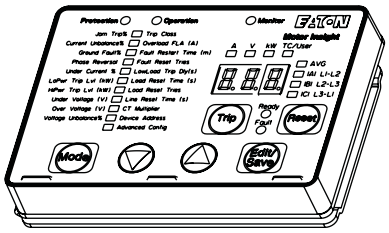
Motor Insight with Mounted Modbus Communication Module



Motor Insight Remote Display

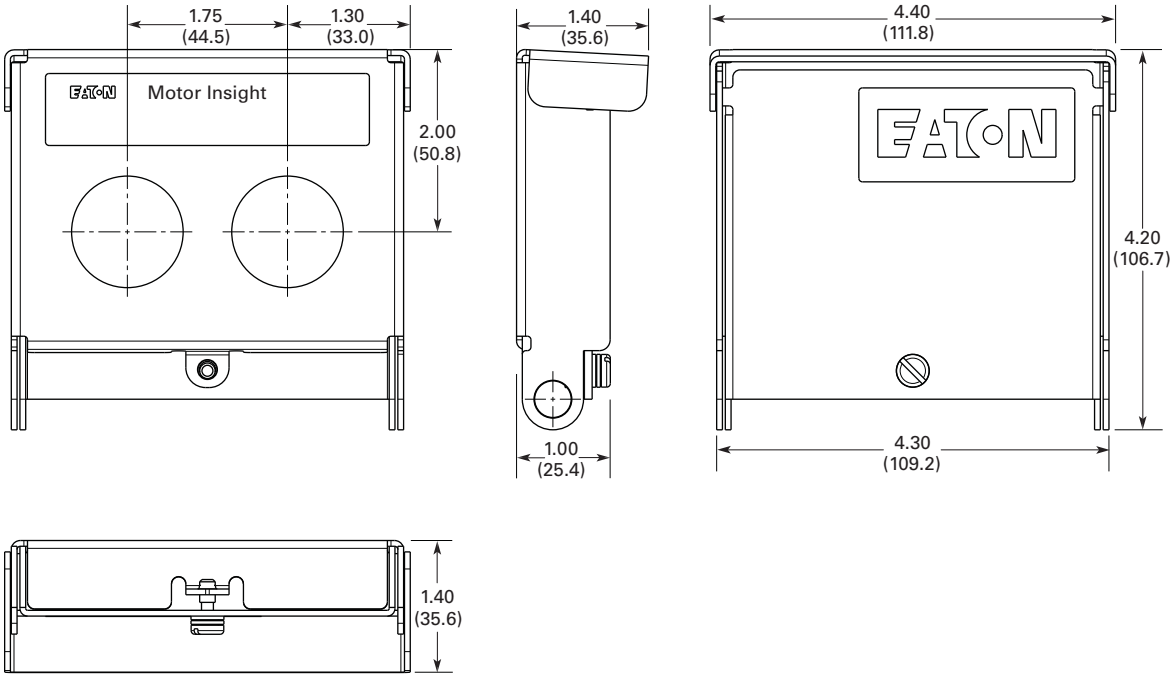






Approximate Dimensions in Inches (mm)

Motor Insight Cover Assembly



Conversion Mounting Plate