

Power Xpert C445 Motor Management Relay



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**Power Xpert C445 Motor Management Relay**

**Product Description**

The Power Xpert® C445 global motor management relay is Eaton’s newest addition to the C400 series of advanced motor protection. The Power Xpert C445 is fully configurable, providing the highest level of monitoring accuracy and protection for the entire power system—from the incoming power source feeding the motor all the way to the individual pump or load. By utilizing integrated power quality and energy usage analytics along with built-in efficiency algorithms, users can save significant energy costs through increased awareness of energy usage at the individual load level.

Due to its unrivaled compact size and modular format, the Power Xpert C445 allows for simple integration into NEMA and IEC Motor Control Center platforms as well as OEM control panels. Based on this smaller size, users can reduce costs and improve system flexibility through simplified wiring, smaller enclosure footprint and seamless field modifications as systems evolve over time. By separating the monitoring and control functionality into separate modules, users can easily customize the Power Xpert C445 mounting configuration to match their individual applications.

The Power Xpert C445 global motor management relay was designed with user safety in mind. Users can access, monitor and configure data parameters within the device without opening the panel door via a variety of communication network options or a micro USB port on the front of the user interface. To configure the Power Xpert C445, users can utilize Eaton’s Power Xpert *in*Control programming software. In addition to this software tool, the Power Xpert C445 can be easily integrated into a variety of PLC and DCS systems through integrated communication protocols including Modbus Serial, PROFIBUS, Modbus TCP and EtherNet/IP.

## Features and Benefits

### Features

#### Product Range

- 0.3–800 A
- Up to 690 Vac
- 4160 Vac with PT ratios
- 20–80 Hz operation
- Selectable trip class (5–40)

#### Product Hardware

- Modular design with multiple options:
  - Base control module: protections, monitoring, communications, I/O
  - Measurement module: sensing capability
  - User interface: control and diagnostics
- AC (120/240) or DC (24) control-power options
- 2% monitoring accuracy on current and voltage values
- Standard on-board I/O
  - (4) DI (AC or DC options)
  - (3) Relay out
    - 2 Form A (NO)
    - 1 Form C (NO/NC) latching or non-latching
- Superior motor protection solutions, including:
  - Motor (current)
  - Line (voltage)
  - Load (power)
- Advanced monitoring algorithms
- Pre-configured operation modes
  - Overload only
  - Direct (FVNR)
  - Reverser (FVR)
  - Star/delta
  - Two speed pole changing
  - Two speed Dahlander
  - Auto transformer
  - Solenoid valve
  - HMCP/MCCB actuation
  - Contactor feeder
  - General purpose input/output
- Compact footprint
- Pass-through modular design
- Flexible communication options
  - Modbus Serial
  - Modbus TCP
  - EtherNet/IP
  - PROFIBUS
- Real-time clock and memory backup module
- Integrated USB communication port
- Power Xpert *inControl* software tool
  - Configuration
  - Monitoring
  - Diagnostics

### Benefits

#### Reliability

- Advanced diagnostics allow for quick and accurate identification of the root cause of a fault
- Allows for greater system coverage through line-, load- and motor-based protections
- Voltage loss restart functionality allows for automatic revival after outages from voltage loss without the need for user intervention
- On-board I/O meets needs of most communication requirements without the need for additional modules
- Seamless integration into EtherNet/IP networks via EIP-Assist tool
- Pre-programmed operation modes support fast, easy installation for most applications
- MTBF 20 years at 50 °C

#### Flexibility

- Modular format with scalable options allows for customization to exact needs of application
- Widest range of communication options for easy integration into majority of PLC/DCS systems
- Fully programmable output relays
- Fully programmable trip and alarm thresholds and time delays

## Standards and Certifications

- CE, UL, CSA
- IEC EN 60947-4-1
- ATEX 95



## Overload Relays

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**System Overview**

The Power Xpert C445 Motor Management Relay is a solid-state based electronic overload device designed to protect single- or three-phase AC electric induction motors from 0.3 to 800 A. The C445 provides intelligent monitoring, protection and efficiency calculations for motor, load and line conditions. It's ideal for oil and gas, water treatment, mining, utility and industrial motor control applications. The C445 offers a modular pass-through design, breaking the sensing, protection, and control into separate modules. This allows the user to select the appropriate options for each module and combine them to meet the exact needs of their application. Together, these modules provide a fully configurable and industry-leading intelligent motor protection solution for the entire system.

**Base Control Module**

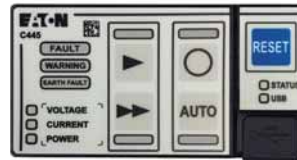
The base control module is the core of the C445 system, providing the various monitoring, protection and control algorithms. Equipped with native I/O connections, communication card options and USB connectivity, the base control module provides users with real-time data on the health and status of their application. Various pre-configured operation modes are available that simplify the wiring and logic requirements for the user.

**Measurement Module**

The measurement module is a pass-through device that samples current and voltage data consumed by the system. This data is continuously transmitted back to the base control module for analysis. Various frame sizes are available for applications up to 800 A, with voltage measurement and positive temperature coefficient (PTC) protection options.

**User Interface**

The user interface provides local motor control and status indication that can be operated from outside of the system's enclosure. An external micro USB connection allows for device commissioning, configuration and monitoring. Various overlay options are available to match the specific operation mode of the application. Two color schemes are available for NEMA (English) or IEC (symbols) based applications.



**Protection Summary** <sup>①</sup>

**Current-Based Protection Summary**

	Trip	Alarm	Trip Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)	Alarm Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)
Thermal overload	X	X	0.3–800 A	Low end of FLA range	Trip Class 5–40	Trip Class 5	1–100%	90%	Instantaneous	Instantaneous
Instantaneous overcurrent	X	X	50–400% FLA	400%	0.001–2,000	2	50–400% FLA	400%	0.2–5.0	2
Jam	X	X	50–400% FLA	400%	1–60	10	50–400% FLA	400%	0.2–5.0	2
Stall	X	—	50–400% FLA	200%	Instantaneous	Instantaneous	—	—	—	—
Undercurrent	X	X	10–90% FLA	50%	1–60	20	10–90% FLA	50%	0.2–5.0	2
Current unbalance	X	X	1–60%	15%	1–60	15	1–60%	15%	0.2–5.0	2
Current phase loss	X	—	60%	60%	2	2	—	—	—	—
Ground (earth) fault	X	X	②	②	1–60	5	②	②	0.2–5.0	2
PTC (requires option)	X	X	Overtemperature Shorted Open	OFF	—	—	Overtemperature Shorted Open	OFF	—	—

**Voltage-Based Protection Summary** <sup>③</sup>

	Trip	Alarm	Trip Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)	Alarm Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)
Phase rotation	X	—	ABC, ACB	ABC	Instantaneous	Instantaneous	—	—	—	—
Voltage phase loss	X	—	70%	70%	2	2	—	—	—	—
Overvoltage	X	X	90–150%	110%	1–60	20	90–150%	110%	0.2–5.0	2
Undervoltage	X	X	10–100%	90%	1–60	20	10–100%	90%	0.2–5.0	2
Voltage unbalance	X	X	2–20%	6%	1–20	20	1–20%	6%	0.2–5.0	2
Frequency deviation (slow)	X	X	0.1–5 Hz	0.1 Hz	1–60	20	0.1–5 Hz	0.1 Hz	0.2–5.0	2
Frequency deviation (fast)	X	X	0.02–2 Hz	0.1 Hz	0.02–60	1	0.02–2 Hz	0.1 Hz	0.2–5.0	2

**Power-Based Protection Summary** <sup>③</sup>

	Trip	Alarm	Trip Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)	Alarm Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)
Low power	X	X	–200 to 200%	50%	1–60	20	–200 to 200%	50%	1–60	2
High power	X	X	–200 to 200%	110%	1–60	20	–200 to 200%	110%	1–60	2
Power factor deviation (low)	X	X	–100 to 100%	0%	1–60	20	–100 to 100%	0	1–60	2
Power factor deviation (high)	X	X	–100 to 100%	100%	1–60	20	–100 to 100%	100%	1–60	2

**Advanced Protection Summary** <sup>③</sup>

	Trip	Alarm	Trip Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)	Alarm Level Range	Default Level	Delay Range (Seconds)	Default Level (Seconds)
Voltage loss restart <sup>④</sup>	—	—	—	—	—	—	—	—	—	—
Peak demand alarm	—	X	User settable <sup>⑤</sup>	—	—	—	—	—	—	—

**Notes**

- ① Not all trips/alarms are enabled by default. Consult C445 user manual for further information.
- ② Sensing level depends on Measurement Module frame size and amperage range. Consult C445 user manual for further information.
- ③ Voltage, Power and Advanced Protections require voltage option on the measurement module.
- ④ Voltage loss restart is a control functionality used for reacceleration schemes after power loss. Consult C445 user manual for further information.
- ⑤ Consult C445 user manual for further information.

## Monitoring Summary

### Current-Based Monitoring

Parameter Name	Range / Units	Description
IA (L1) float	Depends on frame size (amps)	Phase A (L1) motor current; 2% accuracy within 30–125% of FLA
IB (L2) float	Depends on frame size (amps)	Phase B (L2) motor current; 2% accuracy within 30–125% of FLA
IC (L3) float	Depends on frame size (amps)	Phase C (L3) motor current; 2% accuracy within 30–125% of FLA
I Average float	Depends on frame size (amps)	Average motor current; 2% accuracy within 30–125% of FLA
I Unbalance percent	0–100%	Motor current unbalance percent
I Average % of FLA (nominal current)	0–720% of FLA (amps)	Average motor current as a percentage of FLA
Maximum start current floating point	Depends on frame size (amps)	Maximum motor starting current
Motor residual GF RMS	Depends on frame size (amps), scaled via fieldbus	Motor residual ground fault current RMS; Accuracy meets UL 1053 / IEC Class II-B

### Voltage-Based Monitoring <sup>①</sup>

Parameter Name	Range / Units	Description
Voltage AB (L1-L2)	0–690 V; max. 4,160 V with PT ratios	Supply line-to-line voltage AB (L1-L2); 2% accuracy up to 690 Vac
Voltage BC (L2-L3)	0–690 V; max. 4,160 V with PT ratios	Supply line-to-line voltage BC (L2-L3); 2% accuracy up to 690 Vac
Voltage CA (L3-L1)	0–690 V; max. 4,160 V with PT ratios	Supply line-to-line voltage CA (L3-L1); 2% accuracy up to 690 Vac
Average line-to-line voltage	0–690 V; max. 4,160 V with PT ratios	Supply line-to-line voltage average; 2% accuracy up to 690 Vac
Line frequency x 100	20–80 Hz (Centi-Hz)	Supply Frequency in centi-Hz
Voltage phase order	0: unknown; 1: ABC (L1-L2-L3); 2: ACB (L1-L3-L2)	Reports phase sequence of the line voltage
Voltage unbalance percent	0–100%	Supply voltage unbalance percentage

### Power-Based Monitoring <sup>①</sup>

Parameter Name	Range / Units	Description
Total watts	Depends on frame size (Watts)	Total Real Power; 5% accuracy
Total VA	Depends on frame size (Volt-Amps)	Total Apparent Power; 5% accuracy
Total VARs	Depends on frame size (VARs)	Total Reactive Power; 5% accuracy
Power factor	0–100%, Scaled by 0.01% via fieldbus	Apparent power factor in percentage; 1% accuracy
Motor speed RPM	Depends on motor (RPM)	Motor speed in RPM
Motor torque	Depends on motor (Nm)	Motor torque
Motor efficiency percent	PC Tool in %, Scaled by 0.01% via fieldbus	Motor efficiency in percentage
Real energy	Depends on frame size (0.1 kWh)	Real energy scaled; 5% accuracy
Real energy (resettable)	Depends on frame size (0.1 kWh)	Real energy (resettable) scaled; 5% accuracy
Apparent energy	Depends on frame size (0.1 kVAh)	Apparent energy scaled; 5% accuracy
Apparent energy (resettable)	Depends on frame size (0.1 kVAh)	Apparent energy (resettable) scaled; 5% accuracy
Reactive energy	Depends on frame size (0.1 kVARh)	Reactive energy scaled; 5% accuracy
Reactive energy (resettable)	Depends on frame size (0.1 kVARh)	Reactive energy (resettable) scaled; 5% accuracy
Current demand value	Depends on frame size (Watts)	Latest estimate of the demand; 5% accuracy
Demand (resettable)	Depends on frame size (Watts)	Peak demand, user resettable; 5% accuracy
Peak demand time stamp	Time in seconds	Peak demand time stamp (in Unix time)
Demand window duration	Time in minutes	Demand window duration

#### Note

<sup>①</sup> Voltage option must be selected for the measurement module.

### System Monitoring

Parameter Name	Range / Units	Description
Motor state (current based)	0: Stopped; 1: Accelerating; 2: Running	Current Based motor state (independent of command)
Motor control status	Various	Present motor control status bits
Number of operating seconds	Time in seconds	Number of operating seconds
Operating seconds (resettable)	Time in seconds	Number of operating seconds (resettable)
Time to trip overload	Time in seconds	Time for overload to reach trip threshold (100%)
Time to reset overload	Time in seconds	Time for overload to reach reset threshold (thermal memory must drop below 75%)
PTC status	Various	PTC status
Digital input status	0/1	ON/OFF status of digital inputs
Base control module relay status	0/1	Base control module relay status (output status)
Total motor run time	Time in seconds	Total motor run time in seconds
Total motor run time (resettable)	Time in seconds	Total run time user (resettable)
Last measured starting time	Time in seconds	The amount of time the motor took to reach up to speed on the last start.
Number of starts	Number	Total number of motor starts
Number of starts (resettable)	Number	Number of starts (resettable)
Number of contactor operations last hour	Number	Number of contactor operations during the last hour
Latest run time	Time in seconds	Duration in seconds of the last start-to-stop motor run time
Thermal memory percent	0–250%	Thermal memory in percent—overload trip occurs at 100%

### Faults and Events

Parameter Name	Range / Units	Description
Active fault	Various	Provides reason for trip in form of fault code
Active warning	Various	Provides reason for warning in form of fault code
Active inhibit	Various	Provides reason for inhibit in form of fault code
Fault queue—event order	Various	A list of the last 10 faults shown in the order they occurred. Most recent at top
Trip snapshot	Various	Time-stamp log of (12) parameters at time of trip

#### Catalog Number Selection

##### Power Xpert C445 Global Motor Management Relay

#### Required System Components

Order these catalog numbers for a complete C445 system.

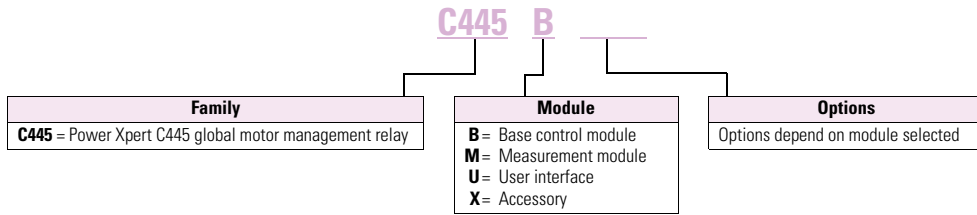
- 1 Base Control Module (C445B...)
- 1 Measurement Module (C445M...)
- 1–2 Connection cables (D77E...), required to provide power and communications from the Base Control Module to the Measurement Module and the User Interface (if used). These must be ordered separately in the length desired.
- 1 programming cable (C445XS-USB-MICRO or C445XS-USB-LEADS), required to configure the device using Power Xpert *inControl*. The same programming cable can be used for multiple systems.

#### Optional Accessories

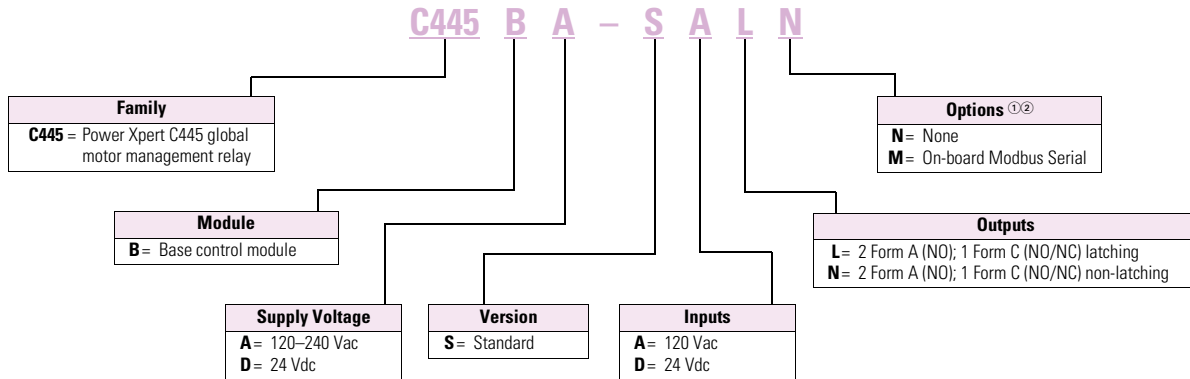
These system accessories are compatible with any C445 system but are not required.

- Communication Modules (C445XC...)
- Real-time Clock and Memory Backup Module (C445XO-RTC)
- User Interfaces (C445UC...)
- User Interface Digital Input Wiring Harnesses (C445XU...), required only if utilizing optional digital inputs on User Interfaces

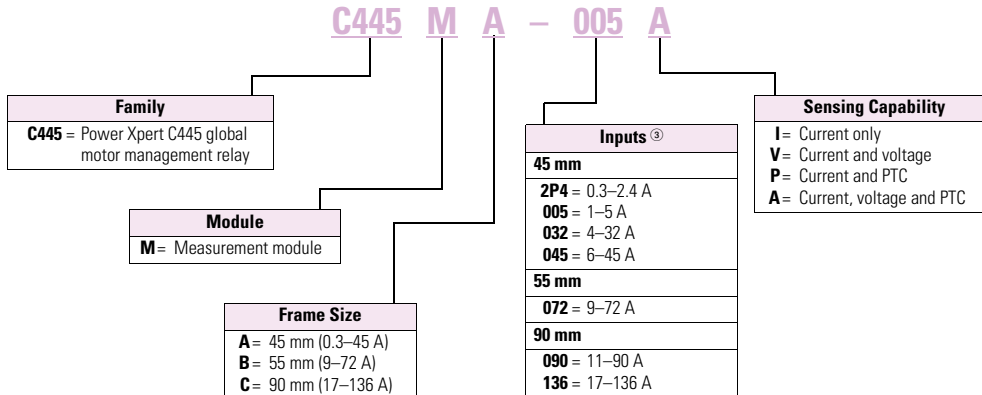
#### Relay



#### Base Control Module



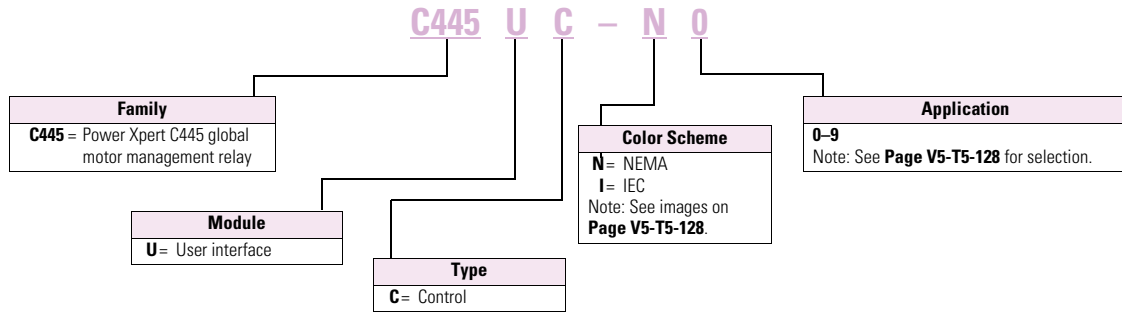
#### Measurement Module



#### Notes

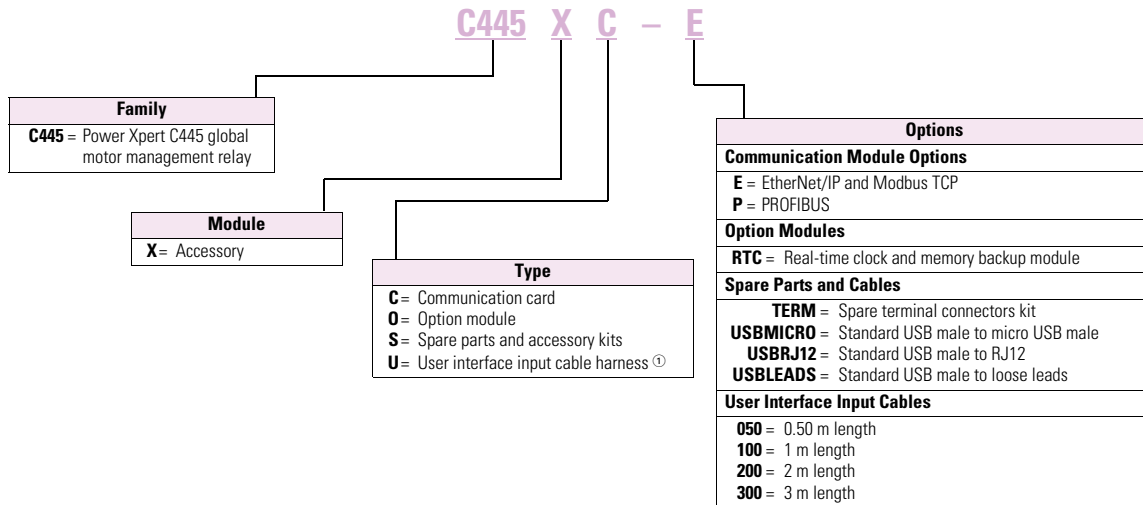
- ① For other communication protocol options, see Accessories chart on **Page V5-T5-125**.
- ② If a real-time clock and memory backup module are required, see Accessories chart on **Page V5-T5-125**.
- ③ For applications above 136 A, see Accessories chart on **Page V5-T5-125**.

User Interface



Power Xpert C445 Global Motor Management Relay

Accessories



Note

① This cable harness is to utilize the user interface inputs. For other C445 connector cables, see Accessories on Page V5-T5-130.



**Product Selection**

**Power Xpert C445 Global Motor Management Relay**

C445B\_

**Base Control Module**



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Power Source	Voltage Range ①	Digital Inputs	Relay Outputs	On-board Communications	Catalog Number
120/240 Vac	0–690 Vac	(4) 120 Vac	(2) Form A, (1) Form C (non-latching)	—	<b>C445BA-SANN</b>
			(2) Form A, (1) Form C (latching)	Modbus Serial	<b>C445BA-SANM</b>
		(4) 24 Vdc	(2) Form A, (1) Form C (latching)	—	<b>C445BA-SALN</b>
			(2) Form A, (1) Form C (non-latching)	Modbus Serial	<b>C445BA-SALM</b>
			(2) Form A, (1) Form C (non-latching)	—	<b>C445BA-SDNN</b>
			(2) Form A, (1) Form C (latching)	Modbus Serial	<b>C445BA-SDNM</b>
24 Vdc	0–690 Vac	(4) 120 Vac	(2) Form A, (1) Form C (non-latching)	—	<b>C445BD-SANN</b>
			(2) Form A, (1) Form C (latching)	Modbus Serial	<b>C445BD-SANM</b>
		(4) 24 Vdc	(2) Form A, (1) Form C (latching)	—	<b>C445BD-SALN</b>
			(2) Form A, (1) Form C (non-latching)	Modbus Serial	<b>C445BD-SALM</b>
			(2) Form A, (1) Form C (non-latching)	—	<b>C445BD-SDNN</b>
			(2) Form A, (1) Form C (latching)	Modbus Serial	<b>C445BD-SDNM</b>

**Note**

① Can be used for 4160 Vac applications with PT ratios.

## C445M\_

## Measurement Module



Frame Size	Current Range (A)	Current (I) Sensing	Voltage (V) Sensing	PTC Sensing	Catalog Number
45 mm	0.3–2.4	Yes	—	—	C445MA-2P4I
		Yes	—	Yes	C445MA-2P4P
		Yes	Yes	—	C445MA-2P4V
		Yes	Yes	Yes	C445MA-2P4A
	1–5	Yes	—	—	C445MA-005I
		Yes	—	Yes	C445MA-005P
		Yes	Yes	—	C445MA-005V
		Yes	Yes	Yes	C445MA-005A
	4–32	Yes	—	—	C445MA-032I
		Yes	—	Yes	C445MA-032P
		Yes	Yes	—	C445MA-032V
		Yes	Yes	Yes	C445MA-032A
	6–45 <sup>①</sup>	Yes	—	—	C445MA-045I
		Yes	—	Yes	C445MA-045P
		Yes	Yes	—	C445MA-045V
		Yes	Yes	Yes	C445MA-045A
55 mm	9–72	Yes	—	—	C445MB-072I
		Yes	—	Yes	C445MB-072P
		Yes	Yes	—	C445MB-072V
		Yes	Yes	Yes	C445MB-072A
90 mm	11–90	Yes	—	—	C445MC-090I
		Yes	—	Yes	C445MC-090P
		Yes	Yes	—	C445MC-090V
		Yes	Yes	Yes	C445MC-090A
	17–136	Yes	—	—	C445MC-136I
		Yes	—	Yes	C445MC-136P
		Yes	Yes	—	C445MC-136V
		Yes	Yes	Yes	C445MC-136A

**Note**

- <sup>①</sup> The 45 mm frame is capable of 6 AWG wire maximum with the exception of insulation types RHH, RHW and RHW-2. If these insulation types are being used, use the 55 mm frame.

### Overload Relays

#### Options

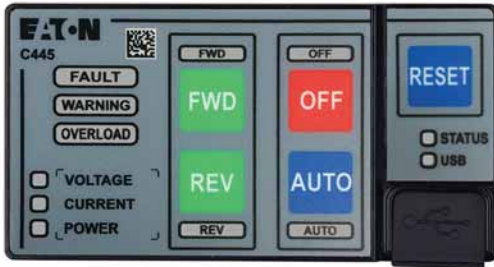
##### NEMA Color Scheme



##### User Interface—NEMA Color Scheme (English) <sup>①②</sup>

Operation Mode	Control Type (Local = UI)	Control Button(s) Action		LED Indicator Labels		Diagnostic LED Label(s)	Catalog Number
FVNR Starter	Local Only	START	OFF	RUN	OFF	FAULT, WARNING, OVERLOAD	<b>C445UC-N0</b>
FVNR Starter	Remote Only	—	F1 <sup>③</sup>	RUN	OFF	FAULT, WARNING, OVERLOAD	<b>C445UC-N1</b>
FVR Starter	Remote Only	—	F1 <sup>③</sup>	FWD REV	OFF	FAULT, WARNING, OVERLOAD	<b>C445UC-N2</b>
2-Speed Starter	Remote Only	—	F1 <sup>③</sup>	SLOW FAST	OFF	FAULT, WARNING, OVERLOAD	<b>C445UC-N3</b>
FVNR Starter	Local/Remote	— HAND	OFF AUTO	RUN HAND	OFF AUTO	FAULT, WARNING, OVERLOAD	<b>C445UC-N4</b>
FVR Starter	Local/Remote	FWD REV	OFF AUTO	FWD REV	OFF AUTO	FAULT, WARNING, OVERLOAD	<b>C445UC-N5</b>
2-Speed Starter	Local/Remote	SLOW FAST	OFF AUTO	SLOW FAST	OFF AUTO	FAULT, WARNING, OVERLOAD	<b>C445UC-N6</b>
MCCB Actuation	Local/Remote	CLOSE —	OFF AUTO	CLOSE —	OFF AUTO	FAULT, WARNING, TRIPPED	<b>C445UC-N7</b>
MCCB Actuation	Local Only	CLOSE —	OFF —	CLOSE —	OFF —	FAULT, WARNING, TRIPPED	<b>C445UC-N8</b>
Overload	Local/Remote	— TEST	F1 AUTO	RUN —	OFF AUTO	FAULT, WARNING, OVERLOAD	<b>C445UC-N9</b>

##### NEMA User Interface Example



**C445UC-N5**

##### Notes

- ① All options include a reset button, micro USB port, and four self-powered 24 Vdc digital inputs. Please see Accessories on **Page V5-T5-130** for digital inputs wiring harness options.
- ② Not all operation modes are stock items. Check with EatonCare for availability.
- ③ F1 function key is reserved for future use.

IEC Color Scheme



User Interface—IEC Color Scheme (Symbols) ①②

Operation Mode	Control Type (Local = UI)	Control Button(s) Action	LED Indicator Labels	Diagnostic LED Label(s)	Catalog Number
FVNR Starter	Local Only	○	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-10</b>
FVNR Starter	Remote Only	— F1 ③	RUN OFF	FAULT, WARNING, EARTH FAULT	<b>C445UC-11</b>
2-Speed Starter	Local Only	▶ ○	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-12</b>
FVR Starter	Local Only	▶ ○	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-13</b>
FVNR Starter	Local/Remote	○ AUTO	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-14</b>
FVR Starter	Local/Remote	▶ ○ AUTO	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-15</b>
2-Speed Starter	Local/Remote	▶ ○ AUTO	— —	FAULT, WARNING, EARTH FAULT	<b>C445UC-16</b>
MCCB Actuation	Local/Remote	○ AUTO	— —	FAULT, WARNING, TRIPPED	<b>C445UC-17</b>
MCCB Actuation	Local Only	○	— —	FAULT, WARNING, TRIPPED	<b>C445UC-18</b>
Overload	Local/Remote	— F1 ③ TEST AUTO	RUN OFF	FAULT, WARNING, EARTH FAULT	<b>C445UC-19</b>

IEC User Interface Example



C445UC-16

Notes

- ① All options include a reset button, micro USB port, and four self-powered 24 Vdc digital inputs. Please see Accessories on **Page V5-T5-130** for digital inputs wiring harness options.
- ② Not all operation modes are stock items. Check with EatonCare for availability.
- ③ F1 function key is reserved for future use.

## Overload Relays

### Accessories

#### ZEB-XCT\_



#### External Current Transformers

Use CTs and 1–5 A C445 measurement module. CT kit does not include measurement module (order separately).

CT Range (A)	Description	Terminal Size	Measurement Module	Catalog Number <sup>①②</sup>
17–300	300:5 single-phase CT, 1.25 inch dia hole, UL and CSA ANSI/IEEE C57.13, 50–400 Hz, 600 Vac, 10 kV, relay class C50, accuracy 0.3% B0.1	(2) 8–32 brass terminals, comes with mounting bracket kit	C445MA-005_	XCT300-5
75–600	600:5 single-phase CT, 2.00 inch dia hole, UL and CSA ANSI/IEEE C57.13, 50–400 Hz, 600 Vac, 10 kV, relay class C50, accuracy 0.3% B0.1	(2) 8–32 brass terminals, comes with mounting bracket kit	C445MA-005_	XCT600-5
100–800	800:5 single-phase CT, 2.50 inch dia hole, UL and CSA ANSI/IEEE C57.13, 50–400 Hz, 600 Vac, 10 kV, relay class C50, accuracy 0.3% B0.1	(2) 8–32 brass terminals, comes with mounting bracket kit	C445MA-005_	XCT800-5

#### C445X\_



#### Communication and Option Modules

Description	Catalog Number
EtherNet/IP and Modbus TCP card with 2-port switch	C445XC-E
PROFIBUS DPV0 and DVP1 card	C445XC-P
Real-time clock and memory backup module	C445XO-RTC

#### Cables, Wiring Harnesses and Spare Parts

##### Connection Cables and Accessories

D77E connection cables are required to connect the base control module to the measurement module and to the user interface. Order the appropriate lengths for each connection.

User interface wiring harnesses are required to utilize the digital inputs on the user interface. Order one wiring harness per user interface to connect to these inputs. C445XS-USBMICRO and C445XS-USBLEADS are used to connect the Power Xpert *in*Control tool (see next page for details). C445XS-USBRJ12 is used for firmware upgrades.

Description	Catalog Number
Connection cable (base control module to measurement module or user interface), 13 cm length, 600 V rating	D77E-QPIP13
Connection cable (base control module to measurement module or user interface), 13 cm length, 1000 V rating	D77E-QPIP13-HV
Connection cable (base control module to measurement module or user interface), 25 cm length, 600 V rating	D77E-QPIP25
Connection cable (base control module to measurement module or user interface), 25 cm length, 1000 V rating	D77E-QPIP25-HV
Connection cable (base control module to measurement module or user interface), 100 cm length, 600 V rating	D77E-QPIP100
Connection cable (base control module to measurement module or user interface), 100 cm length, 1000 V rating	D77E-QPIP100-HV
Connection cable (base control module to measurement module or user interface), 200 cm length, 600 V rating	D77E-QPIP200
Connection cable (base control module to measurement module or user interface), 300 cm length, 600 V rating	D77E-QPIP300
Connection cable (base control module to measurement module or user interface), 300 cm length, 1000 V rating	D77E-QPIP300-HV
User interface digital inputs wiring harness, 50 cm, 16 AWG wires	C445XU-050
User interface digital inputs wiring harness, 100 cm, 16 AWG wires	C445XU-100
User interface digital inputs wiring harness, 200 cm, 16 AWG wires	C445XU-200
User interface digital inputs wiring harness, 300 cm, 16 AWG wires	C445XU-300
Spare parts kit—terminal connectors, mounting feet	C445XS-TERM
Standard USB A male to micro USB male cable	C445XS-USBMICRO
Standard USB A male to loose leads cable (for use with Modbus Serial terminals)	C445XS-USBLEADS
Standard USB A male to RJ-12 cable (for firmware upgrades)	C445XS-USBRJ12

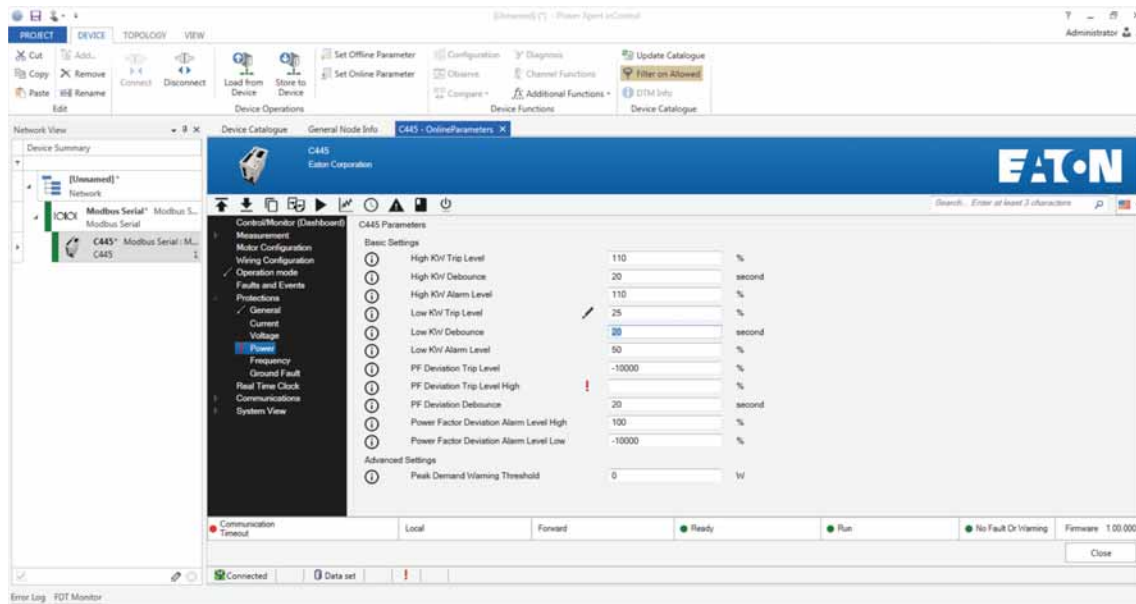
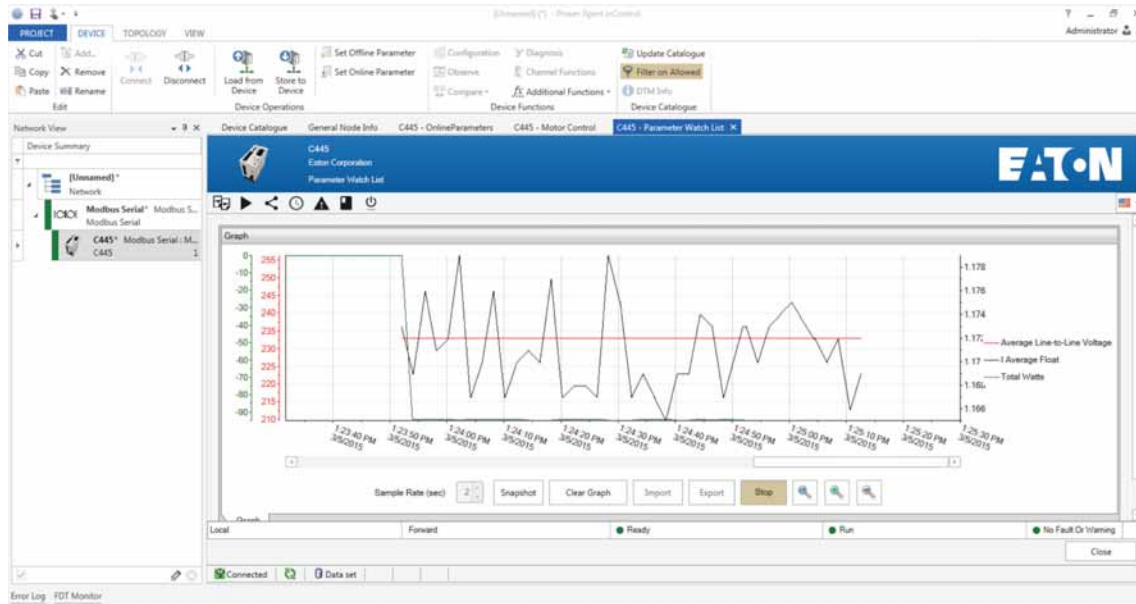
##### Notes

- ① Contact factory for availability.
- ② Catalog numbers are for one single-phase CT, order quantity of 3 for a complete C445 system.

### Power Xpert inControl Software

The Power Xpert *inControl* software tool is designed for programming, controlling and monitoring the Power Xpert C445 motor management relay. Features include loading parameters that can be saved to a file or printed, setting references, starting and stopping the motor, monitoring signals in graphical or text form and real-time display.

Power Xpert *inControl* is available for download free of charge at [www.eaton.com/C445](http://www.eaton.com/C445). Refer to Power Xpert *inControl* User Manual MN040013EN for more information.



### Power Xpert inControl Connection Cables

The following connection methods are possible between the PC running the *inControl* software and C445:

1. USB/Micro USB cable (C445XS-USBMICRO) connected to the Micro USB port on the User Interface.
2. USB/Micro USB cable (C445-USBMICRO) connected to the Micro USB port on the Base Control Module.
3. USB/RS-485 cable (C445XS-USBLEADS) connected to the RS-485 Modbus port on the Base Control Module (if ordered with the Modbus option).

### Technical Data and Specifications

#### Power Xpert C445 Motor Management Relay Short Circuit Ratings (North American CSA and UL) ①

Measurement Module Frame	Overload FLA Range	Standard-Fault Short Circuit Data				High-Fault Short Circuit Data			Thermal-Magnetic Circuit Breakers			
		480 V (kA)		600 V (kA)		Fuses (RK5)		Max. Fuse Size (A) (RK5)	480 V (kA)		600 V (kA)	Max. Breaker Size (A)
		480 V (kA)	600 V (kA)	Max. Fuse Size (A) (RK5)	Max. Breaker Size (A)	480 V (kA)	600 V (kA)	Max. Fuse Size (A) (RK5)	480 V (kA)	600 V (kA)	Max. Breaker Size (A)	
45 mm	0.3–2.4 A	5	5	6 A	15 A	100	100	6 A	100	35	15 A	
45 mm	1–5 A	5	5	20 A	20 A	100	100	20 A	100	35	20 A	
45 mm	4–32 A	5	5	125 A	125 A	100	100	125 A	100	35	125 A	
45 mm	6–45 A	5	5	175 A	175 A	100	100	175 A	100	35	175 A	
55 mm	9–72 A	10	10	250 A	250 A	100	100	250 A	100	35	250 A	
90 mm	11–90 A	10	10	360 A	360 A	100	100	360 A	100	50	360 A	
90 mm	17–136 A	10	10	400 A	400 A	100	100	400 A	100	50	400 A	

#### Power Xpert C445 Motor Management Relay Short Circuit Ratings (IEC) ①

Measurement Module Frame	Overload FLA Range	Standard-Fault Short Circuit Data					High-Fault Short Circuit Data			Thermal-Magnetic Circuit Breakers					
		480 V (kA)		690 V (kA)		Max. Fuse Size (A) (gG)	Max. Breaker Size (A) 480 V	Max. Breaker Size (A) 690 V	Fuses (gG)		480 V (kA)		690 V (kA)	Max. Breaker Size (A) 480 V	Max. Breaker Size (A) 690 V
		480 V (kA)	690 V (kA)	Max. Fuse Size (A) (gG)	Max. Breaker Size (A) 480 V	Max. Breaker Size (A) 690 V	480 V (kA)	690 V (kA)	Max. Fuse Size (A) (gG)	480 V (kA)	690 V (kA)	Max. Breaker Size (A) 480 V	Max. Breaker Size (A) 690 V		
45 mm	0.3–2.4 A	1	1	16 A	15 A	N/A	100	100	10 A	100	N/A	15 A	N/A		
45 mm	1–5 A	1	1	20 A	20 A	20 A	100	100	20 A	100	80	20 A	20 A		
45 mm	4–32 A	3	3	125 A	125 A	125 A	100	100	125 A	100	80	125 A	125 A		
45 mm	6–45 A	3	3	200 A	175 A	160 A	100	100	125 A	100	80	175 A	160 A		
55 mm	9–72 A	5	5	250 A	250 A	250 A	100	100	160 A	100	80	250 A	250 A		
90 mm	11–90 A	5	5	360 A	360 A	360 A	100	100	360 A	100	80	360 A	360 A		
90 mm	17–136 A	10	10	400 A	400 A	400 A	100	100	400 A	100	80	400 A	400 A		

#### Power Xpert C445 Technical Data and Specifications

Description	Specification
<b>Electrical, Motor/Load Ratings</b>	
Operating voltage	110–690 Vac 4160 Vac with Potential Transformer (PT) ratios between 35:1 and 6:1 (purchased separately) (PT) ②
Trip class	5–40, selectable in 5 step increments
Operating current (FLA) range	Varies by measurement module frame. See below.
45 mm measurement module	0.3–2.4 A; 1.0–5.0 A; 4.0–32.0 A; 6–45 A
55 mm measurement module	9.0–72.0 A
90 mm measurement module	11.0–90.0 A; 17.0–136.0 A
Rated frequency	20–80 Hz ②
Application(s)	Single-phase, three-phase
Accuracy	Current: 2% within 30–125% of FLA; 3% ≤ 500% of FLA Voltage: 2% within 110 Vac, 690 Vac Power: 5%
Rated supply voltage	120/240 Vac (or) 24 Vdc
Operating supply voltage range	94–264 Vac (or) 18–30 Vdc
Overvoltage category	24 Vdc = III 120/240 = II
Maximum power consumption	Less than 8 W—varies by module, see below
Base control module + measurement module	Less than 5 W
User interface	Less than 1.5 W
Communication card	Less than 2 W

#### Notes

- ① Short circuit protective device (SCPD) sizing per NEC: Max = 400% of FLA under 100 A, 300% of FLA over 100 A.
- ② Published monitoring accuracies are across the frequency range of 47–63 Hz.

**Power Xpert C445 Technical Data and Specifications, continued**

Description	Specification
<b>Environmental Ratings</b>	
Ambient temperature (operating)	–40 to 60 °C (–40 to 140 °F)
Ambient temperature (storage)	–40 to 85 °C (–40 to 185 °F)
Operating humidity [UL991 (H3)]	5–95% noncondensing
Altitude NEMA ICS1	2000 meters (6600 feet)
Shock IEC 60068-2-27	15 g any direction for 11 milliseconds, non-operating
Vibration IEC 60068-2-6	5 g non-operating and 3 g operating in any direction
Pollution degree per IEC 60947-4-1	3
Ingress protection	IP20 (Base Control Module / Measurement Module) IP54 (User Interface)
Mean time between failures (MTBF)	20 years at 50 °C
<b>Safety</b>	
Thermal overload protection	Per UL 60947-4-1, IEC 60947-4-1
Binary PTC protection	IEC 60947-8
Safety integrity level	SIL 1 (reference 50495)
<b>Electrical / EMC</b>	
Radiated emissions IEC/EN 60947-4-1, Table 15 EN 55011 (CISPR 11) Group 1, Class A	30–1000 MHz
Conducted emissions IEC/EN 60947-4-1, Table 14 EN 55011 (CISPR 11) Group 1, Class A	0.15–30 MHz
ESD immunity per IEC 61000-4-2	± 8 kV air, ± 4 kV contact
Radiated immunity per IEC 61000-4-3	10 V/m 80–1000 MHz 80% amplitude modulation 1 kHz sine wave
Fast transient per IEC 61000-4-4	± 2 kV power ± 1 kV signals, data and control
Surge per IEC 61000-4-5	± 1 kV line-to-line ± 2 kV line-to-ground
Conducted immunity per IEC 61000-4-6	10 V, 0.15–80 MHz 80% amplitude modulation 1 kHz sine wave
Magnetic field per IEC 61000-4-8	30 A 50/60 Hz
Voltage dips per IEC 61000-4-11	Class 2, 110 Vac 60 Hz, 230 Vac 50 Hz 0% during 1/2 cycle 0% during 1 cycle 70% during 25/30 cycles  Note: 70% refers to 70% of nominal operating voltage, 0% refers to 0% of operating voltage, 25/30 cycles correlates to 50/60 Hz.
<b>Output Relay Ratings (Base Control Module)</b>	
Three mono-stable output relays One Form C (NO/NC) Two Form A (NO)	B300 pilot duty on all relays R300 pilot duty on NO relays only
Rated operating current	3 A at 120 Vac, 1.5 A at 240 Vac 1.5 A at 24 Vdc, 0.22 A at 125 Vdc, 0.1 A at 250 Vdc
Utilization category	AC-15; DC-13



## Power Xpert C445 Technical Data and Specifications, continued

Description	Specification						
<b>Input Ratings (Base Control Module)</b>							
Supply voltage	24 Vdc	120 Vac					
Number of inputs	4	4					
Type of inputs	Digital	Digital					
On-state voltage	15–20 Vdc	79–132 Vac					
Off-state voltage	0–5 Vdc	0–30 Vac					
Overvoltage category	III	II					
<b>Input/Output Terminal Blocks</b>							
Wire capacity	30–12 AWG ①						
Screw torque requirement	3.5–4.4 in-lb (0.4–0.5 Nm)						
<b>Measurement Module Current Pass Through</b>							
Measurement module size (current range)	45 mm (0.3–2.4 A)	45 mm (1–5 A)	45 mm (4–32 A)	45 mm (6–45 A)	55 mm (9–72 A)	90 mm (11–90 A)	90 mm (17–136 A)
Supported conductor							
NA 600 V (AWG)	6 AWG	6 AWG	6 AWG	6 AWG	3 AWG	2/0 AWG	2/0 AWG
EMEA 690 V (mm <sup>2</sup> )	16 mm <sup>2</sup>	16 mm <sup>2</sup>	16 mm <sup>2</sup>	16 mm <sup>2</sup>	25 mm <sup>2</sup>	70 mm <sup>2</sup>	70 mm <sup>2</sup>
<b>Voltage Terminals</b>							
Terminal screw torque requirement	3.5–4.4 in-lb (0.4–0.5 Nm)						
Maximum wire capacity (for voltage input terminals)	12–26 AWG solid 0.13 to 3.31 mm <sup>2</sup>						

## PTC Specifications

Description	Specification
Standard	EN 60947-8/A1:2006 "Mark A Control Unit"
Compatible thermal detectors	Mark A type (abrupt characteristic change) as described in EN 60947-8/A1:2006 Annex A wired in series
Terminals	Marked T1 and T2 12–30 AWG solid (0.13–4 mm <sup>2</sup> )
Cold resistance	≤1500 ohms
Measuring voltage	≤2.5 V for resistance ≤1330 ohms ≤7.5 V for resistance ≤4 kohms ≤9.0 V open circuit
Temperature rise response	3600 ohms ±10%
Over temperature reset	1500 ohms ±10%
Short-circuit response	Between 10 and 20 ohms
Short-circuit reset	Between 20 and 40 ohms
Wire break response	20 k to 40 kohms
Isolation	U <sub>imp</sub> = 4 kV

**Note**

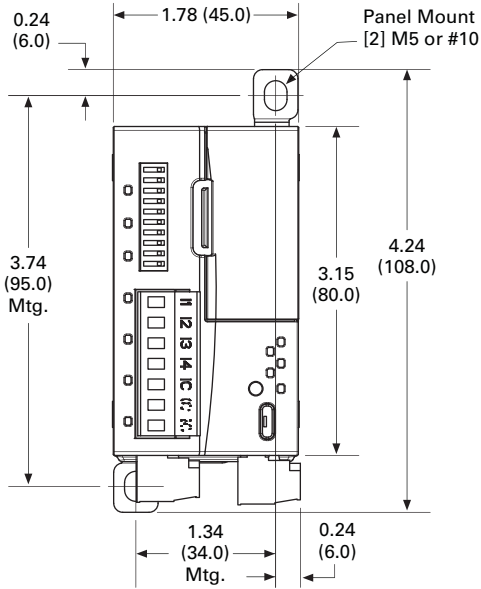
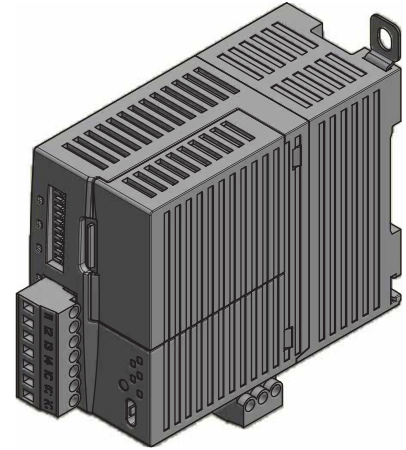
① Use only UL Listed or recognized conductors. Copper wire rated 75C for all field wiring terminals and main conductor wiring.

**Dimensions**

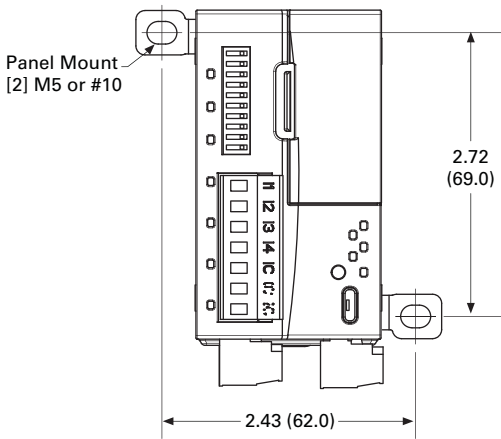
**Power Xpert C445 Motor Management Relay**

Approximate Dimensions in Inches (mm)

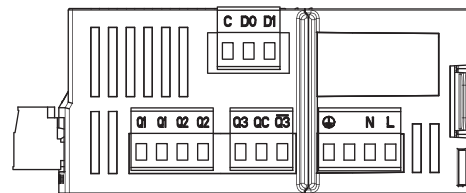
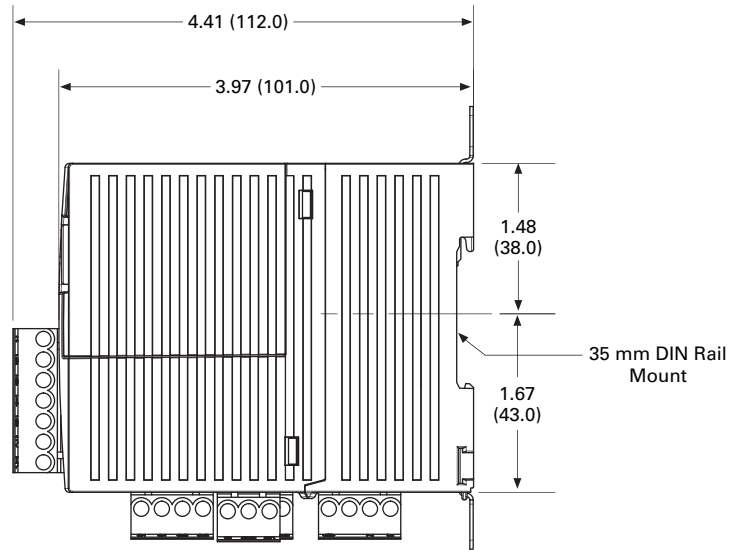
**Base Control Module**



**Panel Mount Option 1**



**Panel Mount Option 2**

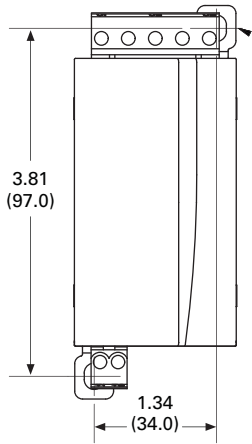
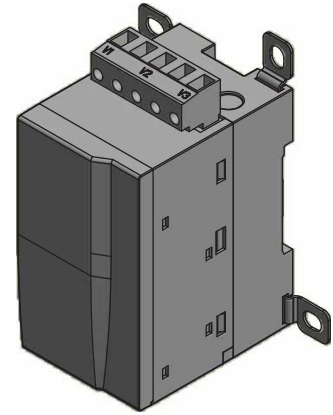
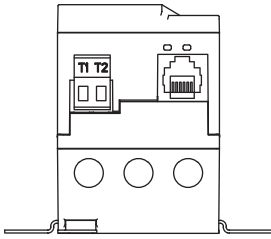


### Overload Relays

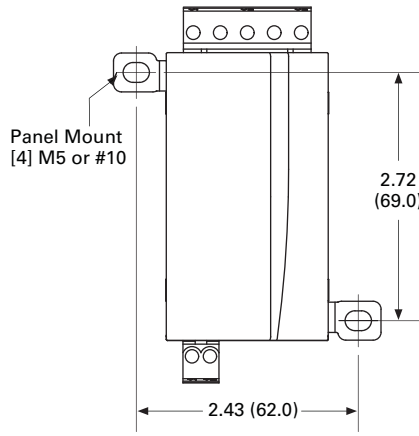
Approximate Dimensions in Inches (mm)

#### Measurement Module—45 mm Frame

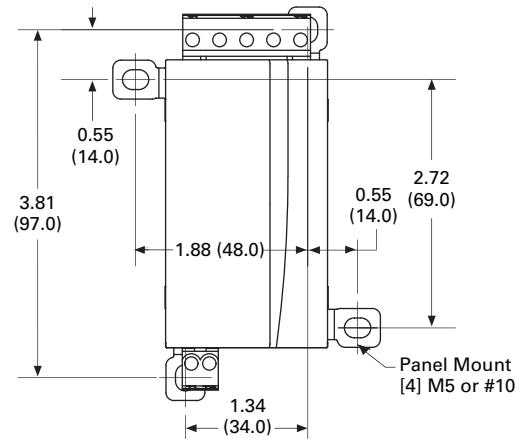
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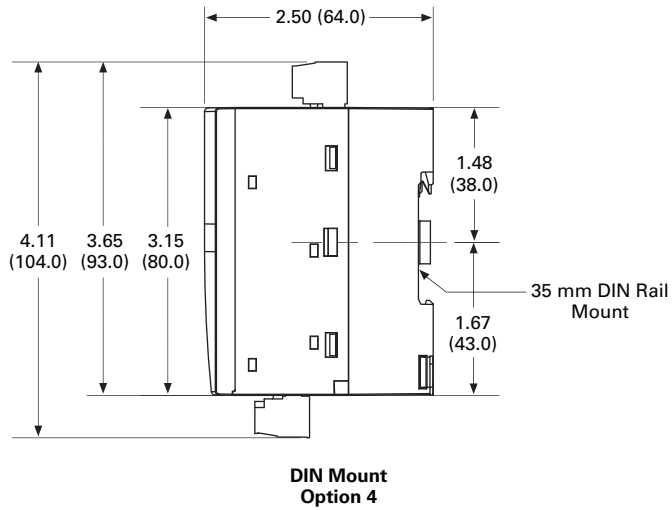
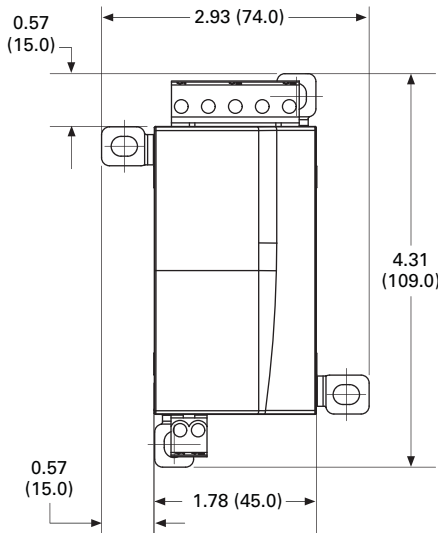
**Panel Mount  
Option 1**



**Panel Mount  
Option 2**



**Panel Mount  
Option 3**

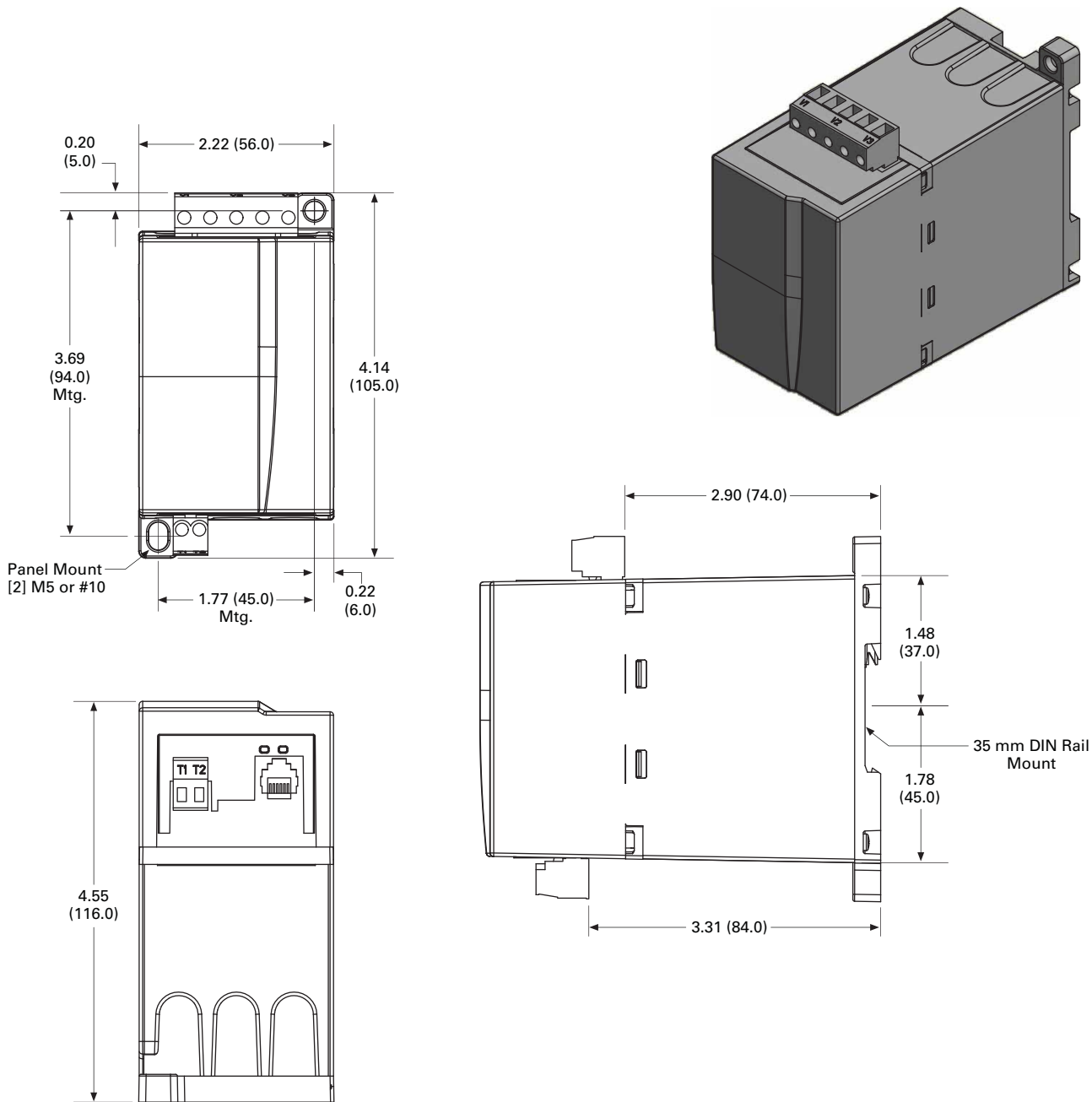


**DIN Mount  
Option 4**

**Note:** Measurement Module part shown has factory-installed terminals for all measurement options (current, voltage and PTC).

Approximate Dimensions in Inches (mm)

**Measurement Module—55 mm Frame**



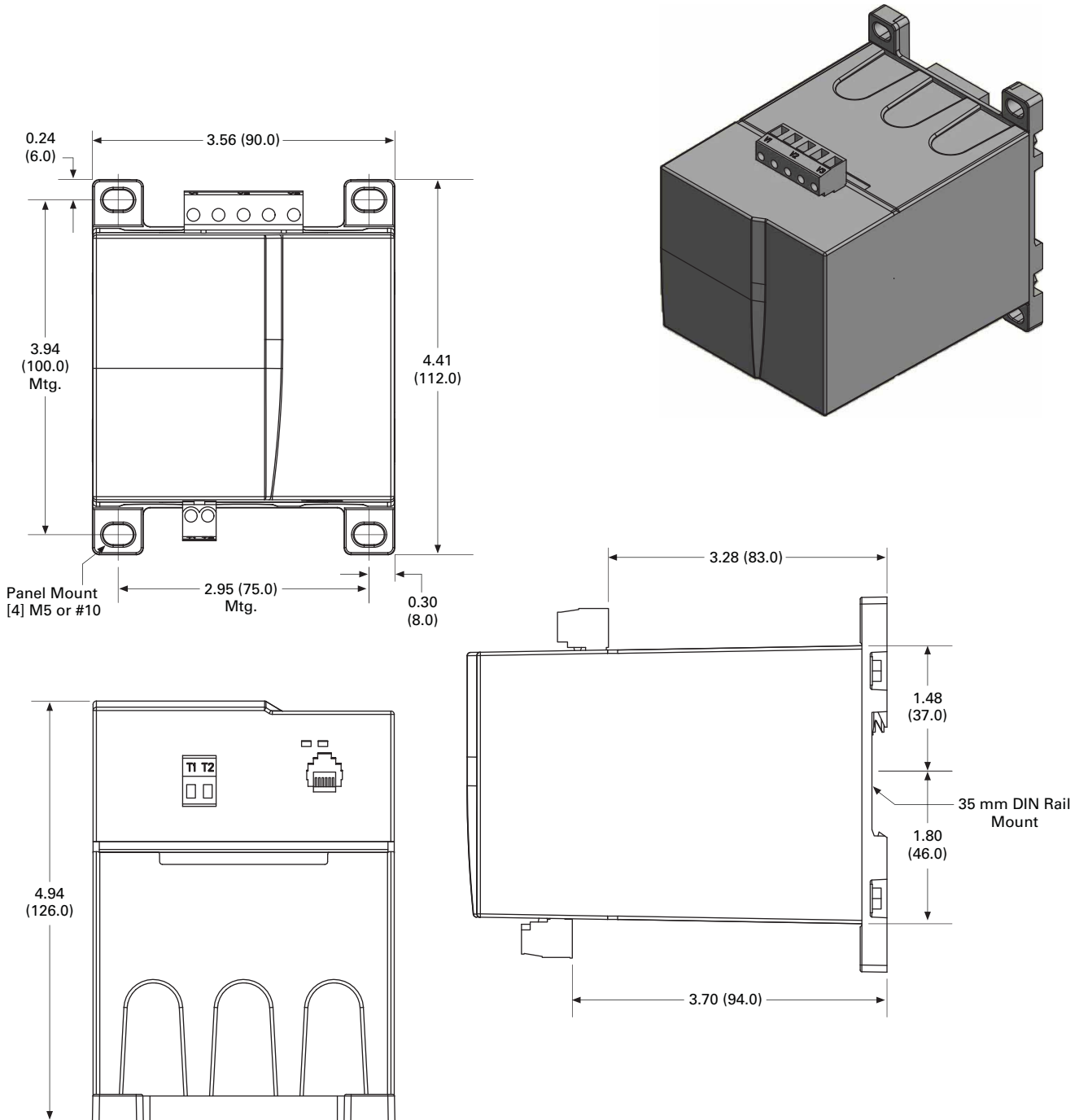
**Note:** Measurement Module part shown has factory-installed terminals for all measurement options (current, voltage and PTC).

## Overload Relays

Approximate Dimensions in Inches (mm)

### Measurement Module—90 mm Frame

5



**Note:** Measurement Module part shown has factory-installed terminals for all measurement options (current, voltage and PTC).

Approximate Dimensions in Inches (mm)

User Interface

