Edison single-phase capacitor switch

Description

Eaton's Cooper Power™ series Edison capacitor switch delivers economical, reliable, and flexible solutions for demanding capacitor switching application needs. Our advanced vacuum interrupter encapsulated within a durable, environmentally friendly, cycloaliphatic epoxy insulation furnishes a switch that is highly resistant to ozone, moisture, contamination, and ultraviolet light.

Edison capacitor switches are operable in vertical and horizontal mounting orientations. The patented terminal ring design allows for 360 degree load termination without breaking any seals for easy installation. See Figure 2. The switch is designed for applications in pole-mounted, substation, and metal-enclosed capacitor banks. This flexible arrangement is ideal for replacing older switches.

Edison capacitor switches are designed to operate under extreme undervoltage applications across the entire -40 to +60 °C temperature range.

Through the combined use of advanced material technology, solid insulation, and high performance vacuum interrupters, the switch has been designed to eliminate or reduce operation and maintenance expenses.

This innovative approach yields operational savings.

- No regular maintenance
- Gas-, foam-, oil-, and regulation-free
- Lightweight and installation friendly
- Advanced Eaton vacuum technology provides trouble free capacitor switching
- Robust, simple permanent magnet latching mechanism provides highest reliability

Designed and manufactured in accordance with IEEE Std C37.66™-2005 standard, the Edison capacitor switch is available in 15 kV or 25 kV ratings.

Features and detailed description

The Edison capacitor switch uses a permanent magnetic latching solenoid (no cams, linkages, or struts). See Figure 1.

This unique design offers the following benefits:

- Low energy requirements to close and open the switch
- Separate open and close coils eliminate the need for circuit boards or relays in the body of the switch
- Critical opening operation powered by a heavy duty precision spring which provides consistent opening speeds that are effectively immune to variations in ambient temperature

All of the Edison capacitor switches can be opened and closed electrically by applying rated control voltage to the proper terminals of the actuator receptacle.

Consistent operating speeds make the Edison Capacitor Switch ideal for Zero Voltage Closing (ZVC) applications.

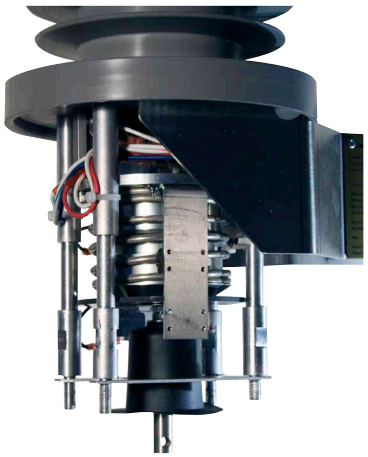


Figure 1. Operating mechanism.

Additionally, the switches can be manually opened by using a hotstick to operate the yellow manual operating handle located under the bottom of the switch.

Switch operation

Connections to the actuating mechanism are made through the standard five-pin or six-pin receptacle on the tank body. See Table 1.

Table 1. Control Wiring Specifications

Number of Pins	MIL Spec
5	MS3102E18-11P
6	MS3102E18-12P

Remote control of the switch is supplied by the customer. The control supplied must provide momentary open and close signals of at least 100 milliseconds for each operation.

Manual open

Edison capacitor switches feature a manual trip handle. Manual trip works with or without supply power. Also, the manual trip handle serves double-duty as a switch position indicator.

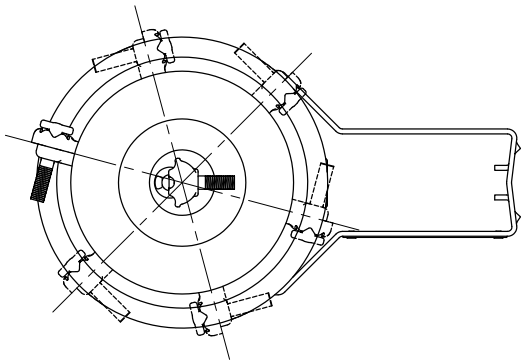


Figure 2. The patented 360 degree terminal ring for installment flexibility.

Vacuum interruption

Eaton vacuum interrupters, specifically designed for capacitor switching, include greatly enhanced contact life. Fast mechanism operation combined with the superior interrupting capabilities of our vacuum interrupter limits prestrike and restrike of switch contacts. Additionally, the high-temperature rated contacts further extend switch mechanical life.

A break on the single phase is accomplished by separating contacts inside the vacuum interrupter. All arcing is contained within the vacuum envelope.

Figure 3. Vacuum interrupter in 15 kV and 25 kV switch ratings.

Construction

Solid dielectric insulation eliminates the need for insulating gas, foam, or oil, thereby greatly reducing life-cycle maintenance costs. The design ensures maintenance free performance throughout an operating temperature range of -40 °C to +60 °C.

Environmental performance

Cycloaliphatic epoxy resists damage caused by ultraviolet radiation. Over 30 years of proven experience of cycloaliphatic epoxy in harsh climates confirms that the Edison capacitor switch will maintain a smooth, self-cleansing, unblemished surface with low-adhesion to contaminants when exposed to ultraviolet radiation.

Hydrophobicity

Cycloaliphatic epoxy maintains excellent hydrophobicity and is highly resistant to moisture absorption. This prevents the continuous sheets of water that could form leakage current paths which, when heated by continuous flow, create a dry band path that deteriorates the creepage withstand level.

The cycloaliphatic epoxy's exceptional ability to resist electrical tracking reduces both flashovers and the associated cost of repairs. The epoxy combines surface-tracking characteristics with robust alternating shed designed per IEC 60815 to provide maintenance free service even in extreme pollution conditions.

Ratings and specifications

Table 2. General Specifications

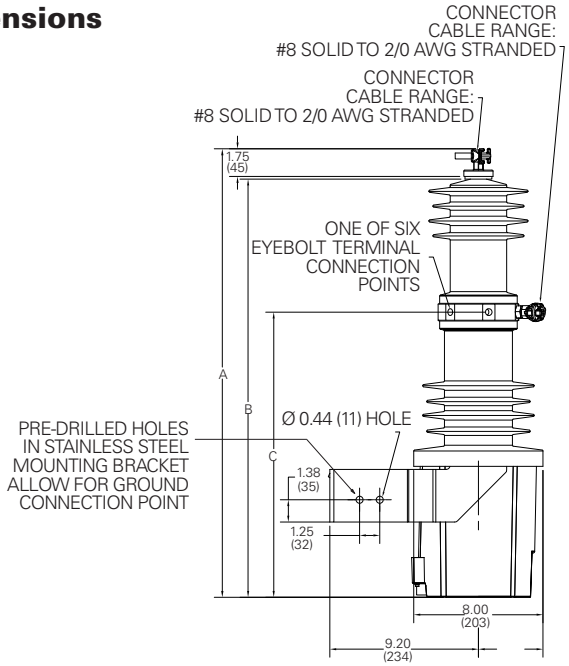
Voltage Class	**15 kV**		**25 kV**	
Switch Type	**ECS15-95**	**ECS15-125**	**ECS25-125**	**ECS25-150**
Rated Maximum Voltage, 50/60 Hz				
Ungrounded capacitor banks, L-L (kV)	15.6	15.6	25	25
Solidly grounded capacitor banks, L-L (kV)	15.6	27	25	38
Impulse Withstand Voltage				
Open contact kV (BIL)	95	95	125	125
Line to ground (kV BIL)	95	125	125	150
Withstand Voltage, 50/60 Hz				
Power Frequency Dry Withstand (kV)	60	50	60	70
Power Frequency Wet Withstand (kV)	50	60	50	60
Continuous current 50/60 Hz (A)	200	200,400	200	200
Capacitive switching current 50/60 Hz (A)	200	200,400	200	200
Fault making peak current (A)	15,000	15,000	15,000	15,000
Symmetrical fault making current (A)	6,000	6,000	6,000	6,000
Withstand peak current (A)	15,000	15,000	15,000	15,000
Short-time symmetrical withstand current (A)	4,500	4,500	4,500	4,500
High frequency transient making peak current (A)	9,000	9,000/12,000*	9,000	9,000
Rated transient inrush frequency (Hz)	6,000	6,000	6,000	6,000
Creepage Distance				
Terminal to terminal (mm)	440	600	813	813
Terminal to ground (mm)	498	610	610	813
Operating Voltage Range, 50/60 Hz**				
110/120 Vac (V)	75 - 130	75-130	75 - 130	75-130
240 Vac (V)	150 - 260	150-260	150 - 260	150-260
Nominal Control Current				
110/120 Vac for 100 msec (A)	9	9	9	9
240 Vac for 100 msec (A)	6	6	6	6
Weight (lb/kg)	32/14	33/15	33/15	34/16
Operating temperature range	-40 °C to +60 °C	-40 °C to +60 °C	-40 °C to +60 °C	-40 °C to +60 °C
Mechanical operations	50,000	50,000	50,000	50,000
Aux Contact Rating				
110/120 Vac (A)	20	20	20	20
240 Vac (A)	20	20	20	20
110/120 Vdc (A)	0.20	0.20	0.20	0.20

* The 15.6 kV rated Edison Capacitor Switch is available with an optional High Frequency Transient Making Peak Current of 12 kA. Contact factory for additional information.

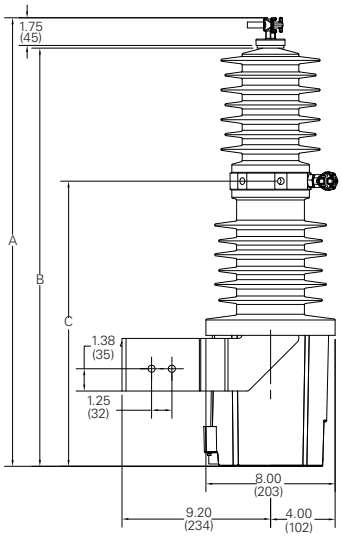
** Contact factory for more information regarding dc control voltages.

Note: The durability of the Edison capacitor switch was demonstrated by completing a minimum of 50,000 mechanical operations after performing the Mechanical Life Test in accordance with IEEE Std C37.66™-2005 standard. One operation is defined as 1 close and 1 open operation.

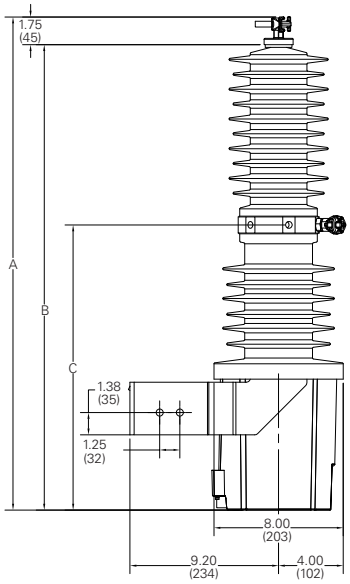
Dimensions



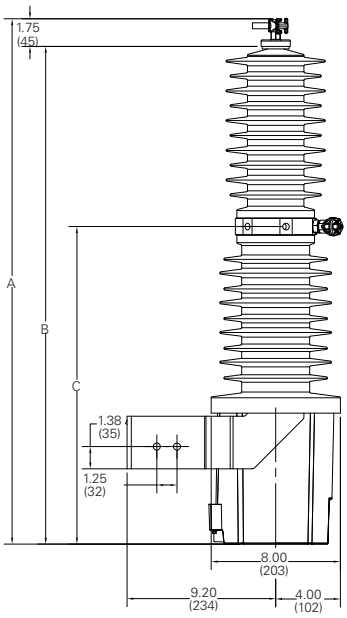
15 kV 95/95 kV BIL (200A)



15 kV 95/125 kV BIL (200A)



15kV 125/125 kV BIL (400A)
25kV 125/125 kV BIL (200A)



15kV 125/150 kV BIL (400A)
25kV 125/150 kV BIL (200A)

Dimensions	A	B	C
95/95 kV BIL	27.78 (706)	25.89 (659)	17.69 (449)
95/125 kV BIL	27.78 (706)	25.89 (659)	17.69 (449)
125/125 kV BIL	30.54 (776)	28.81 (732)	17.69 (449)
125/150 kV BIL	32.54 (827)	30.81 (783)	19.69 (500)

Note: All dimensions are inches (mm). Dimensions shown are approximate.

Creepage	95/95 kV BIL	95/125 kV BIL	125/125 kV BIL	125/150 kV BIL
Terminal to Terminal	17.3 (440)	23.6 (600)	32.0 (813)	32.0 (813)
Terminal to Ground	19.6 (498)	24.0 (610)	24.0 (610)	32.0 (813)

Figure 4. Edison capacitor switch dimensions.

Ordering information

Table 3. Edison Capacitor Switch Catalog Numbering System

1	2	3	4	5	6	7	8	9	10	11	12	13*	14*	15*	16*
E	C	S	A	1	1	1	B	A	1	0	0	0	B	0	A

Standard Catalog Number → | ← Optional Accessories

* Digits 13 through 16 are included as part of the catalog number only when optional accessories are required by the customer. Available options for digits 11-16 are shown on page 6.

Catalog Number Digits

Digits 1-3 Edison Capacitor Switch

Digit 4 Maximum Voltage Rating

A	15.6 kV Maximum Voltage Rating (English Nameplate)
B	25.0 kV Maximum Voltage Rating (English Nameplate)
D*	25.0 kV/15 kV Maximum Voltage Rating (Dual Rating/English Nameplate)

* Only valid for "324" and "333" option codes in digits 5, 6, and 7.

Digit 8 Vacuum Bottle Rating*

B	Eaton 1 (15.6 kV @ 200A)
C	Eaton 2 (25.0 kV @ 200A)
E	Eaton 1 (15.6 kV @ 400A)*

* The 400A options requires option "1" in digit 12 of the catalog number"

Valid Creepage and BIL Option Groups

Digit 5 Open Contact Bushing Creepage Distance (Upper Bushing)

Digit 6 Terminal-to-Ground Bushing Creepage Distance (Lower Bushing)

Digit 7 Open Contact (Upper Bushing) and Terminal-to-Ground (Lower Bushing) BIL Level

Digit 5	Digit 6	Digit 7	Creepage and BIL Description
1	1	1*	1 = 17.3" (15.6kV) 1 = 19.6" (15.6kV) 1 = 95kV BIL/95kV BIL (15.6kV)
2	2	2*	2 = 23.6" (15.6kV, 25.0kV Grounded Wye) 2 = 24.0" (15.6kV, 25.0kV Grounded Wye) 2 = 95kV BIL/125kV BIL (15.6kV, 25.0kV Grounded Wye)
3	2	4**	3 = 32.1" (25.0kV) 2 = 24.0" (25.0kV Grounded Wye) 4 =125kV BIL/125kV BIL (25.0kV)
3	3	3**	3 = 32.1" (25.0kV, 38.0kV Grounded Wye) 3 = 32.0" (25.0kV, 38.0kV Grounded Wye) 3 =125kV BIL/150kV BIL (25.0kV,38.0kV Grounded Wye)

* Options codes "111" and "222" in digits 5, 6 & 7 are not valid when 400A continuous current rating is required.

** Option codes "324" or "333" are valid for 400A continuous current rating.

Digit 9 Factory-Wired Receptacle (Std.)

A	5-Pin/3-Conductor Receptacle (Std.)
B	5-Pin/5-Conductor Receptacle AUX A-N.O. Contact
C	5-Pin/5-Conductor Receptacle AUX B-N.C. Contact
D	6-Pin/6-Conductor Receptacle AUX C-N.O./N.C. Contacts
E	5-Pin/5-Conductor Receptacle (Non-Std. Wiring)

Selection of Factory-Wired Receptacle determines configuration of Mating Plug and Conductor Cable (Digit 13) Consult factory for more available options.

Digit 10 Solenoid Control Voltage*

1	110/120 Vac (70 Vac-130 Vac)
2	240 Vac (150 Vac-260 Vac)

* Contact factory for more information on DC control voltages.

Table 3. Edison Capacitor Switch Catalog Numbering System (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13*	14*	15*	16*
E	**C**	**S**	**A**	**1**	**1**	**1**	**B**	**A**	**1**	**0**	**0**	**0**	**B**	**0**	**A**

Standard Catalog Number → | ← Optional Accessories →

* Digits 13 through 16 are included as part of the catalog number only when optional accessories are required by the customer.

Digit 11 Customer Specific Option

Option	Description	Catalog No.
0*	Standard Edison capacitor switch	N/A

* Assume "0" if field is blank.

Digit 12 Customer Specific Options

Option	Description	Catalog No.	Catalog No.
0*	Standard Edison capacitor switch	N/A	N/A
1**	Optional Line and Load Terminal Eyebolt supplied with Edison capacitor switch. Conductor cable range is #6 solid through 350 MCM	GCS521X2(1)	GCS511X2(1)
2†	Zero Volt Control (ZVC) configured Edison capacitor switch for use with 60Hz (open) and DC pulse (close) operation (Valquest Z-Cap ZVC Control)	N/A	N/A
3††	Zero Volt Control (ZVC) configured Edison capacitor switch for use with DC pulse for open & close operations	N/A	N/A

* Assume "0" if field is blank.

** Required option for 400A continuous current rating.

† Contact factory for further information regarding applications using the Valquest Z-Cap Zero Voltage Control (ZVC).

†† Contact factory for further information regarding type of Zero Voltage Control (ZVC).

Digit 13 Mating Plug and Conductor Cable Options***

Option	Description	Catalog No.
0*	Mating Plug or Conductor Cable Not Supplied (Std)	-
A	5-Pin Mating Plug	CCR010P1
B	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (3ft)	CCR003P3
C	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (5ft)	CCR003P5
D	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (6ft)	CCR003P6
E	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (8ft)	CCR003P8
F	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (10ft)	CCR003P10
G	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (12ft)	CCR003P12
H	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (14ft)	CCR003P14
J	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (18ft)	CCR003P18
K	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (20ft)	CCR003P20
L	5-Pin Mating Plug with 5-Pin/3-Conductor Cable (22ft)	CCR003P22
M	6-Pin Mating Plug	CCR009P1
N	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (3ft)	CCR006P3
P	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (6ft)	CCR006P6
Q	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (8ft)	CCR006P8
R	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (10ft)	CCR006P10
S	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (12ft)	CCR006P12
T	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (14ft)	CCR006P14
U	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (16ft)	CCR006P16
V	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (18ft)	CCR006P18
W	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (20ft)	CCR006P20
X	6-Pin Mating Plug with 6-Pin/6-Conductor Cable (22ft)	CCR006P22

* Option only valid when accessories are required. Consult factory for more available options.

** Contact factory for 5-pin/5-wire capacitor switch cable options.

***Selection of Factory-Wired Receptacle (Digit 9) determines configuration of Mating Plug and Conductor Cable

Digit 14 Wildlife Protector Kit Options

Option	Description	Catalog No.
A*	Wildlife Protectors Order Separately as Standard or not Supplied	–
B	Standard Wildlife Protectors Kit includes Terminal Ring, Line Terminal, and Load Terminal Guards	CCM051A1
C**	Wildlife Protectors Kit for 350 MCM eyebolt includes Terminal Ring, Line Terminal & Load Terminal Guards	CCM051A2

(option E in digit 8 for 400A rating OR option 1 in digit 12 for 200A rating)

* Option only valid when accessories are required.

** Required when 350 MCM eyebolt is selected (option 1 in digit 12)

Digit 15 Load Terminal Options

Option	Description	Line Terminal	Load Terminal
0*	Standard Load Terminal (Eyebolt) Supplied with switch. Conductor cable range #8 solid to 2/0 AWG:	GCS521X1 (1)†	GCS511X1 (1)
1	**Additional** Load Terminal (Eyebolt) Supplied with switch. Conductor cable range #8 solid to 2/0 AWG	GCS521X1 (1)†	GCS511X1 (2)
2**	**Optional** Load Terminal (Eyebolt) Supplied with switch. Conductor cable range #6 solid to 350 MCM 200A switch	GCS521X2 (1)†	GCS511X2 (1)

* Option only valid when accessories are required.

** Required option for 400A continuos current rating.

† Not sold separately.

Digit 16 Customer Specific Options

Option	Description	Catalog No.
A*	Standard Options for Edison capacitor switch	-
B	Parallel Groove Connector supplied for Ground Connection to SS Bracket (Assembled to Bracket)	37200F1 Kit

* Option only valid when accessories are required.

Receptacle, accessories and mounting equipment

Table 4. Receptacle Assembly

Description	Catalog Number
Standard Receptacle Pin Orientation (Figure 5)	N/A (not sold separately)

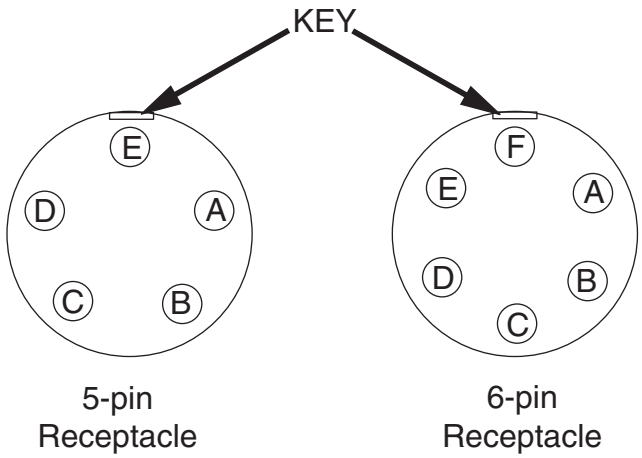


Figure 5. Standard receptacle pin orientation.

Table 5. Wildlife Restraint Equipment

Description	Catalog Number
Bird Guards (complete set for switch)	CCM051A1 (includes CCM049A1, CCM050A1, CCM050A2)
Line Terminal Guard (Figure 6)	CCM049A1
Line Terminal Guard (Figure 7)	CCM042A1*
Ring Terminal Guard (Figure 8)	CCM050A1
Load Terminal Guard (Figure 9)	CCM050A2

* Required for 350 MCM eyebolt connector when option "E" in digit 8 or option "1" in digit 12 are selected

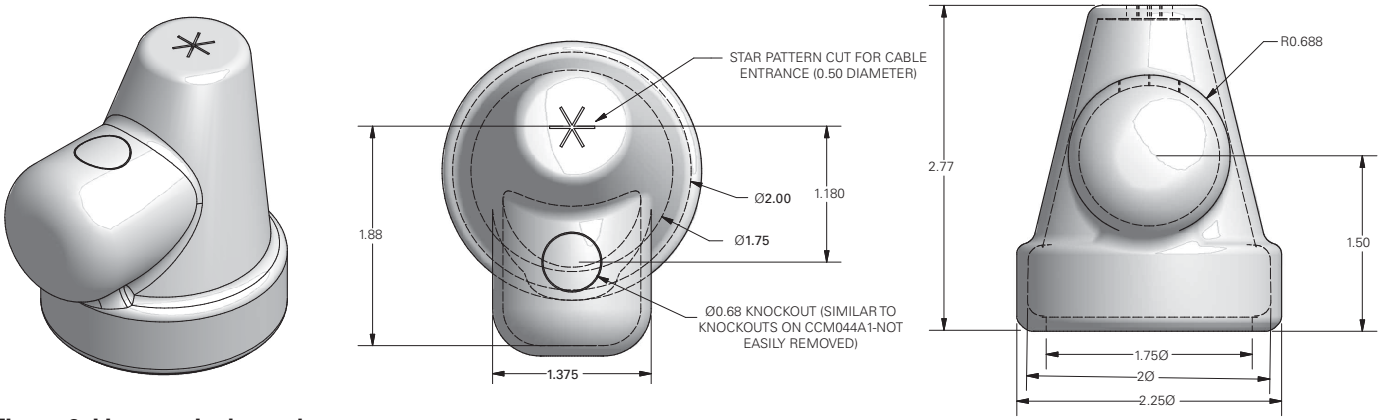


Figure 6. Line terminal guard.

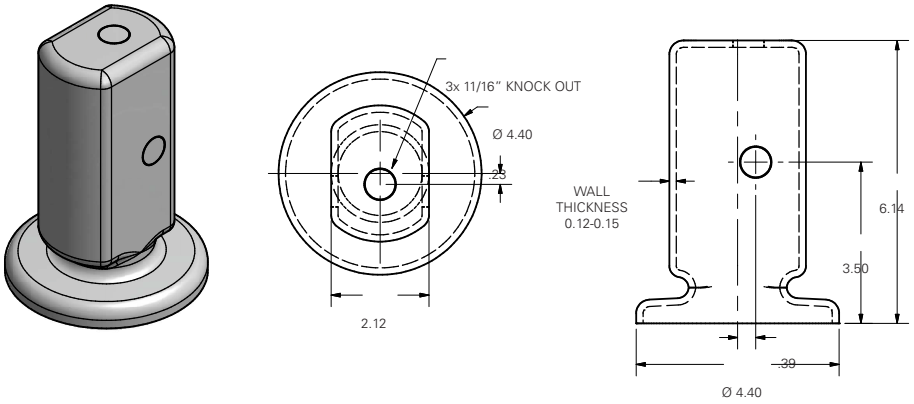


Figure 7. Required for 350 MCM eyebolt.

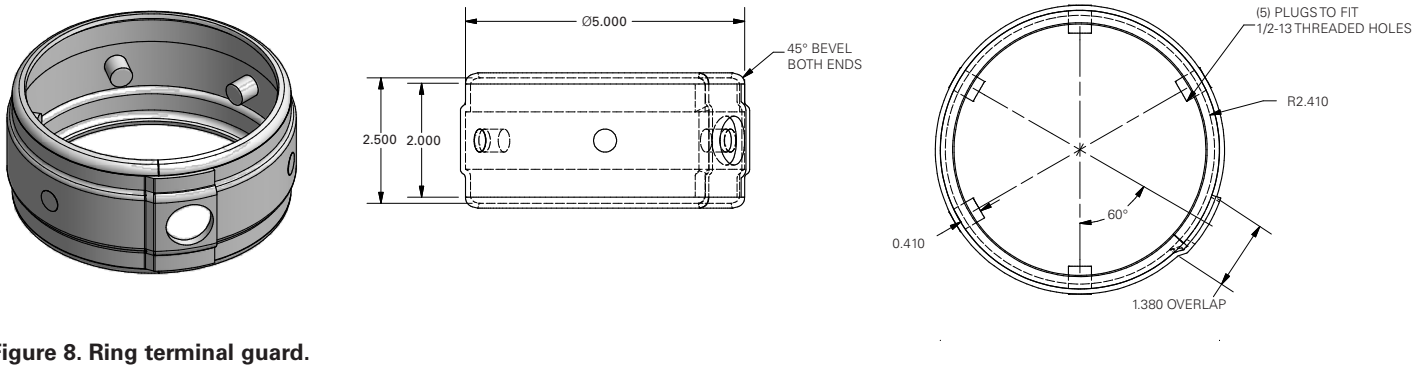


Figure 8. Ring terminal guard.

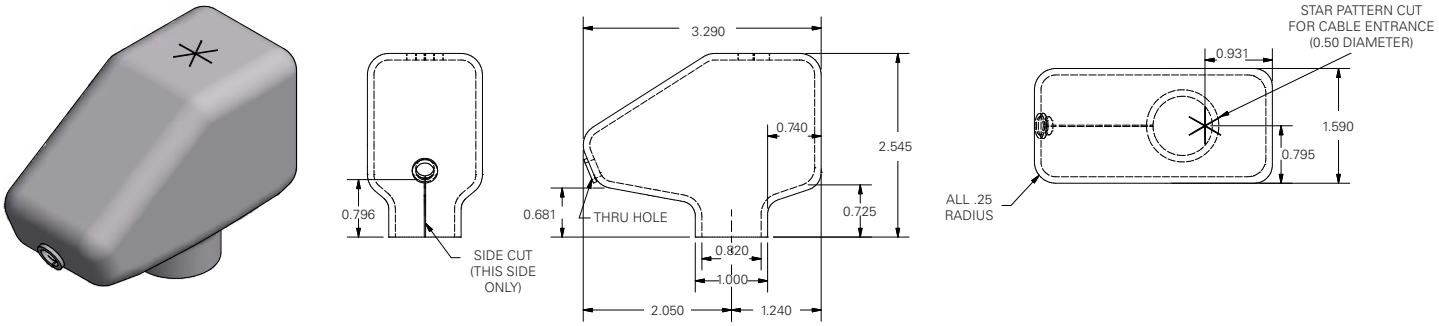


Figure 9. Load terminal guard.

Table 6. Load terminal connector

Description	Catalog Number
Eyebolt Connector for Ring Terminal (Figure 10)	GCS511X1 (Standard)
Eyebolt Connector for Ring Terminal (Figure 11)	GCS511X2 (350 MCM)

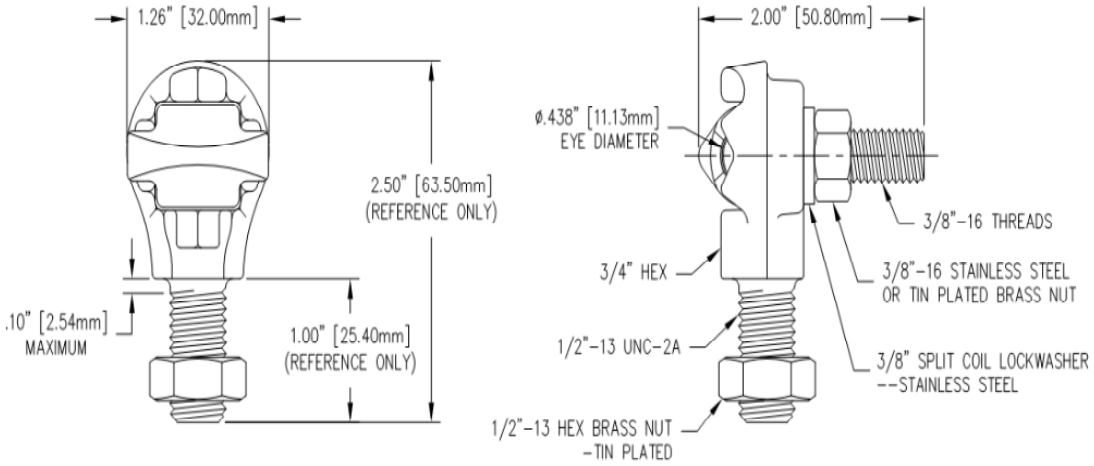


Figure 10. Eyebolt connector dimensional information.

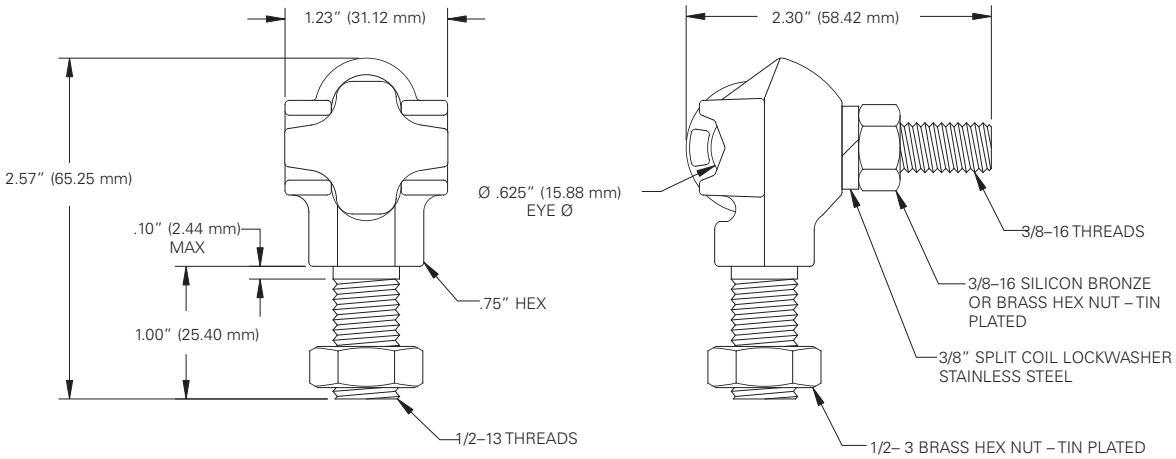


Figure 11. 350 MCM eyebolt connector dimensional information

Required load terminal for 400A option

Table 7. Mounting equipment

Description	Catalog Number
Stainless Steel Mounting Bracket (Figure 12)	N/A (not sold separately)

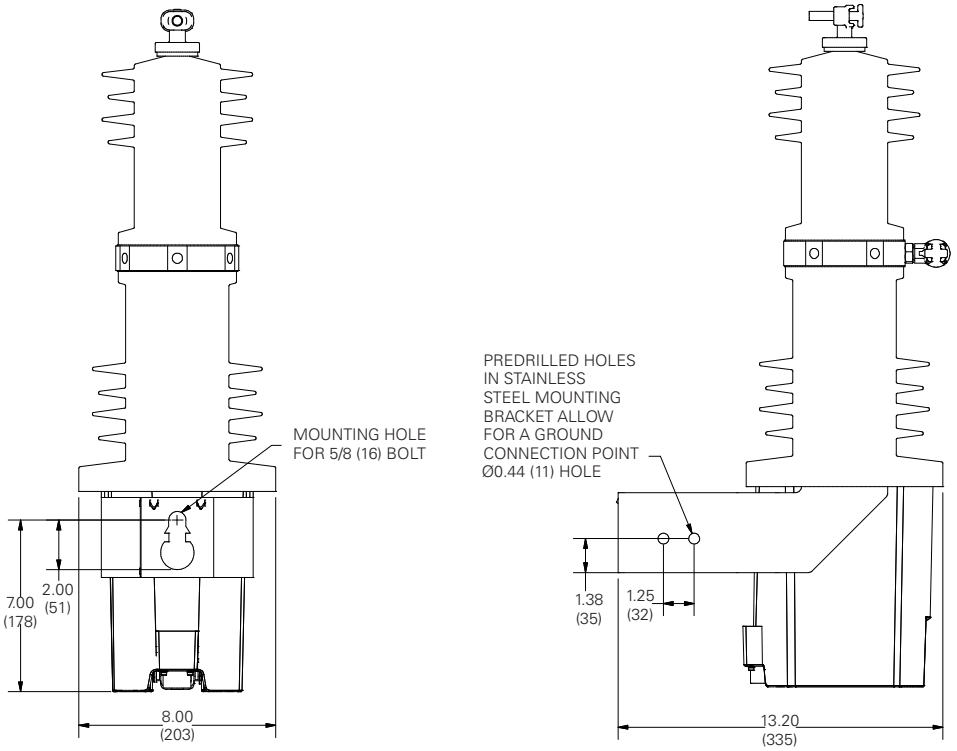


Figure 12. Mounting bracket dimensional information.

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