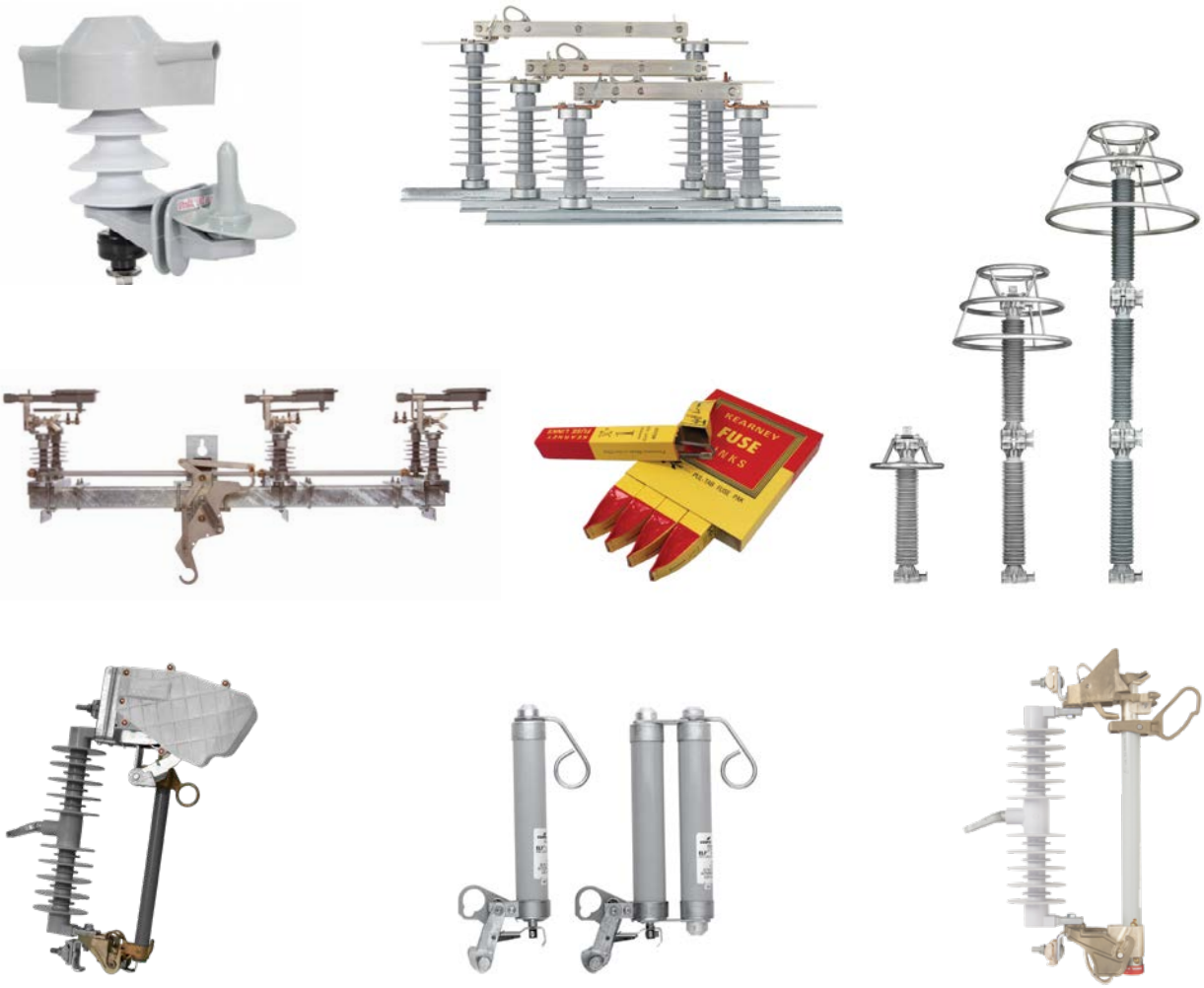
Specifier's guide

COOPER POWER SERIES

Overhead line installation and protective equipment master catalog, 5 kV–35 kV electrical distribution systems



Powering Business Worldwide

Contents

Storm season rapid response

Fast service restoration begins now with planning in anticipation of storm season. Eaton's Cooper Power™ series product team works together with the engineering services team to provide a full storm response procedure to quickly ramp up operations in anticipation of storm impact for fast product shipment and remediation of damaged apparatus during storm recovery. We can individualize a storm response plan for you.

Because storm season is year round for us, we have experience in storm preparedness. Whether your service area is braced for hurricane, thunderstorm and tornado, or ice storm season, any other time is pre-storm planning season.

In spite of every storm being different, there are planned measures that can be proactively taken to reduce business interruption during storm restoration:

- Months prior to storm season, we are auditing stock, analyzing and identifying your historic storm needs for equipment and parts to secure ideal storm inventory
- We anticipate the emergency needs against the size of a storm—large, medium and small
- We annually plan with key suppliers to define when we are in storm mode what actions are required on their part to secure needed raw materials
- We develop capacity expansion plans, and define expedited shipping options from each of our manufacturing facilities

As we track an approaching storm and resulting outages, our "Storm Boss" reports hourly from our Storm Center to all mobilized cross-functional teams.

These individual team members are trained on which steps they are to take as storm levels rise from yellow, to orange, and to red alert.

Power delivery products

We increase our stock levels on key materials for a complete portfolio of Tier One products required for immediate storm restoration of your electrical power system backbone:

- Pole-mounted single-phase transformers
- Pad-mounted and substation single- and three-phase transformers
- Molded rubber cable connector products
- Distribution- and station-class arresters
- Fuses and fuse links
- Cutouts
- Disconnect switches
- Tools and connectors
- Type L reclosers

And, as planned in pre-season, once a storm is imminent, equipment and parts are expedited through production and shipping.

These are the news headlines no utility wants to hear:

"The Category 2 hurricane's storm surge hit New York City, cutting power to 8 million people."

"A combination of strong winds and heavy, wet snow left 700,000 customers without electricity at the height of the storm."

"A 'super derecho' of violent thunderstorms left a more than 700-mile trail of destruction across the Midwest and mid-Atlantic, cutting power to millions."

Storm recovery services

Because we have service offices strategically located throughout North America, the engineering services team can quickly mobilize and coordinate the resources needed for storm-related disaster services so that upon arrival we can provide a comprehensive plan for restoration. Eaton can deploy a team of engineers and technicians within hours after a catastrophic event occurs. And we have the ability to assist with any manufacturers' equipment.

Eaton's engineering services team has five Power Breaker Reconditioning Centers across North America staffed with personnel dedicated to reconditioning and repairing devices to "like-new" condition—quickly and safely.

Proactive storm planning includes:

- Alliances and partnerships for all expected needs
- Site surveys and disaster recovery planning (DRP)
- Ability to assist with any manufacturers' equipment
- Dedicated 24/7 crisis hotline
- Dedicated equipment for disaster recovery
- On-site Command Center trailers

Eaton's UltraSIL advantage

Eaton's Cooper Power series UltraSIL™ polymer-housed surge arrester uses the industry-preferred silicone rubber material. Years of field experience demonstrate that silicone rubber will remain hydrophobic in all types of environments, a feature not found in all polymeric materials such as EPDM rubber. Independent laboratories have verified the superiority of 100% silicone rubber for its resistance to:

- Ultraviolet (UV) degradation
- Contaminated environments
- Temperature instability (+200 °C to –70 °C)

Eaton features its proprietary UltraSIL polymer housing in their distribution arresters, station arresters, cutouts, single-phase switches and three-phase switches.

Distribution arresters

Design features

Dependable UltraSIL polymer housing and composite matrix design

Eaton's manufacturing process utilizes a high-strength composite matrix to encapsulate the arrester's internal components and provide structural strength. In addition to strength, moisture impermeability is a unique characteristic of Eaton's composite matrix material. The composite-matrix-wrapped module has been tested above and beyond the IEEE® standard required testing for medium-voltage arresters, by passing all verification tests of the Water Immersion portion of the Moisture Ingress Test in IEEE Std C62.11 – 2005. Eaton performed further material integrity testing in the form of submerging a composite-matrix-wrapped module assembly in fuchsin dye. Fuchsin dye has extremely low surface tension, which makes it ideal for identifying hair-line cracks invisible to the naked eye. This test involved submerging an end of a composite-wrapped module in a tray of fuchsin dye for a 24-hour test cycle. After completion of the test, the composite-wrapped module assembly was removed from the fuchsin dye, allowed to dry, and the submerged portion of the module assembly was sanded. A magnified cross-section showing the sanded portion of the module assembly proves fuchsin dye was unable to penetrate the high-strength composite matrix material. Covering the composite matrix design is Eaton's industry-preferred UltraSIL polymer silicone rubber housing. Independent laboratories have verified the superiority of 100% silicone rubber for its resistance to UV degradation, contaminated environments and temperature stability (+200 °C to –70 °C). Years of field experience demonstrate that silicone rubber will remain hydrophobic in all types of environments, a feature not found in all polymeric materials. The combination of the composite matrix and silicone rubber materials provide the Evolution surge arrester with primary and secondary moisture seals to ensure a long, reliable life.

Optional insulated mounting hanger

An optional insulated mounting hanger is available to allow connecting to a wide variety of brackets. The insulated hanger, made of glass-filled polyester, has been designed to provide needed mechanical strength for installation and severe loading conditions.

Ground lead isolator

A ground lead isolator is also available. The isolator removes the ground terminal from the arrester in the unlikely event of arrester failure, thus preventing a permanent system fault. An isolator that has operated gives visual indication of internal damage to the arrester and the need for arrester replacement.

Optional universal wildlife protector

Eaton offers complete wildlife resistance protection with both a line terminal guard and a ground terminal ground. Customers have the option of a line terminal wildlife guard that is easily retrofitted to existing arrester installations and provides increased electrical insulation for the high-voltage terminal of the arrester. The flexible design allows for insertion of the lead wire through the bottom of the integral molded flanges. Access holes have been molded above the flanges to allow conductor sizes ranging from 0 to 0.50" in diameter (O.D.). The geometry allows water to shed away from the surface area of the animal guard while minimizing ice buildup and maintains flexibility through extreme operating temperatures. The ground terminal wildlife guard can be easily installed. The guard is compact and economical to ensure wildlife is unable to come in contact with energized objects while on a grounded surface.

UltraSIL polymer-housed VariSTAR surge arresters

Eaton offers a polymer design for medium-voltage distribution systems up to 36 kV. The UltraSIL polymer-housed VariSTAR™ surge arresters are of gapless construction with industry-recognized superior polymer housing material—silicone rubber. Inside each arrester are metal oxide varistors (MOVs) that are manufactured with strict quality control requirements. Eaton's MOV disk design has proven its reliability and protective ability through many years of field service. The exclusive patented manufacturing process makes the arrester impervious to moisture and capable of withstanding extreme electrical, environmental and cantilever load conditions.

UltraSIL polymer-housed VariSTAR surge arresters have been tested to IEEE Std C62.11. Each MOV receives complete production electrical tests to ensure a quality product. Each assembled arrester must pass 100% physical inspection, 100% leakage current test and 100% partial discharge inception voltage test.

For further information regarding Eaton's UltraSIL polymer-housed VariSTAR surge arresters, consult Eaton catalog CA235005EN.

Figure 1. UltraSIL polymer-housed surge arrester

General application recommendations

The rating of an arrester is the maximum power-frequency line-to-ground voltage at which the arrester is designed to pass an operating duty cycle test as defined in IEEE Std C62.11. **Table 1** provides a general application guide for the selection of the proper arrester rating for a given system voltage and grounding configuration as outlined in IEEE Std C62.22.

Table 1. Commonly applied voltage ratings of VariSTAR arresters

System voltage (kV rms)		Recommended arrester rating per IEEE Std C62.22™ (kV rms)		
Nominal	**Maximum**	**Four-wire wye multi-grounded neutral**	**Three-wire wye solidly grounded neutral**	**Delta and ungrounded wye**
2.4	2.54	—	—	3
4.16Y/2.4	4.4Y/2.54	3	6	6
4.16	4.4	—	—	6
4.8	5.08	—	—	6
6.9	7.26	—	—	9
8.32Y/4.8	8.8Y/5.08	6	9	—
12.0Y/6.93	12.7Y/7.33	9	12	—
12.47Y/7.2	13.2Y/7.62	9	15	—
13.2Y/7.62	13.97Y/8.07	10	15	—
13.8Y/7.97	14.52Y/8.38	10	15	––
13.8	14.52	—	—	18
20.78Y/12.0	22Y/12.7	15	21	—
22.86Y/13.2	24.2Y/13.87	18	24	—
23	24.34	—	—	30
24.94Y/14.4	26.4Y/15.24	18	27	—
27.6Y/15.93	29.3Y/16.89	21	30	—
34.5Y/19.92	36.5Y/21.08	27	36	—
46Y/26.6	48.3Y/28	36	—	—

Temporary overvoltage (TOV) withstand ability

The UltraSIL polymer-housed arrester's ability to withstand 60 Hz overvoltage conditions is shown in **Figure 2**. The graph illustrates the time an arrester can survive such a voltage, and recover, without going into thermal runaway for a given voltage magnitude (expressed in per units of arrester MCOV). The figure shows TOV withstand ability, with and without prior duty. The prior duty curve is based upon absorption of rated energy immediately preceding application of the overvoltage.

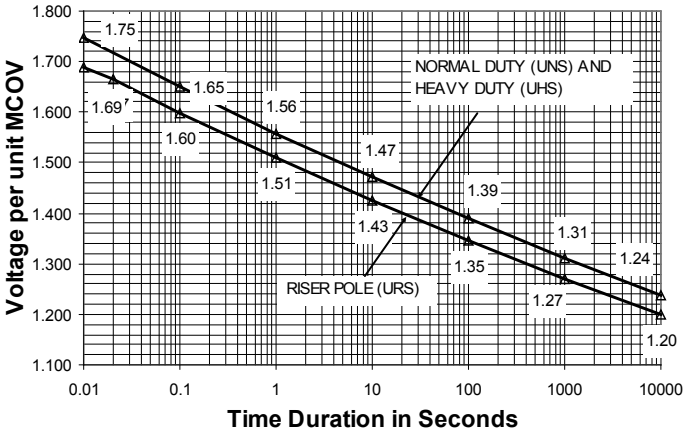


Figure 2. Temporary overvoltage curve for normal duty, heavy duty and riser pole distribution arresters. No prior duty—60 °C ambient.

Design

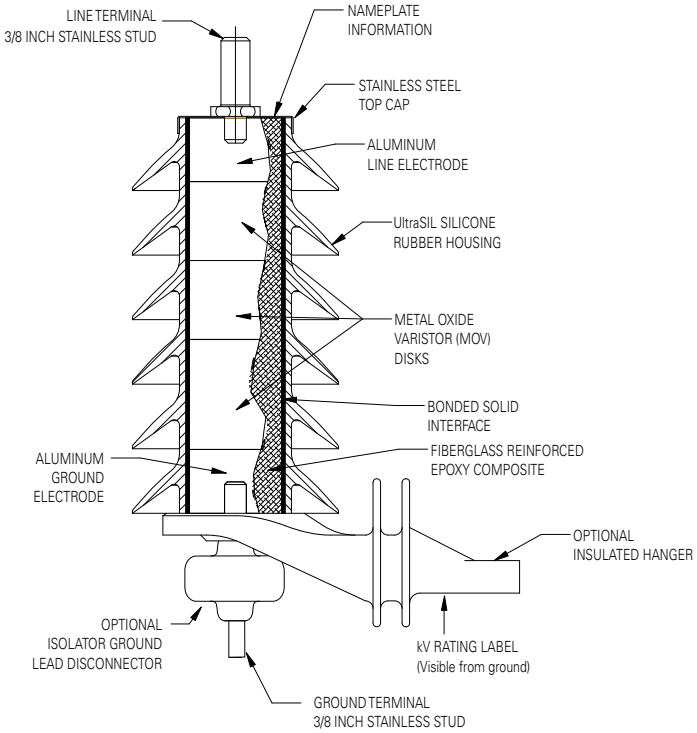


Figure 3. Cutaway illustration of the VariSTAR distribution surge arrester

Eaton's UltraSIL polymer-housed VariSTAR surge arrester design highlights include:

- UltraSIL silicone rubber that has undergone a wide range of long-term environmental testing that has verified lifetime superiority
- High-strength composite wrap insulating material that eliminates manufacturing variances
- A secondary moisture seal under the primary silicone rubber housing seal, which makes the arrester impervious to moisture
- Insulated mounting base, made of glass-filled polyester, to allow connecting to a wide variety of brackets
- Ground lead isolator to illustrate a visible indication of internal damage to the arrester and the need for arrester replacement
- Optional universal wildlife protector

Table 2. Distribution arrester selection

Product description	Rating	Figures	Standard housing	Creep distance	Minimum recommended clearances ①②	
					Phase-to-ground	Phase-to-phase
Normal Duty (UNS)	3	1, 2, 3	03	7.2	2.75	3.75
	6	1, 2, 3	04	10.1	3.75	5.00
	9	1, 2, 3	05	13.0	5.00	6.50
	10	1, 2, 3	05	13.0	5.00	6.50
	12	1, 2, 3	06	15.9	5.75	7.25
	15	1, 2, 3	07	18.8	6.50	8.25
	18	1, 2, 3	08	21.7	9.00	10.75
	21	1, 2, 3	09	24.6	9.00	10.75
	24	1, 2, 3	10	27.5	10.50	12.75
	27	1, 2, 3	11	30.4	10.50	12.75
	30	1, 2, 3	12	33.3	10.50	12.75
	33	1, 2, 3	13	36.2	12.50	15.75
	36	1, 2, 3	14	39.1	12.50	15.75
Heavy Duty (UHS and URS)	3	1, 2, 3	03	7.2	3.00	4.25
	6	1, 2, 3	04	10.1	4.00	5.50
	9	1, 2, 3	05	13.0	5.25	7.00
	10	1, 2, 3	05	13.0	5.25	7.00
	12	1, 2, 3	06	15.9	6.00	7.75
	15	1, 2, 3	07	18.8	6.75	8.75
	18	1, 2, 3	08	21.7	9.25	11.25
	21	1, 2, 3	09	24.6	9.25	11.25
	24	1, 2, 3	10	27.5	10.75	13.25
	27	1, 2, 3	11	30.4	10.75	13.25
	30	1, 2, 3	12	33.3	10.75	13.25
	33	1, 2, 3	13	36.2	12.75	16.25
	36	1, 2, 3	14	39.1	12.75	16.25

① All clearances are measured from center line of arrester per IEEE Std C62.22.

② With optional wildlife protector, add 0.2 inches.

Table 2. Distribution arrester selection, continued

Product description	Rating	MCOV	Nominal discharge current (kA)	Equivalent front-of-wave protective level (kV crest) ①	Maximum discharge voltage (kV crest) 8/20 µs current wave at nominal current
Normal Duty (UNS)	3	2.55	5	11.0	10.4
	6	5.10	5	22.0	20.8
	9	7.65	5	31.7	30.0
	10	8.40	5	33.0	31.2
	12	10.2	5	41.5	39.2
	15	12.7	5	51.8	49.0
	18	15.3	5	62.2	58.8
	21	17.0	5	66.0	62.4
	24	19.5	5	77.0	72.8
	27	22.0	5	87.2	82.4
	30	24.4	5	97.1	91.8
	33	27.0	5	108.0	102.0
	36	29.0	5	116.0	110.0
Heavy Duty (UHS)	3	2.55	10	11.0	9.9
	6	5.10	10	21.9	19.8
	9	7.65	10	33.0	29.8
	10	8.40	10	35.0	31.6
	12	10.2	10	43.9	39.7
	15	12.7	10	53.1	48.0
	18	15.3	10	66.0	59.6
	21	17.0	10	70.0	63.2
	24	19.5	10	80.9	73.1
	27	22.0	10	94.0	84.9
	30	24.4	10	102.0	92.4
	33	27.0	10	116.0	105.0
	36	29.0	10	123.0	111.0
Riser Pole (URS)	3	2.55	10	10.3	9.4
	6	5.10	10	20.7	18.7
	9	7.65	10	29.8	27.0
	10	8.40	10	31.0	28.1
	12	10.2	10	39.1	35.4
	15	12.7	10	48.7	44.1
	18	15.3	10	58.4	42.9
	21	17.0	10	62.0	56.2
	24	19.5	10	72.3	65.5
	27	22.0	10	81.4	73.8
	30	24.4	10	91.0	82.5
	33	27.0	10	100.0	90.0
	36	29.0	10	108.0	97.6

① Based on nominal current impulse that results in a discharge voltage cresting in 0.5 µs.

UltraSIL polymer-housed Evolution surge arrester

Eaton offers a polymer design for medium-voltage distribution systems up to 36 kV. Inside each arrester are metal oxide varistors (MOVs) that are manufactured at our Olean, NY facility, allowing strict quality control over all aspects of disk production, in series with a proprietary insulating ceramic ring assembly. Eaton's MOV disk design has proven its reliability and protective ability through many years of field service. The exclusive patented manufacturing process makes the arrester impervious to moisture and capable of withstanding extreme electrical, environmental and cantilever load conditions.

UltraSIL polymer-housed Evolution surge arrester has been tested to IEEE Std C62.11. Each MOV receives complete production electrical tests to ensure a quality product. Each assembled arrester must pass 100% physical inspection, 100% partial discharge inception voltage test and 100% 60 Hz sparkover level test.

For further information regarding Eaton's UltraSIL polymer-housed Evolution surge arrester, consult Eaton catalog CA235018EN.

Figure 4. UltraSIL polymer-housed Evolution surge arrester

Extreme advantage

Environmental stewardship

The Evolution surge arrester offers the opportunity to lower carbon dioxide emissions while enabling them to demonstrate their environmental stewardship. Utilities have the opportunity to significantly lower their CO2 emissions and demonstrate an increased commitment to environmental stewardship. For a standard 10 kV arrester, the average watts loss = 500 mW. With the Evolution surge arrester, the maximum watts loss = 20 mW for a total loss avoidance per arrester of 480 mW.

Wide-ranging benefits

The Evolution surge arrester enhances asset protection, reduces equipment failures and improves supply chain management. The surge arrester leads the way in reducing equipment failure rates by vastly improving discharge voltages, which reduces the total voltage impressed upon the equipment. It has lower discharge voltages as compared to traditional heavy-duty and riser-pole arresters, eliminating the need for specialty ratings and multiple arrester types for each application. The Evolution surge arrester provides a nondecaying TOV (temporary overvoltage) curve with overvoltage protection far superior to standard MOV arresters. The Evolution surge arrester is capable of withstanding overvoltage conditions caused by line-to-ground faults for as long as fault conditions exist. Extending the Evolution surge arrester's performance during 60 Hz overvoltage conditions also reduces system maintenance and helps improve system reliability.

Superior performance

The Evolution surge arrester offers a superior level of performance with revolutionary insulating materials capable of withstanding extreme electrical and environmental conditions. The IEEE Std C62.22™ recommends at least a 15–20% margin of protection for equipment insulation. Industry experts may require as much as 50% or more based on the importance, age, and cost of the equipment being protected. The Evolution surge arrester exceeds protective levels offered by standard MOV arresters, including riser-pole arresters. In addition, it helps compensate for two variables related to installation practices and equipment protection: excessive lead length and aged equipment insulation. The Evolution surge arrester is an effective insurance policy against premature equipment failure. It meets the need for better discharge voltages and improved margins of protection. It will provide better protection than traditional heavy-duty and riser-pole arresters. Customers currently using a heavy-duty and/or riser-pole arrester can now standardize with one—the Evolution surge arrester. Customers will benefit from inventory reduction and supply chain improvements. Line crews will be delighted.

General application recommendations

The rating of an arrester is the maximum power-frequency line-to-ground voltage at which the arrester is designed to pass an operating duty cycle test as defined in IEEE Std C62.11. **Table 3** provides a general application guide for the selection of the proper arrester rating for a given system voltage and grounding configuration as outlined in IEEE Std C62.22.

Table 3. Commonly applied voltage ratings of Evolution surge arresters

System voltage (kV rms)		Recommended arrester rating per IEEE std C62.22 (kV rms)					
		Four-wire wye multi-grounded neutral		Three-wire wye solidly grounded neutral		Delta and ungrounded wye	
Nominal	Maximum	Standard MOV arrester	URT	Standard MOV arrester	URT ①	Standard MOV arrester	URT ①
2.4	2.54	—	—	—	—	3	3
4.16Y/2.4	4.4Y/2.54	3	3	6	3	6	3
4.16	4.4	—	—	—	—	6	3
4.8	5.08	—	—	—	—	6	6
6.9	7.26	—	—	—	—	9	6
8.32Y/4.8	8.8Y/5.08	6	6	9	6	—	—
12.0Y/6.93	12.7Y/7.33	9	9	12	9/10	—	—
12.47Y/7.2	13.2Y/7.62	9	9	15	9/10	—	—
13.2Y/7.62	13.97Y/8.07	10	10	15	10	—	—
13.8Y/7.97	14.52Y/8.38	10	10	15	10	––	—
13.8	14.52	—	—	—	—	18	10
20.78Y/12.0	22Y/12.7	15	15	21	15	—	—
22.86Y/13.2	24.2Y/13.87	18	18	24	18	—	—
23	24.34	—	—	—	—	30	18
24.94Y/14.4	26.4Y/15.24	18	18	27	18	—	—
27.6Y/15.93	29.3Y/16.89	21	21	30	21	—	—
34.5Y/19.92	36.5Y/21.08	27	27	36	27	—	27
46Y/26.6	48.3Y/28	36	36	—	—	—	—

① Recommended arrester ratings for the Evolution arrester for 3-Wire Solidly Grounded Neutral, Delta and Ungrounded Wye circuits are based upon 5% regulation error.

Temporary overvoltage (TOV) withstand ability

Eaton's UltraSIL polymer-housed arrester's ability to withstand 60 Hz overvoltage conditions is shown in **Figure 5**. The graph illustrates the time an arrester can survive such a voltage, and recover, without going into thermal runaway for a given voltage magnitude (expressed in per units of arrester MCOV).

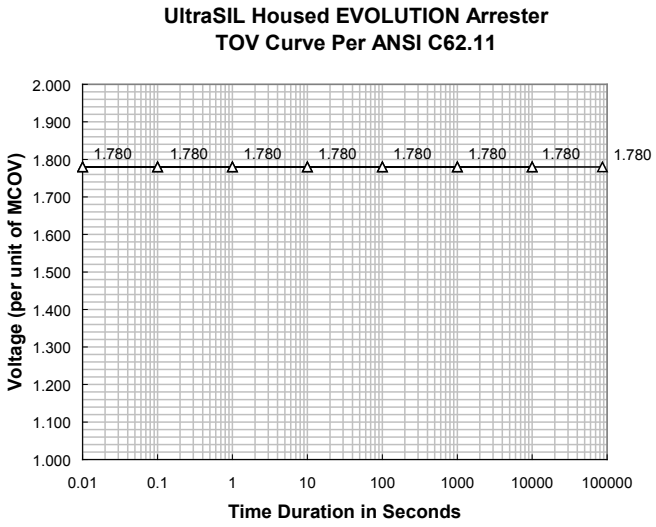


Figure 5. Temporary overvoltage curve of the Evolution distribution arrester; no prior duty—60 °C ambient

Design

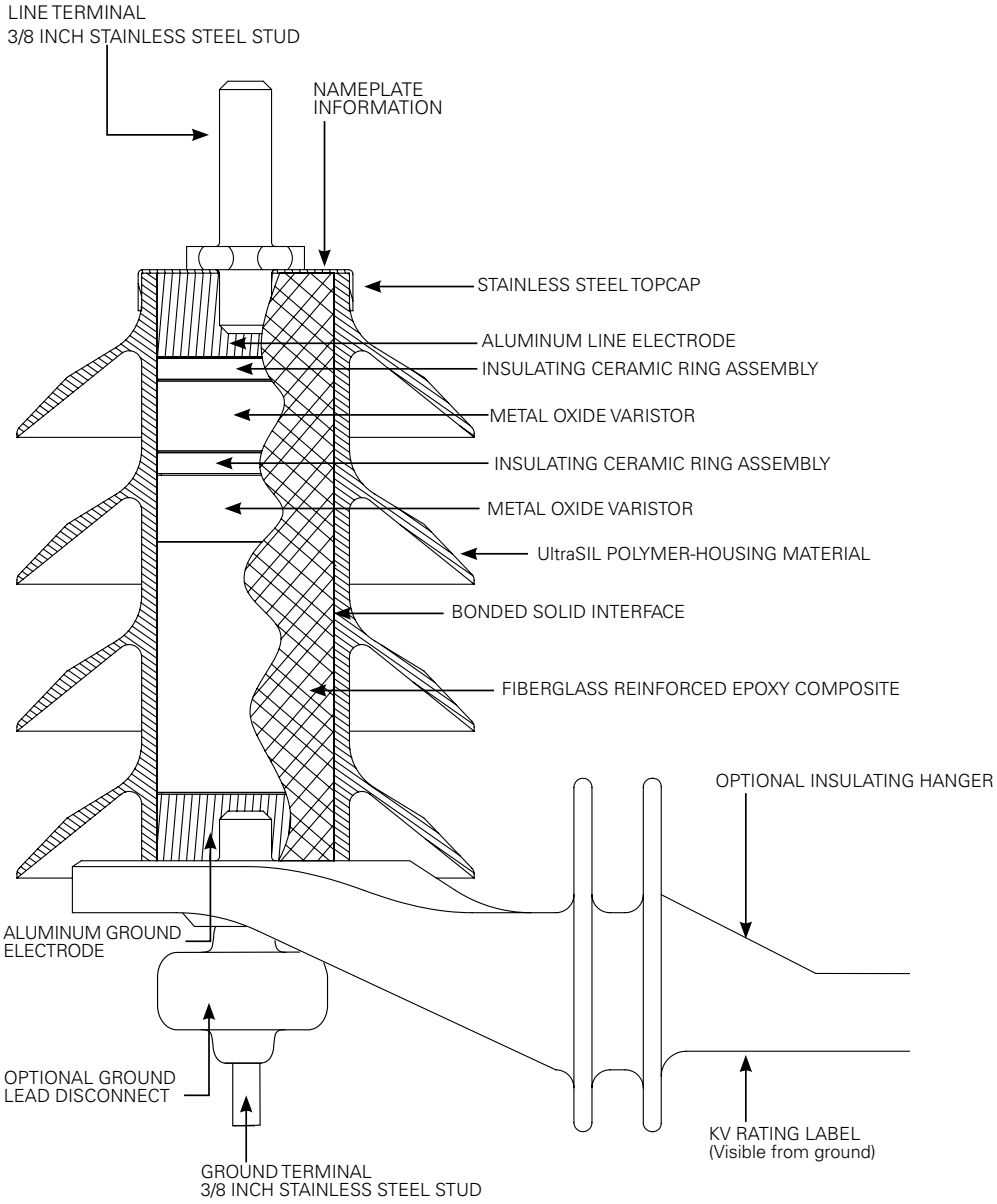


Figure 6. Cutaway illustration of the Evolution distribution surge arrester

Eaton's UltraSIL polymer-housed Evolution surge arrester design highlights include:

- UltraSIL silicone rubber that has undergone a wide range of long-term environmental testing that has verified lifetime superiority
- Insulating ceramic ring assembly that withstands system voltage during steady-state conditions and reduces electrical stress across the MOV disks
- MOV disks manufactured at Eaton's Olean, NY, facility
- High-strength composite wrap insulating material that eliminates manufacturing variances
- A secondary moisture seal under the primary silicone rubber housing seal, which makes the arrester impervious to moisture
- Insulated mounting base, made of glass-filled polyester, to allow connecting to a wide variety of brackets
- Ground lead isolator to illustrate a visible indication of internal damage to the arrester and the need for arrester replacement
- Optional universal wildlife protector

Table 4. Arrester physical characteristics

Product description	Rating	Figures	Standard housing	Creep distance	Minimum recommended clearances ①②	
					Phase-to-ground	Phase-to-phase
Evolution (URT)	3	4, 5, 6	04	10.1	3.00	4.25
	6	4, 5, 6	05	13.0	4.00	5.50
	9	4, 5, 6	05	13.0	5.25	7.00
	10	4, 5, 6	05	13.0	5.25	7.00
	12	4, 5, 6	07	18.8	6.00	7.75
	15	4, 5, 6	07	18.8	6.75	8.75
	18	4, 5, 6	08	21.7	9.25	11.25
	21	4, 5, 6	09	24.6	9.25	11.25
	24	4, 5, 6	10	27.5	10.75	13.25
	27	4, 5, 6	11	30.4	10.75	13.25
	30	4, 5, 6	12	33.3	10.75	13.25
	33	4, 5, 6	13	36.2	12.75	16.25
	36	4, 5, 6	14	39.1	12.75	16.25

① All clearances are measured from center line of arrester per IEEE Std C62.22.

② With optional wildlife protector, add 0.2 inches.

Product description	Rating	MCOV	Nominal discharge current (kA)	Equivalent front-of-wave protective level (kV crest) ①	Maximum discharge voltage (kV crest) 8/20 µs current wave at nominal current	Minimum 60 Hz sparkover (kV crest/√2)
Evolution (URT)	3	2.55	10	20.0	10.2	4.54
	6	5.10	10	23.0	20.3	9.08
	9	7.65	10	32.4	23.8	13.6
	10	8.40	10	32.4	25.4	15.0
	12	10.2	10	52.4	31.8	18.2
	15	12.7	10	55.4	38.5	22.6
	18	15.3	10	64.8	47.8	27.2
	21	17.0	10	64.8	50.6	30.3
	24	19.5	10	87.8	58.6	34.7
	27	22.0	10	97.2	68.0	39.2
	30	24.4	10	117.2	74.0	43.4
	33	27.0	10	120.2	84.0	48.1
	36	29.0	10	129.6	89.0	51.6

① Based on nominal current impulse that results in a discharge voltage cresting in 0.5 µs.

Catalog number configuration

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digits 1 to 3 – Arrester type

UNS – Normal-duty distribution arrester

UHS – Heavy-duty distribution arrester

URS – Riser pole distribution arrester

URT – Evolution distribution arrester

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digits 4 to 5 – Arrester rating (MCOV)

03 = 3 kV (2.55 kV)
06 = 6 kV (5.10 kV)
09 = 9 kV (7.65 kV)
10 = 10 kV (8.4 kV)
12 = 12 kV (10.2 kV)
15 = 15 kV (12.7 kV)
18 = 18 kV (15.3 kV)
21 = 21 kV (17.0 kV)
24 = 24 kV (19.5 kV)
27 = 27 kV (22.0 kV)
30 = 30 kV (24.4 kV)
33 = 33 kV (27.0 kV)
36 = 36 kV (29.0 kV)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digits 6 to 7 – Housing code

	03	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**
3	UNS, UHS, URS	URT										
6		UNS, UHS, URS	URT									
9			UNS, UHS, URS, URT									
10			UNS, UHS, URS, URT									
12				UNS, UHS, URS	URT							
15					UNS, UHS, URS, URT							
18						UNS, UHS, URS, URT						
21							UNS, UHS, URS, URT					
24								UNS, UHS, URS, URT				
27									UNS, UHS, URS, URT			
30										UNS, UHS, URS, URT		
33											UNS, UHS, URS, URT	
36												UNS, UHS, URS, URT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 8 – Line terminal wire

0 – No line terminal wire

1 – 12", #6 AWG Insulated wire, stripped 1.25" both ends

2 – 12", #6 AWG Insulated wire, 1 ring terminal/1 end stripped 1.25"

3 – 12", 6 AWG Insulated wire, 2 ring terminals

4 – 18", #6 AWG Insulated wire, stripped 1.25" both ends

5 – 18", #6 AWG Insulated wire, 1 ring terminal/1 end stripped 1.25"

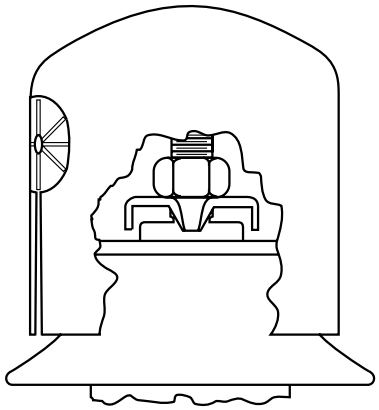
6 – 18", 6 AWG Insulated wire, 2 ring terminals

7 – 30", #6 AWG Insulated wire, stripped 1.25" both ends

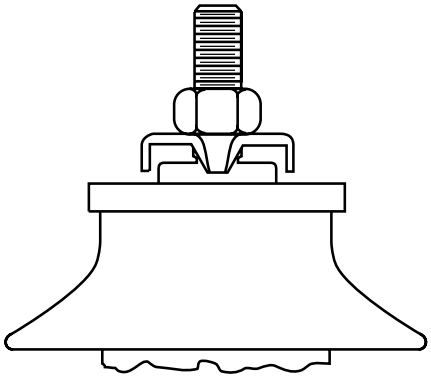
8 – 30", #6 AWG Insulated wire, 1 ring terminal/1 end stripped 1.25"

9 – 30", 6 AWG Insulated wire, 2 ring terminals

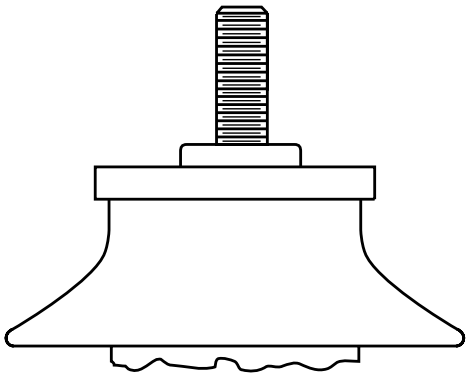
Digit 9 – Line terminal options



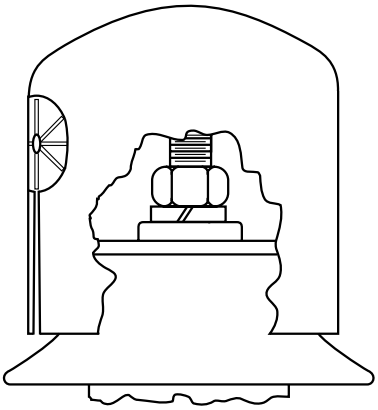
A = Silicon bronze nut, stainless steel wire clamp and universal wildlife protector. Reference **Figure 8** for dimensional information.



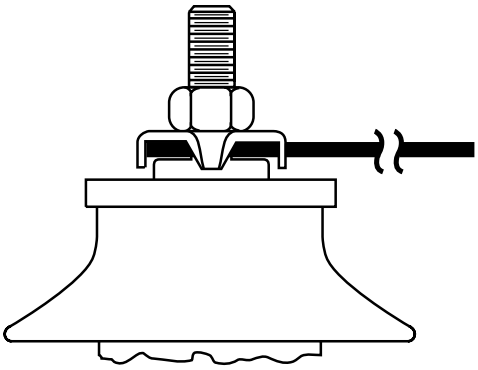
B = Silicon bronze nut and stainless steel wire clamp.



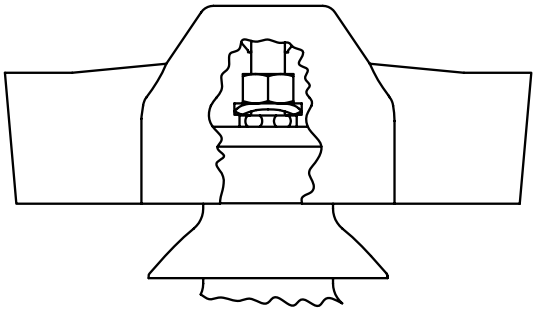
C = No hardware.



D = Silicon bronze nut, lock washer, flat washer and universal wildlife protector (for leads with ring terminals). Reference **Figure 8** for dimensional information.



K = Silicon bronze nut, stainless steel wire clamp.



X = Silicon bronze nut, stainless steel wire clamp and line terminal wildlife guard. Reference **Figure 9** for dimensional information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 10 – Isolator

0 – No isolator

1 – Black isolator (standard)

2 – Red isolator

3 – Yellow isolator

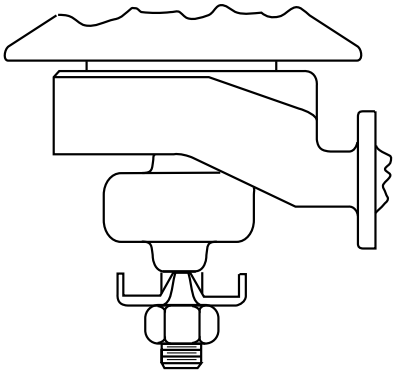
4 – Blue isolator

5 – White isolator

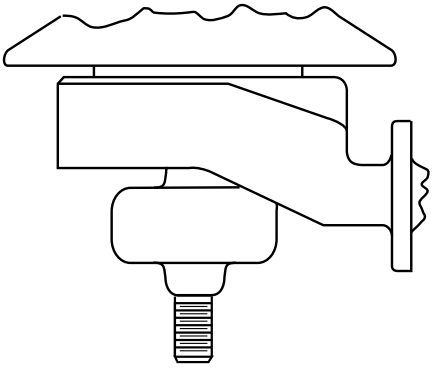
6 – Orange isolator

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

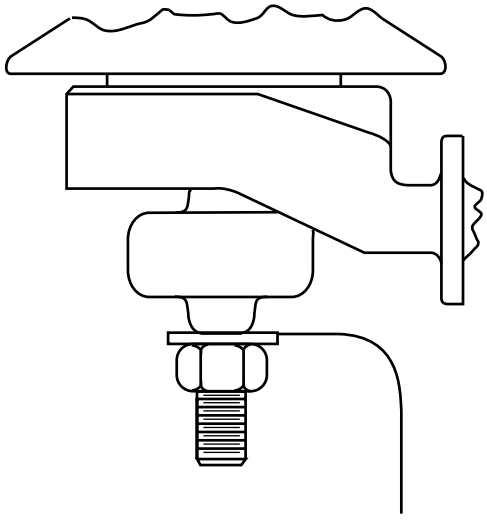
Digit 11 – Ground terminal options



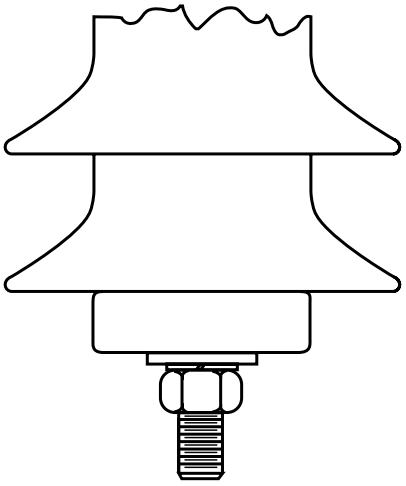
A = Stainless steel wire clamp with silicon bronze nut (shown with optional isolator and insulated hanger).



B = No hardware (shown with optional isolator and insulated hanger).

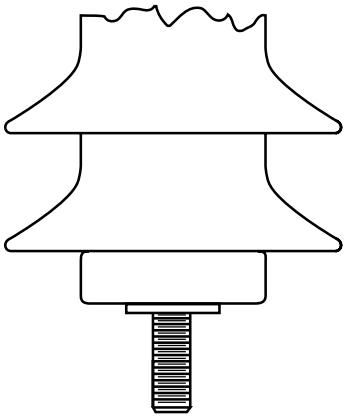


C = Copper transformer grounding strap with stainless steel lock washer and silicon bronze nut (shown with optional isolator and insulated hanger).

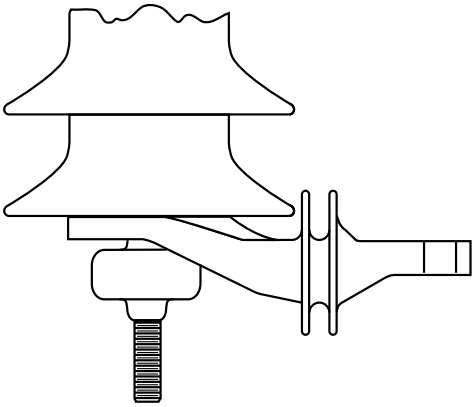


D = Stainless steel washer, lock washer, silicon bronze nut.

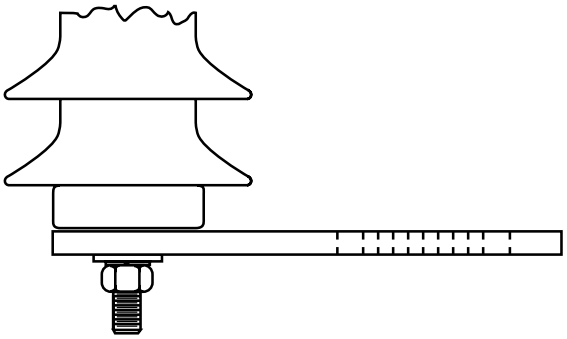
Digit 12 – Base configuration options



0 = Insulated base (base mounted arrester).



1 = Insulated hanger (required with optional isolator) (**available only if digits 6 and 7 are housing options 15 or less**). For more information, contact your Eaton representative.

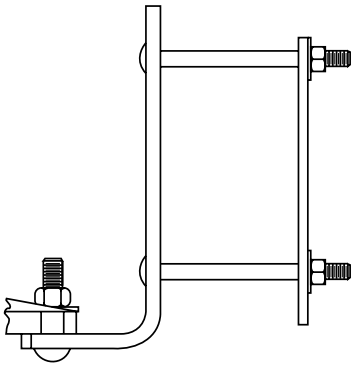


2 = Insulated base with conductive mounting bracket **(requires "0" in digit 10 and "D" in digit 11).**

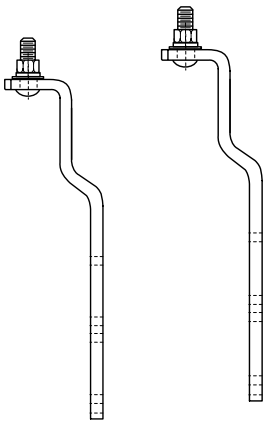
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 13 – Mounting bracket options

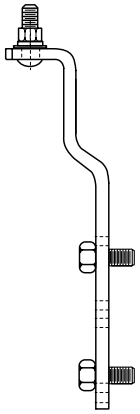
A = Without an additional mounting bracket.



B = NEMA® Cross-arm bracket (arrester mounting hardware included) **(requires "1" or "2" in digit 12)**
(Refer to **Figure 11** for dimensional information.)



C = Transformer bracket (arrester mounting hardware included) **(requires "1" or "2" in digit 12)**
(Refer to **Figure 12** and **Figure 13** for dimensions by rating.)



D = Option **C** plus transformer mounting hardware (2 each – $^{1}/_{2}$", 13-unc x $^{3}/_{4}$" bolts, flat washers, and lock washers) **(requires "1" or "2" in digit 12)**
(Refer to **Figure 12** and **Figure 13** for dimensions by rating.)

Note: Available on UNS, UHS, URS and URT designs.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 14 – Nameplate information

1 – IEEE Std C62.11 required data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Digit 15 – Packaging

A – Individual Carton (Assembled Terminal Hardware). Each arrester is shipped in an individual high-strength cardboard carton. The top and bottom terminal hardware is assembled to the arrester. Any optional brackets or hardware are provided unassembled.

C – Bulk Packed (Assembled Terminal Hardware). Pallet-sized bulk cardboard packaging for transformer mounting bracket options (Digits 13 = C or D only). Each arrester is shipped fully assembled including transformer mounting bracket. Available for 3–24 kV arresters only.

3 – International, Individual Carton (Assembled Terminal Hardware). Each arrester with accessories is shipped in an individual cardboard carton. The top and bottom terminal hardware is assembled to the arrester. Individual cartons are packed within a heavy-duty quadwall carton having a skid bottom and suitable for double stacking within an ocean shipping container.

Station arresters

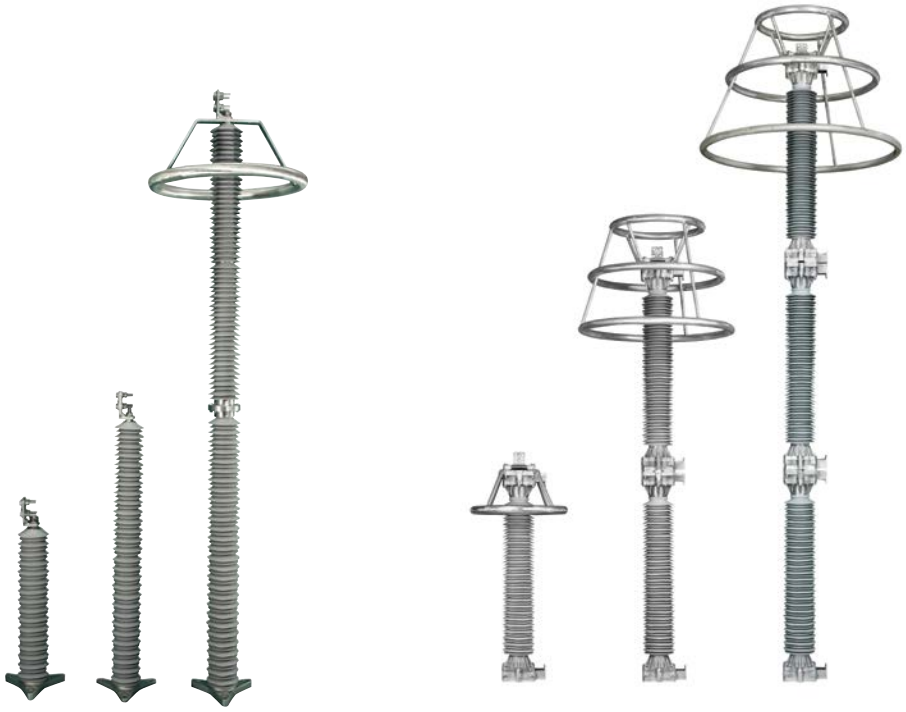


Figure 7. Station-class surge arresters

Eaton UltraSIL polymer-housed intermediate and station class arresters

Eaton offers a full line of IEEE Std C62.11 compliant intermediate and station class arresters to meet varying electrical and mechanical needs of users. Our UltraSIL silicone rubber housing utilizes the industry-recognized superior properties of silicone rubber with a unique high-creep alternating shed profile designed to withstand the most extreme environments.

All of our arresters utilize metal oxide varistor (MOV) disks that are made in Eaton's Olean, NY, plant. By manufacturing our own disks, we maintain strict quality control over the entire production process, from initial raw material inspection to final physical and electrical testing of each disk.

All our intermediate and station class arresters operate in a manner that is typical of arresters. During steady-state conditions, line-to-ground voltage is applied continuously between the line and ground terminals of the arrester. When surges occur, the arrester immediately limits, or clamps, the overvoltage condition by conducting the surge current to ground. After passage of the surge, the arrester returns to its initial state, conducting minimal leakage current.

Our intermediate class station arresters are featured in document CA235012EN, our standard station class arresters in CA235013EN, our UXL arresters in CA235019EN, and directionally vented arresters in CA235035EN. More details and electrical characteristics other than featured in this document are available in catalog sections.

For porcelain arresters, reference catalog CA235022EN.

General application recommendations

The rating of an arrester is the maximum power frequency line-to-ground voltage at which the arrester is designed to pass an operating duty cycle test as defined in IEEE Std C62.11. **Table 5** provides a general application guide for the selection of the proper arrester rating for a given system voltage and grounding configuration as outlined in IEEE Std C62.22.

Table 5. Arrester ratings commonly used on three-phase systems

System voltages L-L (kV)		Arrester ratings (kV)	
Nominal	**Maximum**	**Grounded circuits ①**	**High-impedance/ ungrounded circuits**
3.3	3.7	3	—
6.6	7.3	6	9
10.0	11.5	9	12–15
11.0	12.0	9–10	12–15
16.4	18.0	15	18–21
22.0	24.0	24.0	24–27
33.0	36.3	27–30	36–39
47.0	52.0	39–48	54–60
66.0	72.0	54–60	66–84
91.0	100	78–84	90–96
110	123	96–108	120–138
132	145	108–120	132–144
155	170	132–144	162–172
220	245	180–198	204–240
275	300	216–240	258–294
330	362	258–288	294–360
400	420	312–360	—
500	550	396	—

① Grounded neutral circuits

Temporary overvoltage (TOV) withstand ability

The UltraSIL polymer-housed arrester's ability to withstand 60 Hz overvoltage conditions is shown in **Figure 8**. The graph illustrates the time an arrester can survive such a voltage, and recover, without going into thermal runaway for a given voltage magnitude (expressed in per units of arrester MCOV). The figure shows TOV withstand ability, with and without prior duty. The prior duty curve is based upon absorption of rated energy immediately preceding application of the overvoltage.

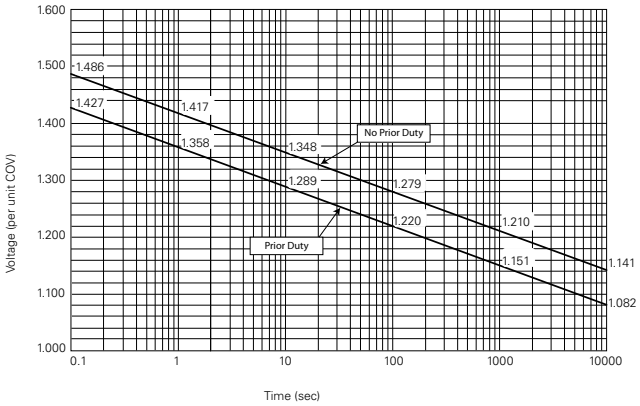


Figure 8. Temporary overvoltage curve for UltraSIL intermediate and station class (USAA, UHAA, UXAA, UXLB, and UXLC) arresters—60 degrees ambient temperature

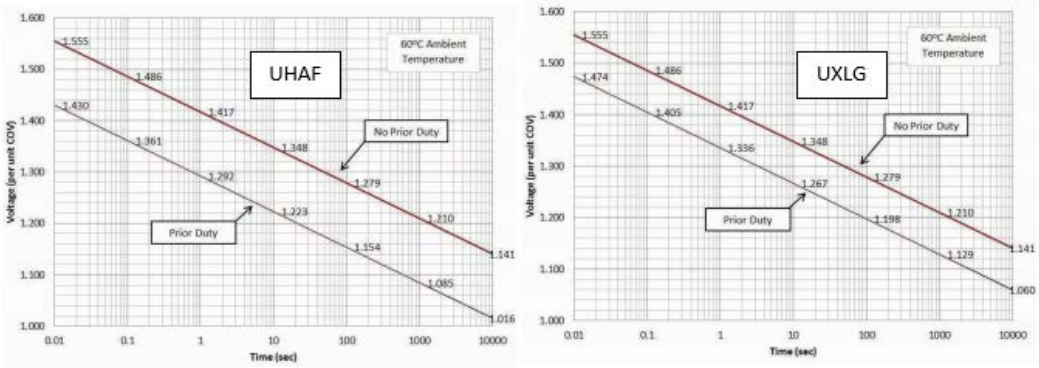


Figure 9. Temporary overvoltage curve for UltraSIL UHAF and UXLG directionally vented station class arresters—60 degrees ambient temperature

Features and design details

Construction of polymer-housed intermediate and station class arresters can be seen in **Figure 10**.

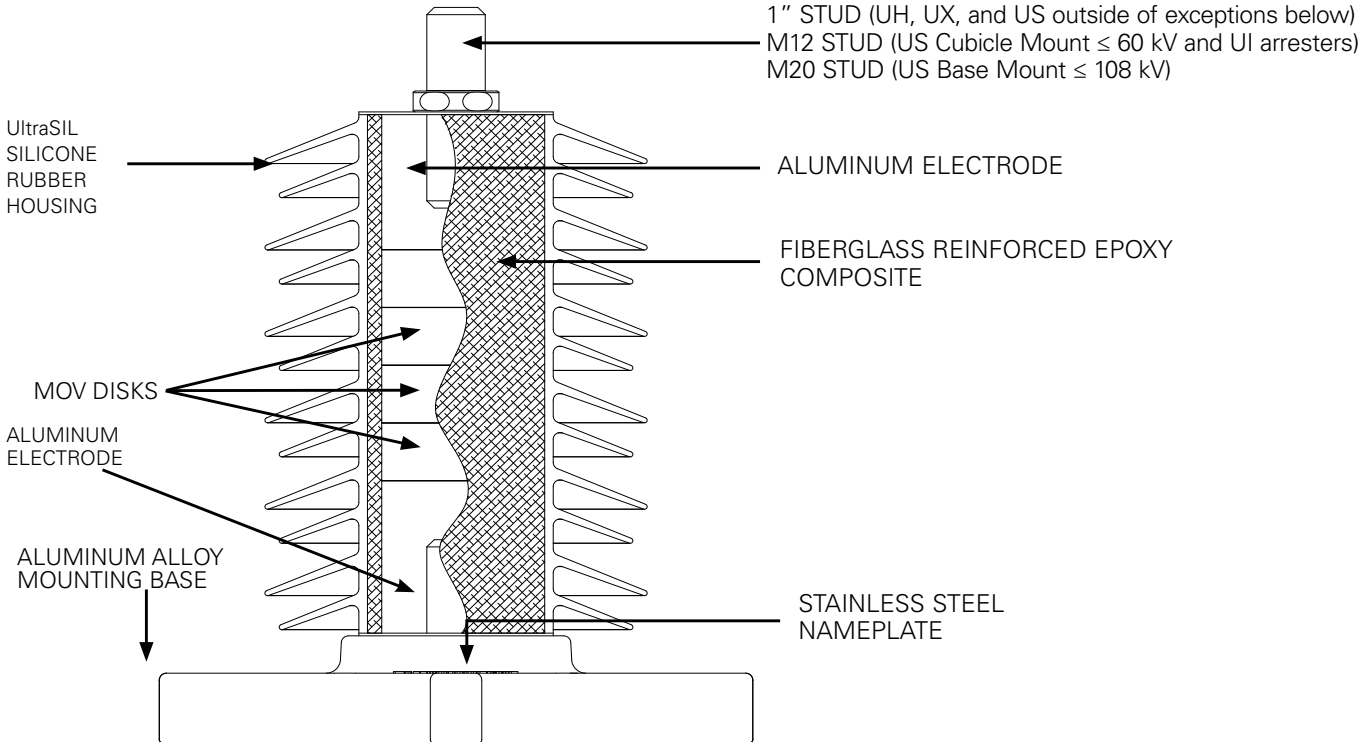


Figure 10. Cutaway illustration of the polymer-housed intermediate and station class arresters

In circumstances where extremely high strength is required of the arrester (i.e., being used in lieu of station bus supports) or directional venting is pertinent to protect valuable station assets, a directionally vented hollow core arrester may be specified. A directionally vented arrester is shown in **Figure 11**.

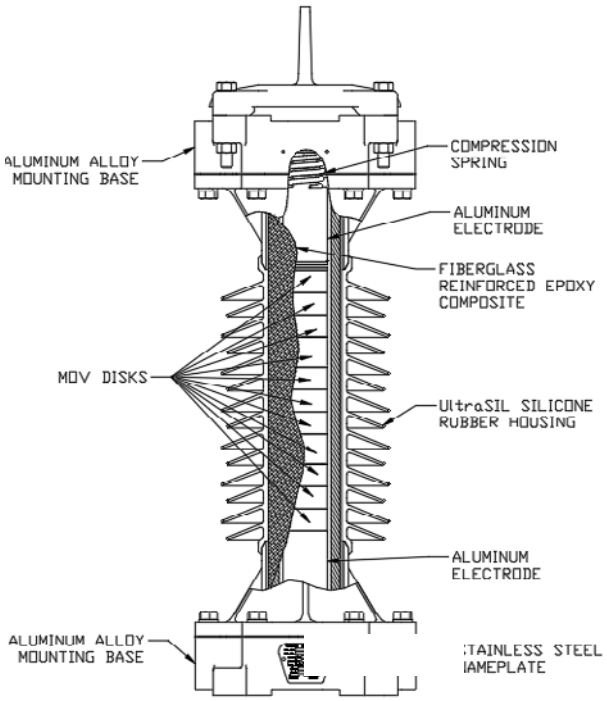


Figure 11. Directionally vented super high-strength station class arrester—UHAF and UXLG

Intermediate and station class arrester selection

Intermediate and station class arrester selection can be challenging. Eaton offers a wide range of arresters to meet a broad spectrum of system requirements including a wide range of voltages, energy handling capabilities and strengths.

An overview of Eaton's different polymer-housed station class arresters and their characteristics can be seen in **Table 6**.

Table 6. Intermediate and station class arrester electrical and mechanical characteristics overview

Arrester Type	Intermediate	Station	Station	Station	Station	Station	Station	Station	Station	Station
Catalog Number Suffix	UIAA	USAA	USAA	UHAA	UHAA	UXAA	UXLB	UXLC	UHAF	UXLG
Arrester Voltage Ratings (kV)	3–108	3–108	120–240	3–108	120–240	3–108	3–360	132–360	3–288	3–396
Double impulse discharge energy rating (kJ/kV)							15	15	9	15
Single impulse discharge energy rating (kJ/kV)	3.9	3.9	6.2	6.2	10	10				
System Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Impulse classifying current (kA)	10	10	10	10	10	10	10	10	10	10
High current withstand (kA)	100	100	100	100	100	100	100	100	100	100
Pressure relief rating (kA rms sym.)	40	63	63	63	63	63	63	63	63	63
Cantilever strength ultimate (in-lb)	10,000	15,000	20,000	20,000	35,000	35,000	80,000	92,000	120,000	180,000
Cantilever strength MDCL Static (in-lb)	4000	6000	8000	8000	14,000	14,000	32,000	36,800	48,000	72,000

Catalog number configuration

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Digits 1 to 4 – Arrester type

UIAA - Intermediate arrester

USAA - Standard energy handling station arrester

UHAA - High energy handling station arrester

UXAA - Extra-high energy handling station arrester

UXLB - Extra-high energy handling, high electrical build, 80,000 in-lb station arrester

UXLC - Extra-high energy handling, high electrical build, 92,000 in-lb station arrester

UHAF - High energy handling, standard electrical build, super-high strength (120,000 in-lb), directionally vented station arrester

UXLG - Extra-high energy handling, high electrical build, ultra-high strength (180,000 in-lb), directionally vented, station arrester

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Digits 5 to 10 – Arrester rating and duty cycle (MCOV)

kV/MCOV Availability by type	
UIAA	3 to 108 kV
USAA	3 to 240 kV
UHAA	3 to 240 kV
UXAA	3 to 108 kV
UXLB	3 to 360 kV
UXLC	132 to 360 kV
UHAF	3 to 396 kV
UXLG	3 to 396 kV

003002 = 3 kV (2.55 kV)	**060048** = 60 kV (48.0 kV)	**192152** = 192 kV (152 kV)
006005 = 6 kV (5.10 kV)	**066053** = 66 kV (53.0 kV)	**198160** = 198 kV (160 kV)
009007 = 9 kV (7.65 kV)	**072057** = 72 kV (57.0 kV)	**204165** = 204 kV (165 kV)
010008 = 10 kV (8.4 kV)	**078062** = 78 kV (62.0 kV)	**216174** = 216 kV (174 kV)
012010 = 12 kV (10.2 kV)	**084068** = 84 kV (68.0 kV)	**228180** = 228 kV (180 kV)
015012 = 15 kV (12.7 kV)	**090070** = 90 kV (70.0 kV)	**240190** = 240 kV (190 kV)
018015 = 18 kV (15.3 kV)	**096076** = 96 kV (76.0 kV)	**258209** = 258 kV (209 kV)
021017 = 21 kV (17.0 kV)	**096077** = 96 kV (77.0 kV)	**264212** = 264 kV (212 kV)
024019 = 24 kV (19.5 kV)	**108084** = 108 kV (84.0 kV)	**276220** = 276 kV (220 kV)
027022 = 27 kV (22.0 kV)	**120098** = 120 kV (98.0 kV)	**288230** = 288 kV (230 kV)
030024 = 30 kV (24.4 kV)	**132106** = 132 kV (106 kV)	**312245** = 312 kV (245 kV)
033027 = 33 kV (27.0 kV)	**138111** = 138 kV (111 kV)	**330267** = 330 kV (267 kV)
036029 = 36 kV (29.0 kV)	**144115** = 144 kV (115 kV)	**336269** = 336 kV (269 kV)
039031 = 39 kV (31.5 kV)	**150120** = 150 kV (120 kV)	**360289** = 360 kV (289 kV)
042034 = 42 kV (34.0 kV)	**162130** = 162 kV (130 kV)	**378306** = 378 kV (306 kV)
045036 = 45 kV (36.5 kV)	**168131** = 168 kV (131 kV)	**396318** = 396 kV (318 kV)
048039 = 48 kV (39.0 kV)	**172140** = 172 kV (140 kV)	
054042 = 54 kV (42.0 kV)	**180144** = 180 kV (144 kV)	

Exceptions:

- 42 kV and 45 kV designs not available in UHAF and UXLG
- 150 kV design only available in UXLB and UXLC
- 96 kV and 77 kV MCOV designs only available in UXLB, UXLC, UHAF and UXLG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Digit 11 – Housing design

A – High-creep UltraSIL polymer housing

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Digits 12 and 13 – Housing code

Refer to the table for standard housing codes by arrester types. For optional housing codes including extended leakage designs, refer to Eaton catalog sections.

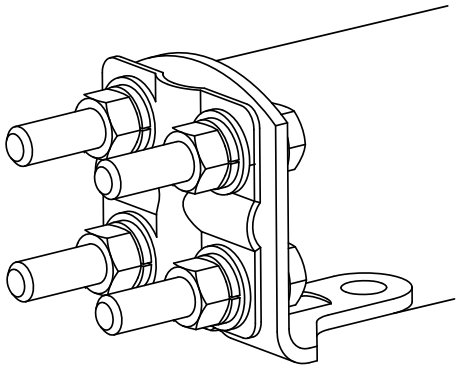
Arrester rating	Housing code (leakage in inches)							
	UIAA	USAA	UHAA	UXAA	UXLB	UXLC	UHAF	UXLG
3	06 (23)	08 (30.7)	08 (30.7)	08 (30.7)	10 (38.4)		14 (67.7)	14 (68.1)
6	06 (23)	10 (38.4)	10 (38.4)	10 (38.4)	12 (46.1)		14 (67.7)	14 (68.1)
9	08 (30.7)	10 (38.4)	10 (38.4)	10 (38.4)	12 (46.1)		14 (67.7)	14 (68.1)
10	08 (30.7)	10 (38.4)	10 (38.4)	10 (38.4)	12 (46.1)		14 (67.7)	14 (68.1)
12	08 (30.7)	12 (46.1)	12 (46.1)	12 (46.1)	14 (53.7)		14 (67.7)	14 (68.1)
15	08 (30.7)	12 (46.1)	12 (46.1)	12 (46.1)	14 (53.7)		14 (67.7)	14 (68.1)
18	10 (38.4)	14 (53.7)	14 (53.7)	14 (53.7)	16 (61.4)		14 (67.7)	14 (68.1)
21	10 (38.4)	14 (53.7)	14 (53.7)	14 (53.7)	16 (61.4)		14 (67.7)	14 (68.1)
24	12 (46.1)	16 (61.4)	16 (61.4)	16 (61.4)	18 (69.1)		14 (67.7)	14 (68.1)
27	14 (53.7)	16 (61.4)	16 (61.4)	16 (61.4)	18 (69.1)		14 (67.7)	14 (68.1)
30	14 (53.7)	18 (69.1)	18 (69.1)	18 (69.1)	20 (76.8)		14 (67.7)	14 (68.1)
33	16 (61.4)	18 (69.1)	18 (69.1)	18 (69.1)	22 (84.4)		14 (67.7)	14 (68.1)
36	16 (61.4)	18 (69.1)	18 (69.1)	18 (69.1)	22 (84.4)		14 (67.7)	14 (68.1)
39	18 (69.1)	22 (84.4)	22 (84.4)	22 (84.4)	24 (92.1)		14 (67.7)	14 (68.1)
42	18 (69.1)	22 (84.4)	22 (84.4)	22 (84.4)	24 (92.1)			
45	20 (76.8)	24 (92.1)	24 (92.1)	24 (92.1)	26 (99.8)			
48	22 (84.4)	26 (99.8)	26 (99.8)	26 (99.8)	28 (107.5)		24 (114.2)	24 (114.7)
54	22 (84.4)	26 (99.8)	26 (99.8)	26 (99.8)	28 (107.5)		24 (114.2)	24 (114.7)
60	26 (99.8)	28 (107.5)	28 (107.5)	28 (107.5)	32 (122.8)		24 (114.2)	24 (114.7)
66	26 (99.8)	36 (138.2)	30 (115.2)	30 (115.2)	32 (122.8)		24 (114.2)	24 (114.7)
72	28 (115.2)	36 (138.2)	32 (122.8)	32 (122.8)	44 (168.9)		24 (114.2)	24 (114.7)
78	34 (130.5)	40 (153.5)	40 (153.5)	40 (153.5)	46 (176.6)		36 (170)	36 (170.5)
84	36 (138.2)	44 (168.9)	44 (168.9)	44 (168.9)			36 (170)	36 (170.5)
90	38 (145.9)	46 (176.6)	46 (176.6)	46 (176.6)	50 (191.9)		36 (170)	36 (170.5)
96	40 (153.5)	48 (184.3)	48 (184.3)	48 (184.3)	52 (199.6)		36 (170)	36 (170.5)
108	44 (168.9)	52 (199.6)	52 (199.6)	52 (199.6)	56 (215)		48 (225.9)	48 (226.4)
120		56 (207.3)	56 (215)		64 (245.7)		48 (225.9)	48 (226.4)
132		60 (230.3)	60 (230.3)		64 (245.7)	84 (322.4)	48 (225.9)	48 (226.4)
138		64 (245.7)	64 (245.7)		80 (307.1)	84 (322.4)	48 (225.9)	48 (226.4)
144		64 (245.7)	64 (245.7)		80 (307.1)	86 (330.1)	48 (225.9)	48 (226.4)
162		80 (307.1)	80 (307.1)		86 (330.1)	90 (345.5)	60 (284.2)	60 (285.2)
168		82 (314.8)	82 (314.8)		86 (330.1)	90 (345.5)	60 (284.2)	60 (285.2)
172		84 (322.4)	84 (322.4)		92 (353.2)	B0(422.2)	72 (340.1)	72 (341)
180		86 (330.1)	86 (330.1)		A4 (399.2)	B2 (429.9)	72 (340.1)	72 (341)
192		88 (337.8)	88 (337.8)		B0 (422.2)	B6 (445.3)	72 (340.1)	72 (341)
198		92 (353.2)	92 (353.2)		B2 (429.9)	C0 (460.6)	84 (395.9)	84 (396.9)
204		94 (360.8)	94 (360.8)		B4 (437.6)	C0 (460.6)	84 (395.9)	84 (396.9)
216		A6 (406.9)	A6 (406.9)		B6 (445.3)	C2 (468.3)	84 (395.9)	84 (396.9)
228		B0 (422.2)	B0 (422.2)		B8 (453)	C0 (460.6)	84 (395.9)	84 (396.9)
240		B2 (429.9)	B2 (429.9)		C6 (483.7)	C6 (483.7)	96 (451.8)	96 (452.7)
258					C8 (614.2)	E8 (690.9)	96 (451.8)	96 (452.7)
264					C8 (614.2)	F0 (698.6)	96 (451.8)	96 (452.7)
276					E8 (690.9)	F4 (714)	96 (451.8)	96 (452.7)
288					F2 (706.3)	F6 (721.7)	96 (451.8)	96 (452.7)
312					F6 (721.7)	H6 (798.4)		C0 (567.4)
330					H2 (783.1)	J4 (829.1)		D2 (623.2)
336					H2 (783.1)	J6 (836.8)		D2 (623.2)
360					J8 (844.5)	K2 (859.8)		E4 (679.1)
378								E4 (679.1)
396								E4 (679.1)

Standard housing code leakage distance (inches)

Housing code	UIAA	USAA, UHAA, UXAA, UXLB, UXLC	UHAF	UXLG
06	23	23		
08	30.7	30.7		
10	38.4	38.4		
12	46.1	46.1		
14	53.7	53.7	68.1	67.7
16	61.4	61.4		
18	69.1	69.1		
20	76.8	76.8		
22	84.4	84.4		
24	92.1	92.1	114.7	114.2
26	99.8	99.8		
28	115.2	107.5		
30		115.2		
32		122.8		
34	130.5			
36	138.2	138.2	170.5	170
38	145.9			
40	153.5	153.5		
44	168.9	168.9		
46	176.6	176.6		
48	184.3	184.3	226.4	225.9
50	192	192		
52	199.7	199.6		
54	207.4	207.3		
56	215.1	215		
60		230.3	285.2	284.2
64		245.7		
72			341	340.1
80		307.1		
82		314.8		
84		322.4	396.9	395.9
86		330.1		
88		337.8		
90		345.5		
92		353.2		
94		360.8		
96			452.7	451.8
A4		399.3		
A6		406.9		
B0		422.2		
B2		429.9		
B4		437.6		
B6		445.3		
B8		453		
C0		460.6	567.4	
C2		468.3		
C6		483.7		
C8		614.2		
D2			623.2	
E4			679.1	
E8		690.9		
F0		698.6		
F2		706.3		
F4		714		
F6		721.7		
H2		783.1		
H6		798.4		
J4		829.1		
J6		836.8		
J8		844.5		
K2		859.8		

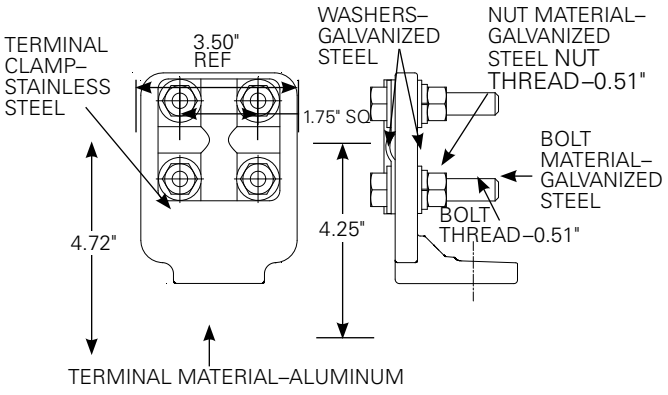
Digit 14 – Line terminal options

4—NEMA Four-hole pad (standard option UI design)



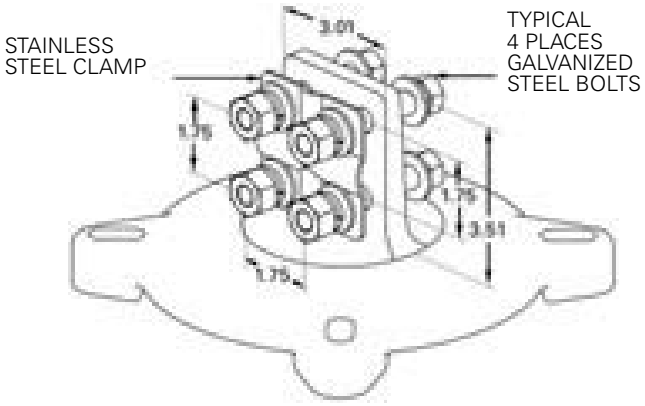
NEMA Four-hole pad accepts copper or aluminum conductors from 0.16" dia. (#6) to 0.82" dia. (500 MCM) **(Standard Option)**

4—NEMA Four-hole pad (standard option, e.g., US, UH, UX, UXLB and UXLC designs)



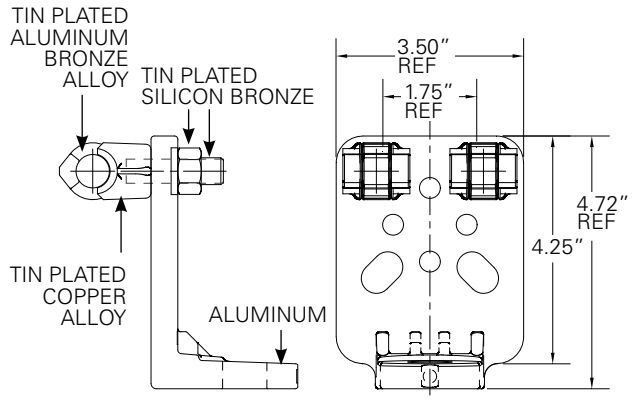
NEMA Four-hole pad and stainless terminal clamp accepts copper or aluminum conductors from 0.16" dia. (#6) to 1.15" dia. (1000 MCM).
(Top illustration shows terminal clamp, bottom illustration shows terminal clamp removed.)

4—NEMA Four-hole pad with clamp (standard option for UHAF and UXLG designs)



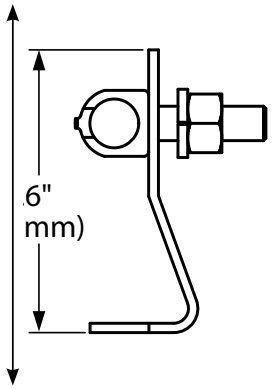
NEMA Four-hole aluminum alloy pad stainless terminal clamp accepts copper or aluminum conductors from 0.16" dia. (#6) to 0.78" dia. (500 MCM).

A – NEMA Four-hole pad with two eyebolt connectors
Available on US, UH, UX, UXLB and UXLC designs.



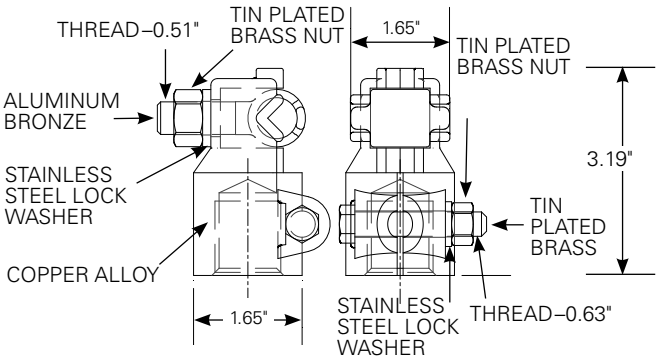
NEMA four-hole pad and two eyebolts
accepts conductors 1/0 sol-500 MCM
(Top illustration shows two eyebolts, bottom illustration shows two eyebolts removed.)

1 – Eyebolt style connector
Available on UI, US, UH, UX, UXLB, and UXLC designs.



UI design

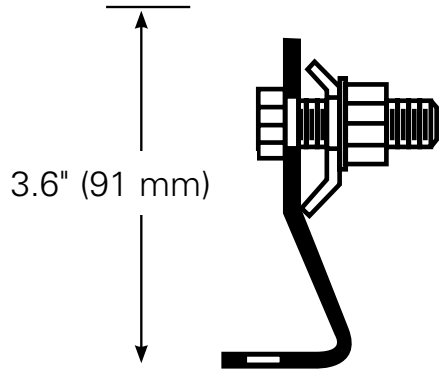
1 = Eyebolt connector
accepts copper or aluminum conductors from
0.16" dia. (#6) to 0.575" dia. (250 MCM)



US, UH, UX, UXLB, UXLC design

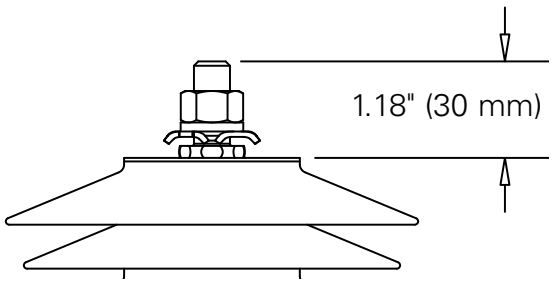
Eyebolt connector
accepts copper or aluminum conductors from
0.16" dia. (#6) up to 0.57" dia. (250 MCM)

3 – Clamp style connector
Only available on UI designs.



3 = Clamp style connector
accepts copper or aluminum conductors from
0.16" dia. (#6) to 0.82" dia. (500 MCM)

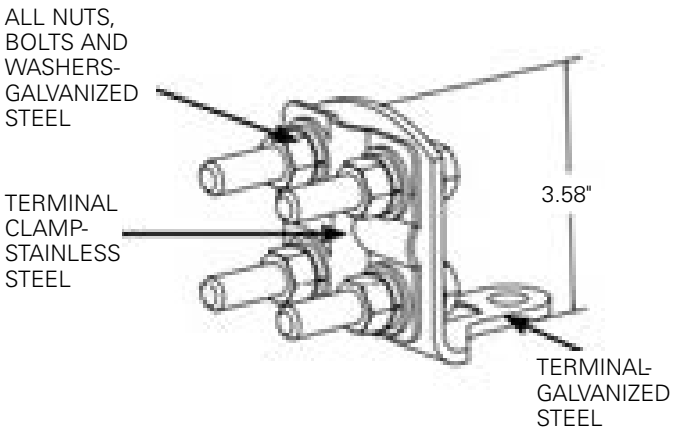
5 – Wire clamp
Only available for cubicle designs—UI, US 3 to 36 kV.



5 = Wire clamp accepts
copper or aluminum conductors from
0.16" dia. (#6) to 0.575" dia. (250 MCM) (cubicle mount)

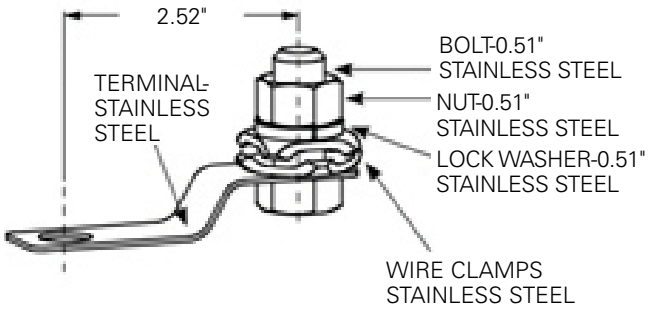
Digit 15 – Ground terminal options

Standard Offering—Select **5**



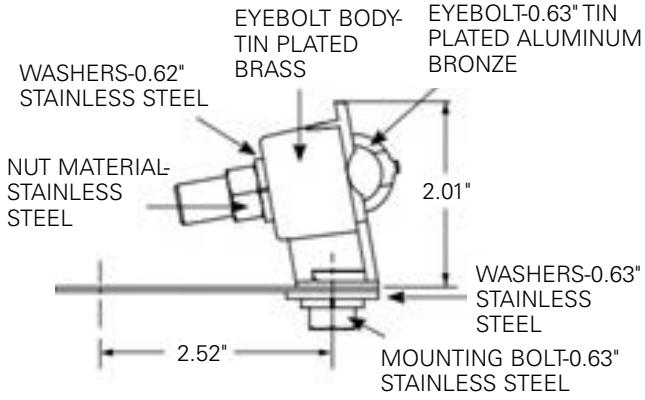
NEMA Four-hole pad
Accepts copper or aluminum conductors from 0.16" dia. (#6) to 0.82" dia. (500 MCM)

Optional Offering—Select **1**



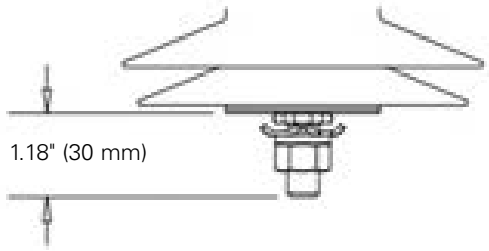
Clamp style connector
Accepts copper or aluminum conditors from 0.16" dia. (#6) to 0.575" dia. (250 MCM)

Optional Offering—Select **9**



Eyebolt connector
Accepts copper or aluminum conductors from 0.16" dia. (#6) to 0.575" dia. (250 MCM)

Optional Offering—Select **B**



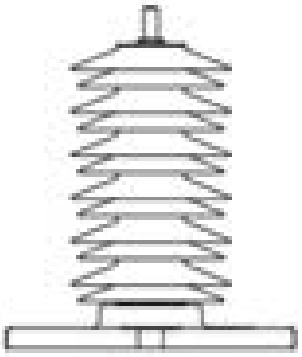
Wire clamp
Accepts copper or aluminum conductors from 0.16" dia. (#6) to 0.575" dia. (250 MCM)

(Cubicle Mount)
For use with option code "B" digit 16 cubicle mount US type (3–36 kV)

B – also available on UI

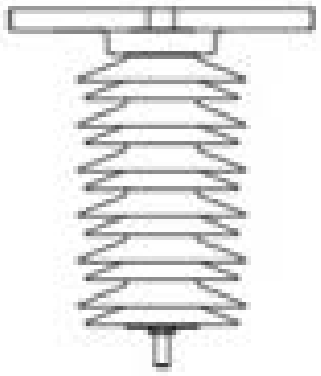
Directionally vented arresters only available with NEMA Four-hole pad.

Digit 16 – Mounting configuration



A = Mounting base located on bottom
(standard option)

B = No mounting base (cubicle mount)
(UI and US type 3–36 kV)



C = Mounting Base Located on Top
(suspension mount not available for UHAF and UXLG)

Cubicle mount option "B" only available for US or UI type 3–36 kV.

Directionally vented arresters only available with standard mounting option "A".

Digit 17 – Nameplate

"1" – Nameplate for standard mount per ANSI C62.11

"2" – Nameplate for cubicle mount (US or UI Type 3–36 kV) option code "B" for digit 16

Digit 18 – Packaging

"1" – Cardboard packaging

"2" – Wood crating

Low-voltage arresters

Secondary arresters and protective gaps

Figure 12. Type L (upper left), Type S4 (lower left), and protective gap (right)

The necessity of providing surge arrester protection on low-voltage circuits is fundamentally the same as for primary system protection. While secondary lines usually are shorter than primary lines, they are still subject to surges that can cause stress beyond the insulation withstand of connected equipment.

Eaton's Type L secondary arrester protects street-lighting controls, low-voltage relays, railroad-signal circuits and fire alarms. They are applicable for voltages up to 175 Vac or 125 Vdc and are designed for indoor mounting. Type S4 arresters protect secondary distribution circuits, control circuits and signal circuits up to 650 Vac and are designed for indoor or outdoor use. Protective gaps isolate electrical equipment during normal service conditions and provide a path to ground for surge current during arrester operations.

For more information on Type L, Type S4 and protective gaps, consult Eaton catalog CA235001EN.

Recommended application of L, S4 and protective gaps

Table 7. Recommended application

Recommended applications of surge arresters

System voltage	Type	Rating ①
120 volts	L	175 V
120/240 volts	L	175 V
120/240 volts Y	L	175 V
240 volts	S4	650 V
480 volts	S4	650 V
600 volts	S4	650 V
2.4 kV delta	Protective gap	6 kV
4.16Y/2.4 kV	Protective gap	11 kV
4.8 kV delta	Protective gap	11 kV
8.32Y/4.8 kV	Protective gap	15 kV
6.9 kV delta	Protective gap	15 kV
12.47Y/7.2 kV	Protective gap	15 kV
13.2 kV delta	Protective gap	15 kV
14.4 kV delta	Protective gap	15 kV

① An arrester rating represents the maximum line-to-ground voltage to which the arrester should be subjected. Because surge arresters are inherently sensitive to overvoltages, they should never be subjected to 60 Hz voltages above their rated voltage, even during momentary abnormal conditions. If such a condition is likely, a special system study may be necessary, and a higher rated arrester may be required.

Table 8. Type L maximum discharge voltage

Electrical ratings and characteristics

Arrester rating	1.5 kA	3 kA	5 kA	10 kA
175 Vac 125 Vdc	1.1	1.2	1.4	1.7

Table 9. Type S4 maximum discharge voltage

Rating	1.5 kA	3 kA	5 kA	10 kA
650 V	2.1	2.4	2.7	3.0

Table 10. Protective gap sparkover characteristics

System voltage (kV)	60 Hz sparkover (kV rms)	Impulse sparkover Crest (kV)
2.4 delta	6	11
4.16Y/2.4, 4.8 delta	11	17.5
8.32Y/4.8, 6.9 delta	15	25
12.4Y/7.2	15	25
13.2 delta, 14.4 delta	15	25

Table 11. Type L arresters catalog numbers

		Standard package	
Description	Catalog number	Quantity	Weight of package (lb)
Arrester with 1" grounding link	**AS1B1**	5	5
Arrester only	**AS1B2**	5	5

Table 12. Type S4 arresters catalog numbers

Description	Catalog number	Standard package Quantity	Weight of package (lb)
Single unit w/o terminal cap, without mtg. bracket with line lead	**ASZ1A101**	1	2
Single unit with terminal cap, without mtg. bracket, with line lead	**ASZ1A102**	1	2
Single unit with terminal cap, with mtg. bracket, with line lead	**ASZ1A103**	1	2

Table 13. Protective gaps catalog numbers

Description (60 Hz sparkover)	Catalog number	Standard package Quantity	Weight of package (lb)
6 kV	**AG1A22**	1	1
11 kV	**AG1A23**	1	1
15 kV	**AG1A24**	1	1

VariSTAR Storm Trapper secondary class MOV surge arrester

Eaton's Cooper Power series VariSTAR Storm Trapper™ secondary class MOV surge arrester is designed to provide overvoltage protection for low voltage equipment and distribution circuits. Storm Trapper is available in 175, 350 and 650 volt configurations in one to three poles supporting two to four wire systems.

For more information on the VariSTAR Storm Trapper, visit Eaton catalog CA235020EN.

Electrical characteristics and application

Table 14. Protective characteristics

Arrester rating	MCOV	Maximum discharge voltage 8/20 µs current wave (kV crest)				
(V rms)	(V rms)	1.5 kA ①	3 kA ①	5 kA ①	10 kA(a)	10 kA ②
175	175	1.1	1.2	1.4	1.7	3.1
350	350	1.6	1.7	1.0	2.3	3.5
650	650	2.2	2.4	2.7	3.1	4.0

① 1.5" leads.

② 18" leads.

Table 15. Performance test characteristics ①

Description	Characteristics
Duty cycle	20 current surges of 1.5 kA crest 8/20 µs waveshape followed by 2 current surges of 1.5 kA crest 8/20 µs waveshape
High current, short duration discharge	2 current surges of 10 kA crest 4/10 µs waveshape

① Per IEEE Std C62.11™-1993.

Table 16. Insulation characteristics

Arrester rating (V rms)	1.2/50 µs impulse (kV crest)	1 min. dry (kV rms)	10 sec. wet (kV rms)
175	10	6	6
350	10	6	6
650	10	6	6

Table 17. Common applications

System configuration		Storm Trapper arrester		
Phase/wiring	**Voltage (volts rms)**	**MCOV (volts rms) ①**	**Number of poles**	**Catalog number ②**
Single-phase/two-wire	120	175	1	**ASZ175B1**
	240	350	1	**ASZ350B1**
	480	650	1	**ASZ650B1**
	600	650	1	**ASZ650B1**
Single-phase/three-wire	240/120	175	2	**ASZ175B2**
	480/240	350	2	**ASZ350B2**
Three-phase (ungrounded)/three-wire	240	350	3	**ASZ350B3**
	480	650	3	**ASZ650B3**
Three-phase (one-phase grounded)/three-wire	240	350	2	**ASZ350B2**
	480	650	2	**ASZ650B2**
Three-phase (one-phase center-tap grounded)/four-wire	240/120	350	3	**ASZ350B3**
	480/240	650	3	**ASZ650B3**
Three-phase/four-wire	208Y/120	175	3	**ASZ175B3**
	480Y/277	350	3	**ASZ350B3**

① Maximum continuous operating voltage (MCOV) is the maximum designated rms value of power frequency voltage that may be applied continuously between the terminals of the arrester.

② Mounting bracket option available. Add suffix 1 to change catalog number (Example: A5Z175B11).

Catalog numbers available

Table 18. Storm Trapper catalog numbers

Arrester rating (V rms)	Number of poles	Catalog number without mounting bracket	Catalog number with mounting bracket
175	1	**ASZ175B1**	**ASZ175B11**
175	2	**ASZ175B2**	**ASZ175B21**
175	3	**ASZ175B3**	**ASZ175B31**
350	1	**ASZ350B1**	**ASZ350B11**
350	2	**ASZ350B2**	**ASZ350B21**
350	3	**ASZ350B3**	**ASZ350B31**
650	1	**ASZ650B1**	**ASZ650B11**
650	2	**ASZ650B2**	**ASZ650B21**
650	3	**ASZ650B3**	**ASZ650B31**

Storm Trapper H.E. (high energy) low-voltage distribution class MOV surge arrester

Eaton designs its Cooper Power series Storm Trapper H.E. low-voltage distribution-class surge arresters to provide surge protection at distribution transformer secondary bushings. Years of research in low-voltage secondary circuits concluded that the types and magnitudes of surges that can exist in these circuits are more severe than previously thought. The Storm Trapper H.E. arrester was born out of this research and designed to reliably handle the stresses of these circuits. The research further noted that transformer failure rates can be significantly reduced by adding surge protection to transformer secondary bushings.

For more information on Storm Trapper H.E. arresters, consult Eaton catalog CA235015EN.

Features and electrical characteristics

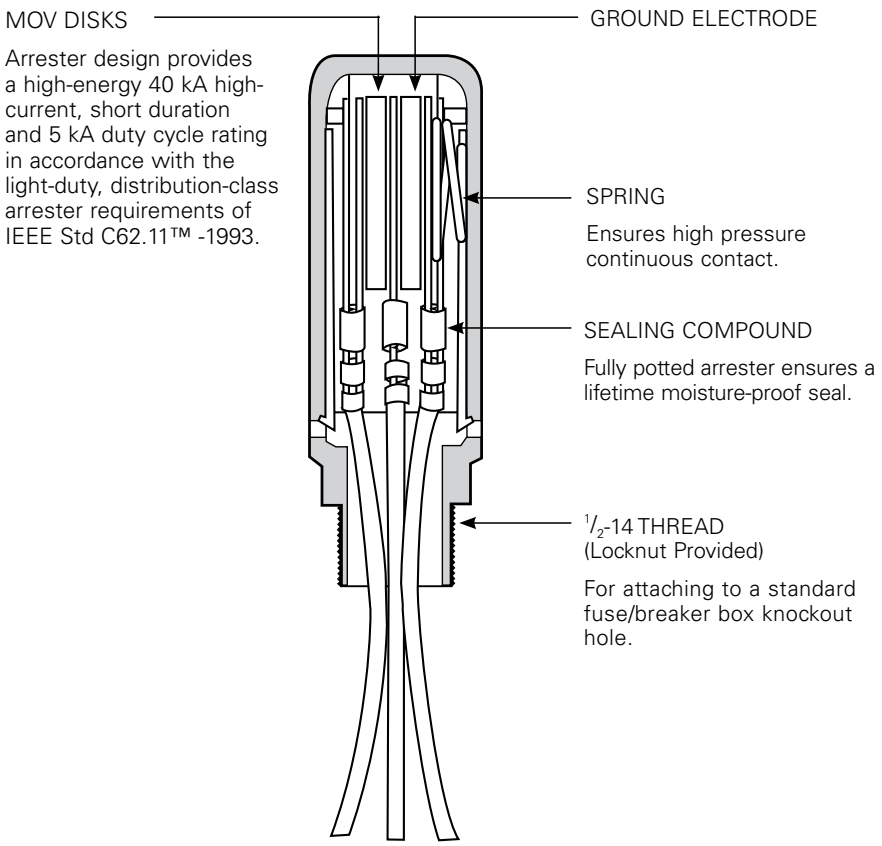


Figure 13. Cutaway of Storm Trapper H.E.

Table 19. Protective characteristics

Arrester rating (V rms)	MCOV (V rms)	Maximum energy capability (joules/phase)	Front of wave protective level (kV crest) ①	Maximum discharge voltage (kV crest) 8/20 µs current wave				
			5 kA	1.5 kA	5 kA	10 kA	20 kA	40 kA
175	175	3226	1.7	1.4	1.6	1.8	2.0	2.4
240	240	3405	1.8	1.5	1.7	1.9	2.2	2.6
480	400	3776	2.0	1.7	1.9	2.1	2.4	2.9
650	540	4660	2.6	2.1	2.4	2.6	3.0	3.6

① Based on a current impulse that results in a discharge voltage cresting in 0.5 µs.

Table 20. Withstand voltages

Arrester rating (V rms)	1.2/50 impulse (kV crest)	1 min dry (kV rms)	10 sec wet (kV rms)
All ratings	10	6	6

Table 21. Performance test characteristics ①

Description	Characteristics
High-current, short-duration	2 discharges of 40 kA crest, 4/10 µs current wave
Low-current, long-duration	20 surges of 75 A–2000 microsecond duration
Duty cycle	22 operations of 5 kA crest, 8/20 µs current wave

① Tests were performed in accordance with applicable sections of IEEE Std C62.11™ -1993 (metal oxide surge arresters for alternating current power circuits).

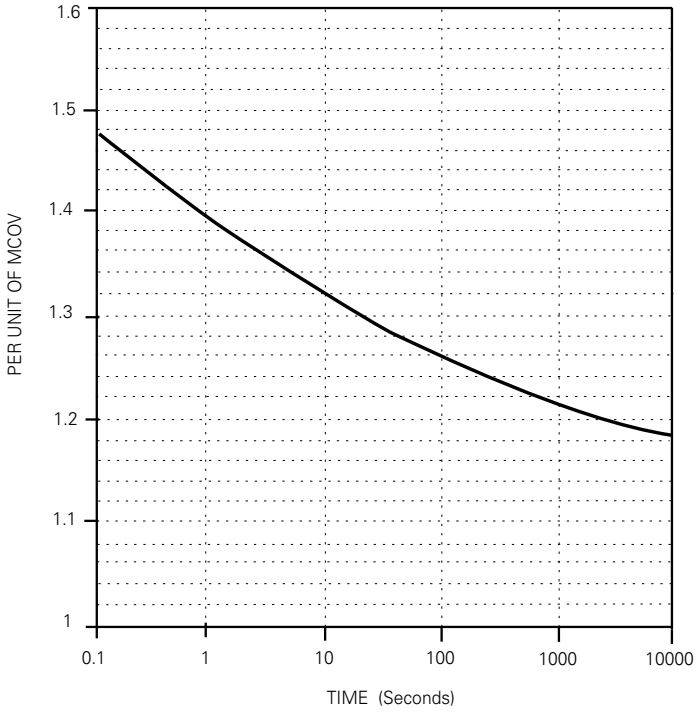


Figure 14. Storm Trapper H.E. temporary overvoltage capability

Catalog numbers

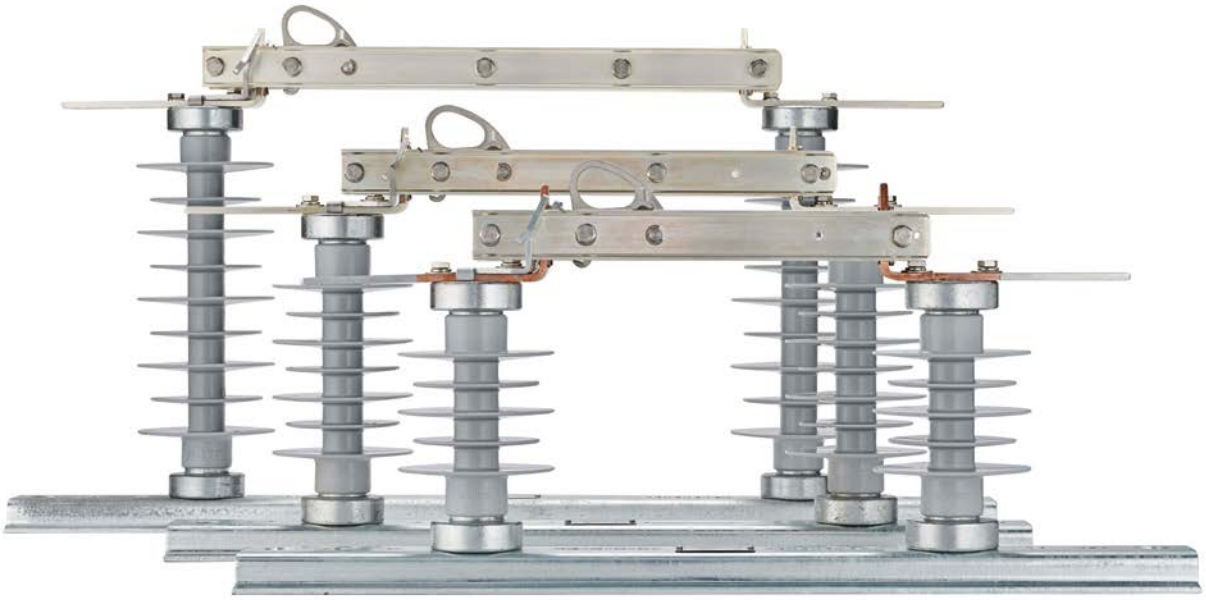
Table 22. Storm Trapper H.E. catalog numbers

Storm Trapper H.E. arrester type	Voltage rating (V rms)	MCOV (V rms)	Number of poles	Catalog number without hanger bracket ①
External mount	175	175	1	**ASZH175C100**
	175	175	2	**ASZH175C200**
	175	175	3	**ASZH175C300**
	240	240	1	**ASZH240C100**
	240	240	2	**ASZH240C200**
	240	240	3	**ASZH240C300**
	480	400	1	**ASZH480C100**
	480	400	2	**ASZH480C200**
	480	400	3	**ASZH480C300**
	650	540	1	**ASZH650C100**
	650	540	2	**ASZH650C200**
	650	540	3	**ASZH650C300**
Metal-enclosed	175	175	1	**ASZH175E100**
	175	175	2	**ASZH175E200**
	175	175	3	**ASZH175E300**
	240	240	1	**ASZH240E100**
	240	240	2	**ASZH240E200**
	240	240	3	**ASZH240E300**
	480	400	1	**ASZH480E100**
	480	400	2	**ASZH480E200**
	480	400	3	**ASZH480E300**
	650	540	1	**ASZH650E100**
	650	540	2	**ASZH650E200**
	650	540	3	**ASZH650E300**

① To order an arrester with mounting bracket, change the last digit from a 0 to a 1. (Example: Change ASZH480C200 to ASZH480C201)

Single-phase switches

D-73P single-phase disconnect and bypass switches



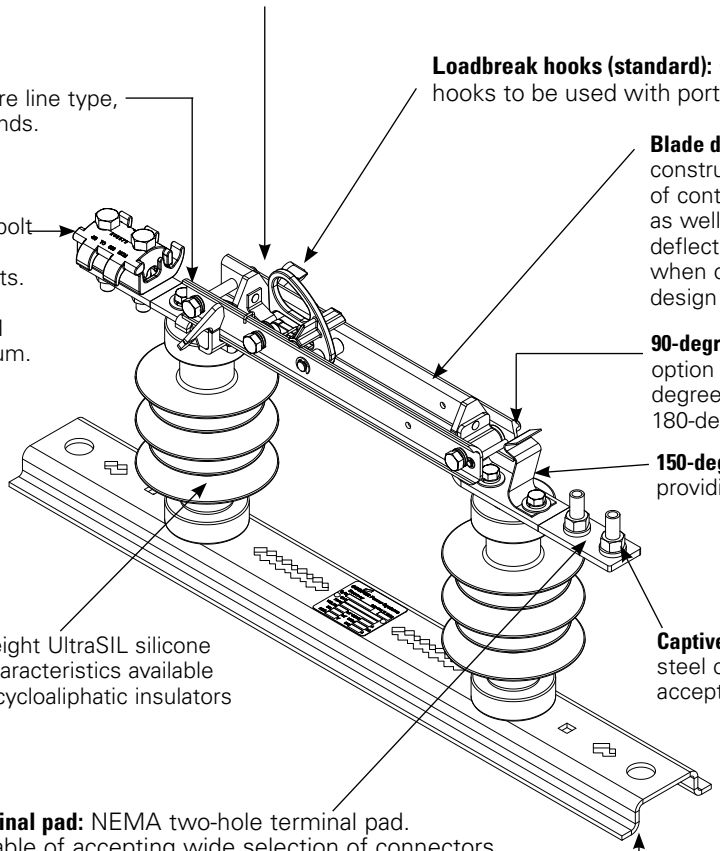
Eaton's D-73P distribution-class, single-throw disconnect switch provides a durable, rugged lightweight switch for line sectionalizing or isolating equipment on distribution circuits up to 38 kV. These UltraSIL polymer-insulated switches are constructed to ensure stable high-current capability and full thermal capacity under the required duties of today's load and short-circuit conditions.

The D-73P3 bypass switch model provides an economical way for bypassing and disconnecting pole-mounted distribution-class reclosers and regulators. This permits maintenance without disturbing continuity of service.

The switches can be mounted in vertical, underhung, pole-mounted or single/double crossarm configurations. A variety of terminal connections and options are available to customize the switch for the user's needs.

For more detailed information on Eaton's D-73P disconnect and bypass switches, consult catalog CA008005EN.

Features and design details



Minimum current interchanges: Uniform conductivity is ensured through utilization of hard drawn copper bar in forming one piece stationary contacts and terminal pads. Design reduces current interchange points to a minimum.

Loadbreak hooks (standard): Galvanized steel hooks to be used with portable loadbreak tool.

Contacts: High-pressure line type, both clip and hinge ends.

Blade design: Silver-plated copper in truss-type construction with cross braces in front and back of contacts provides secure force on contacts, as well as, superior rigidity, thus minimizing side deflection and maintaining positive alignment when closing the switch. The blade and latch design provides for positive latch.

Parallel groove clamp: Two-bolt tinned bronze clamp secured with two galvanized steel bolts. Conductor range: #6 solid to 397.5 MCM ASCR, 500 MCM Copper or 556 MCM Aluminum.

90-degree stop pin: Pin included as standard option to provide blade opening stop at 90 degrees. Pin able to be removed in field for 180-degree opening.

150-degree latch: Optional positive stop for providing blade latch at 150-degree opening.

Insulators: Available in lightweight UltraSIL silicone rubber polymer, 2.25 B.C., characteristics available upon request. Porcelain and cycloaliphatic insulators also available.

Captive bolts: Two captive stainless steel carriage bolts. 1-3/4" long bolts, accepts compression terminals.

Terminal pad: NEMA two-hole terminal pad. Capable of accepting wide selection of connectors. See Table 1 for standard offering. 600 A ratings have tin-plated pads to accommodate either bronze or aluminum terminals. 900 A switch has silver-plated contacts.

Switch base: Base and backstrap is rugged, hot-dipped galvanized 7 gauge steel that have a dead-ending hole for conductor at each end. Rigidity of base prevents distortion/twisting when bolting down. Standard base offering comes equipped with 1" diameter hole for dead-ending conductors.

Vertical or underhung mounting: Easily adaptable to single or double crossarm construction.

Backstrap: 15" backstrap with two mounting bolts, washers, lockwashers, and nuts **standard**. Optional full length (25.25") backstrap also available with two or four mounting bolts.

Figure 15. D-73P disconnect switch features

Electrical ratings and dimension specifications

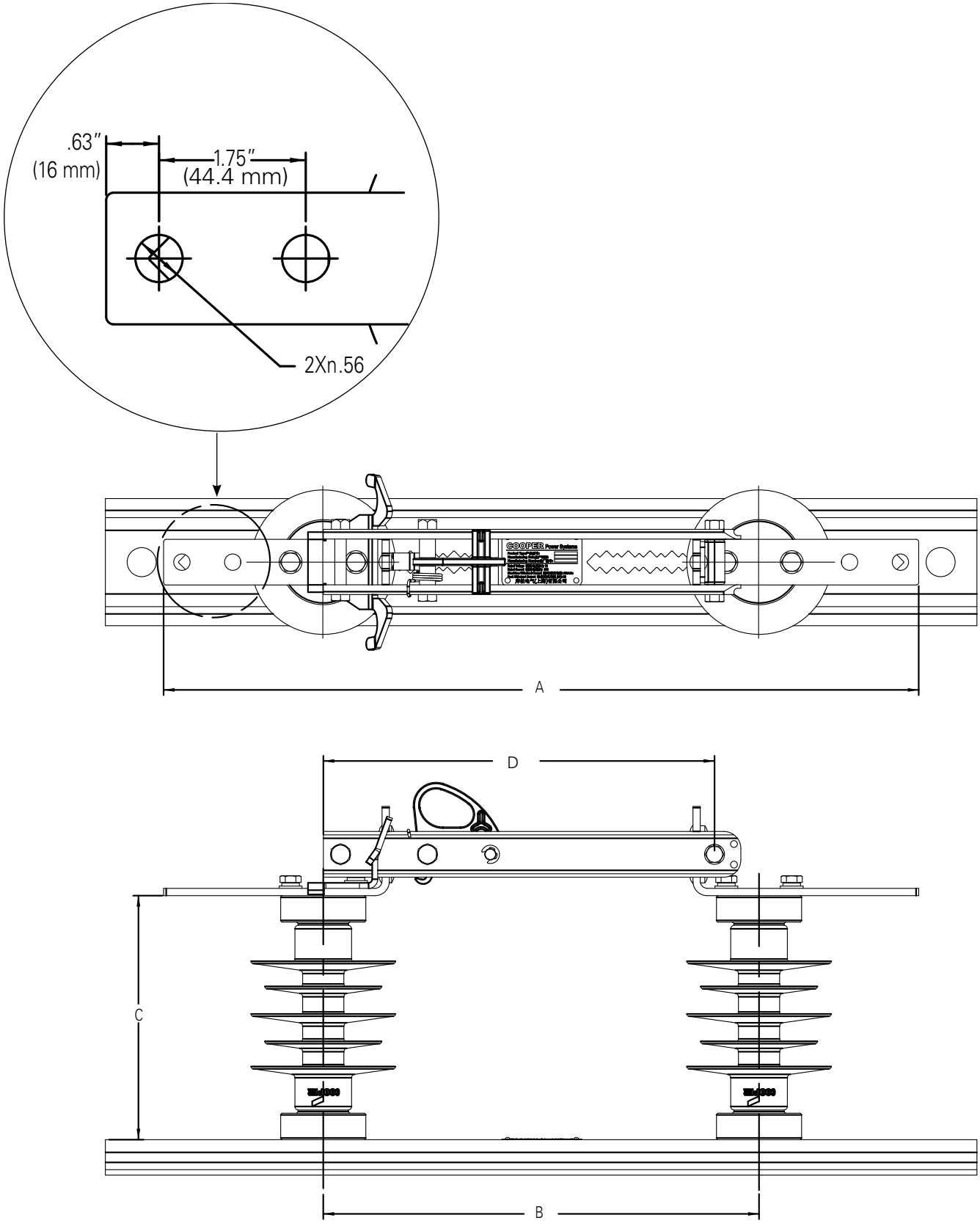
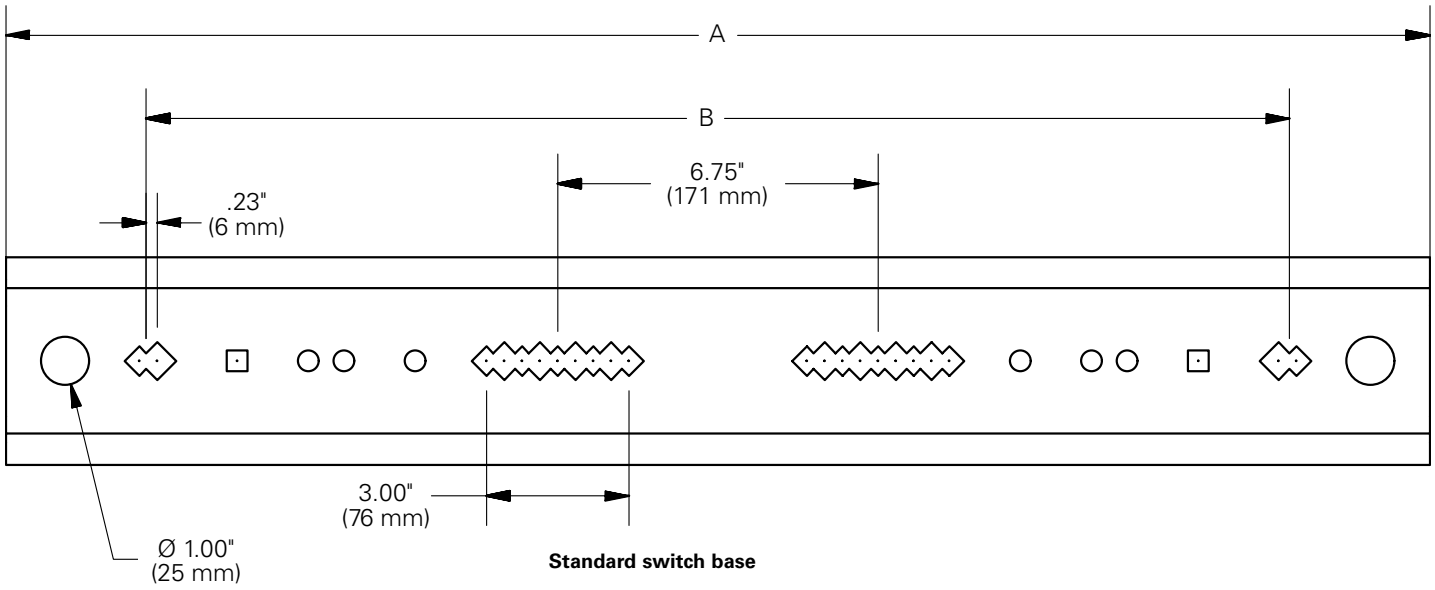


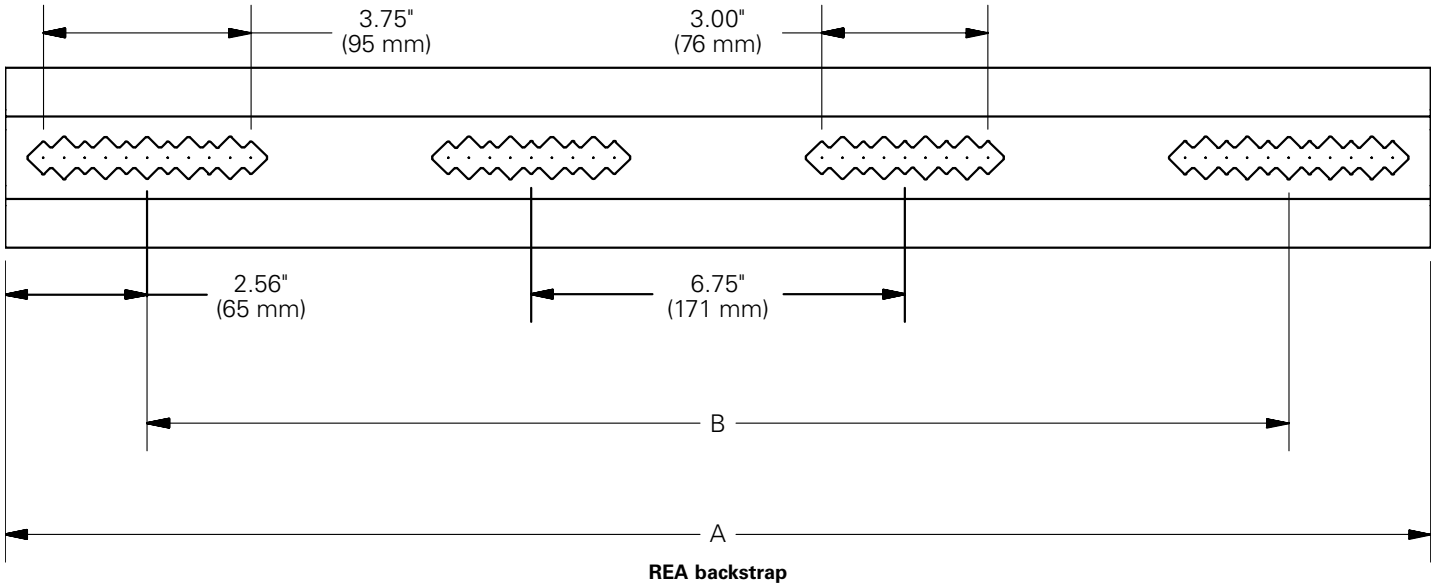
Figure 16. D-73P disconnect switch overview

Table 23. D-73P disconnect switch electrical ratings and dimensions (reference Figure 16)

	Ratings			Catalog number		Dimensional data in inches (mm)					Insulator mechanical ratings			
Insulation material	kV max. design	BIL kV	Mom. kA	600 A	900 A	A	B	C	D	Creep	Switch weight, lb	Cantilever	Tension, lb	Torsion ft-lb
UltraSIL polymer	15.5	110	40	**D73P16S0**	**D73P19S0**	26 (660)	15 (381)	8.4 (213)	14.38 (365)	20.2 (513)	26.5	1350	5000	350
UltraSIL polymer	27	125	40	**D73P26S0**	**D73P29S0**	26 (660)	15 (381)	8.4 (213)	14.38 (365)	20.2 (513)	26.5	1350	5000	350
UltraSIL polymer	27	150	40	**D73P36S0**	**D73P39S0**	29 (737)	18 (457)	10.8 (274)	16.75 (425)	28 (711)	33	1350	5000	350
UltraSIL polymer	38	150	40	**D73P46S0**	**D73P49S0**	29 (737)	18 (457)	10.8 (274)	16.75 (425)	28 (711)	33	1350	5000	350
UltraSIL polymer	38	200	40	**D73P56S0**	**D73P59S0**	34 (859)	23 (580)	15.0 (381)	21.3 (542)	38 (965)	45	1350	5000	350



Standard switch base



REA backstrap

Figure 17. D-73P Disconnect switch base and backstrap options; for more options, consult catalog

Table 24. D-73P Base dimensions (reference Figure 17)

Table for base channels

		Dimensions in inches (mm)	
	BIL	**A**	**B**
Standard	110, 125, 150	30.00 (762)	24.09 (612)
	200	37.85 (961)	31.94 (811)
Slotted	110, 125, 150	30.00 (762)	24.00 (610)
	200	31.94 (811)	31.90 (810)

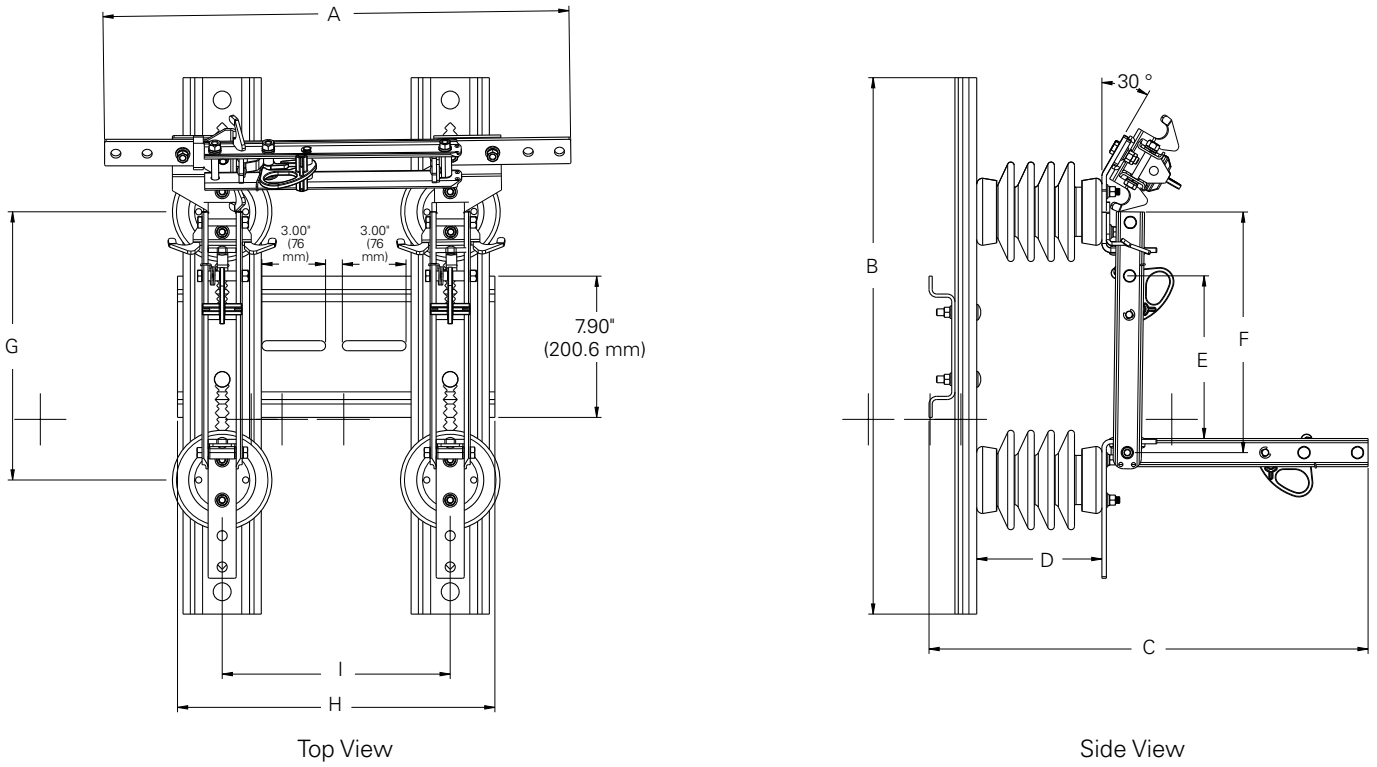


Figure 18. D-73P3 bypass switch overview

Table 25. D-73P3 bypass switch electrical ratings and dimensions (reference Figure 18)

	Ratings			**Catalog number**				**Dimensional data in inches (mm)**								
Insulation material	**kV Max. design**	**BIL kV**	**Mom. kA**	**600 A**	**900 A**	**Insulator creep**	**Weight (lb)**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
UltraSIL polymer	15.5	110	40	**D73316S0**	**D73319S0**	20.2 (513)	62	26 (660)	30 (762)	25.95 (659)	8.4 (213)	9.1 (231)	13.45 (342)	15 (381)	17.75 (451)	12.75 (324)
UltraSIL polymer	27	125	40	**D73326S0**	**D73329S0**	20.2 (513)	62	26 (660)	30 (762)	25.95 (659)	8.4 (213)	9.1 (231)	13.45 (342)	15 (381)	17.75 (451)	12.75 (324)
UltraSIL polymer	27	150	40	**D73336S0**	**D73339S0**	28 (711)	75	29 (660)	30 (762)	28 (711)	10.8 (274)	13 (330)	15.75 (400)	18 (457)	20.75 (527)	15.75 (400)
UltraSIL polymer	38.0	150	40	**D73346S0**	**D73349S0**	28 (711)	75	29 (660)	30 (762)	28 (711)	10.8 (274)	13 (330)	15.75 (400)	18 (457)	20.75 (427)	15.75 (400)

Ordering information

Table 26. D-73P and D-73P3 catalog number configurator

1	2	3	4	5	6	7	8	9
D	**7**	**3**	**P**	**1**	**6**	**S**	**0**	**P**

BASE CATALOG NUMBER

CODE	SWITCH TYPE
P	**Distribution-class disconnect switch (D-73P)**
3	**Distribution-class Recloser/regulator bypass switch (D-73P3)**

CODE	VOLTAGE BIL
1	**15 kV, 110 BIL**
2	**27 kV, 125 BIL**
3	**27 kV, 150 BIL**
4	**38 kV, 150 BIL**
5 ①	**38kV, 200 BIL**

① Digit 5 can only be "5" for D-73P.

CODE	CURRENT
6	**600 A**
9	**900 A**

CODE	INSULATOR MATERIAL
S	**Silicone rubber**
P	**Porcelain Not available with option 5**

CODE	BASE
0 ①	**Serrated slot**
2	**Smooth slot**

① Digit 8 always "0" for D-73P3.

CODE	OPTIONS
A	**150 Degree latch**
B	**Bypass studs (D-73P only)**
C	**Captive volts**
D	**REA vackstrap (2-3/8" x 9" bolts) (D-73P only)**
E	**REA backstrap (4-3/8" x 9" bolts) (D-73P only)**
L	**Left-hand operation (D-73P3 only)**
M	**Pole-mount bracket** ① **(D-73P3 only)**
N	**Without 90° stop pin**
P	**Parallel groove clamp** ②
R	**No backstrap**
S	**Stainless steel loadbreak hook**
X	**Extended pole-mount bracket (D-73P3 only)**

① 2-bolt backstrap standard for bypass switch.

② Conductor range: #6 solid to 397.5 MCM ASCR, 500 MCM Copper or 556 MCM Aluminum.

Note: Leave digit 9 blank if no option is required.

Example: 600 A, 15 kV, D-73P disconnect switch in silicone rubber with standard base and parallel groove clamp = D73P16S0P

D-73P cutout disconnect, line-tap disconnect and V-style switches

The cutout disconnect switch is designed for riser pole applications where the switch is easily installed with included crossarm bracket. The switch combines Eaton's Type L cutout and D-73P disconnect switch to provide a rugged and reliable low-cost switching device.

Figure 19. D-73P cutout disconnect switch

The line tap disconnect switch provides a disconnect switch option for cable-riser and crossover application.

Figure 20. D-73P line tap disconnect switch

The V-style crossarm disconnect switch is available with multiple bases and mounting configurations, making it a versatile switching option for vertical or inverted crossarm installations.

Figure 21. V-style crossarm disconnect switch

Cutout, line tap and V-style disconnect switches are available in 600 A and 900 A designs in ratings for distribution systems up to 38 kV 150 kV BIL.

For more information, including detailed dimensional and fitment data, on cutout, line tap or V-style crossarm disconnect switches, consult Eaton catalog CA008005EN.

Ordering information

Table 27. Cutout, line tap and V-style disconnect switch catalog number configurator

1	2	3	4	5	6	7	8	9	10
D	**7**	**3**	**C**	**D**	**1**	**6**	**S**	**0**	**X**

BASE CATALOG NUMBER

Digits 4-5	
DESCRIPTION	CODE
Cutout disconnect switch	**CD**
Line tap switch	**LT**
Crossarm vertical switch	**VS**

Digit 6	
VOLTAGE, BIL	CODE
15.5 kV, 110 BIL	**1**
27 kV, 125 BIL	**2**
27 kV, 150 BIL	**3**
38 kV, 150 BIL	**4**

Digit 7	
AMP	CODE
600 A	**6**
900 A	**9**

Digit 8	
INSULATOR MATERIAL	CODE
Silicone rubber	**S**

Digit 9	
BASE	CODE
CD, LT	**0**
V base for VS	**3**
HOM base for VS	**4**

Digit 10	
OPTION	CODE
150 Degree latch	**A**
Captive bolts (1.75" long, SST)	**C**
NEMA D bracket (for CD)	**D**
No mounting bracket (for CD)	**N**
Parallel groove connector	**P**
Extended mounting bracket (for CD)	**X**
1" Straight hanger (LT type only)	**H3** ①
1" Angled hanger (LT type only)	**H4**
3/4" Angled hanger (LT type only)	**H5**

Example: D73CD16S0X - 600 A, 15 kV, D73-CD switch with silicone rubber insulators and extended mounting bracket.

① 1" straight hanger not available on switches with option code 1 or 2 in digit 6.

Note: Leave digit 10 blank if no option is required.

D-73-TS in-line tension switch

Eaton offers a single insulator in-line tension switch for installation directly into the line wherever sectionalizing is desired.

For more information on the D-73P in-line tension switch, including detailed dimensional information, consult Eaton catalog CA008005EN.

Catalog numbers and ratings

Table 28. D-73-TS in-line tension switch catalog numbers and ratings

Base catalog number ①	Continuous current (A)	BIL (kV)	Power frequency dry 60 sec (kV)	Momentary current (rms kA)	Momentary current (Peak kA)	Insulator creep distance	Rated ultimate tension strength
						Inches (mm)	Lb (N)
D73TS36S0	600	150	70	25	65	23.2 (589)	15,000 (66,723)
D73TS39S0	900	150	70	25	65	23.2 (589)	15,000 (66,723)
D73TS56S0	600	200	95	25	65	38.9 (988)	15,000 (66,723)
D73TS59S0	900	200	95	25	65	38.9 (988)	15,000 (66,723)

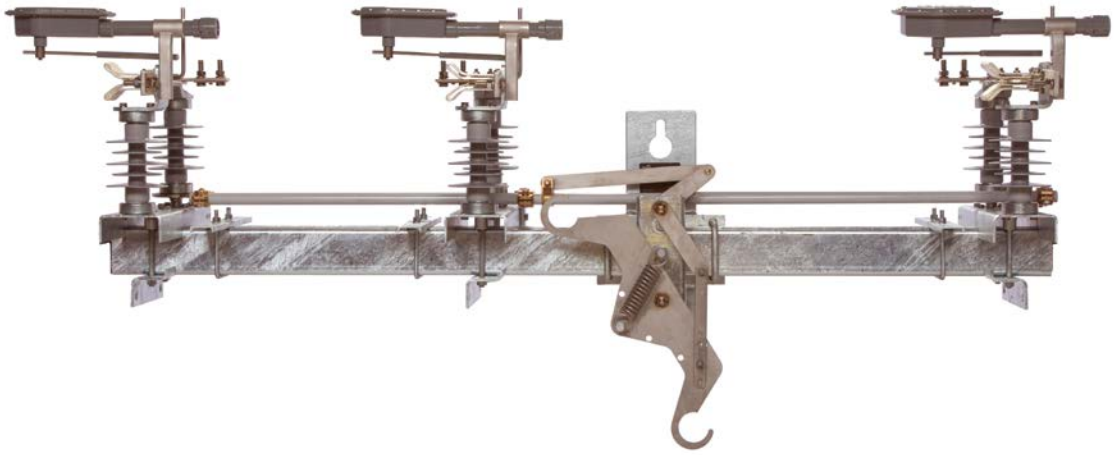
① To order a D-73-TS in-line tension disconnect switch use the base catalog number noted in **Table 28**. Add options as required from **Table 29**.

Table 29. D-73-TS in-line tension switch catalog number suffix options

Code	Option
A	150 degree latch
P	Parallel groove connectors
Y	Four SS terminal bolts with hardware

Three-phase M-Force switches

M-Force three-phase switch



Description

Eaton's Cooper Power series M-Force™ switch is a distribution-class, gang-operated, unitized three-phase overhead loadbreak switch.The M-Force switch is offered in distribution voltage classifications of 15.5 kV, 27 kV, and 38 kV. The M-Force switch may be used for line sectionalizing, paralleling, by-passing, or isolating.

M-Force stands for "Magnetic Force". Eaton has the only reverse loop contacts found on distribution-class sidebreak switches. The reverse loop contacts utilize high-current magnetic forces for added reliability. The reverse-loop design allows for high contact pressure to be maintained during fault conditions. This feature prevents pitting and distorting of the switch blade and contacts even under severe momentary overload. More information on the M-Force switch can be found in CA008004EN.

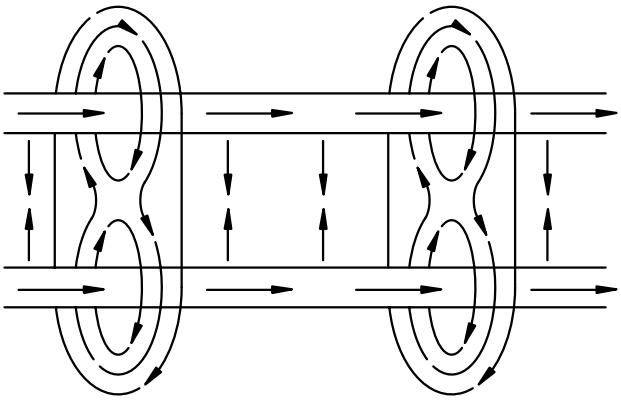


Figure 22. Current flowing in same direction

Basic concept

Current-carrying conductors that are parallel to each other and have current flowing in the same direction, attract each other due to the magnetic forces acting on them. Current-carrying conductors that are parallel to each other and have current flowing in the opposite direction, repel due to the magnetic forces acting on them.

Current flows through the two parallel inner segments of the reverse loop contacts in the same direction, thus these two segments attract each other, initiating contact pressure. Current flow through the inner segment and the outer segment is in opposite directions, which causes a repelling force that amplifies the contact pressure.

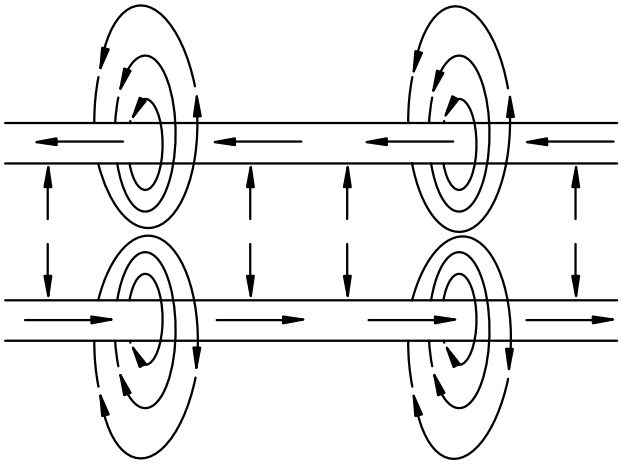


Figure 23. Current flowing in opposite direction

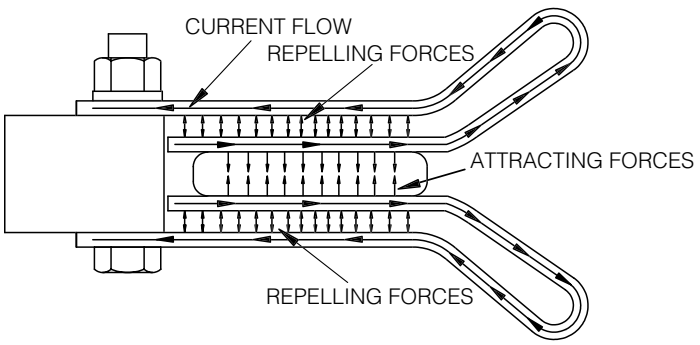


Figure 24. Magnetic forces acting on contacts

Design features

Reverse-loop contacts

The reverse-loop contacts utilize high-current magnetic forces for added reliability. The reverse-loop design allows for high contact pressure to be maintained during fault conditions and prevent pitting and distorting of the switch blade and contacts under severe momentary overload. These contacts maintain extremely cool temperatures under the rated full load.

Insulators

The M-Force switch comes standard with polymer (silicone rubber) insulators but are also offered with cycloaliphatic epoxy and porcelain options. Insulator bolt circle patterns for 15 kV and 25 kV switches are 2.25" and 35 kV switches are 3.00".

Extended bearing assembly

The stainless steel shaft on the rotating insulator bearing assembly has been extended to 4" to prevent horizontal movement of the rotating insulator during operation, which ensures proper blade/contact alignment. The bearing assembly has oil-impregnated bushings that provide maintenance-free operation for the life of the switch.

Insulated Reliabreak arm

The Reliabreak™ pick-up arm on the M-Force switch is insulated on one side, which isolates the interrupter from the current path during a close operation. This decreases the possibility of misalignment during operation, which ensures proper load interruption.

Positive locking dead-end brackets

The dead-end brackets on the M-Force switch are of a positive locking design. This design allows for dead-ending at an angle without any distortion of the brackets.

Phase unit

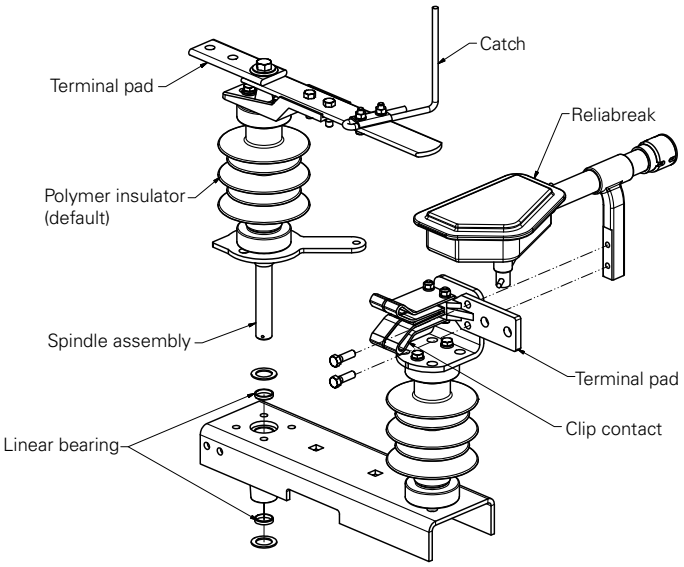


Figure 25. M-Force switch phase unit

Ordering information

Coastal and high-contaminant environments refer to the M-Force switch catalog section to see additional available options.

Table 30. M-Force switch catalog number configurator

M 1 H 11 T R 2 ?

Voltage Class
1 - 15.5 kV/110 kV BIL
2 - 27 kV/150 kV BIL
3 - 38 kV/200 kV BIL

Mounting Configuration
H - Horizontal upright (standard option)
A - Horizontal pole top
P - Phase over phase
R - Vertical riser
G - Horizontal upright (go95 spacing)
S - Vertical riser (go95 spacing)
T - Triangular
U - Underhung (go95 spacing)

Control Rod and Mechanism
Reciprocating Mechanism
11 - 28' Round pipe 1.0" o.d. (standard option)
21 - 28' Round fiberglass
41 - 28' 1" Pipe w/fiberglass top section
51 - 28' Pipe w/cycloaliphatic insulator

Torsional Mechanism
A2 - 28' 1.5" Pipe (Steel universal section)
B2 - 28' 1.5" Pipe (Fiberglass universal section)
C2 - 28' 1.5" Pipe (Cycloaliphatic insulator)

None
03- Hookstick operated (no control rod)

Crossarm Options
T - Steel with single-point lift (standard option)
S - Steel with two-point lift
G - Fiberglass with single-point lift
F - Fiberglass with two-point lift

Insulator Material
R - Polymer (standard option)
C - Cycloaliphatic epoxy
P - Porcelain

Options (see page 7 for details)
Note: More than one may be chosen.
append codes in alphanumeric order.
B - Provisions for crossarm support bracket
C - Captive hardware on terminal pads (incompatible with option U below)
E - Extension links (14")
F - Bonded reciprocating control handle (standard on torsional controls)
G - Reciprocating handle with interlocks
H - Lightning arrester brackets
I - Steel interphase rod
J - Provisions for neutral wire
K - Provisions for sensors
R - Additional nameplate on handle
S - Ice shields (3/4" ice break on open or close operation)
T - Grounding connector on crossarm mounting bracket
U - Terminals, copper, #2–500 MCM (incompatible with option c above)
V - Pole mounting band
1 - Extra 7' of control rod
2 - Extra 14' of control rod

Insulator Bolt Pattern
2 - 2.25" Bolt circle for 15 and 27 kV switches
3 - 3.00" Bolt circle for 35 kV switches

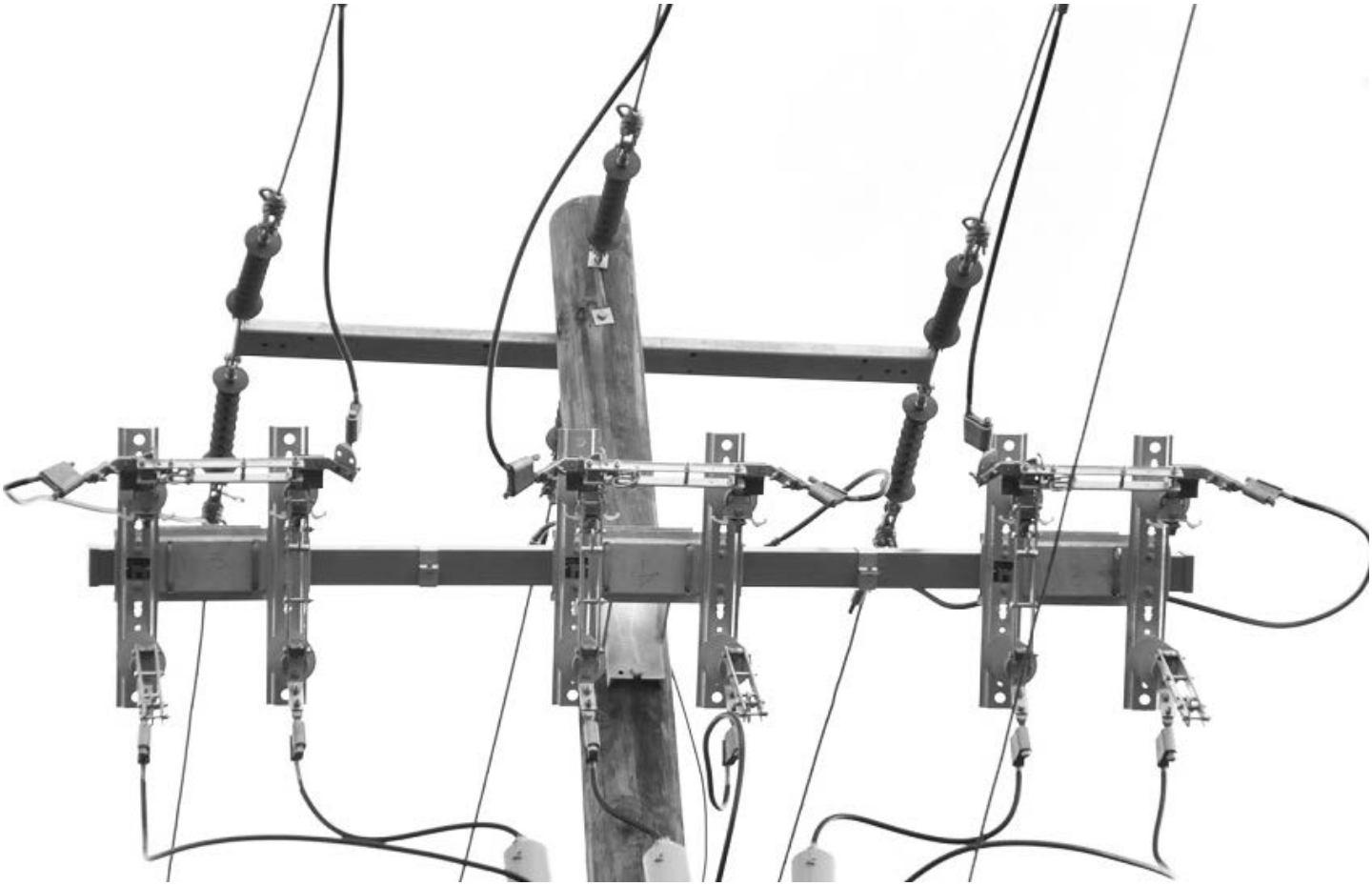
Consult factory for other bolt circle options.

Table 31. Replacement Reliabreak kits ①

Manufacture date	Base part number	Replacement Reliabreak
Post 10/2016	M1H, M1R, M1P, M1G, M1S, M2H, M2G, M2R, M2S	4710938P01-S6
	M3H and M3G	4710938P02-S6
	M3R and M3S	4710938P03-S6
4/2015 to 10/2016	M1H, M1R, M1P, M1G, M1S, M2H, M2G, M2R, M2S	4711006P01
	M3H and M3G	4711008P01
	M3R and M3S	4711010P01
Prior to 4/2015	M1H, M1R, M1P, M1G, M1S, M2H, M2G, M2R, M2S	SB25REL2-1P-S6
	M3H and M3G	SB25REL2-1P-900-S6
	M3R and M3S	SB25REL2-1P-900VS6

① All kits are one phase. If replacing all Reliabreaks on a switch, you will need three kits.

3D-73P Three-phase bypass switch

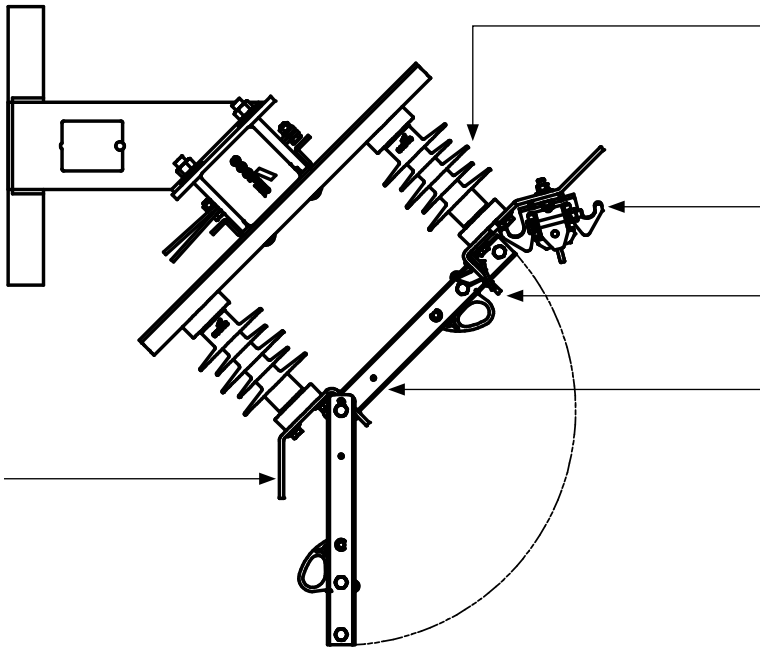


Eaton offers three of its D-73P polymer distribution class disconnect switches pre-mounted on a fiberglass crossarm, allowing for increased ease of installation and an economical way to bypass equipment.

The 3D-73P three-phase bypass switch incorporates the features of the D-73P hook-stick operated single-phase bypass switch into a convenient three-phase solution on a crossarm. This switch is a reliable solution for isolating equipment on distribution circuits up to 38 kV.

For more detailed information on Eaton's 3D-73P three-phase bypass switches, consult catalog CA008010EN.

Features and design details



Insulators: Lightweight UltraSIL silicone rubber polymer, 2.25 B.C. available in 110, 125, and 150 V BIL.

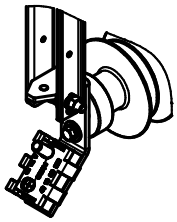
Loadbreak hooks (standard): Galvanized steel hooks to be used with portable loadbreak tool.

Contacts: High-pressure line type, both clip and hinge ends.

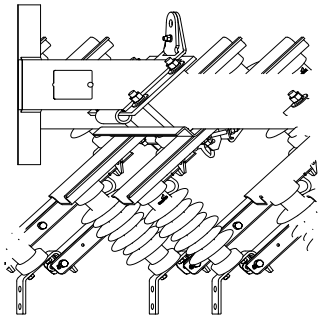
Blade design: Silver-plated copper in truss-type construction with cross braces in front and back of contacts provides secure force on contacts, as well as, superior rigidity, thus minimizing side deflection and maintaining positive alignment when closing the switch. The blade and latch design provides for positive latch.

90-degree stop pin: Pin included as standard option to provide blade opening stop at 90 degrees. Pin able to be removed in field for 180-degree opening.

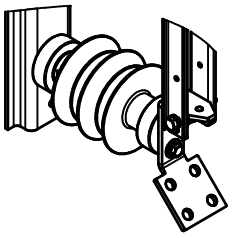
Terminal pad: NEMA two-hole terminal pad. Capable of accepting wide selection of connectors. 600 A ratings have tin-plated pad to accommodate either bronze or aluminum terminals. 900 A switch has silver-plated contacts.



Parallel groove clamp: Two-bolt tinned bronze clamp secured with two galvanized steel bolts. Conductor range: #6 solid to 397.5 MCM ASCR, 500 MCM Copper or 556 MCM Aluminum.



Single-point lift: Single-point, center of gravity lifting bracket available for ease of installation.



4-Hole terminal pad: NEMA four-hole terminal pad. Capable of accepting wide selection of connectors. See **Table 33** for standard offering. 600 A ratings have tin-plated pads to accommodate either bronze or aluminum terminals. 900 A switch has silver-plated contacts.

Figure 26. 3D-73P Three-phase bypass switch features

Electrical ratings and dimension specifications

Electrical ratings are that of the D-73P single-phase bypass switch found in catalog CA008005EN.

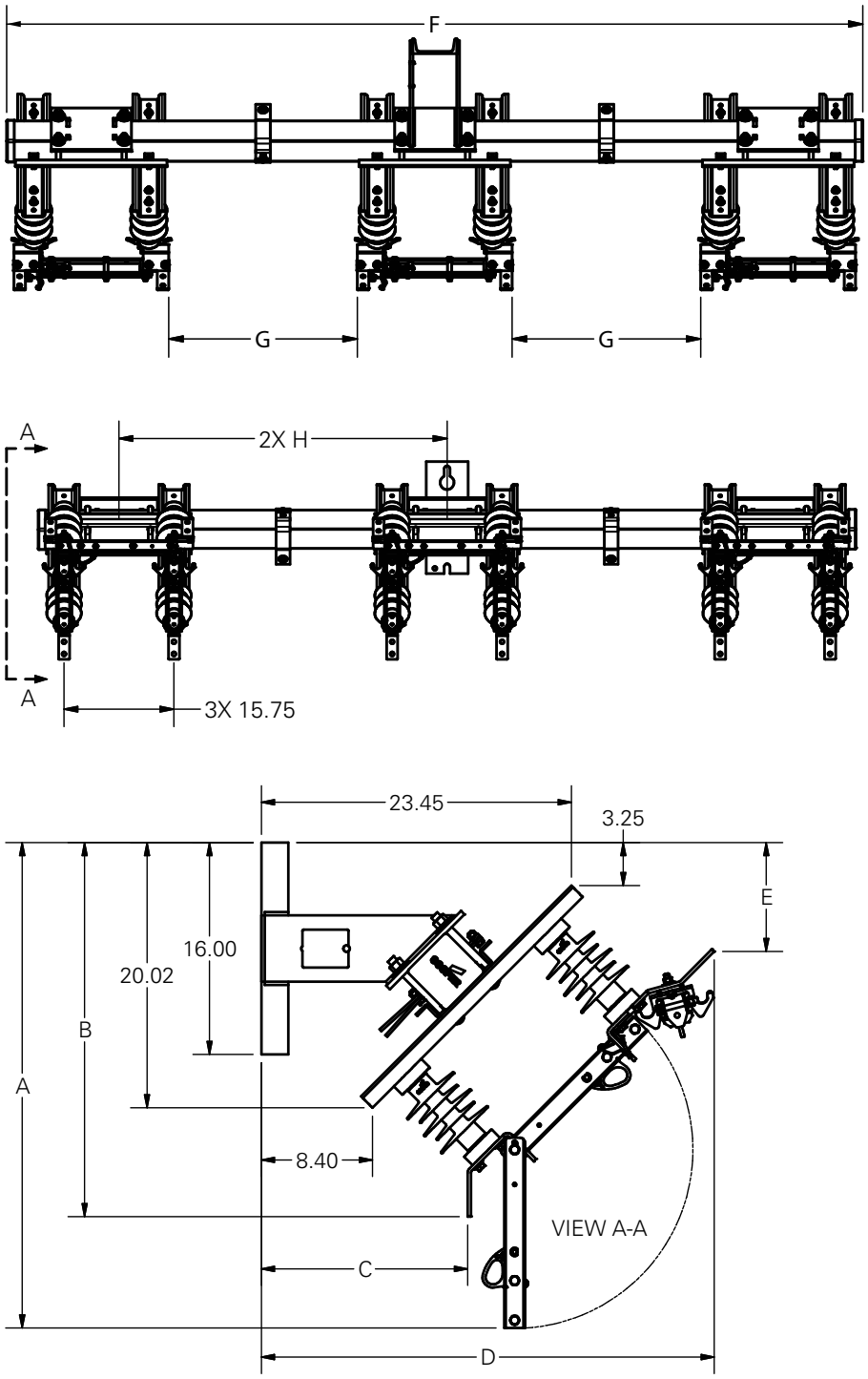


Figure 27. Top, front and side views of 3D-73P

Table 32. 3D-73P Dimensional specifications

Voltage	BIL	A	B	C	D	E	F	G	H
15 kV	110 kV	36.65	28.24	15.60	34.27	8.22	117.19	25.82	47.00
27 kV	125 kV	36.65	28.24	15.60	34.27	8.22	117.19	25.82	47.00
27 kV	150 kV	42.25	30.96	16.20	36.99	8.82	121.19	27.82	49.00
38 kV	150 kV	42.25	30.96	16.20	36.99	8.82	121.19	27.82	49.00

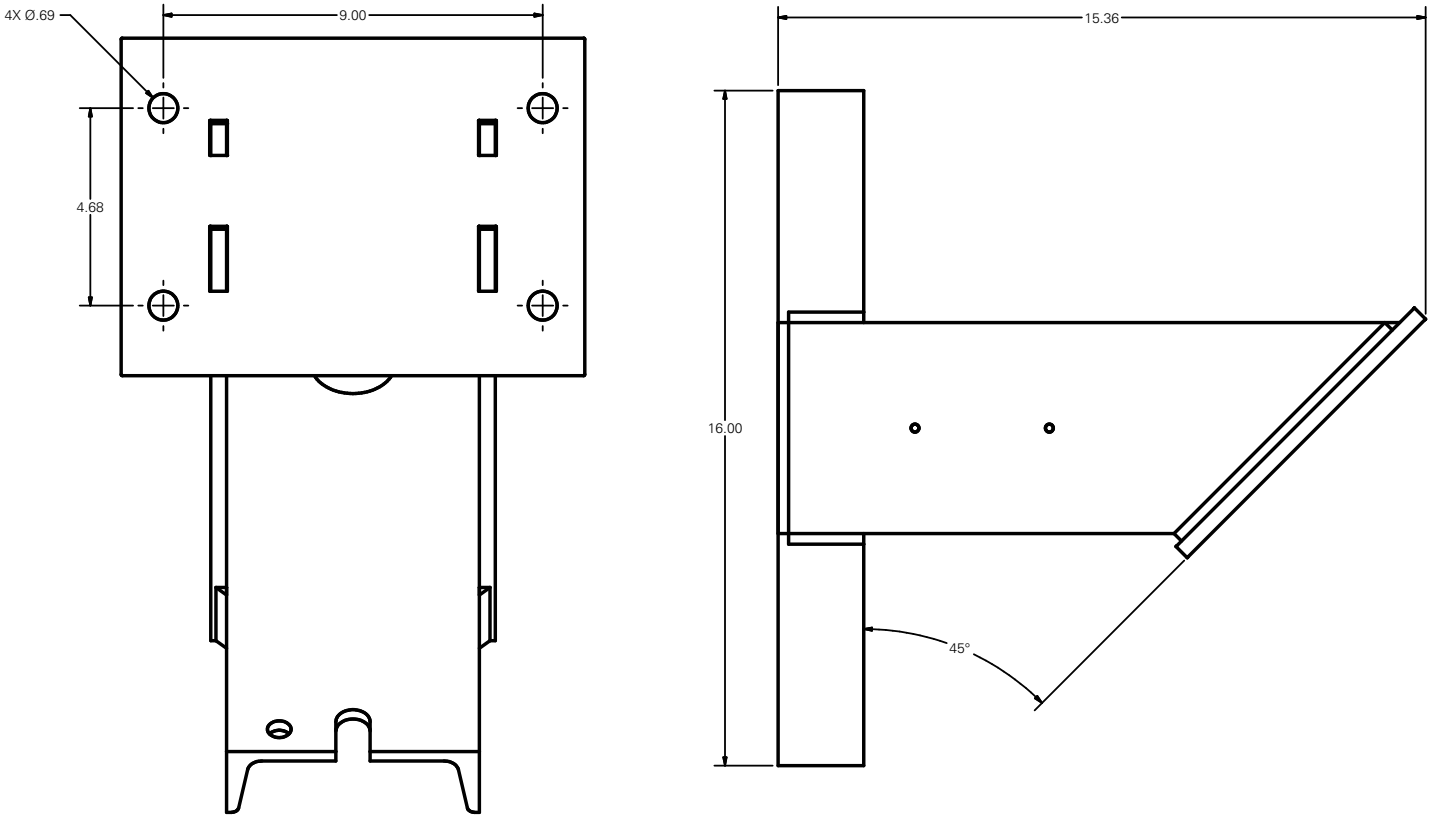


Figure 28. Pole mount bracket

Ordering information

Table 33. 3D-73P catalog number configurator

1	2	3	4	5	6	7	8	9	10
3	**D**	**7**	**3**	**3**	**2**	**6**	**S**	**0**	**P**

Three-phase base catalog number

Code	Switch type
3	Distribution-class recloser/ regulator bypass switch (d-73p3)

Code	Voltage BIL
1	15 kV, 110 BIL
2	27 kV, 125 BIL
3	27 kV, 150 BIL
4	38 kV, 150 BIL

Code	Current
6	600 A
9	900 A

Code	Insulator material
S	Silicone rubber

Code	Crossarm
0	Fiberglass

Code	Options (Leave digit 10 blank if no option is required.)
C	Captive bolts
L	Left handed operation
P	Parallel groove clamp
S	Single point lift
4	4-hole terminal pads (2-hole standard)

Note: Leave digit 10 blank if no option is required.

Example: 600 A, 25 kV, 3D-733 disconnect switch in silicone rubber with parallel groove clamp = 3D73326S0P

Cutouts

UltraSIL polymer-insulated and porcelain Type L open distribution cutout

Eaton offers Type L cutouts in both polymer and porcelain designs that provide reliable overcurrent protection for primary distribution circuits. Overcurrent protection safeguards an electric system from excessive currents produced by abnormal conditions such as faults, line or equipment overloads, or equipment failures. Type L cutouts are ruggedly constructed and will provide full-range overcurrent protection from minimum melt of a given fuse link to the maximum nameplate interrupting current rating of the cutout.

Type L cutouts have been tested to IEEE Std 37.41 and IEEE Std C37.42-2009. They are available in 15.5 kV and 27 kV ratings and can be supplied with 100 A or 200 A fuseholders or a 300 A disconnect blade.

Eaton's Type L cutout is designed for fuseholder interchangeability with S&C Electric Co. (Type XS), Hubbell Power Company (Type C) and ABB (Type ICX) fuseholders.

For further information regarding Eaton's Type L cutout, consult Eaton catalog CA132026EN.

Design

Eaton's Type L cutout was designed with service life and user experience in mind. Some design highlights include:

- The Type L cutout frame is over molded with industry-leading, track-resistant, UltraSIL silicone rubber polymer housing. Independent laboratory tests have verified the superiority of silicone rubber in terms of resistance to UV degradation, surface tracking, and performance in contaminated environments
- The fuseholder is constructed of an epoxy-impregnated glass filament wound tube over a moisture-proof inner polymer liner material that holds up to years of service
- The grooved flipper assembly controls link tension, ensures low-fault current interruption and prevents link breakage on "close-in"
- The cast bronze lower hinge assembly has deep pockets for the trunnion to pivot in—this rugged design means easy fuseholder installation and removal
- Silver-to-silver top contacts throughout the design ensure excellent continuous current handling capability and minimize contact resistance

Table 34. 15 kV and 27 kV Polymer and porcelain Type L interchangeable cutout specifications

Base catalog number ①		Maximum voltage rating (kV)	BIL (kV)	Continuous current (A)	Interrupting rating (A rms)		Creep distance inches (mm)		Approximate weight lb (kg)	
Polymer	**Porcelain**				**Symmetrical**	**Asymmetrical**	**Polymer**	**Porcelain**	**Polymer**	**Porcelain**
S4B1	**L4B1**	15.5	110	100	7100	10,000	14.2 (362)	8.5 (216)	8.2 (3.7)	14.5 (6.5)
S4BA ②	**L4BA** ②	15.5	110	100	10,600	16,000	14.2 (362)	8.5 (216)	8.3 (3.8)	14.6 (6.6)
S4B2 ②	**L4B2** ②	15.5	110	200	8000	12,000	13.8 (350.52)	8.5 (216)	8.7 (3.9)	15.0 (6.8)
S4B3	**L4B3**	15.5	110	300	Disconnect ③	Disconnect ③	14.2 (362)	8.5 (216)	7.7 (3.5)	14.0 (6.4)
	L9C1	27	125	100	5300	8000		11.0 (279)		16.7 (7.5)
	L9CA ②	27	125	100	8000	12,000		11.0 (279)		16.8 (7.6)
	L9C2 ②	27	125	200	7100	10,000		11.0 (279)		17.2 (7.8)
	L9C3	27	125	300	Disconnect ③	Disconnect ③		11.0 (279)		16.2 (7.3)
S9D1	**L9D1**	27	150	100	5300	8000	24.4 (619.76)	17.0 (432)	10.2 (4.6)	22.5 (10.2)
S9DA ②	**L9DA** ②	27	150	100	8000	12,000	24.4 (619.76)	17.0 (432)	10.3 (4.7)	22.6 (10.3)
S9D2 ②	**L9D2** ②	27	150	200	7100	10,000	24.4 (619.76)	17.0 (432)	10.7 (4.9)	23.0 (10.4)
S9D3	**L9D3**	27	150	300	Disconnect ③	Disconnect ③	24.4 (619.76)	17.0 (432)	9.7 (4.4)	22.0 (10.0)

① Base catalog number for standard polymer-insulated and porcelain Type L unit. See **Table 36** for optional connectors and brackets.

② These units include an arc shortening rod and must be used with removable buttonhead fuse links.

③ 300 A disconnect short-time current ratings: 12 kA (asym) momentary, 8.6 kA (sym) 15-cycle and 1.6 kA 3 sec.

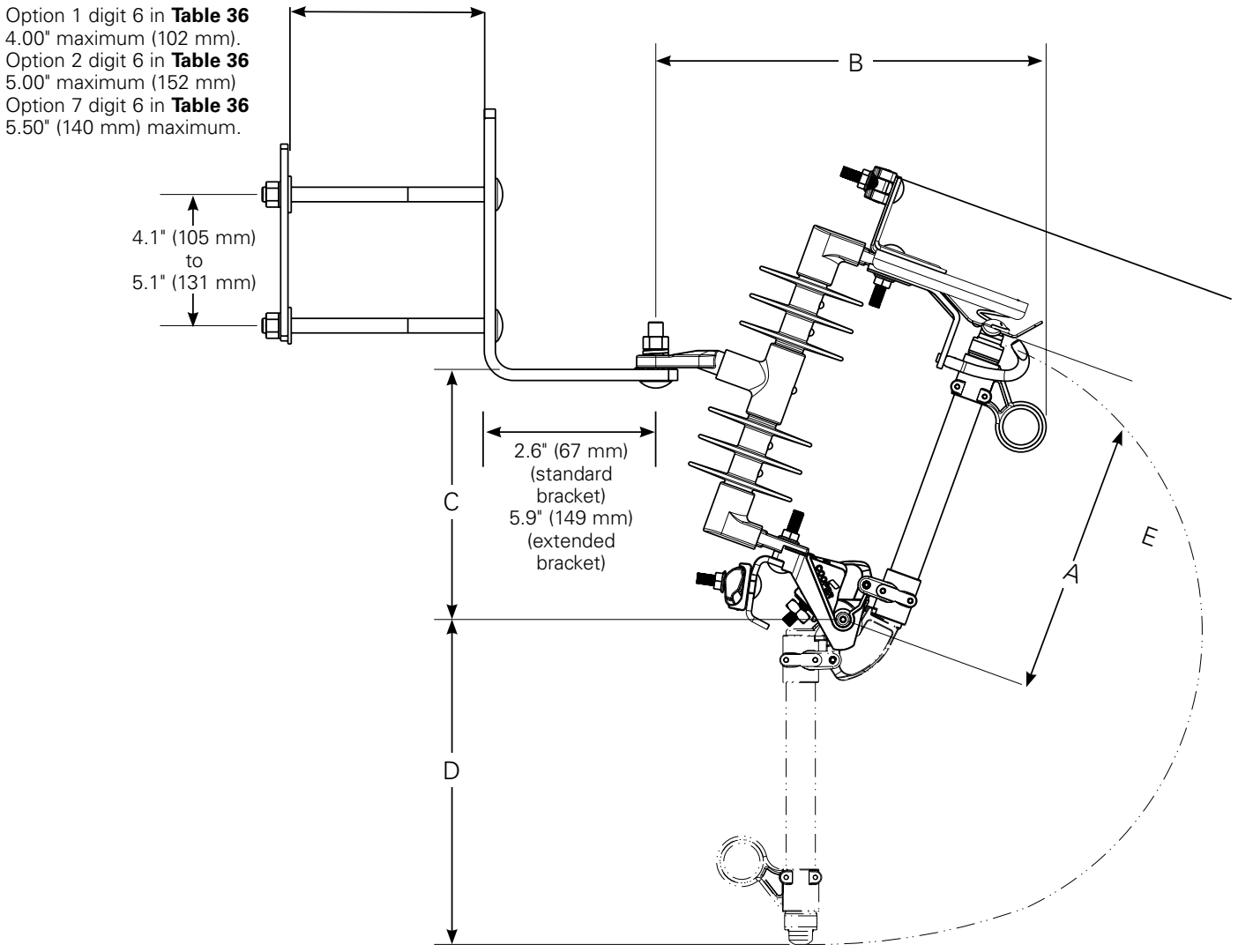


Figure 29. Polymer-insulated Type L cutout assembly

Table 35. Type L cutout dimensional data (refer to Figure 29)

Voltage rating kV	BIL kV	Dimensions inches (mm)					Creepage distance inches (mm)	
		A	B	C	D	E	Polymer	Porcelain
15.5	110	11.3 (288)	13.5 (343)	8.1 (207)	11.5 (292)	16.3 (414)	13.8 (350.52)	8.5 (216)
27	125 ①	14.7 (374)	14.0 (358)	10.1 (257)	14.9 (379)	19.6 (498)	—	11.0 (279)
27	150	14.7 (374)	14.2 (363)	10.1 (257)	14.9 (379)	19.6 (498)	24.4 (619.76)	17.0 (432)

① Electrical and dimensional information applies to porcelain cutouts only.

Ordering information

Table 36. Type L cutout ordering information

Digit 1
S = Polymer type L cutout
L = Porcelain type L cutout

Digit 4 Fusing option
0 = No fusing
1 = 100 A, Standard interrupt ①
A = 100 A, High interrupt ①
2 = 200 A ①
3 = 300 A blade
E = ELF Fuse
T = Tandem ELF fuse

① See **Table 34** for interrupting rating based on cutout frame.

Digit 6 Bracket and hardware
0 = No bracket
1 = NEMA "B" (5" bolts)
2 = NEMA "B" (6" bolts)
3 = Extended bracket (5" bolts)
4 = NEMA "D" pole mounting bracket extended
5 = Same as 1 with arrester mounting hardware
6 = Same as 3 with arrester mounting hardware
7 = NEMA "B" (6.5" bolts)
8 = NEMA "D" pole mounting bracket

1	2	3	4	5	6	7	8	9
S	4	B	1	E	1	A		

Digits 2 and 3 Voltage and BIL rating
4B = 15.5 kV, 110 kV BIL
9C = 27 kV, 125 kV BIL ①
9D = 27 kV, 150 kV BIL

① Porcelain only.

Digits 8 and 9 Combo options
Standard configuration - leave blank ①
W/ELF - Refer to ELF catalog section CA132027EN, Tables 8 and 9.
W/tandem ELF - refer to Tandem ELF catalog section CA132028EN, Tables 8 and 9.

① If E or T is selected for Digit 4, digits for 8 and 9 must be selected.
Refer to ELF fuse catalog section CA132027EN for further detail.
Refer to tandem ELF fuse catalog section CA132028EN for further detail.

Digit 7 Packaging
A = Individual packaging (standard)
C = Cutout wildlife guard

Digit 5 Terminal options
E = Small eyebolt
L = Large eyebolt
P = Parallel groove
R = Parallel groove - bottom vertical entry
T = Large eyebolt - bottom vertical entry

Table 37. Type L fuseholders, disconnect blades and replacement caps

Catalog number	Maximum design voltage kV	Continuous current A-rms	Interrupting rating A-rms asym	Approximate fuseholder length Inches (mm)	Approximate weight lb (kg)	Replacement caps
For 15.5 kV, 110 kV BIL cutouts						
LDB100A	15.5	100	10,000	11.32 (288)	1.9 (0.86)	LDB100CAP
LDBA00A ①	15.5	100	16,000	11.32 (288)	2.0 (0.91)	LDBA00CAP
LDB200B ①	15.5	200	12,000	11.32 (288)	2.4 (1.1)	LDB20BCAP
LDB300A	15.5	300	Disconnect ②	11.32 (288)	1.4 (0.64)	LC12X1
For 27 kV, 125 kV BIL cutouts						
LDC100A	27	100	8,000	14.74 (374)	2.1 (0.95)	LDB100CAP
LDCA00A ①	27	100	12,000	14.74 (374)	2.2 (1.0)	LDCA00CAP
LDC200B ①	27	200	10,000	14.74 (374)	2.6 (1.2)	LDC20BCAP
LDC300A	27	300	Disconnect ②	14.74 (374)	1.6 (0.73)	LC12X1
For 27 kV, 150 kV BIL cutouts						
LDC100A	27	100	8,000	14.74 (374)	2.1 (0.95)	LDB100CAP
LDCA00A ①	27	100	12,000	14.74 (374)	2.2 (1.0)	LDCA00CAP
LDC200B ①	27	200	10,000	14.74 (374)	2.6 (1.2)	LDC20BCAP
LDC300A	27	300	Disconnect ②	14.74 (374)	1.6 (0.73)	LC12X1

① These fuseholders include an arc shortening rod and must be used with removable buttonhead fuse links.

② 300 A disconnect short time current ratings: 12 kA (asym) momentary, 8.6 kA (sym) 15-cycle and 1.6 kA 3 sec.

Type L cutout and arrester combinations

Eaton offers cutout and arrester combinations to provide the convenience of a compact, efficient unit with less pole-top hardware. Combining these units also provides easier installation, handling and procurement.

Additional information on cutout arrester combos can be found in Eaton catalog CA132026EN.

Table 38. Type L cutout/arrester combination catalog numbering system

Digits 1 - 7 Cutout part number
Determine cutout part number from **Table 36**.

Digit 12 Arrester line terminal hardware
0 = Terminal clamp (SS), hex nut (SiBrz), leadwire ①②
1 = Terminal clamp (SS), hex nut (SiBrz), two-hole arrester wildlife guard, leadwire ①②③④

① Standard arrester line terminal hardware.
② 15 kV Type L cutouts w/arrester use 11.0" leadwire.
③ 27 kV Type L cutouts w/arrester use 9.0" leadwire.
④ Arrester wildlife guard AV346X1C.

1	2	3	4	5	6	7	8	9	10	11	12	13
S	**4**	**B**	**1**	**P**	**1**	**A**	**0**	**0**	**1**	**C**	**0**	**A**

Digit 10 Arrester type
1 = ND polymer VariSTAR arrester ①
3 = HD polymer VariSTAR arrester ①
5 = RP polymerVariSTAR arrester ①
8 = HD/RP polymer Evolution arrester ②
A = ND porcelain VariSTAR③
C = HD porcelain VariSTAR④

① See UltraSIL Polymer-Housed VariSTAR arrester catalog section CA235005EN for further information.
② See UltraSIL Polymer-Housed Evolution arrester catalog section CA235018EN for further information.
③ See ND VariSTAR Type AZS arrester catalog section CA235017EN for further information.
④ See HD VariSTAR Type AZL catalog section CA235006EN for further information.

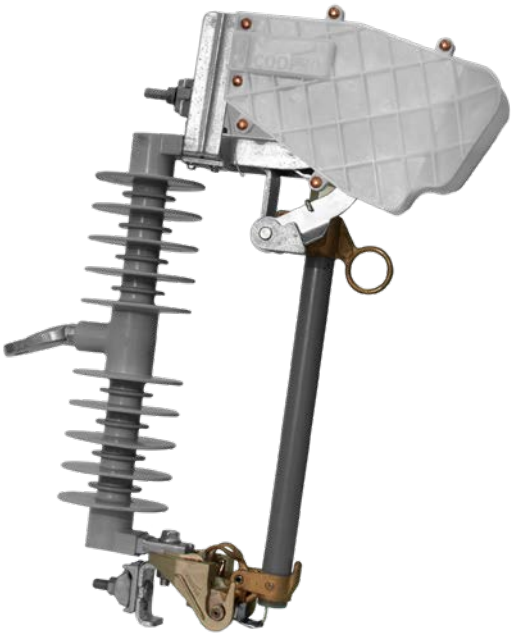
Digit 13 Arrester ground terminal
A = Flat washer (SS), terminal clamp (SS), hex nut (SiBrz) ①

① Standard arrester ground terminal hardware.

Digit 11 Arrester kV rating
A = 3 kV
B = 6 kV
C = 9 kV
D = 10 kV
E = 12 kV
F = 15 kV
G = 18 kV
H = 21 kV
J = 24 kV
K = 27 kV
L = 30 kV
M = 36 kV

Note: Porcelain arresters are not available in combination with UltraSIL polymer-insulated Type L cutouts.

UltraSIL polymer-insulated and porcelain loadbreak Type LB open distribution cutout



Design

Eaton's Type LB cutouts carry all of the same great design features of the Type L cutout but add a spring-loaded contact blade and elephant ear assembly to reliably, efficiently and positively break load without the use of special loadbreak tools.

Type LB cutouts have been tested to and meet or exceed all requirements set forth by IEEE Std C37.41-2008 and IEEE Std C37.42-2009.

Eaton's Type LB cutouts are physically and electrically interchangeable with the Chance Type C loadbreak cutouts from Hubbell Power Systems.

For more information on the design, ratings, features and characteristics of the Eaton Type LB cutout, reference Eaton catalog CA132035EN.

Electrical ratings and dimensional specifications

Table 39. Loadbreak Type LB interchangeable cutout specifications

Base catalog number ①		Maximum voltage rating (kV)	BIL (kV)	Continuous current (A)	Loadbreak (A)	Interrupting rating (A rms)		Creep distance inches (mm)		Approximate weight ③ lb (kg)	
Polymer	Porcelain					Symmetrical	Asymmetrical	Polymer	Porcelain	Polymer	Porcelain
YS4B1	**YL4B1**	15.5	110	100	300	7,100	10,000	14.2 (362)	8.5 (216)	11.6 (5.3)	17.9 (8.1)
YS4BA ②	**YL4BA** ②	15.5	110	100	300	10,600	16,000	14.2 (362)	8.5 (216)	11.7 (5.4)	18.0 (8.2)
YS4B2 ②	**YL4B2** ②	15.5	110	200	300	8,000	12,000	14.2 (362)	8.5 (216)	12.1 (5.5)	18.4 (8.3)
YS9C1	**YL9C1**	27	125	100	50	5,300	8,000	22.3 (566)	11.0 (279)	13.6 (6.1)	20.1 (9.0)
YS9CA ②	**YL9CA** ②	27	125	100	50	8,000	12,000	22.3 (566)	11.0 (279)	13.7 (6.2)	20.2 (9.1)
YS9C2 ②	**YL9C2** ②	27	125	200	50	7,100	10,000	22.3 (566)	11.0 (279)	14.1(6.4)	20.8 (9.4)

① Base catalog number for standard polymer-insulated and porcelain Type LB unit. See **Table 41** for optional connectors and brackets.

② These units include an arc shortening rod and must be used with removable buttonhead fuse links.

③ Includes a standard NEMA Type B bracket assembly.

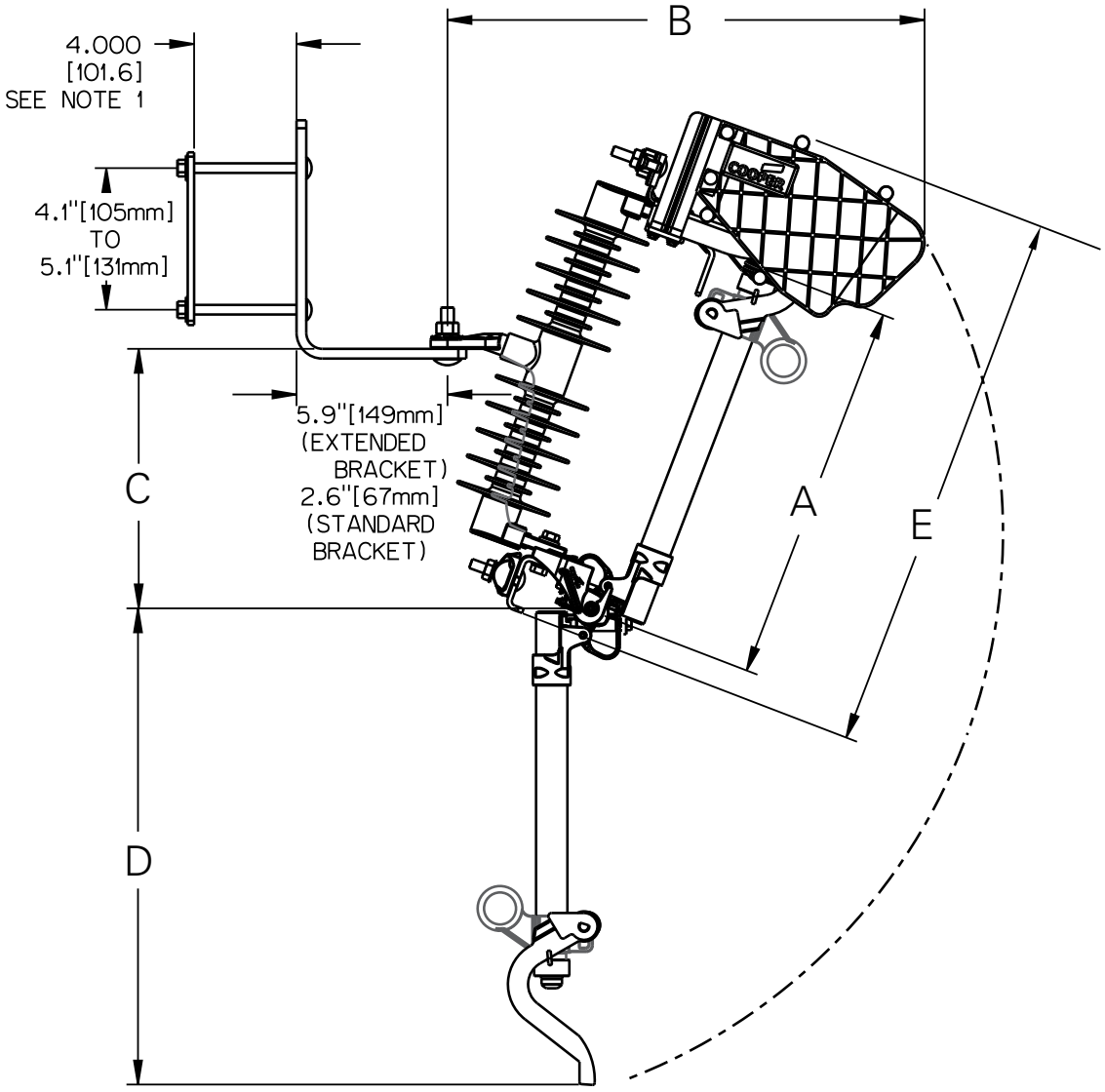


Figure 30. Loadbreak Type LB cutout assembly

Table 40. Loadbreak Type LB cutout dimensional data (refer to Figure 30)

Voltage rating kV	BIL kV	Dimensions inches (mm)					Creepage distance inches (mm)	
		A	B	C	D	E	Polymer	Porcelain
15.5	110	11.1 (281)	18.1 (459)	8.5 (216)	15.2 (386)	17.9 (456)	14.2 (362)	8.5 (216)
27	125	14.9 (378)	18.6 (473)	10.1 (257)	18.6 (473)	21.3 (542)	22.3 (566)	17.0 (432)

Ordering information

Table 41. Loadbreak Type LB cutout catalog number configurator

Digit 7 Bracket and hardware
0 = No bracket
1 = NEMA "B" (5" bolts)
2 = NEMA "B" (6" bolts)
3 = Extended bracket (5" bolts)
4 = NEMA "D" pole mounting bracket extended
5 = Same as 1 with arrester mounting hardware
6 = Same as 3 with arrester mounting hardware
7 = NEMA "B" (6.5" bolts)
8 = NEMA "D" pole mounting bracket

Digit 5 Interrupting rating
1 = 100 A, Standard interrupt ①
A = 100 A, High interrupt ①
2 = 200 A ①

① See **Table 39** for interrupting rating based on cutout frame.

Digits 1 and 2
YS = Polymer Type LB cutout
YL = Porcelain Type LB cutout

1	2	3	4	5	6	7	8
Y	S	4	B	1	E	1	A

Digits 3 and 4 voltage and BIL rating
4B = 15.5 kV, 110 kV BIL
9C = 27 kV, 125 kV BIL

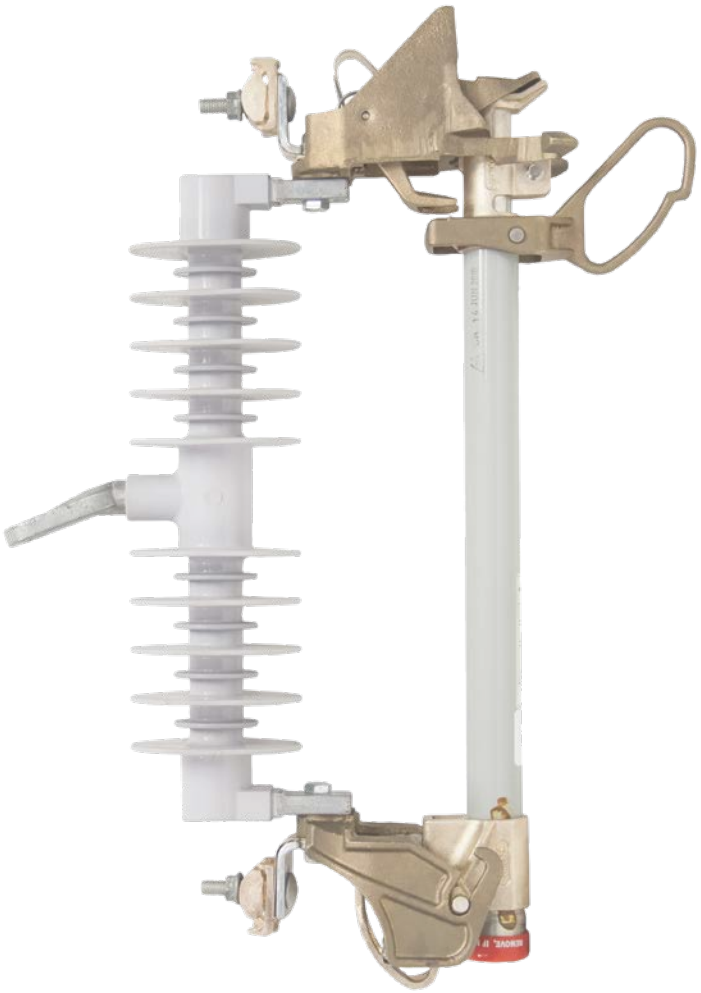
Digit 8 packaging
A = Individual Packaging (Standard)

Digit 6 terminal options
E = Small Eyebolt
L = Large Eyebolt
P = Parallel Groove
R = Parallel Groove - bottom vertical entry
T = Large Eyebolt - bottom vertical entry

Table 42. Loadbreak Type LB cutout fuseholders, disconnect blades and replacement caps

Catalog number	Maximum design voltage kV	Continuous current A-rms	Interrupting rating A-rms asym	Approximate fuseholder length inches (mm)	Approximate weight lb (kg)	Replacement caps
For 15.5 kV, 110 kV BIL cutouts						
YLDB100A	15.5	100	10,000	11.32 (288)	1.9 (.86)	LDB100CAP
YLDBA00A	15.5	100	16,000	11.32 (288)	2.0 (.91)	LDBA00CAP
YLDB200B	15.5	200	12,000	11.32 (288)	2.4 (1.1)	LDB20BCAP
For 27 kV, 125 kV BIL cutouts						
YLDC100A	27	100	8,000	14.74 (374)	2.1 (.95)	LDB100CAP
YLDCA00A	27	100	12,000	14.74 (374)	2.2 (1.0)	LDCA00CAP
YLDC200B	27	200	10,000	14.74 (374)	2.6 (1.2)	LDC20BCAP
For 27 kV, 150 kV BIL cutouts						
YLDC100A	27	100	8,000	14.74 (374)	2.1 (.95)	LDB100CAP
YLDCA00A	27	100	12,000	14.74 (374)	2.2 (1.0)	LDCA00CAP
YLDC200B	27	200	10,000	14.74 (374)	2.6 (1.2)	LDC20BCAP

UltraSIL polymer-insulated CMU fuse open distribution cutout



Design

Eaton's CMU fuse outdoor distribution cutout incorporates Eaton's UltraSIL silicone rubber insulating material, deep lower casting pockets, and silver-to-silver contact points to create a smooth operating, long-lived cutout that houses Eaton's CMU boric acid power fuse.

Eaton's CMU cutout is available in 17 kV and 27 kV ratings and meets or exceeds all requirements set forth by IEEE Std C37.41-2008 and C37.42-2009.

The Eaton CMU fuse open distribution cutout is compatible with Eaton CMU fuses (catalog CA132038EN), Eaton X-Limiter Hinge Mounted current-limiting fuses (catalog CA132054EN), and S&C Electric SMU-20 fuses.

For more information on the CMU cutout, reference Eaton catalog CA132065EN.

Electrical ratings and dimensional specifications

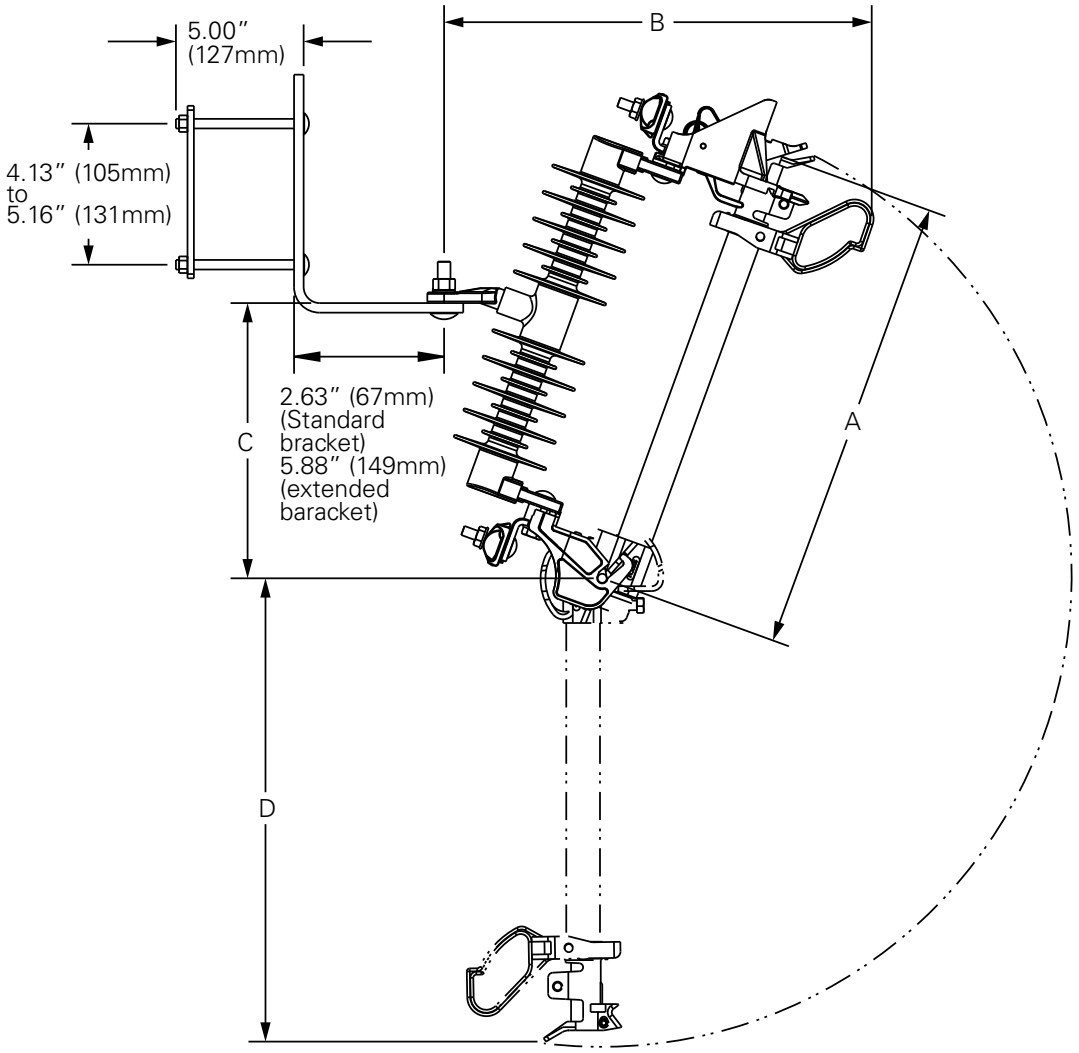


Figure 31. Eaton CMU cutout assembly

Table 43. Eaton CMU cutout dimensional specifications (refer to Figure 31)

Voltage rating kV	BIL kV	Dimensions in inches (mm)			
		A	B	C	D
17.1	150	17.91 (455)	16.74 (425)	10.77 (274)	18.13 (461)
27.1 ①	150	21.13 (537)	17.25 (438)	12.63 (321)	21.88 (556)

① Maximum voltage rating compatible with 29 kV.

Table 44. Eaton CMU cutout ratings and specifications

Base catalog number ①② Polymer	Maximum voltage rating (kV)	BIL (kV)	Creep distance inches (mm)	Approximate weight lb (kg)
S4CMU	17	150	22.3 (566)	11.3
S9CMU	27 ③	150	27.0 (686)	11.5

① Base catalog number for standard polymer-insulated unit. See **Table 45** for optional connectors and brackets.

② Compatible with X-Limiter—see catalog CA132054EN.

③ Maximum voltage rating compatible with 29 kV.

Ordering information

Table 45. Eaton CMU cutout catalog configurator

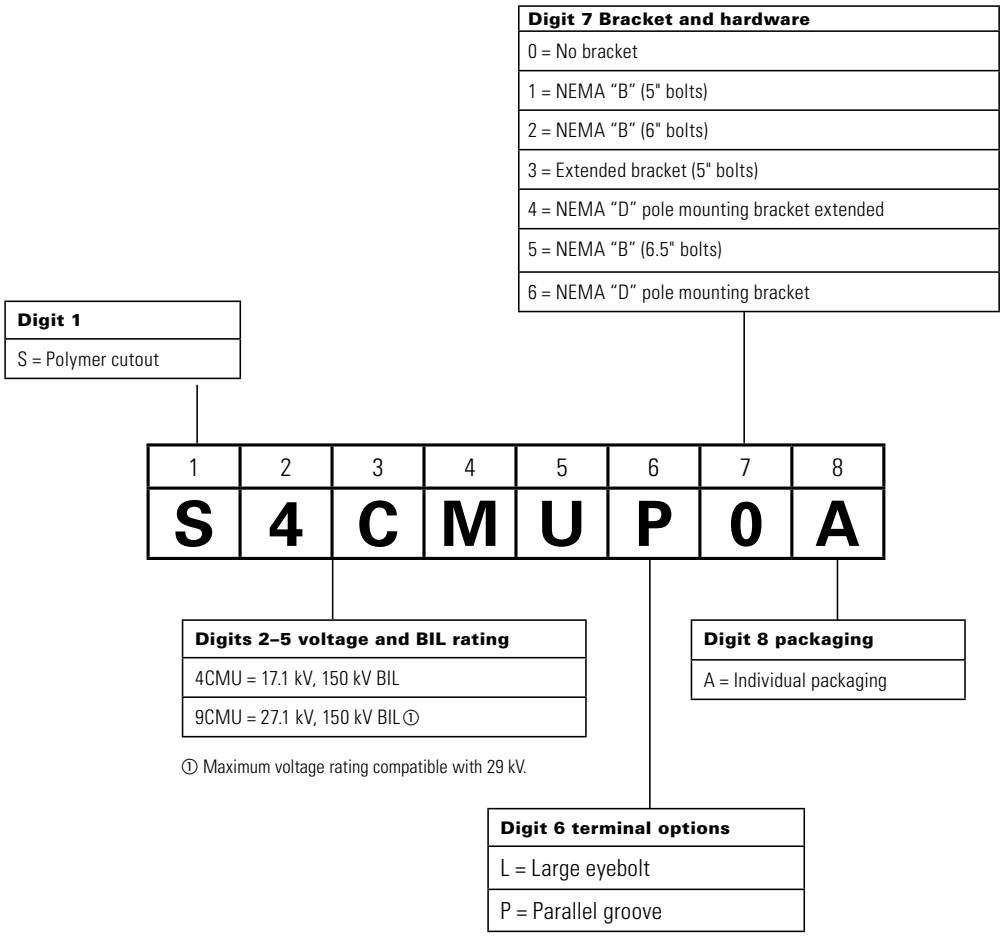


Table 46. Replacement end fitting specifications

Base catalog number Polymer	Maximum voltage rating (kV)	BIL (kV)	Fuse replacement end fittings
S4CMU	17	150	CMU3095
S9CMU	27①	150	CMU3095

① Maximum voltage rating compatible with 29 kV.

Fusing

Overview (current-limiting vs. expulsion)

Current-limiting fuses

Current-limiting fuses are classified in three ways:

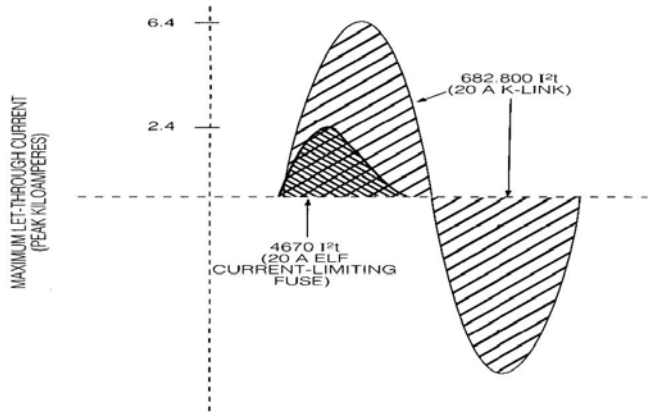
- Back-up fuse
- General purpose fuse
- Full-range fuse

All classifications can limit system fault currents to a fraction of available system fault level and are defined by IEEE Std C37.40.

Operating advantages:

- Fast clearing
- Reduced burning at the point of fault
- Minimal line damage
- Reduction of damage to other equipment in the faulted circuit

Energy let-through is the amount energy that is passed through the circuit before the fuse can operate. This energy can be harmful to equipment on the circuit. Traditional fusing requires energy to travel a full cycle after a fault occurs before the fuse will operate. This graph is a demonstration of how quickly a current-limiting fuse will operate vs. a K-Link expulsion fuse. The reduced amount of energy that is passed into the circuit after a fault occurs can reduce damage to equipment within the circuit—saving the customer from experiencing an outage and avoiding the replacement of expensive equipment. Current-limiting fuses can be thought of as "zero-forcing devices" because of their ability to force the cycle back to zero—preventing excess energy let-through.



Back-up current-limiting fuses

Back-up current-limiting fuses are designed to clear high fault current. High fault currents occur when there is an internal equipment failure. Back-up current-limiting fuses minimize the effects of the high fault current stresses on other equipment, along with the distribution system. Back-up fuses require a low current interrupting device to be run in series for full current protection (high and low). Typical applications are on overhead distribution transformers, distribution single-phase deadfront padmount transformers and distribution three-phase deadfront padmount transformers.

General purpose

A general purpose fuse interrupts currents from the maximum interrupting rating, down to the current that causes the fuse element to melt in one hour. This is approximately 170%–240% of the fuse rating. General purpose fuses do not include all the possible currents that the fuse may be required to clear. For example, the fuse could be required to interrupt a current much lower than the value stated by the one-hour criterion.

Full-range current-limiting fuse

A full-range current-limiting fuse can interrupt all currents from the maximum rated interrupting to the minimum continuous current that causes melting of the fusible element. Full-range fuses provide protection by successfully interrupting any normal 60-cycle current that will melt its element (within the designated rating). This fuse does not have a one-hour limitation. Full-range fuses provide comprehensive coverage and some fit within an interchangeable cutout mount. They operate differently than an expulsion fuse link and provide environmentally safe operation. Typical applications are on overhead cutouts, riser poles, three-phase deadfront padmount transformers and capacitors.

Expulsion fuses

Expulsion fuse operation is based on two criteria:

- Melting open an element while building up adequate dielectric strength to clear a fault
- Waiting for current to pass through reference point zero to clear the fault

Common applications for expulsion fuses:

- Overhead systems such as fuse links mounted in open cutouts
- Underground systems known as Bay-O-Net links

Other types of expulsion fuses are vacuum, SF6 and boric acid fuses.

Expulsion fuses do not absorb appreciable energy, which means they do not modify the circuit during the fault interruption process—giving them the reference "zero-awaiting devices." The faulted current will travel through the zero reference before the fuse will be able to clear the circuit. The expulsion link has a greater energy let-through as the faulted circuit travels through the zero reference.

Although expulsion links let through more energy than current-limiting fuses, they have use in applications where insulation levels are not of concern or fault magnitudes are very low.

Fire mitigation

Protect your investment and increase your distribution reliability with Eaton's Cal Fire Exempt fusing options. Eaton offers full-range current-limiting fuses along with a boric acid expulsion fuse that are Cal Fire exempt. This side by side comparison highlights the benefits and features of using cutting edge fusing technology.

ELF fuse

Eaton's Cooper Power series ELF™ fuse is a full-range, current-limiting dropout fuse with a self-contained design that eliminates noise and expulsive showers associated with expulsion fuse operation, making it suitable for use in areas where a high-fire hazard exists. The ELF-LR fuse has been granted permanent exemption by the California Department of Forestry and Fire Protection (CAL FIRE) from pole clearance requirements when the fuse is installed in the field according to manufacturer's specifications.

Low maintenance and reduction of field service time

- Drop-open design indicates operation and simplifies fault location
- Once operated, line personnel simply use a clampstick to remove the suspended ELF fuse
- Universal fit design makes the CMU fuse an easy retrofit into industry standard interchangeable cutouts
- One-piece construction reduces re-fusing complexity, inventory and lineman time in the field
- Out-of-the-box unit; no assembly is required
- Light weight—approximately 2.4 lb for 95 kV BIL cutout mountings through 40 A ratings
- Easy installation from the ground with a clampstick CMU power fuse

The CMU power fuse utilizes the proven performance of boric acid to create the de-ionizing action needed to interrupt the current. A spring-loaded arcing rod carries the normal continuous current through the unit when the circuit is operational.

Under normal conditions, the fusible element's temperature is well below its melting temperature and does not melt. When a fault occurs that is large enough to melt the fuse element, an arc is initiated and elongated by the unit's spring, pulling the arcing rod up into the boric acid interrupting medium. The heat produced decomposes the boric acid liner inside, producing water vapor and boric anhydride that helps to de-ionize the arc. The by-products extinguish the arc at a natural current zero and exit out the bottom of the fuse.

Installation

- No special tools required
- CMU power fuse and end fittings are designed to fit industry standard mountings

Applications

- Power transformers
- Feeder circuits
- Distribution transformers
- Potential transformers
- Station service transformers
- Metal-enclosed switchgear
- Pad-mounted switches
- Overhead capacitor racks

Safety benefits

- Silent interruption—no gas, sparks, or debris emitted
- Significant fire risk reduction—perfect for preventing wildfires in dry or drought-stricken areas
- Significant vegetation maintenance reduction—eliminates the need to maintain the required radius of mowed grasses beneath every distribution pole
- Increased safety to line personnel during circuit re-energizing operation

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Kearney fuse links

Eaton's Cooper Power series Kearney fuse links can be applied to a variety of applications requiring overcurrent protection of distribution systems and equipment. When properly coordinated with other overcurrent protective devices, sectionalizing to isolate faulted feeder branches or equipment can be accomplished.

Kearney fuse links are designed and tested to IEEE Std C37.42 and come in various speeds to meet a broad range of coordination needs.

Kearney fuse links come individually packed in a convenient perforated box for protection of the link and easy opening of the box in the field.

For more information on Kearney fuse links, consult Eaton catalog CA132031EN.

Figure 32. Kearney fuse link packaging

Kearney fuse links incorporate design features that simplify the end user's experience and help error proof installation. These features include a color-coded tube with printed fuse link type, a captive washer, and ampere size markings on top of the screw terminal.

Expulsion fuse links

Figure 33. Kearney fuse link

Kearney fuse links come in type K, T, 200 (N), KS, SQ, QA, X and secondary indicating fuses. These fuses cover a wide range of speed ratios as shown in the chart.

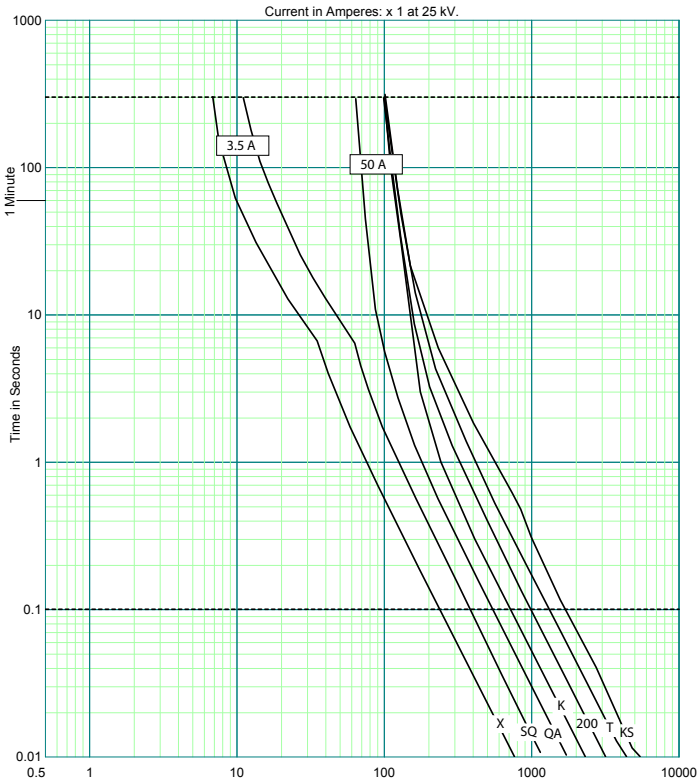


Figure 34. Kearney fuse link speed ratios

Kearney fuse links come in Fit-All™, Trip-O-Link™ and indicating tubular secondary designs. Detailed dimension and technical information can be found in catalog CA132031EN.

Published TCC references for Kearney fuse links are available in the appendix of this guide book.

Table 47. Fit-All fuse link catalog numbers

Current rating	Type X	Type SQ	Type KS	Type 200	Type QA	Type K	Type T
0.2	—	02SQ-60	—	—	—	—	—
0.3	—	03SQ-60	—	—	—	—	—
0.33	41033CPS	—	—	—	—	—	—
0.4	—	04SQ-60	—	—	—	—	—
0.5	41050CPS	—	—	—	—	—	—
0.6	—	06SQ-60	—	—	—	—	—
0.7	—	07SQ-60	—	—	—	—	—
0.75	41075	—	—	—	—	—	—
1	41100CPS	10SQ-60	21001	11001	6413-2T	31001	51001CPS
1.25	41125	—	—	—	—	—	—
1.3	—	13SQ-60	—	—	—	—	—
1.4	—	14SQ-60	—	—	—	—	—
1.5	41150	—	—	—	—	—	—
1.6	—	16SQ-60	—	—	—	—	—
2	41200	—	21002	11002	6414-2T	31002CPS	51002
2.1	—	21SQ-60	—	—	—	—	—
2.5	41250CPS	—	—	—	—	—	—
2.75	41275CPS	—	—	—	—	—	—
3	—	—	21003	11003	6415-2T	31003CPS	51003
3.1	—	31SQ-60	—	—	—	—	—
3.5	41350	35SQ-60	—	—	—	—	—
4	41400	—	—	—	—	—	—
4.2	—	42SQ-60	—	—	—	—	—
5	—	—	21005	11005	6416-2T	31005	51005CPS
5.2	—	52SQ-60	—	—	—	—	—
5.5	41550	—	—	—	—	—	—
6	—	—	21006	—	—	31006	51006
6.3	—	63SQ-60	—	—	—	—	—
7	41007CPS	70SQ-60	21007	11007	6417-2T	31007	51007
7.8	—	78SQ-60	—	—	—	—	—
8	—	—	—	11008	6417-8-2T	31008	51008CPS
10	41010CPS	—	21010CPS	11010	6418-2T	31010	51010CPS
10.4	—	104SQ-60	—	—	—	—	—
12	—	—	—	—	—	31012	51012
14	—	140SQ-60	—	—	—	—	—
15	41015CPS	—	21015	11015	6419-2T	31015	51015
20	—	—	21020	11020	6420-2T	31020CPS	51020CPS
21	—	210SQ-60	—	—	—	—	—
25	—	—	21025	11025	6421-2T	31025CPS	51025
30	—	—	21030	11030	6422-2T	31030CPS	51030CPS
32	—	320SQ-60	—	—	—	—	—
40	—	—	21040	11040CPS	6423-2T	31040CPS	51040CPS
46	—	460SQ-60	—	—	—	—	—
50	—	—	21050CPS	11050	6424-2T	31050CPS	51050CPS
60	—	—	—	—	6425-2T	—	—
65	—	—	21065	11065	—	31065CPS	51065CPS
75	—	—	—	11075	6426-2T	—	—
80	—	—	21080CPS	11080	—	31080CPS	51080CPS
85	—	—	—	11085	—	—	—
100	—	—	21100CPS	11100	6427-2T	31100CPS	51100
125	—	—	21125	11125	6428-2T	—	—
140	—	—	—	—	—	31140	51140
150	—	—	21150CPS	11150	6429-2T	—	—
175	—	—	—	11175	6724-2T	—	—
200	—	—	21200CPS	11200	6725-2T	31200	51200

Notes:

1. Fit-All fuse links listed above have removable button heads. For non-removable button heads, add "A" in front of the part number. Exceptions: Non-removable button heads are not available for Types X, SQ, QA links or 125 A, 150 A and 200 A Type 200 links.
2. Fit-All fuse links listed above are all 23" (584 mm) long. For 26" (660 mm) long fuse links, add -29, except the SQ links. For SQ links, replace -60 with -26.

Table 48. Trip-O-Link fuse link catalog numbers

Current Rating	Type X	Type KS	Type 200	Type QA	Type K	Type T
0.33	42033	—	—	—	—	—
0.50	42050	—	—	—	—	—
0.75	42075	—	—	—	—	—
1.00	42100	22001	12001	6813	32001	52001
1.25	42125	—	—	—	—	—
1.50	42150	—	—	—	—	—
2	42200	22002	12002	6814	32002	52002
2.50	42250	—	—	—	—	—
2.75	42275	—	—	—	—	—
3	—	22003	12003	6815	32003	52003
3.50	42350	—	—	—	—	—
4	42400	—	—	—	—	—
5	—	22005	12005	6816	—	—
5.50	42550	—	—	—	—	—
6	—	—	—	—	32006	52006
7	42007	22007	12007	6817	—	—
8	—	—	—	—	32008	52008
10	42010	22010	12010	6818	32010	52010
12	—	—	—	—	32012	52012
15	42015	22015	12015	6819	32015	52015
20	—	22020	12020	6820	32020	52020
25	—	22025	12025	6821	32025	52025
30	—	22030	12030	7482	32030	52030
40	—	22040	12040	7483	32040	52040
50	—	22050	12050	7484	32050	52050

Table 49. Indicating type tubular secondary fuse catalog numbers

Current rating (A)	Tinned leads	Insulated leads
10	8316	8316-5
15	8317	8317-5
20	8318	8318-5
25	8319	8319-5
30	8320	8320-5
40	8321	8321-5
50	8322	8322-5
60	8323	8323-5
75	8324	8324-5
100	8325	8325-5
125	8326	8326-5
150	8327	—
175	8328	—
200	8329	—
300	11405	—

Edison fuse links

Eaton's Edison fuse links share the same overcurrent protection properties as Kearney fuse links but come in different speed ratios and packaging. They also add silver element links to the fuse link lineup giving the end user flexibility in considering the puts and takes of both silver and tin. In addition to adding silver links, Edison links also feature a group of links for 38 kV distribution applications.

For more information on Edison fuse links consult, Eaton catalog CA132008EN.

Table 50. Edison fuse link types and ratings

System rating	Fuse type	Ampere rating
27 kV Distribution	K (tin)	1–200
(Open-type cutout)	K (silver)	6–200
(Open-type cutout)	T (tin)	1–200
(Open-type cutout)	T (silver)	6–200
(Open-type cutout)	S	3–200
(Open-type cutout)	H	1–8
(Open-type cutout)	N	2–200
(Open-type cutout)	D	1–20
38 kV Distribution	EK	1–100
(Open-type cutout)	ET	1–100
(Open-type cutout)	EH	1–5
15 kV Distribution	K	6–50
(Open-link cutout)	T	6–50
(Open-link cutout)	H	1–8
(Open-link cutout)	D	1–20

Table 51. Edison link speed ratios ①

Edison fuse link	Description	Average speed ratio
Distribution systems through 27 kV		
Type K	Fast	6 through 8.1 (meets IEEE standards for a fast fuse)
Type N	Fast	6 through 11 (universal fuse link similar to Type K link)
Type T	Slow	10 through 13.1 (meets IEEE standards for a slow fuse)
Type H	Very slow	6 through 18 (high-surge withstand characteristics)
Type D	Very slow	7 through 46 (high-surge withstand characteristics)
Type S	Very slow	15 through 20 (high-surge withstand characteristics)
Distribution systems through 38 kV		
Type EK	Fast	6 through 8.1
Type ET	Slow	10 through 13.1
Type EH	Very slow	13 through 22 (high-surge fuse link)

① **Figure 35** compares the speed ratio of Type K, Type N, Type T, and Type S Edison links.

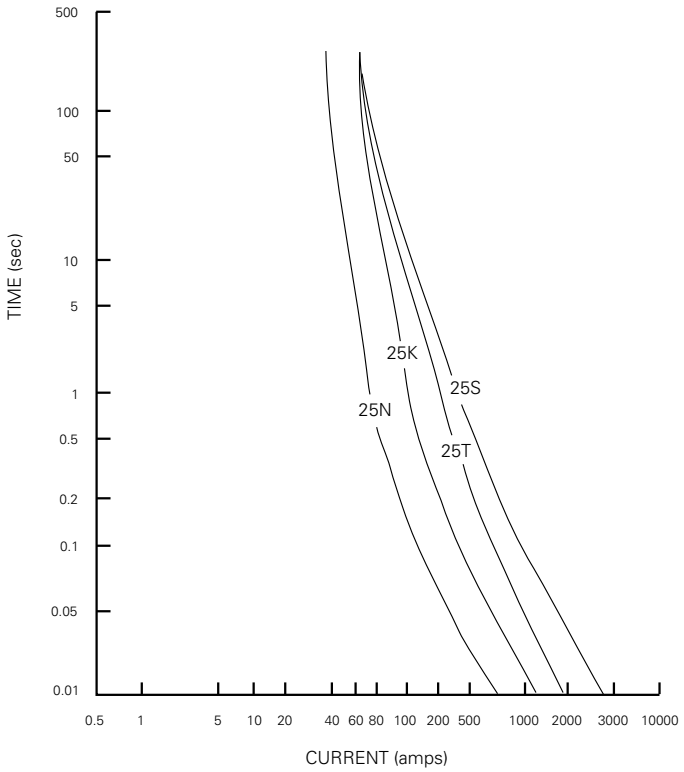


Figure 35. Edison link speed comparisons

Table 52. Edison removable buttonhead fuse link catalog numbers through 27 kV

Current rating (A)	Type H	Type D	Type K (silver)	Type N	Type S	Type K (tin)	Type T (tin)	Type T (silver)	Standard box quantity
Removable buttonhead									
1	**FL3H1**	**FL3D1**				**FL3K1**	**FL3T1**		15
1.5		**FL3D105**							15
2	**FL3H2**	**FL3D2**		**FL3N2**		**FL3K2**	**FL3T2**		15
3	**FL3H3**	**FL3D3**			**FL2S3**	**FL3K3**	**FL3T3**		15
4		**FL3D4**							15
5	**FL3H5**	**FL3D5**		**FL3N5**	**FL2S5**	**FL3K5**	**FL3T5**		15
6			**FL6K6**			**FL3K6**	**FL3T6**	**FL6T6**	15
7		**FL3D7**		**FL3N7**	**FL2S7**				15
8	**FL3H8**		**FL6K8**	**FL3N8**		**FL3K8**	**FL3T8**	**FL6T8**	15
10		**FL3D10**	**FL6K10**	**FL3N10**	**FL2S10**	**FL3K10**	**FL3T10**	**FL6T10**	15
12			**FL6K12**			**FL3K12**	**FL3T12**	**FL6T12**	15
15		**FL3D15**	**FL6K15**	**FL3N15**	**FL2S15**	**FL3K15**	**FL3T15**	**FL6T15**	15
20		**FL3D20**	**FL6K20**	**FL3N20**	**FL2S20**	**FL3K20**	**FL3T20**	**FL6T20**	15
25			**FL6K25**	**FL3N25**	**FL2S25**	**FL3K25**	**FL3T25**	**FL6T25**	15
30			**FL6K30**	**FL3N30**	**FL2S30**	**FL3K30**	**FL3T30**	**FL6T30**	15
40			**FL6K40**	**FL3N40**	**FL2S40**	**FL3K40**	**FL3T40**	**FL6T40**	15
50			**FL6K50**	**FL3N50**	**FL2S50**	**FL3K50**	**FL3T50**	**FL6T50**	15
60				**FL3N60**					10
65			**FL6K65**		**FL2S65**	**FL3K65**	**FL3T65**	**FL6T65**	10
75				**FL3N75**					10
80			**FL6K80**		**FL2S80**	**FL3K80**	**FL3T80**	**FL6T80**	10
85				**FL3N85**					10
100			**FL6K100**	**FL3N100**	**FL2S100**	**FL3K100**	**FL3T100**	**FL6T100**	10
125				**FL3N125**	**FL2S125**				5
140			**FL6K140**			**FL3K140** ①	**FL3T140** ①	**FL6T140**	5
150				**FL3N150**	**FL2S150**				5
200			**FL6K200**	**FL3N200**	**FL2S200**	**FL3K200** ①	**FL3T200** ①	**FL6T200**	5

① Indicates fuses with double leaders.

Table 53. Edison non-removable buttonhead fuse link catalog numbers through 27 kV

Current rating (A)	Type H	Type D	Type K (silver)	Type N	Type K (tin)	Type T (tin)	Type T (silver)	Standard box quantity
Non-removable buttonhead								
1	**FL11H1**	**FL1D1**			**FL11K1**	**FL11T1**		15
1.5		**FL1D105**						15
2	**FL11H2**	**FL1D2**			**FL11K2**	**FL11T2**		15
3	**FL11H3**	**FL1D3**			**FL11K3**	**FL11T3**		15
4		**FL1D4**						15
5	**FL11H5**	**FL1D5**		**FL11N5**	**FL11K5**	**FL11T5**		15
6			**FL12K6**		**FL11K6**	**FL11T6**	**FL12T6**	15
7		**FL1D7**						15
8	**FL11H8**		**FL12K8**	**FL11N8**	**FL11K8**	**FL11T8**	**FL12T8**	15
10		**FL1D10**	**FL12K10**	**FL11N10**	**FL11K10**	**FL11T10**	**FL12T10**	15
12			**FL12K12**		**FL11K12**	**FL11T12**	**FL12T12**	15
15		**FL1D15**	**FL12K15**	**FL11N15**	**FL11K15**	**FL11T15**	**FL12T15**	15
20		**FL1D20**	**FL12K20**	**FL11N20**	**FL11K20**	**FL11T20**	**FL12T20**	15
25			**FL12K25**	**FL11N25**	**FL11K25**	**FL11T25**	**FL12T25**	15
30			**FL12K30**	**FL11N30**	**FL11K30**	**FL11T30**	**FL12T30**	15
40			**FL12K40**	**FL11N40**	**FL11K40**	**FL11T40**	**FL12T40**	15
50			**FL12K50**	**FL11N50**	**FL11K50**	**FL11T50**	**FL12T50**	15
60				**FL11N60**				10
65			**FL12K65**		**FL11K65**	**FL11T65**	**FL12T65**	10
75				**FL11N75**				10
80			**FL12K80**		**FL11K80**	**FL11T80**	**FL12T80**	10
85				**FL11N85**				10
100			**FL12K100**	**FL11N100**	**FL11K100**	**FL11T100**	**FL12T100**	10
125				**FL11N125**				5
140			**FL12K140**		**FL11K140**	**FL11T140**	**FL12T140**	5
150				**FL11N150**				5
200			**FL12K200**	**FL11N200**	**FL11K200**	**FL11T200**	**FL12T200**	5

Table 54. Edison removable buttonhead fuse link catalog numbers for 38 kV rated cutouts without arc shortening rods

Current rating (A)	Type EH	Type EK	Type ET	Standard box quantity
1	**FL8H1**	**FL16K1**	**FL16T1**	10
2	**FL8H2**	**FL16K2**	**FL16T2**	10
3	**FL8H3**	**FL16K3**	**FL16T3**	10
5	**FL8H5**	**FL16K5**	**FL16T5**	10
6		**FL16K6**	**FL16T6**	10
8		**FL16K8**	**FL16T8**	10
10		**FL16K10**	**FL16T10**	10
12		**FL16K12**	**FL16T12**	10
15		**FL16K15**	**FL16T15**	10
20		**FL16K20**	**FL16T20**	10
25		**FL16K25**	**FL16T25**	10
30		**FL16K30**	**FL16T30**	10
40		**FL16K40**	**FL16T40**	10
50		**FL16K50**	**FL16T50**	5
65		**FL16K65**	**FL16T65**	5
80		**FL16K80**	**FL16T80**	5
100		**FL16K100**	**FL16T100**	5

Table 55. Edison open-link fuse link catalog numbers

Current rating (A)	H	D	K	T	Standard box quantity
1	**FL4H1**	**FL4D1**		**FL4T1**	15
1.5		**FL4D105**			15
2	**FL4H2**	**FL4D2**		**FL4T2**	15
3	**FL4H3**	**FL4D3**		**FL4T3**	15
4		**FL4D4**			15
5	**FL4H5**	**FL4D5**			15
6			**FL4K6**	**FL4T6**	15
7		**FL4D7**			15
8	**FL4H8**		**FL4K8**	**FL4T8**	15
10		**FL4D10**	**FL4K10**	**FL4T10**	15
12			**FL4K12**	**FL4T12**	15
15		**FL4D15**	**FL4K15**	**FL4T15**	15
20		**FL4D20**	**FL4K20**	**FL4T20**	15
25			**FL4K25**	**FL4T25**	15
30			**FL4K30**	**FL4T30**	15
40			**FL4K40**	**FL4T40**	15
50			**FL4K50**	**FL4T50**	15

Current-limiting fusing

Companion II back-up current-limiting fuse

Eaton Cooper Power series Companion™ II fuse can be conveniently applied as an add-on, back-up, current-limiting fuse. The Companion II back-up fuse will interrupt high fault current and at the same time, limit the amount of energy that is let-through to the protected equipment. The Companion II fuse offers major advantages over other back-up, current-limiting fuses in the industry. This design offers a small, compact, reliable fuse that is easier to handle in field installations. The modular design also offers greater flexibility in the selection of terminal options and the ability to re-use the terminals after a fuse operation. More information on Eaton's Companion II fuse can be found in Eaton catalog CA132021EN.

Application, coordination and characteristics

Table 56. Companion II fuse voltage application

System voltage (kV)		Recommended Companion II rating (kV)	
Nominal	Maximum	Four-wire multi-grounded neutral	Delta
2.4	2.54	—	8.3
2.4/4.16	2.54/4.4	8.3	—
4.16	4.4	—	8.3
4.8	5.1	—	8.3
4.8/8.32	5.1/8.8	8.3	—
6.9	7.26	—	8.3
6.93/12.0	7.3/12.7	8.3	—
7.2	7.62	—	8.3
7.2/12.47	7.62/13.2	8.3	—
7.62	8.1	—	8.3
7.62/13.2	8.1/14.0	8.3	—
7.97	8.4	—	8.3
7.97/13.8	8.4/14.5	8.3	—
8.32	8.8	—	8.3
8.32/14.4	8.8/15.2	8.3	—
12/20.8	12.7/22.0	15.5	—
12.47	13.2 ①	—	15.5 ②
13.2/22.9	14/24.2	15.5	—
13.2	14 ①	—	15.5 ②
13.8	14.5 ①	—	15.5 ②
14.4/24.9	15 2/26.4	15.5	—
14.4	15.2 ①	—	15.5 ②
19.9/34 5	21.1/36.5	23	—
34.5	36.5 ①	—	23 ②
46	48.3 ①	—	23 ②

① Fuse voltage ratings recommended for these systems are based on simultaneous operation of the Companion II fuses for high current faults.

② For single-phase applications on delta systems, one fuse of this rating is required in each phase.

Table 57. Companion II fuse-fuse link coordination

	Coordinates with fuse links up through					
Companion II fuse rating	Type K	Type T	Edison Type N	Edison Type S	Edison Type H	Edison Type D
12 K	12	8	20	5	8	1.5
25 K	25	15	30	7	8	20
40 K	40	20	50	15	8	20
	Kearney Type X	Kearney Type QA	Kearney Type 200	Kearney Type KS		
12 K	2.5	15	10	3		
25 K	10	30	20	7		
40 K	15	50	30	15		

Table 58. Protective characteristics

Voltage rating (kV)	Companion II rating ①	Maximum peak arc voltage (kV)	Minimum melt I^2t (kA^2s) ②	Maximum let-through I^2t (kA^2s)	Maximum interrupting current (kA)
8.3	12	25	2.6	18	50
	25	25	10.4	45	50
	40	25	33.9	140	50
15.5/17.2	12	43	2.6	18	43
	25	43	10.4	45	43
	40	43	33.9	140	43
23	12	64	2.6	18	31
	25	64	10.5	45	31

① Coordinates with NEMA type K fuse links up through designated rating (amperes). Contact your Eaton representative for coordination assistance with other types of expulsion fuse links.

② Minimum melt I^2t is for the back-up current-limiting fuse section only.

Configuration and part number selection

Table 59. 8.3 kV Companion II fuse

Current rating	Interrupting rating (kA-Sym)	Companion II fuse catalog number	
		Base catalog number	Terminal code ① digits 11 and 12 ②
12 K	50	**FAH8KV12K_R1**	Refer to **Table 62**
25 K	50	**FAH8KV25K_R1**	Refer to **Table 62**
40 K	50	**FAH8KV40K_R1**	Refer to **Table 62**

① To order Companion II fuse without terminal options, move R1 to digits 11 and 12. See example above.

② Terminal codes must appear in descending order of the alphabet.

Table 60. 15.5/17.2 kV Companion II fuse

Current rating	Interrupting rating (kA-Sym)	Companion II fuse catalog number	
		Base catalog number	Terminal code ① digits 11 and 12 ②
12 K	43	**FAH17KV12K_R1**	Refer to **Table 62**
25 K	43	**FAH17KV25K_R1**	Refer to **Table 62**
40 K	43	**FAH17KV40K_R1**	Refer to **Table 62**

① To order Companion II fuse without terminal options, move R1 to digits 11 and 12. See example above.

② Terminal codes must appear in descending order of the alphabet.

Table 61. 23 kV Companion II fuse

Current rating	Interrupting rating (kA-Sym)	Companion II fuse catalog number	
		Base catalog number	Terminal code ① digits 11 and 12 ②
12 K	31	**FAH23KV12K_R1**	Refer to **Table 62**
25 K	31	**FAH23KV25K_R1**	Refer to **Table 62**

① To order Companion II fuse without terminal options, move R1 to digits 11 and 12. See example above.

② Terminal codes must appear in descending order of the alphabet.

Replacement fuse ordering

To order a replacement fuse, choose the appropriate base catalog number from **Table 59**, **Table 60** and **Table 61**.

Examples:
To order an 8.3 kV, 25 K rated fuse with spline stud and eyebolt terminal, the part number would be:

FAH8KV25KBGR1

To order an 8.3 kV, 25 K replacement fuse only the part number would be:

FAH8KV25KR1

Companion II terminal hardware

To order replacement terminal hardware separately choose two appropriate terminal codes from **Table 62**. After selecting the appropriate terminal codes, order catalog number:

HWKT

Note: Terminal codes must appear in descending order of the alphabet.

Example:

To order a hardware kit including an eyebolt terminal and spline stud, the catalog number would be:

BGHWKT

Table 62. Terminal options ①

Terminal Code	Description
B	Eyebolt (#8–2/0 cable sizes)
C	Parallel-groove (#6–2/0 cable sizes)
D	Spade adapter
G	Spline stud
J	Offset adapter
L	Universal adapter
M	Hot line clamp-bronze (#4–2/0 cable sizes)
N	Large parallel-groove (#8–250 MCM cable sizes)
P	Medium parallel-groove (#8–2/0 cable sizes)
Q	Parallel-groove terminal (#8–2/0 cable sizes) Parallel-groove connector is shipped in a bag with fuse (not installed)

① To order single terminal connector hardware kit

Terminal code **HWKT**

(Example: JHWKT—offset adapter hardware kit)

Terminal options

The Companion II fuse is available with several types of terminal options. Any combination of spline stud, parallel-groove, spade or eyebolt connector is available. A universal adapter is available for installations that require angled installation of the fuse to meet clearance requirements. In addition to end terminals, an optional hot-line clamp is available for easy connection to overhead line.

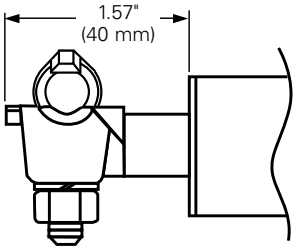


Figure 36. Eyebolt terminal (#8–2/0) (-B)

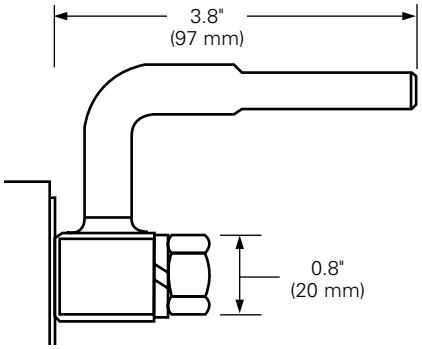


Figure 40. Offset adapter terminal (-J)

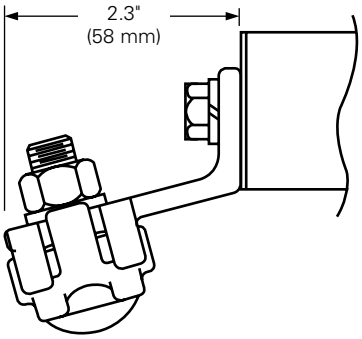


Figure 43. Large parallel-groove terminal (250 MCM) (-N)

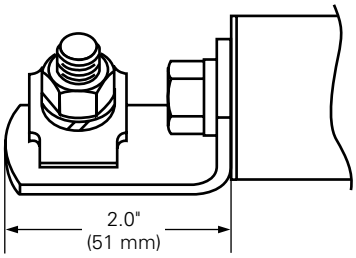
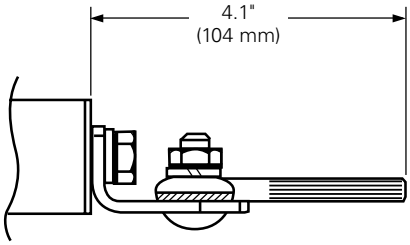


Figure 37. Parallel-groove terminal (#6–2/0) (-C)



Note: Stud is rotatable by 180°.

Figure 41. Universal adapter terminal (-L)

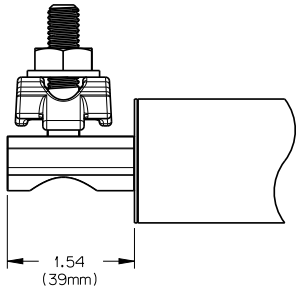


Figure 44. Medium parallel-groove terminal (#8–2/0 cable sizes) (-P)

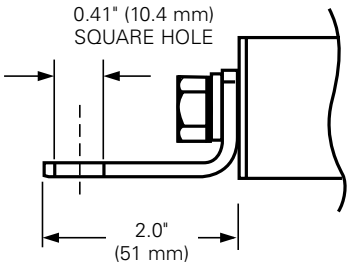


Figure 38. Spade terminal (-D)

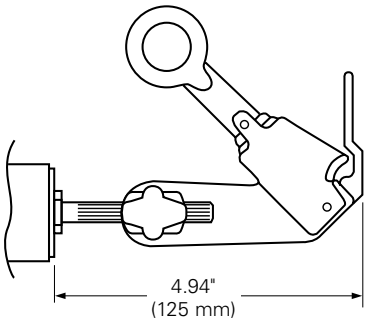


Figure 42. Hot-line clamp (-M)

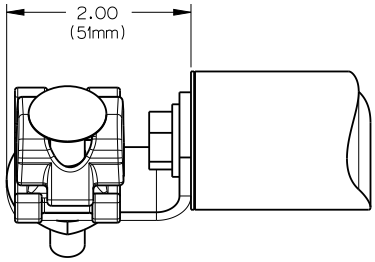


Figure 45. Parallel-groove terminal (#8–2/0 cable sizes) (-Q)

Note: Parallel-groove connector is shipped in a bag with fuse (not installed) as shown above.

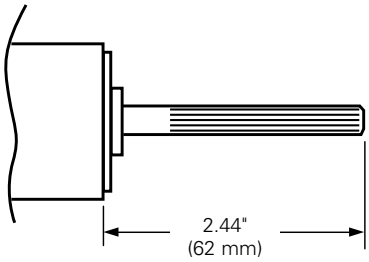


Figure 39. Spline stud terminal (-G)

ELF current-limiting dropout fuse

Eaton's Cooper Power series ELF current-limiting dropout fuse is a full range current-limiting fuse designed for mounting in an industry standard interchangeable cutout that is presently used for expulsion fuses. The ELF fuse is designed to be used to protect pole-type transformers, single-phase and three-phase laterals and underground taps. The ELF dropout fuse operates silently, unlike expulsion fuses. In addition, the expulsive shower that exists with an expulsion fuse operation is eliminated. This offers increased safety to line personnel during circuit energization operations. In addition, the reliable drop open design makes locating the fault easy.

For additional information on Eaton's ELF current-limiting dropout fuse, refer to Eaton catalog CA132027EN.

Table 63. ELF fuse electrical ratings and characteristics

Fuse ratings		Cutout rating		Continuous current ratings (A) ①					
Voltage (kV)	Current (A)	Voltage (kV)	BIL (kV)	25 °C	40 °C	55 °C	Minimum melt I^2t ($A^2 \cdot s$)	Maximum clear I^2t ($A^2 \cdot s$)	Maximum interrupting current (A rms symmetrical)
8.3	6	15	110	8	7	6	520	4550	31,000
8.3	8	15	110	12	11	11	1150	6500	31,000
8.3	12	15	110	18	17	16	1150	7000	31,000
8.3	18	15	110	25	24	23	1350	8600	31,000
8.3	20	15	110	27	26	25	2000	11,700	31,000
8.3	25	15	110	34	33	31	2900	17,000	31,000
8.3	30	15	110	43	41	39	4000	20,000	31,000
8.3	40	15	110	50	48	46	8000	39,000	31,000
8.3	50 ②	15	110	68	65	62	16,000	65,000	31,000
8.3	65 ②	15	110	78	75	71	20,000	100,000	31,000
8.3	80 ②	15	110	95	91	87	32,000	150,000	31,000
8.3	100 ②	15	110	120	114	109	46,000	215,000	31,000
15.0	6	15	110	8	7	6	520	4550	20,000
15.0	8	15	110	12	11	11	1150	6500	20,000
15.0	12	15	110	18	17	16	1150	7000	20,000
15.0	18	15	110	25	24	23	1350	8600	20,000
15.0	20	15	110	27	26	25	2000	11,700	20,000
8.3	6	27	150	8	7	6	520	4550	31,000
8.3	8	27	150	12	11	11	1150	6500	31,000
8.3	12	27	150	18	17	16	1150	7000	31,000
8.3	18	27	150	25	24	23	1350	8600	31,000
8.3	20	27	150	27	26	25	2000	11,700	31,000
8.3	25	27	150	34	33	31	2900	17,000	31,000
8.3	30	27	150	43	41	39	4000	20,000	31,000
8.3	40	27	150	50	48	46	8000	39,000	31,000
8.3	50 ②	27	150	68	65	62	16,000	65,000	31,000
8.3	65 ②	27	150	78	75	71	20,000	100,000	31,000
8.3	80 ②	27	150	95	91	87	32,000	150,000	31,000
8.3	100 ②	27	150	120	114	109	46,000	215,000	31,000
15.0 ③	6	27	150	8	7	6	520	4550	43,000
15.0 ③	8	27	150	12	11	11	1150	6500	43,000
15.0 ③	12	27	150	18	17	16	1150	7000	43,000
15.0 ③	18	27	150	25	24	23	1350	8600	43,000
15.0 ③	20	27	150	27	26	25	2000	11,700	43,000
15.0 ③	25	27	150	34	33	31	2900	17,000	43,000
15.0	30	27	150	43	41	39	5100	25,000	20,000
15.0 ③	30 ②	27	150	43	41	39	5100	25,000	43,000
15.0 ③	40 ②	27	150	50	48	46	8000	39,000	43,000
15.0 ③	50 ②	27	150	68	65	62	16,000	65,000	43,000
23.0	6	27	150	8	7	6	520	5200	31,000
23.0	8	27	150	12	11	11	1150	7000	31,000
23.0	12	27	150	18	17	16	1150	8000	31,000
23.0	18	27	150	25	24	23	1350	10,000	31,000
23.0	20	27	150	27	26	25	2000	14,000	31,000
23.0	25 ②	27	150	34	33	31	2900	20,000	31,000
23.0	30 ②	27	150	43	41	39	5100	30,000	31,000
24.0	6	36	170	8	7	6	520	5200	13,000
24.0	8	36	170	12	11	11	1150	7000	13,000
24.0	12	36	170	18	17	16	1150	8000	13,000
24.0	18	36	170	25	24	23	1350	10,000	13,000
24.0	20	36	170	27	26	25	2000	14,000	13,000

① For temperatures other than listed, a deration factor of 0.26% per °C can be applied.

② Multi-barrel design

③ 15 kV, 125 kV BIL, 6 through 25 A (single barrel part numbers FAK44W6 through FAK44W25) and 30 through 50 A (double barrel part numbers FAK44W30P, FAK44W40, and FAK44W50) have been tested and approved for 17.2 kV application.

Table 64. Recommended ELF current-limiting dropout fuse voltage ratings

System voltage (kV)		Recommended fuse ratings (kV)			
		Four-wire multi-grounded neutral		Three-wire wye or delta	
Nominal	Maximum	Single-phase	Three-phase	Single-phase (line-to-line)	Three-phase
2.4	2.54	—	—	8.3	8.3
4.16/2.4	4.4/2.54	8.3	8.3	—	—
4.16	4.4	—	—	8.3	8.3
4.8	5.08	—	—	8.3	8.3
6.9	7.26	—	—	8.3	8.3
7.2	7.62	—	—	8.3	8.3
7.97	8.4	—	—	8.3	8.3
8.32/4.8	8.8/5.08	8.3	8.3	—	—
11.0	12.0	—	—	15	15
12.0/6.93	12.7/7.33	8.3	15 or 8.3 ①	—	—
12.47/7.2	13.2/7.62	8.3	15 or 8.3 ①	—	—
12.47	13.2	—	—	15	15
13.2/7.62	13.97/8.07	8.3	15 or 8.3 ①	—	—
13.2	13.97	—	—	15	15
13.8/7.97	14.52/8.38	8.3	15 or 8.3 ①	—	—
13.8	14.52	—	—	15	15
14.4	15.24	—	—	15	15
16.3	17.1	—	—	15 ②	15 ②
20.78/12.0	22.0/12.7	15	23 or 15 ①	—	—
22.0	24.0	—	—	23 ③	23 ③
22.86/13.2	24.2/13.97	15	23 or 15 ①	—	—
23.0	24.34	—	—	23 ③	23 ③
24.9/14.4	26.4/15.24	15	23 or 15 ①②	—	—
34.5/19.92	36.51/21.08	23	—	—	—

① This lower-voltage fuse rating may be used if either of the following conditions are met:

1. If the probability and a line-to-line and a three-phase ungrounded fault is very low.

-or-

2. If all of the below conditions are met:
   - If the probability of a three-phase ungrounded primary fault is very low.
   - If a secondary breaker or other series connected device is used to interrupt secondary faults.
   - If no more than 50% of the secondary load is delta connected.
   - If the line-to-line primary fault current is high enough to assure simultaneous operation of two fuses by melting at a maximum of 0.2 seconds.

② 15 kV, 125 kV BIL, 6 through 25 A (single barrel part numbers FAK44W6 through FAK44W25) and 30 through 50 A (double barrel part numbers FAK44W30P, FAK44W40, and FAK44W50) are recommended for this application.

③ A 23 kV rated fuse is recommended where 125 kV BIL interchangeable cutout mountings are used and a 24 kV rated fuse is recommended where 170 kV BIL interchangeable cutout mountings are used.

Table 65. Recommendations for distribution transformers in single-phase applications

Fuse voltage	8.3 kV		8.3 kV		8.3 kV		15.0 kV	
System voltage	2400 Δ		4160 Y/2400		4800 Δ		8320 Y/4800	
Single-phase transformer size (kVA)	Figure 46A		Figure 46D		Figure 46A		Figure 46D	
	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
10	4.17	6	4.17	6	2.08	6 ①	2.08	6 ①
15	6.25	12 ①	6.25	12 ①	3.13	6	3.13	6
25	10.42	18	10.42	18	5.21	8	5.21	8
37.5	15.63	20	15.63	20	7.81	12	7.84	12
50	20.83	30	20.83	30	10.42	18	10.42	18
75	31.25	40	31.25	40	15.63	20	15.63	20
100	41.67	50	41.67	50	20.83	30	20.83	30
167	69.58	80	69.58	80	34.79	50	34.79	50
250	104.17	100 ④	104.17	100 ④	52.08	65	52.08	65
333	138.75	—	138.75	—	69.38	80	69.38	80

Fuse voltage	8.3 kV		8.3 kV		8.3 kV		15.0 kV	
System voltage	7200 Δ		12470 Y/7200		13200 Y/7620		12000 Δ	
Single-phase transformer size (kVA)	Figure 46A		Figure 46D		Figure 46D		Figure 46A	
	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
10	1.39	6 ①	1.39	6 ①	1.31	6 ①	0.83	6 ①
15	2.08	6 ①	2.08	6 ①	1.97	6 ①	1.25	6 ①
25	3.47	6	3.47	6	3.28	6	2.08	6 ①
37.5	5.21	8	5.21	8	4.92	8	3.13	6
50	6.94	12 ①	6.94	12 ①	6.56	12 ①	4.17	6
75	10.42	18	10.42	18	9.84	18 ①	6.25	12 ①
100	13.89	20	13.89	20	13.12	18	8.33	12
167	23.19	30	23.19	30	21.92	30	13.92	20
250	34.72	50	34.72	50	32.81	40 ②	20.83	30
333	46.25	65	46.25	65 ③	43.70	50	27.75	40
500	69.44	80	69.44	80 ③	65.62	80 ③	41.67	50

Fuse voltage	15.0 kV		15.0 kV		15.0 kV		23.0 kV	
System voltage	13200 Δ		14400 Δ		24940 Y/14400		34500 Y/19920	
Single-phase transformer size (kVA)	Figure 46A		Figure 46A		Figure 46D		Figure 46D	
	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
10	0.76	6 ①	0.69	6 ①	0.69	6 ①	0.50	6 ①
15	1.14	6 ①	1.04	6 ①	1.04	6 ①	0.75	6 ①
25	1.89	6 ①	1.74	6 ①	1.74	6 ①	1.25	6 ①
37.5	2.84	6 ①	2.60	6 ①	2.60	6 ①	1.88	6 ①
50	3.79	6	3.47	6	3.47	6	2.51	6 ①
75	5.68	8	5.21	8	5.21	8	3.77	6
100	7.58	12	6.94	12 ①	6.94	12 ①	5.02	8
167	12.65	18	11.60	18	11.60	18	8.38	12
250	18.94	25	17.36	25	17.36	25	12.55	18
333	25.23	30	23.13	30	23.13	30	16.72	25
500	37.88	50	34.72	50	34.72	50	25.10	30

① Fuse allows more than 300% load for 300 seconds.

② 8.3 kV rated fuse is a single-barrel fuse, 15 kV rated fuse is a double-barrel fuse.

③ Available only at 8.3 kV.

④ This lower voltage fuse rating may be used if either of the following conditions are met:

1. If the probability of a line-to-line or a three-phase ungrounded fault is very low.

-or-

2. If all of the below conditions are met:

- If the probability of a three-phase ungrounded primary fault is very low.
- If a secondary breaker or other series connected device is used to interrupt secondary faults.
- If no more than 50% of the secondary load is delta connected.
- If the line-to-line primary fault current is high enough to assure simultaneous operation of two fuses by melting at a maximum of 0.2 seconds.

Table 66. Recommendations for distribution transformers in three-phase applications

Fuse voltage	8.3 kV				8.3 kV		8.3 kV				8.3 kV	
System voltage	2400 Δ				4160 Y/2400		4800 Δ				8320 Y/4800	
	Figure 46B ①		Figure 46C		Figures 46E ① and 46F		Figure 46B ①		Figure 46C		Figures 46E ① and 46F	
Single-phase kVA	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
10	4.17	6	7.22	12 ②	4.17	6	2.08	6 ②	3.61	6	2.08	6 ②
15	6.25	12 ②	10.83	18	6.25	12 ②	3.13	6	5.41	8	3.13	6
25	10.42	18	18.04	25	10.42	18	5.21	8	9.02	12	5.21	8
37.5	15.63	20	27.06	40	15.63	20	7.81	12	13.53	18	7.84	12
50	20.83	30	36.09	50	20.83	30	10.42	18	18.04	25	10.42	18
75	31.25	40	54.13	80	31.25	40	15.63	20	27.06	40	15.63	20
100	41.67	50	72.17	100	41.67	50	20.83	30	36.08	50	20.83	30
167	69.58	80	120.28	—	69.58	80	34.79	50	60.14	80	34.79	50
250	104.17	100 ③	180.42	—	104.17	100 ③	52.08	65	90.21	—	52.08	65
333	138.75	—	240.56	—	138.75	—	69.38	80	120.28	—	69.38	80

Fuse voltage	8.3 kV				15.0 kV or 8.3 kV ③		15.0 kV or 8.3 kV ③				15.0 kV	
System voltage	7200 Δ				12470 Y/7200		13200 Y/7620				12000 Δ	
	Figure 46B ①		Figure 46C		Figures 46E ① and 46F		Figures 46E ① and 46F		Figure 46B		Figures 46C	
Single-phase kVA	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
15	2.08	6 ②	3.61	6	2.08	6 ②	1.97	6 ②	1.25	6 ②	2.17	6 ②
25	3.47	6	6.01	8	3.47	6	3.28	6	2.08	6 ②	3.61	6
37.5	5.21	8	9.02	12	5.21	8	4.92	8	3.13	6	5.41	8
50	6.94	12 ②	12.03	18	6.94	12 ②	6.56	12 ②	4.17	6	7.22	12 ②
75	10.42	18	18.04	25	10.42	18	9.84	18 ②	6.25	12 ②	10.83	18
100	13.89	20	24.06	30	13.89	20	13.12	18	8.33	12	14.43	20
167	23.19	30	40.10	50	23.19	30	21.92	30	13.92	20	24.06	30
250	34.72	50	60.14	80	34.72	50	32.81	40 ④	20.83	30	36.08	50
333	46.25	65	80.19	100	46.25	65 ⑤	43.70	50	27.75	40	48.11	50
500	69.44	80	120.28	—	69.44	80 ⑤	65.62	80 ⑤	41.67	50	72.17	—

Fuse voltage	15.0 kV				15.0 kV				15 kV ③⑥	
System voltage	13200				14400				24940 Y/14400	
	Figure 46B ①		Figure 46C		Figure 46B ①		Figure 46C		Figures 46E ① and 46F	
Single-phase kVA	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings	Rated amps	Fuse ratings
10	0.76	6 ②	1.31	6 ②	0.69	6 ②	1.20	6 ②	0.69	6 ②
15	1.14	6 ②	1.97	6 ②	1.04	6 ②	1.80	6 ②	1.04	6 ②
25	1.89	6 ②	3.28	6	1.74	6 ②	3.01	6	1.74	6 ②
37.5	2.84	6	4.92	8	2.60	6 ②	4.51	8 ②	2.60	6 ②
50	3.79	6	6.56	12 ②	3.47	6	6.01	8	3.47	6
75	5.68	8	9.84	18 ②	5.21	8	9.02	12	5.21	8
100	7.58	12	13.12	25	6.94	12 ②	12.03	18	6.94	12 ②
167	12.65	18	21.87	30	11.60	18	20.05	25	11.60	18
250	18.94	25	32.80	50	17.36	25	30.07	40	17.36	25
333	25.23	30	43.74	—	23.13	30	40.09	50	23.13	30
500	37.88	50	65.61	—	34.72	50	60.14	—	34.72	50

① The recommended fuse sizes for this connection are based on equal size transformers in the bank. If a larger transformer is used in the bank for supplying single-phase loads, the fuse selections should be based on the larger transformer kVA.

② Fuse allows more than 300% load for 300 seconds.

③ This lower voltage fuse rating may be used if either of the following conditions are met:
1. If the probability of a line-to-line or a three-phase ungrounded fault is very low.
-or-
2. If all of the below conditions are met:
- If the probability of a three-phase ungrounded primary fault is very low.
- If a secondary breaker or other series connected device is used to interrupt secondary faults.
- If no more than 50% of the secondary load is delta connected.
- If the line-to-line primary fault current is high enough to assure simultaneous operation of two fuses by melting at a maximum of 0.2 seconds.

④ 8.3 kV rated fuse is a single-barrel fuse, 15 kV rated fuse is a double-barrel fuse.

⑤ Available only at 8.3 kV.

⑥ 15 kV, 125 kV BIL 6 through 25 A (single-barrel part numbers FAK44W6 through FAK44W25) and 30 through 50 A (double-barrel part numbers KAF44W30P, FAK44W40, and FAK44W50) are recommended for this application

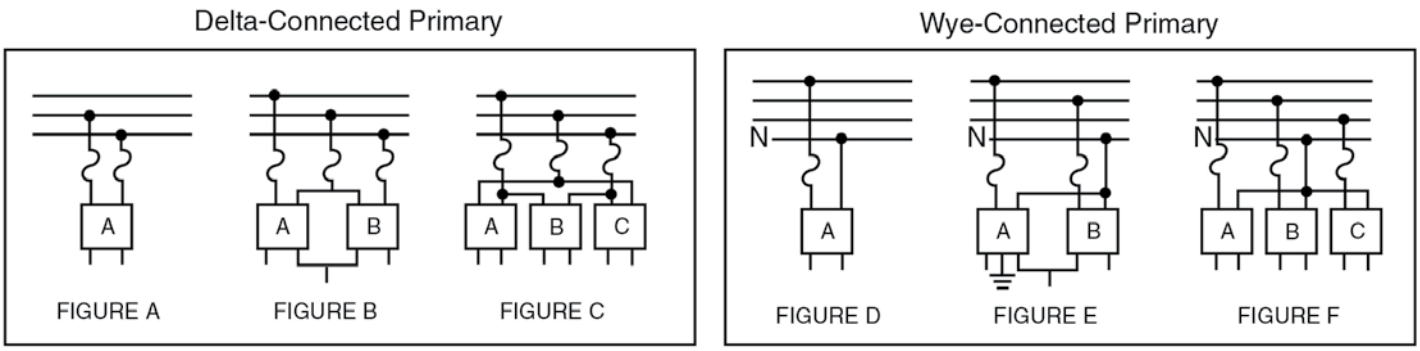


Figure 46. Schematic of primary voltage system connections

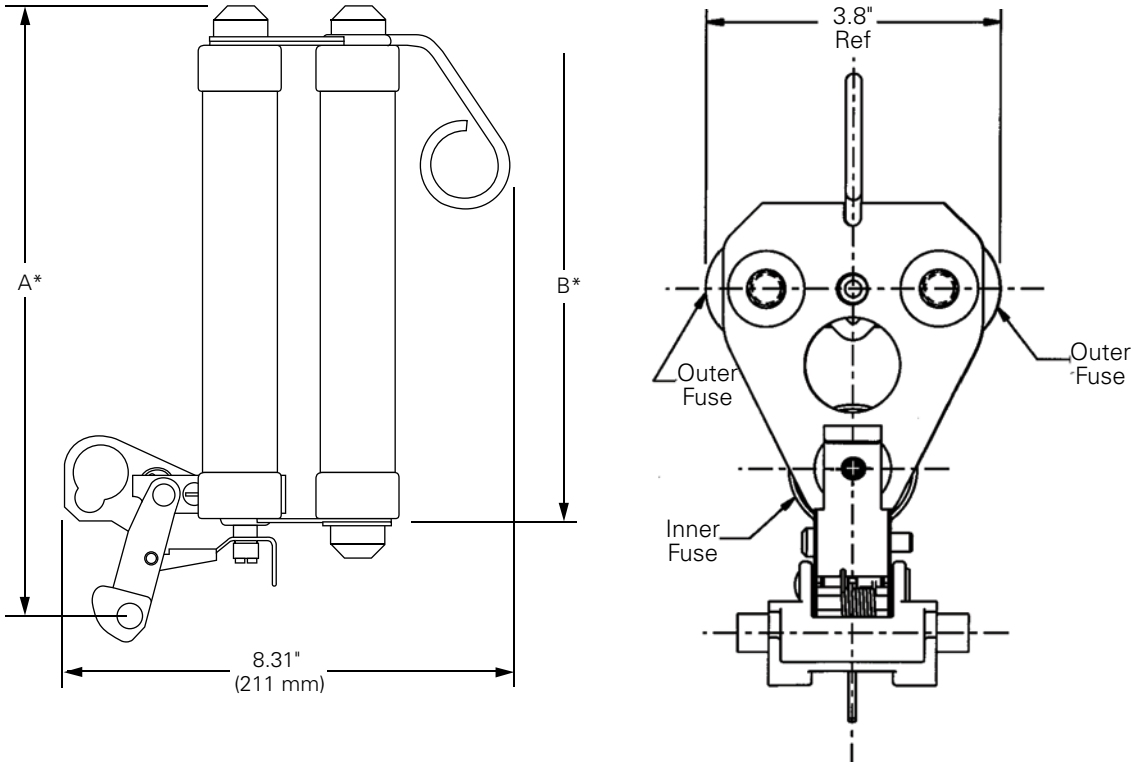


Figure 47. Double/triple barrel ELF fuse dimensions

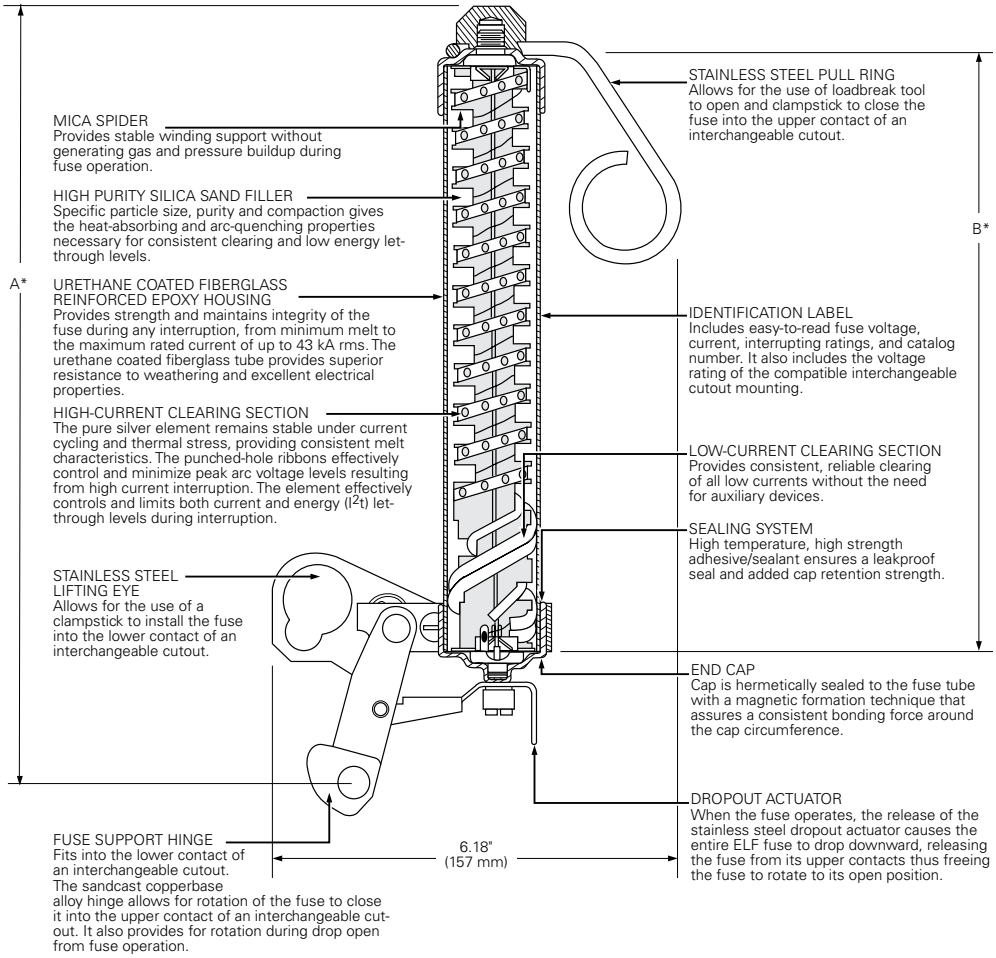


Figure 48. Double/triple barrel ELF fuse dimensions

Table 67. ELF current-limiting dropout fuse catalog numbers for 15 kV, 110 kV BIL interchangeable cutouts

Fuse rating				Dimensions in inches (mm)	
Voltage (kV)	**Current rating (A)**	**ELF fuse catalog number**	**Figure**	**A**	**B**
8.3	6	**FAK23W6**	48	11.37 (289)	8.83 (224)
8.3	8	**FAK23W8**	48	11.37 (289)	8.83 (224)
8.3	12	**FAK23W12**	48	11.37 (289)	8.83 (224)
8.3	18	**FAK23W18**	48	11.37 (289)	8.83 (224)
8.3	20	**FAK23W20**	48	11.37 (289)	8.83 (224)
8.3	25	**FAK23W25**	48	11.37 (289)	8.83 (224)
8.3	30	**FAK23W30**	48	11.37 (289)	8.83 (224)
8.3	40	**FAK23W40**	48	11.37 (289)	8.83 (224)
8.3	50	**FAK23W50** ①	47	11.37 (289)	8.83 (224)
8.3	65	**FAK23W65** ①	47	11.37 (289)	8.83 (224)
8.3	80	**FAK23W80** ①	47	11.37 (289)	8.83 (224)
8.3	100	**FAK23W100** ②	47	11.37 (289)	8.83 (224)
15.0	6	**FAK24W6**	48	11.37 (289)	8.83 (224)
15.0	8	**FAK24W8**	48	11.37 (289)	8.83 (224)
15.0	12	**FAK24W12**	48	11.37 (289)	8.83 (224)
15.0	18	**FAK24W18**	48	11.37 (289)	8.83 (224)
15.0	20	**FAK24W20**	48	11.37 (289)	8.83 (224)

① Double-barrel design.

② Triple-barrel design.

Table 68. ELF current-limiting dropout fuse catalog numbers 27 kV, 125 kV or 150 kV BIL interchangeable cutouts

Fuse rating				Dimensions in inches (mm)	
Voltage (kV)	Current rating (A)	ELF fuse catalog number	Figure	A	B
8.3	6	**FAK43W6**	48	15.16 (385)	12.34 (313)
8.3	8	**FAK43W8**	48	15.16 (385)	12.34 (313)
8.3	12	**FAK43W12**	48	15.16 (385)	12.34 (313)
8.3	18	**FAK43W18**	48	15.16 (385)	12.34 (313)
8.3	20	**FAK43W20**	48	15.16 (385)	12.34 (313)
8.3	25	**FAK43W25**	48	15.16 (385)	12.34 (313)
8.3	30	**FAK43W30**	48	15.16 (385)	12.34 (313)
8.3	40	**FAK43W40**	48	15.16 (385)	12.34 (313)
8.3	50	**FAK43W50** ①	47	15.16 (385)	12.34 (313)
8.3	65	**FAK43W65** ①	47	15.16 (385)	12.34 (313)
8.3	80	**FAK43W80** ①	47	15.16 (385)	12.34 (313)
8.3	100	**FAK43W100** ②	47	15.16 (385)	12.34 (313)
15.0 ③	6	**FAK44W6**	48	15.16 (385)	12.34 (313)
15.0 ③	8	**FAK44W8**	48	15.16 (385)	12.34 (313)
15.0 ③	12	**FAK44W12**	48	15.16 (385)	12.34 (313)
15.0 ③	18	**FAK44W18**	48	15.16 (385)	12.34 (313)
15.0 ③	20	**FAK44W20**	48	15.16 (385)	12.34 (313)
15.0 ③	25	**FAK44W25**	48	15.16 (385)	12.34 (313)
15.0	30	**FAK44W30**	48	15.16 (385)	12.34 (313)
15.0 ③	30	**FAK44W30P** ①	47	15.16 (385)	12.34 (313)
15.0 ③	40	**FAK44W40** ①	47	15.16 (385)	12.34 (313)
15.0 ③	50	**FAK44W50** ①	47	15.16 (385)	12.34 (313)
23.0	6	**FAK45W6**	48	15.16 (385)	12.34 (313)
23.0	8	**FAK45W8**	48	15.16 (385)	12.34 (313)
23.0	12	**FAK45W12**	48	15.16 (385)	12.34 (313)
23.0	18	**FAK45W18**	48	15.16 (385)	12.34 (313)
23.0	20	**FAK45W20**	48	15.16 (385)	12.34 (313)
23.0	25	**FAK45W25** ①	47	15.16 (385)	12.34 (313)
23.0	30	**FAK45W30** ①	47	15.16 (385)	12.34 (313)

① Double-barrel design.

② Triple-barrel design.

③ 15 kV, 125 kV BIL, 6 through 25 A (single barrel part numbers FAK44W6 through FAK44W25) and 30 through 50 A (double barrel part numbers FAK44W30P, FAK44W40, and FAK44W50) have been tested and approved for 17.2 kV application.

Table 69. ELF current-limiting dropout fuse catalog numbers for 36 kV, 170 kV BIL cutouts

Fuse rating				Dimensions in inches (mm)	
Voltage (kV)	Current rating (A)	ELF fuse catalog number	Figure	A	B
24.0	6	**FAK46W6**	48	18.55 (471)	15.7 (399)
24.0	8	**FAK46W8**	48	18.55 (471)	15.7 (399)
24.0	12	**FAK46W12**	48	18.55 (471)	15.7 (399)
24.0	18	**FAK46W18**	48	18.55 (471)	15.7 (399)
24.0	20	**FAK46W20**	48	18.55 (471)	15.7 (399)

Note: 36 kV ABB non-loadbreak cutout series V.

K-Limiter

K-Limiter high ampere Companion II fuse

Eaton designs its Cooper Power series K-Limiter fuse to be conveniently applied as an add-on, backup, current-limiting fuse and as an extension of Eaton's Cooper Power series NX™ Companion II fuse. The K-Limiter backup fuse will interrupt high fault current and at the same time, limit the amount of energy that is let-through to the protected equipment. This fuse is designed to be applied in series with an expulsion or other type of weak link fuse.

For additional information on Eaton's K-Limiter high ampere Companion II fuse, refer to Eaton catalog CA132059EN.

Table 70. Electrical ratings and characteristics

Fuse type	Voltage and current ratings		Maximum interrupting current
Backup	4.3 kV	50–80K	50,000 A rms symmetrical
	8.3 kV	65–140K	50,000 A rms symmetrical
	15.5 kV	65–80K	50,000 A rms symmetrical

Table 71. Protective characteristics

Voltage rating (kV)	K-Limiter rating ①	Maximum continuous current (A)	Minimum melt I^2t (A^2s) ②	Maximum let-through I^2t (A^2s)
4.3	50	100	9000	265,000
4.3	80	110	26,000	400,000
8.3	65	100	24,460	240,000
8.3	80	110	46,900	294,000
8.3	100	130	100,000	360,000
8.3	140	150	100,000	700,000
15.5	65	100	24,460	240,000
15.5	80	110	46,900	295,000

① Coordinates with NEMA Type K fuse links up through designated rating (amperes). Contact your Eaton representative for coordination assistance with other types of expulsion fuse links.

② Minimum melt I^2t is for the backup current-limiting fuse section only.

Table 72. K-Limiter fuse voltage application

System voltage (kV) nominal	Recommended K-Limiter rating (kV) maximum	Four-wire multi-grounded neutral	Delta
2.4	2.54	—	4.3
2.4/4.16	2.54/4.4	4.3	—
4.16	4.4	—	4.3
4.8	5.1	—	8.3
4.8/8.32	5.1/8.8	8.3	—
6.9	7.26	—	8.3
6.93/12.0	7.3/12.7	8.3	—
7.2	7.62	—	8.3
7.2/12.47	7.62/13.2	8.3	—
7.62	8.1	—	8.3
7.62/13.2	8.1/14.0	8.3	—
7.97	8.4	—	8.3
7.97/13.8	8.4/14.5	8.3	—
8.32	8.8	—	8.3
8.32/14.4	8.8/15.2	8.3	—
12/20.8	12.7/22.0	15.5	—
12.47	13.2 ①	—	8.3 ②
13.2/22.9	14/24.2	15.5	—
13.2	14 ①	—	8.3 ②
13.8	14.5 ①	—	8.3 ②
14.4/24.9	15 2/26.4	15.5	—
14.4	15.2 ①	—	8.3 ②

① Fuse voltage ratings recommended for these systems are based on simultaneous operation of the K-Limiter fuses for high current faults.

② For single-phase applications on delta systems, one fuse of this rating is required in each phase.

Table 73. K-Limiter fuse-fuse link coordination

Coordinates with fuse links up through			
K-Limiter fuse rating	ANSI Type K	ANSI Type T	M.E. Type N
50K	50	30	60
65K	65	30	60
80K	80	40	75
100K	100	50	75
140K	140	80	85
		Kearney Type QA	Kearney Type KS
50K		60	20
65K		75	25
80K		75	30
100K		100	30
140K		150	50

Table 74. Dimensional information

Voltage rating (kV)	Fuse ampere rating	A inches (mm)	Approx. weight lb (kg)
4.3	K50	6.42 (163.1)	3 (1.4)
4.3	K80	6.42 (163.1)	3 (1.4)
8.3	K65	11.94 (295.6)	5.5 (2.5)
8.3	K80	11.94 (295.6)	5.5 (2.5)
8.3	K100	11.94 (295.6)	5.5 (2.5)
8.3	K140	11.94 (295.6)	5.5 (2.5)
15	K65	16.00 (406)	9.0 (4.0)
15	K80	16.00 (406)	9.0 (4.0)

Ordering information

Selecting a catalog number

To order a K-Limiter fuse, first choose a fuse voltage and current rating from the Application Section in columns to the left. After selecting the fuse size, choose the appropriate Base Catalog Number from **Table 76**–**Table 78** and add the appropriate terminal option code from **Table 75**.

Table 75. Terminal options

Terminal code	Description
"-A1"	Spade and Eyebolt Connector
"-B1"	Spline Stud and Spade Connector
"-B2"	Spline Stud and Spade with Parallel-Groove Connector
"-C1"	Spade and Spade
"-C2"	Spade and Spade with Parallel-Groove Connector
"-D1"	End Boss and Spade
"-D2"	End Boss and Spade with Parallel-Groove Connector
"-D3"	End Boss and Eyebolt
"-E1"	Spline Stud and Eyebolt

Table 76. 4.3 kV K-Limiter fuse

Current rating	Interrupting rating (kA-sym)	K-Limiter fuse catalog number	
		Base catalog number	Terminal code
50K	50	**43K050**	Refer to **Table 75**
80K	50	**43K080**	Refer to **Table 75**

Table 77. 8.3 kV K-Limiter fuse

Current rating	Interrupting rating (kA-sym)	K-Limiter fuse catalog number	
		Base catalog number	Terminal code
50K	50	**83K050**	Refer to **Table 75**
65K	50	**83K065**	Refer to **Table 75**
80K	50	**83K080**	Refer to **Table 75**
100K	50	**83K100**	Refer to **Table 75**
140K	50	**83K140**	Refer to **Table 75**

Table 78. 15.5 kV K-Limiter fuse

Current rating	Interrupting rating (kA-sym)	K-Limiter fuse catalog number	
		Base catalog number	Terminal code
50K	50	**155K050**	Refer to **Table 75**
65K	50	**155K065**	Refer to **Table 75**
80K	50	**155K080**	Refer to **Table 75**

NXC full-range current-limiting capacitor fuse

Greater latitude in capacitor bank design is now possible with Eaton's Cooper Power series NXC™ outdoor, current-limiting capacitor fuse. It allows safe fusing of at least 50,000 joules of parallel connected energy. Available in voltage ratings of 8.3, 15.5, and 23 kV, the NXC fuse offers positive leader wire ejection for reliable interruption and elimination of electrical stress to circuit apparatus. The top end cap has provision for convenient bus bar mounting. Fast, full-range clearing capability, inherent advantage of the NX current-limiting fuse line, allows the NXC fuse to perform effectively under both high and low fault currents.

For additional information on Eaton's NXC full-range current-limiting capacitor fuse, refer to catalog CA132047EN.

Table 79. Fusing recommendations

Capacitor or unit voltage rating	Fuse voltage rating (kV)	50 kvar ①	100 kvar	150 kvar	200 kvar	300 kvar	400 kvar
2400	8.3	30	65	90 ②	—	—	—
2770	8.3	25	65	80 ②	—	—	—
4160	8.3	18	40	65	65	—	—
4800	8.3	18	30	45	65	—	—
6640	8.3	18	25	40	45	65	90 ②
7200	8.3	18	25	30	40	65	80 ②
7620	8.3	18	18	30	40	65	80 ②
7960	8.3	18	18	30	40	65	80 ②
8320	15.5	10	18	25	35	50 ②	70 ②
9960	15.5	10	18	25	30	50 ②	60 ②
12,470	15.5	—	12	18	25	35	50 ②
13,280	15.5	—	12	18	25	35	50 ②
13,800	15.5	—	10	18	25	30	50 ②
14,400	15.5	—	10	18	25	30	50 ②
19,920	23.0	—	12	12	18	25	36 ②
21,600	23.0	—	12	12	18	25	25

① For 50 kvar capacitors, it is difficult to choose reasonably sized fuses that will withstand the I^2t outrush. This occurs due to the fact that I^2t withstand goes down exponentially with fuse link rating rather than linearly. Consequently, the 50 kvar capacitor fusing recommendations only cover those units with voltages up to 9960 V.

② Indicates 2 fuses in parallel.

Dimensions

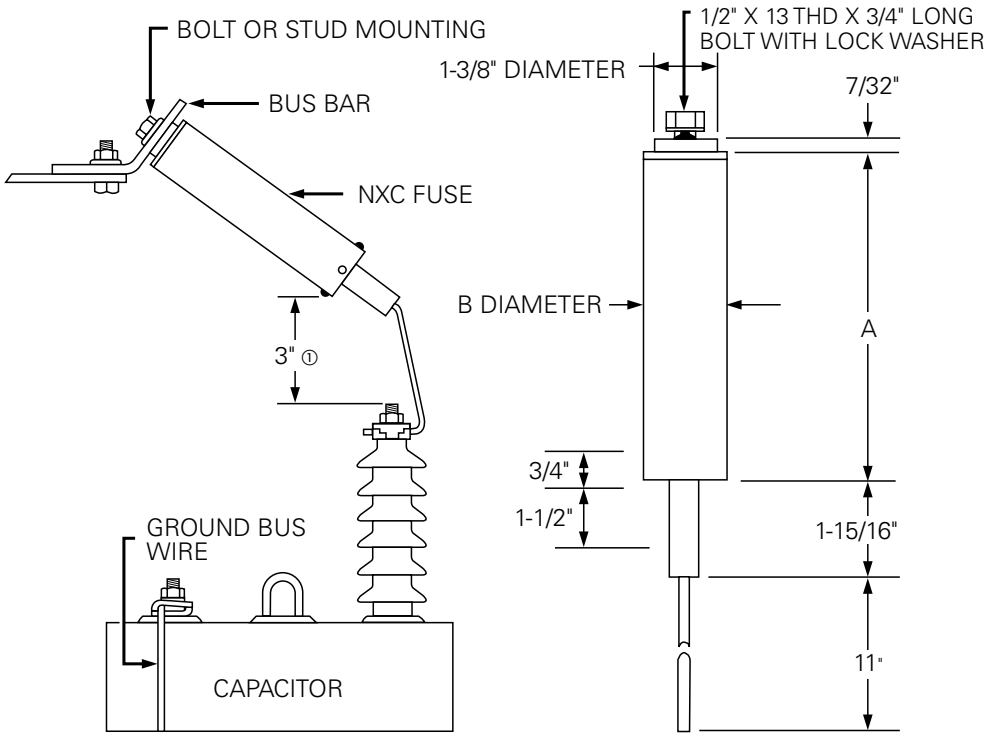


Figure 49. NXC installation

① Recommended minimum spacing

Table 80. Ratings and ordering information

Voltage (kV)	Continuous current (amps)	Interrupting symmetrical (amps)	Catalog number	Dimensions (inches)		Approx. weight (lb)
				A	B	
8.3	10	50,000	**FA5J10**	8	2-1/8	2.5
8.3	18	50,000	**FA5J18**	8	2-1/8	2.5
8.3	25	50,000	**FA5J25**	8	2-1/8	2.5
8.3	30	50,000	**FA5J30**	8	2-1/8	2.5
8.3	40	50,000	**FA5J40**	8	2-1/8	2.5
8.3	45	50,000	**FA5J45** ①	8	2-1/8	2.5
8.3	65	50,000	**FA5J65** ①	9-3/16	3-9/16	7.8
15.5	10	50,000	**FA6J10**	12-11/32	2-1/8	3.4
15.5	12	50,000	**FA6J12**	12-11/32	2-1/8	3.4
15.5	18	50,000	**FA6J18**	12-11/32	2-1/8	3.4
15.5	25	50,000	**FA6J25**	12-11/32	2-1/8	3.4
15.5	30	50,000	**FA6J30**	12-11/32	2-1/8	3.4
15.5	35	50,000	**FA6J35** ①	13-11/32	2-1/8	4.3
15.5	43	50,000	**FA6J43** ①	13-11/32	2-1/8	4.3
23	12	50,000	**FA7J12** ①	15-5/32	2-1/8	3.9
23	18	50,000	**FA7J18**	15-5/32	2-1/8	3.9
23	25	50,000	**FA7J25** ①	18-3/16	2-1/8	5.3

① Contact your Eaton representative for information on pricing and availability.

X-Limiter hinge-mounted current-limiting fuse

Eaton's Cooper Power series X-Limiter™ hinge-mounted fuses are designed to fit Eaton's CMU Cutout. X-Limiter hinge-mounted fuses are full-range, current-limiting fuses to be used indoors or for metal-clad applications, and outdoors for crossarm mounting or substation mounting, for the following: Eaton CMU Cutout (CA132065EN), S&C Type SM®-20, or S&C SM-4. The availability of the X-Limiter hinge-mounted fuse makes it easy to convert from expulsion fuses directly to a full-range, current-limiting fuse in the same mounting. The designs utilize standard end fittings (hinge-end and latched-end) to ensure a perfect fit in the mountings.

For additional information on Eaton's X-Limiter hinge-mounted current-limiting fuse, refer to catalog CA132054EN.

Table 81. Electrical characteristics

Fuse type	Full-range
Maximum interrupting current	50,000 A ① rms symmetrical

① Except 17 kV, parallel 80 and 100 A fuses are rated 43 kA rms symmetrical.

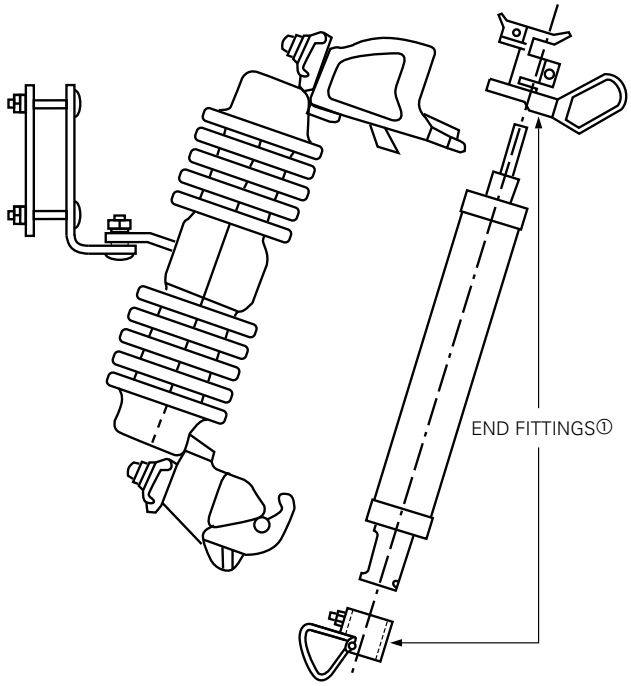


Figure 50. X-Limiter hinge-mounted fuse with dropout indication

① The X-Limiter hinge-mounted fuse utilizes the upper and lower CMU3095 end fittings.

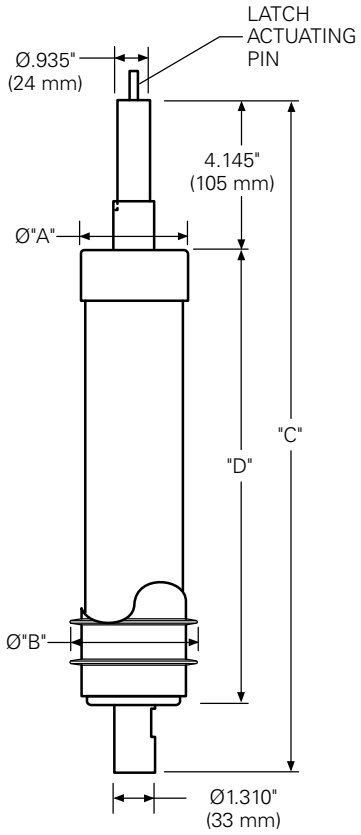


Figure 51. X-Limiter hinge-mounted fuse with dropout indication (latch actuating pin)

Table 82. 8.3 kV Type X-Limiter hinge-mounted fuse for Eaton's 17.1 kV CMU cutout (refer to Figure 50 and Figure 51)

Current rating (A)	Catalog number ① (includes dropout indication)	Dimensions (refer to Figure 51) inches (mm)			
		A	B	C	D
10	**83F010HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
12	**83F012HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
18	**83F018HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
20	**83F020HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
25	**83F025HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
30	**83F030HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
40	**83F040HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
50	**85F050HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
65	**83F065HD1A**	3.13 (80)	4.40 (112)	18.16 (461)	11.80 (300)
80	**83F080HD1A**	3.13 (80)	4.40 (112)	18.16 (461)	11.80 (300)
100	**83F100HD1A**	3.13 (80)	4.40 (112)	18.16 (461)	11.80 (300)
125	**83F125HD1A**	3.13 (80)	4.40 (112)	18.16 (461)	11.80 (300)
140	**83F140HD1A**	3.13 (80)	4.40 (112)	18.16 (461)	11.80 (300)

① Standard fuse surface is "UV" resistant epoxy (A).

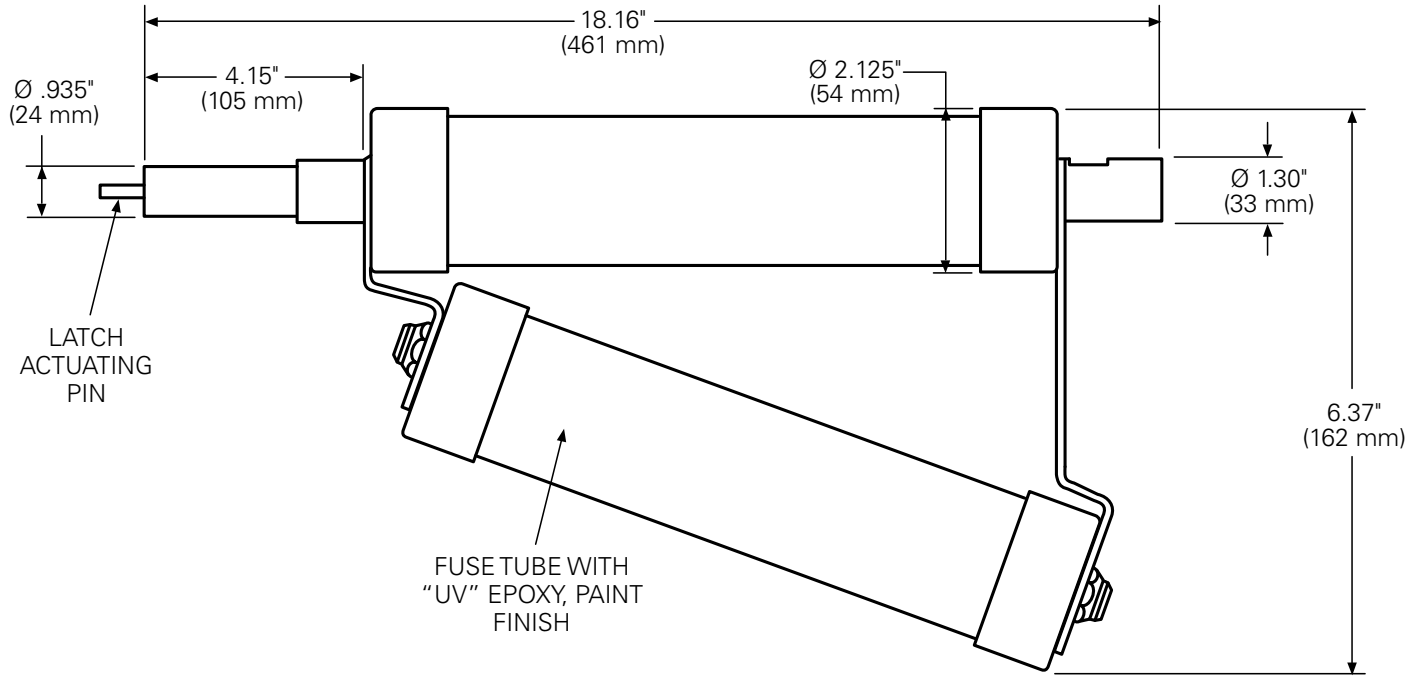


Figure 52. 17.0 kV X-Limiter hinge-mounted 65–100 A fuse with dropout indication (latch actuating pin) for Eaton's 17.0 kV CMU cutout ①

① The X-Limiter hinge-mounted fuse utilizes the upper and lower CMU3095 end fittings.

Table 83. 15.5 kV Type X-Llimiter hinge-mounted fuse for Eaton's 17.1 kV CMU cutout (refer to Figure 50 and Figure 51)

Current rating (A)	Catalog number ① (includes dropout indication)	Dimensions (refer to Figure 51) inches (mm)			
		A	B	C	D
10	**15F010HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
12	**15F012HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
18	**15F018HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
20	**15F020HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
25	**15F025HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
30	**15F030HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
40	**15F040HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)
50	**15F050HD1A**	2.13 (54)	3.75 (95)	18.16 (461)	11.80 (300)

① Standard fuse surface is "UV" resistant epoxy (A).

Table 84. 17.0 kV Type X-Limiter hinge-mounted fuse for Eaton's 17.1 kV CMU cutout (refer to Figure 52)

Current rating (A)	Catalog number (includes dropout indication)
65	**15F065HD1A**
80	**15F080HD1A**
100	**15F100HD1A**

Table 85. 15.5 kV Type X-Limiter hinge-mounted fuse for Eaton's 27.1 kV CMU cutout (refer to Figure 50 and Figure 51)

Current rating (A)	Catalog number ① (includes dropout indication)	Dimensions (refer to Figure 51) inches (mm			
		A	B	C	D
10	**15F010HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
12	**15F012HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
18	**15F018HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
20	**15F020HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
25	**15F025HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
30	**15F030HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
40	**15F040HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
50	**15F050HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	15.10 (384)
65	**15F065HD2A**	3.13 (80)	4.40 (112)	21.46 (545)	15.10 (384)
80	**15F080HD2A**	3.13 (80)	4.40 (112)	21.46 (545)	15.10 (384)
100	**15F100HD2A**	3.13 (80)	4.40 (112)	21.46 (545)	15.10 (384)
125	**15F125HD2A**	3.13 (80)	4.40 (112)	21.46 (545)	15.10 (384)

① Standard fuse surface is "UV" resistant epoxy (A).

Table 86. 23 kV Type X-Limiter hinge-mounted fuse for Eaton's 27.1 kV CMU cutout (refer to Figure 50 and Figure 51)

Current rating (A)	Catalog number ① (includes dropout indication)	Dimensions (refer to Figure 51) inches (mm)			
		A	B	C	D
10	**23F010HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
12	**23F012HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
18	**23F018HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
20	**23F020HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
25	**23F025HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
30	**23F030HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
40	**23F040HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)
50	**23F050HD2A**	2.13 (54)	3.75 (95)	21.46 (545)	14.85 (377)

① Standard fuse surface is "UV" resistant epoxy (A).

Table 87. 23 kV Type X-Limiter hinge-mounted fuse for S&C 34.5 kV (38.0 kV) Type SMD-20 outdoor mount (refer to Figure 50 and Figure 51)

Current rating (A)	Catalog number ① (includes dropout indication)	Dimensions (refer to Figure 51) inches (mm)			
		A	B	C	D
10	**23F010HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
12	**23F012HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
18	**23F018HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
20	**23F020HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
25	**23F025HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
30	**23F030HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
40	**23F040HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)
50	**23F050HD3A**	2.13 (54)	3.75 (95)	27.60 (701)	14.85 (377)

① Standard fuse surface is "UV" resistant epoxy (A).

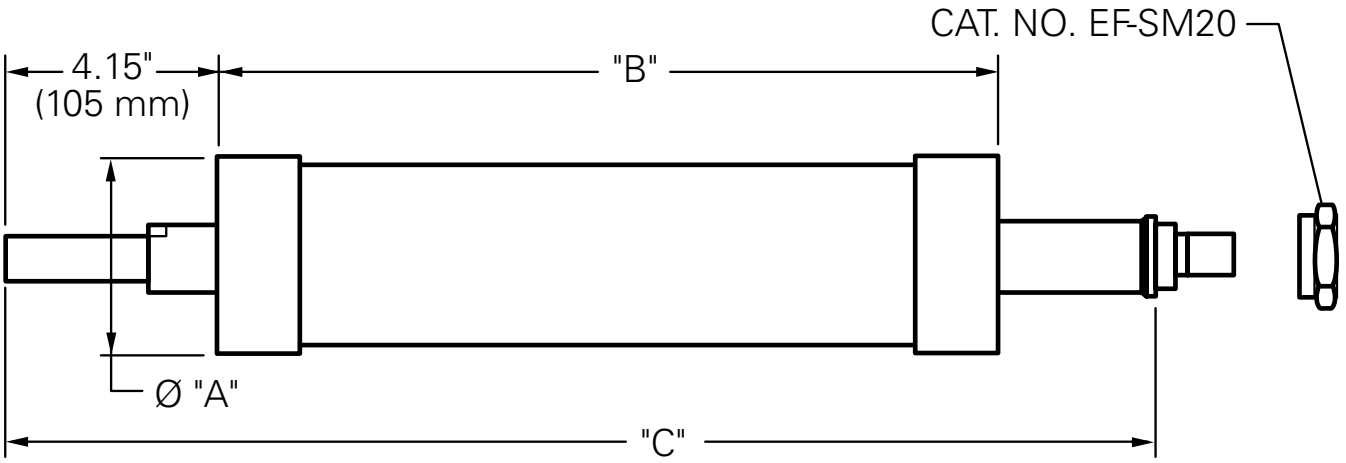


Figure 53. X-Limiter hinge-mounted fuse for S&C Type SM-20 indoor mount, locknut included

Table 88. 8.3 kV Type X-Limiter hinge-mounted fuse to fit S&C 13.8 kV (17.0 kV) Type SM-20 indoor mounting ①

Current rating (A)	Catalog number SM-20	Dimensions (refer to Figure 53) inches (mm)		
		A	B	C
10	**83F010HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
12	**83F012HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
18	**83F018HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
20	**83F020HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
25	**83F025HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
30	**83F030HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
40	**83F040HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
50	**83F050HC1AN**	2.13 (54)	7.77 (197)	17.71 (450)
65	**83F065HC1AN**	3.13 (80)	10.68 (271)	17.71 (450)
80	**83F080HC1AN**	3.13 (80)	10.68 (271)	17.71 (450)

① Typical S&C mounting CAT #90412.

Note: Add the letter "N" to the catalog number to have the locknut furnished with the fuse (Example: 83F010HC1N)

Table 89. 15.5 kV Type X-Limiter hinge-mounted fuse to fit S&C 25 kV (27 kV) Type SM-20 indoor mounting ①

Current rating (A)	Catalog number SM-20	Dimensions (refer to Figure 53) inches (mm)		
		A	B	C
10	**15F010HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
12	**15F012HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
18	**15F018HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
20	**15F020HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
25	**15F025HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
30	**15F030HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
40	**15F040HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
50	**15F050HC2AN**	2.13 (54)	12.08 (307)	21.28 (541)
65	**15F065HC2AN**	3.13 (80)	14.25 (362)	21.28 (541)
80	**15F080HC2AN**	3.13 (80)	14.25 (362)	21.28 (541)

① Typical S&C mounting CAT #90413.

Note: Add the letter "N" to the catalog number to have the locknut furnished with the fuse (Example: 83F010HC1N)

Table 90. 15.5 kV X-Limiter hinge-mounted fuse for S&C 14.4 kV (17.0 kV) Type SM-4 indoor mount (refer to Figure 54)

Current rating (A)	Catalog number	Dimensions A inches (mm)
20	**15F020VHA1A**	2.13 (54)
25	**15F025VHA1A**	2.13 (54)
30	**15F030VHA1A**	2.13 (54)
40	**15F040VHA1A**	2.13 (54)
50	**15F050VHA1A**	2.13 (54)
65	**15F065VHA1A**	3.12 (79)
80	**15F080VHA1A**	3.12 (79)

Table 91. 15.5 kV X-Limiter hinge-mounted fuse for S&C 25 kV (27 kV) Type SM-4 indoor mount (refer to Figure 55)

Current rating (A)	Catalog number	Dimensions A inches (mm)
20	**15F020VHA2A**	2.13 (54)
25	**15F025VHA2A**	2.13 (54)
30	**15F030VHA2A**	2.13 (54)
40	**15F040VHA2A**	2.13 (54)
50	**15F050VHA2A**	2.13 (54)
65	**15F065VHA2A**	3.12 (79)
80	**15F080VHA2A**	3.12 (79)

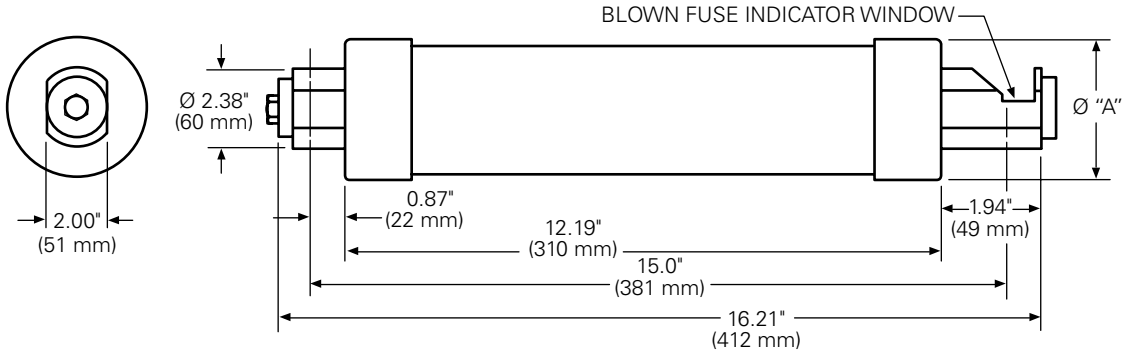


Figure 54. 15.5 kV X-Limiter hinge-mounted fuse for S&C 14.4 kV (17.0 kV) Type SM-4 indoor mount ①

① The X-Limiter hinge-mounted fuse utilizes the upper and lower S&C end fittings. Typical S&C end fittings for the SM-4 indoor mount is S&C #87119.

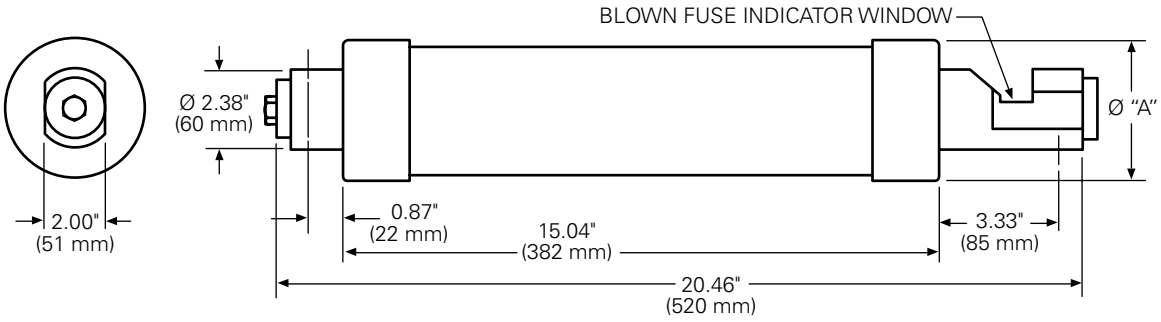


Figure 55. 15.5 kV X-Limiter hinge-mounted fuse for S&C 25 kV (27 kV) Type SM-4 indoor mount

Power fusing

CMU medium-voltage power fuses

Eaton's Cooper Power series CMU power fuse is a boric acid, expulsion-style fuse. Suitable for both indoor and outdoor applications, the CMU power fuse provides an economical alternative to refillable fuses. CMU expulsion power fuses are available in three maximum voltage classes: 17 kV, 27 kV, and 38 kV. The fuse unit comes in three speed variations: Standard "E", Slow "SE", and Fast "K". Amperage sizes range from 3 A through 200 A. The CMU power fuse interrupting rating greatly exceeds that of conventional distribution cutouts that use a fuse tube and link design, and considerably reduces the hazards and noise of the violent exhaust common to cutouts under fault interrupting conditions. The CMU power fuse, employing the use of a calibrated silver element, boric acid for its interrupting media and rod mechanism for arc extension, creates low arcing voltage and mild exhaust during fault interruption.

For additional information on Eaton's CMU medium-voltage power fuses, refer to catalog CA132038EN.

Table 92. CMU catalog numbers and information

Voltage rating speed	Rating A	Catalog numbers	Min. melt curve reference R240-91-	Max. clear curve reference R240-91-	Max. Int. kA Sym	Approx. shipping weight	Indoor end fittings catalog number	Outdoor end fittings catalog number
17 kV, K	3	**CMU702003**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	6	**CMU702006**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	8	**CMU702008**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	10	**CMU702010**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	12	**CMU702012**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	15	**CMU702015**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	20	**CMU702020**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	25	**CMU702025**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	30	**CMU702030**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	40	**CMU702040**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	50	**CMU702050**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	65	**CMU702065**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	80	**CMU702080**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	100	**CMU702100**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	140	**CMU702140**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, K	200	**CMU702200**	153	156	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	5	**CMU612005**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	7	**CMU612007**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	10	**CMU612010**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	13	**CMU612013**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	15	**CMU612015**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	20	**CMU612020**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	25	**CMU612025**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	30	**CMU612030**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	40	**CMU612040**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	50	**CMU612050**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	65	**CMU612065**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	80	**CMU612080**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	100	**CMU612100**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	125	**CMU612125**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	150	**CMU612150**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	175	**CMU612175**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, E std	200	**CMU612200**	152	155	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	15	**CMU712015**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	20	**CMU712020**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	25	**CMU712025**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	30	**CMU712030**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	40	**CMU712040**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	50	**CMU712050**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	65	**CMU712065**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	80	**CMU712080**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	100	**CMU712100**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	125	**CMU712125**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	150	**CMU712150**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	175	**CMU712175**	151	154	14	2.1	**CMU3097**	**CMU3095**
17 kV, SE slow	200	**CMU712200**	151	154	14	2.1	**CMU3097**	**CMU3095**

Note: Muffler can be ordered separately. Order catalog number CMUFDA1103.

Table 92. CMU catalog numbers and information (continued)

Voltage rating speed	Rating A	Catalog numbers	Min. melt curve reference R240-91-	Max. clear curve reference R240-91-	Max. Int. kA Sym	Approx. shipping weight	Indoor end fittings catalog number	Outdoor end fittings catalog number
27 kV, K	3	**CMU703003**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	6	**CMU703006**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	8	**CMU703008**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	10	**CMU703010**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	12	**CMU703012**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	15	**CMU703015**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	20	**CMU703020**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	25	**CMU703025**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	30	**CMU703030**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	40	**CMU703040**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	50	**CMU703050**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	65	**CMU703065**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	80	**CMU703080**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	100	**CMU703100**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	140	**CMU703140**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, K	200	**CMU703200**	153	159	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	5	**CMU613005**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	7	**CMU613007**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	10	**CMU613010**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	13	**CMU613013**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	15	**CMU613015**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	20	**CMU613020**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	25	**CMU613025**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	30	**CMU613030**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	40	**CMU613040**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	50	**CMU613050**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	65	**CMU613065**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	80	**CMU613080**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	100	**CMU613100**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	125	**CMU613125**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	150	**CMU613150**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	175	**CMU613175**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, std	200	**CMU613200**	152	158	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	15	**CMU713015**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	20	**CMU713020**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	25	**CMU713025**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	30	**CMU713030**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	40	**CMU713040**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	50	**CMU713050**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	65	**CMU713065**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	80	**CMU713080**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	100	**CMU713100**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	125	**CMU713125**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	150	**CMU713150**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	175	**CMU713175**	151	157	12.5	2.1	**CMU3097**	**CMU3095**
27 kV, SE slow	200	**CMU713200**	151	157	12.5	2.1	**CMU3097**	**CMU3095**

Note: Muffler can be ordered separately. Order catalog number CMUFDA1103.

Table 92. CMU catalog numbers and information (continued)

Voltage rating speed	Rating A	Catalog numbers	Min. melt curve reference R240-91-	Max. clear curve reference R240-91-	Max. Int. kA Sym	Approx. shipping weight	Indoor end fittings catalog number	Outdoor end fittings catalog number
38 kV, K	3	**CMU704003**	153	159	10	2.8	**CMU3097**	
38 kV, K	6	**CMU704006**	153	159	10	2.8	**CMU3097**	
38 kV, K	8	**CMU704008**	153	159	10	2.8	**CMU3097**	
38 kV, K	10	**CMU704010**	153	159	10	2.8	**CMU3097**	
38 kV, K	12	**CMU704012**	153	159	10	2.8	**CMU3097**	
38 kV, K	15	**CMU704015**	153	159	10	2.8	**CMU3097**	
38 kV, K	20	**CMU704020**	152	158	10	2.8	**CMU3097**	
38 kV, K	25	**CMU704025**	152	158	10	2.8	**CMU3097**	
38 kV, K	30	**CMU704030**	152	158	10	2.8	**CMU3097**	
38 kV, K	40	**CMU704040**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	50	**CMU704050**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	65	**CMU704065**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	80	**CMU704080**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	100	**CMU704100**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	140	**CMU704140**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, K	200	**CMU704200**	153	159	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	5	**CMU614005**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	7	**CMU614007**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	10	**CMU614010**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	13	**CMU614013**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	15	**CMU614015**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	20	**CMU614020**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	25	**CMU614025**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	30	**CMU614030**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	40	**CMU614040**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	50	**CMU614050**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	65	**CMU614065**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	80	**CMU614080**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	100	**CMU614100**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	125	**CMU614125**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	150	**CMU614150**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	175	**CMU614175**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, E std	200	**CMU614200**	152	158	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	15	**CMU714015**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	20	**CMU714020**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	25	**CMU714025**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	30	**CMU714030**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	40	**CMU714040**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	50	**CMU714050**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	65	**CMU714065**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	80	**CMU714080**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	100	**CMU714100**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	125	**CMU714125**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	150	**CMU714150**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	175	**CMU714175**	151	157	10	2.8	**CMU3097**	**CMU3095**
38 kV, SE slow	200	**CMU714200**	151	157	10	2.8	**CMU3097**	**CMU3095**

Note: Muffler can be ordered separately. Order catalog number CMUFDA1103.

End fittings

CMU end fittings are required to complete the electrical connection between the fuse unit and the mounting. End fittings are positioned on the top and bottom of the fuse unit. They can be used over again if they remain undamaged. End fittings are available in two versions: indoor and outdoor.

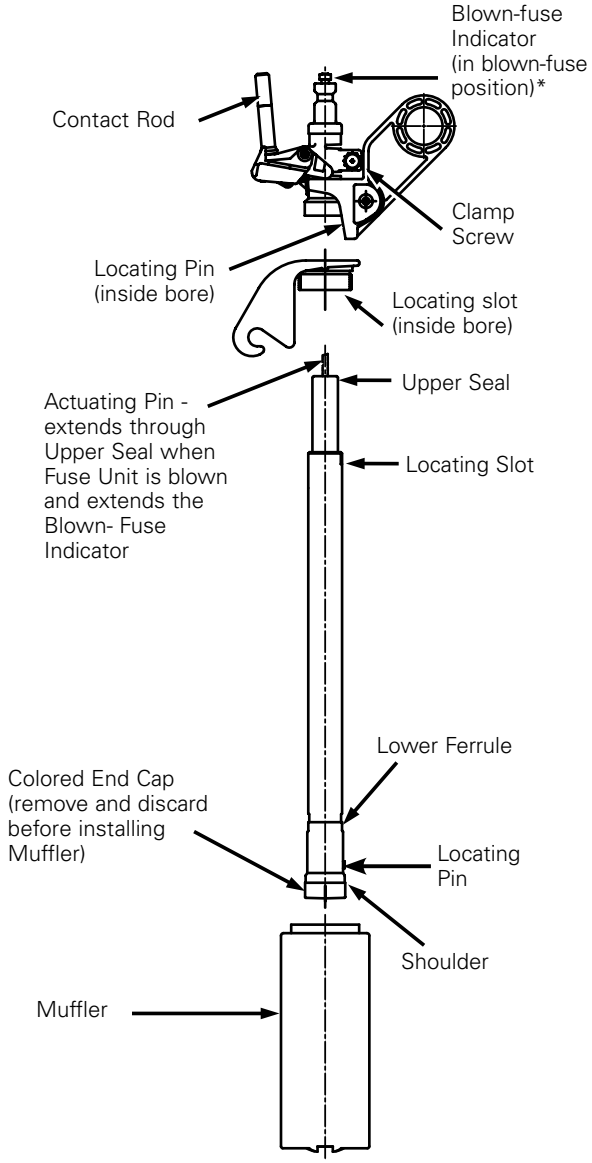


Figure 56. Indoor CMU power fuse fuse fittings

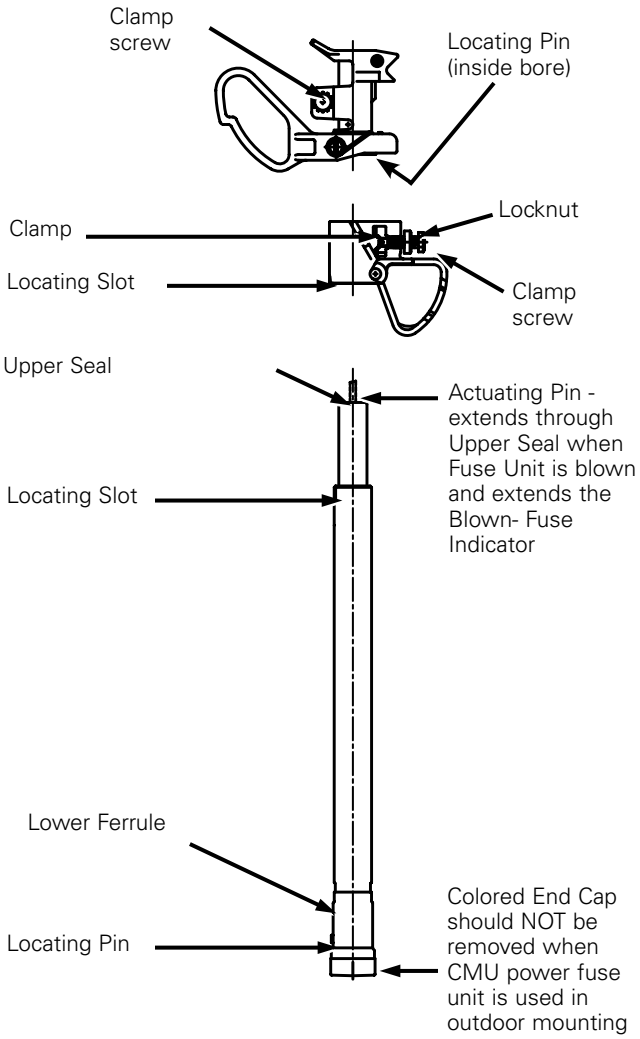


Figure 57. Outdoor CMU power fuse fittings

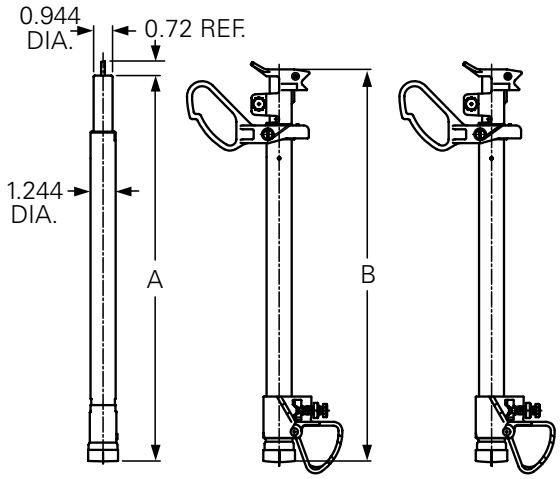


Figure 58. Outdoor CMU power fuse fitting dimensions

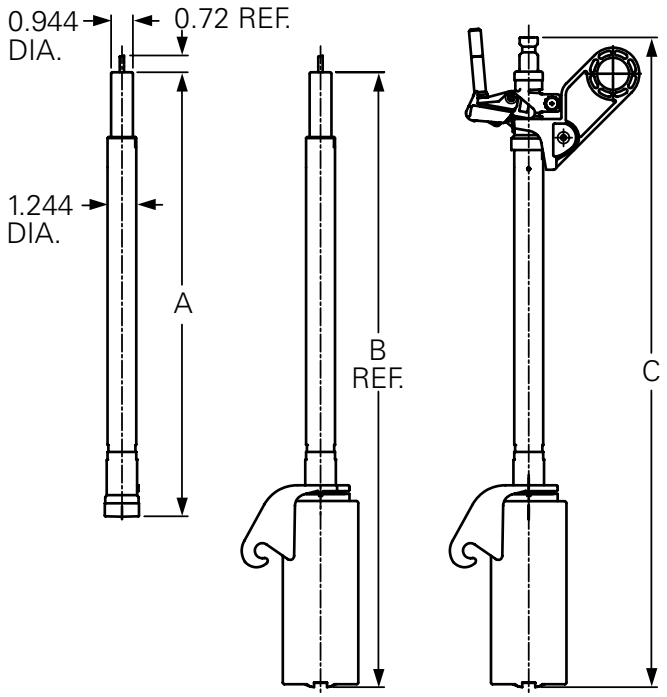


Figure 59. Outdoor (top) and indoor (bottom) dimensions

Table 93. Outdoor fuse fitting dimensions

	Dimensions in inches	
Rating	**A**	**B**
17.1 kV	19.08	19.41
27.0 kV	22.58	22.91
38.0 kV	28.76	29.09

Table 94. Outdoor/indoor dimensions

	Dimensions in inches		
Rating	**A**	**B**	**C**
17.1 kV	19.08	27.19	28.82
27.0 kV	22.58	30.69	32.32
38.0 kV	28.76	36.87	38.50

Pole line hardware

Eaton's pole line hardware product portfolio is designed to meet and exceed all applicable standards. All products are RUS approved and allow eligible customers to receive full financial reimbursements. We also provide industry leading lead-times backed by a strong stocking position at our distribution center.

For more information on pole line hardware, consult Eaton catalog CA325002EN.

Bolts

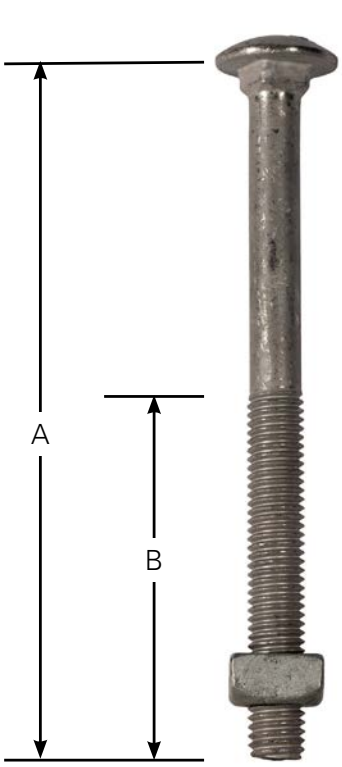


Figure 60. Carriage bolt

Figure 61. Double arming bolt

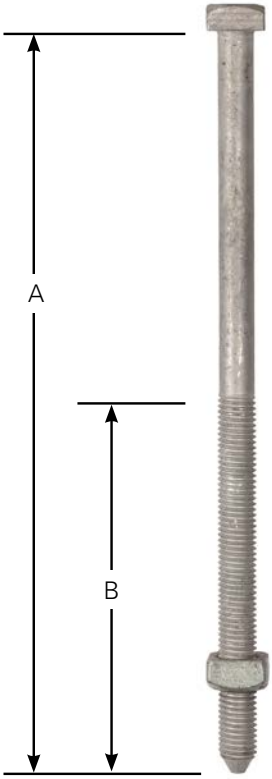


Figure 62. Machine bolt

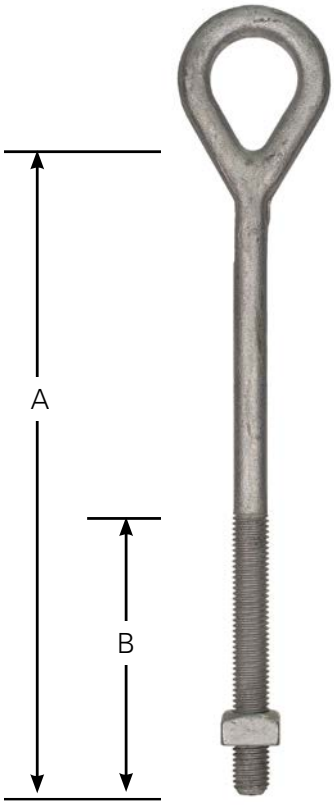


Figure 63. Ovaleye bolt

Table 95. Bolt specifications

Product description	Catalog number	Figure	Length "A" (inches)	Thread length "B" (inches)	Threads per inch	Ultimate tensile strength (lb)	Note
3/8" Diameter carriage bolts	**DF1C450**	60	4.5	3	16	4250	Includes a regular square nut
	DF1C5	60	5	3	16	4250	Includes a regular square nut
1/2" Diameter carriage bolts	**DF2C6**	60	6	3	13	7800	Includes a regular square nut
5/8" Diameter double arming bolts	**DF2D12**	61	12		11	12400	Includes 4 square nuts
	DF2D14	61	14		11	12400	Includes 4 square nuts
	DF2D16	61	16		11	12400	Includes 4 square nuts
	DF2D18	61	18		11	12400	Includes 4 square nuts
	DF2D20	61	20		11	12400	Includes 4 square nuts
	DF2D22	61	22		11	12400	Includes 4 square nuts
	DF2D24	61	24		11	12400	Includes 4 square nuts
3/4" Diameter double arming bolts	**DF3D12**	61	12		10	18350	Includes 4 square nuts
	DF3D14	61	14		10	18350	Includes 4 square nuts
	DF3D16	61	16		10	18350	Includes 4 square nuts
	DF3D18	61	18		10	18350	Includes 4 square nuts
	DF3D20	61	20		10	18350	Includes 4 square nuts
	DF3D22	61	22		10	18350	Includes 4 square nuts
	DF3D24	61	24		10	18350	Includes 4 square nuts
1/2" Diameter machine bolts	**DF2B6**	62	6	3	13	7800	Includes assembled square nut
	DF2B7	62	7	3	13	7800	Includes assembled square nut
	DF2B8	62	8	4	13	7800	Includes assembled square nut
	DF2B10	62	10	6	13	7800	Includes assembled square nut
	DF2B12	62	12	6	13	7800	Includes assembled square nut
	DF2B14	62	14	6	13	7800	Includes assembled square nut
5/8" Diameter machine bolts	**DF3B6**	62	6	3	11	12400	Includes assembled square nut
	DF3B7	62	7	4	11	12400	Includes assembled square nut
	DF3B8	62	8	4	11	12400	Includes assembled square nut
	DF3B9	62	9	4	11	12400	Includes assembled square nut
	DF3B10	62	10	6	11	12400	Includes assembled square nut
	DF3B12	62	12	6	11	12400	Includes assembled square nut
	DF3B14	62	14	6	11	12400	Includes assembled square nut
	DF3B16	62	16	6	11	12400	Includes assembled square nut
	DF3B18	62	18	6	11	12400	Includes assembled square nut
	DF3B20	62	20	6	11	12400	Includes assembled square nut
	DF3B22	62	22	6	11	12400	Includes assembled square nut
	DF3B24	62	24	6	11	12400	Includes assembled square nut
3/4" Diameter machine bolts	**DF4B6**	62	6	3	10	18350	Includes assembled square nut
	DF4B7	62	7	4	10	18350	Includes assembled square nut
	DF4B8	62	8	4	10	18350	Includes assembled square nut
	DF4B9	62	9	4	10	18350	Includes assembled square nut
	DF4B10	62	10	6	10	18350	Includes assembled square nut
	DF4B12	62	12	6	10	18350	Includes assembled square nut
	DF4B14	62	14	6	10	18350	Includes assembled square nut
	DF4B16	62	16	6	10	18350	Includes assembled square nut
	DF4B18	62	18	6	10	18350	Includes assembled square nut
	DF4B20	62	20	6	10	18350	Includes assembled square nut
	DF4B22	62	22	6	10	18350	Includes assembled square nut
	DF4B24	62	24	6	10	18350	Includes assembled square nut
7/8" Diameter machine bolts	**DF5B12**	62	12	6	9	25400	Includes assembled square nut
	DF5B14	62	14	6	9	25400	Includes assembled square nut
	DF5B16	62	16	6	9	25400	Includes assembled square nut
	DF5B18	62	18	6	9	25400	Includes assembled square nut
	DF5B20	62	20	6	9	25400	Includes assembled square nut
	DF5B22	62	22	6	9	25400	Includes assembled square nut
	DF5B24	62	24	6	9	25400	Includes assembled square nut
5/8" Diameter ovaleye bolts	**DF2E8**	63	8	4.5	9	13500	Includes assembled square nut
	DF2E10	63	10	4.5		13500	Includes assembled square nut
	DF2E12	63	12	6		13500	Includes assembled square nut
	DF2E14	63	14	6		13500	Includes assembled square nut
3/4" Diameter ovaleye bolts	**DF2F14**	63	14	6		20050	Includes assembled square nut

Washers and nuts

Figure 64. Square nut

Figure 65. Washernut

Figure 67. MF locknut

Figure 69. Round washer

Figure 66. Square washer

Figure 68. Square curved washer

Table 96. Washer and nut specifications

Product description	Catalog number	Figure	Allows bolt/rod dia. (inches)	Washer outside dia. (inches)	Square size	Ultimate tensile strength
Regular square nut	**DF1N2**	64	1/2			7800
	DF1N4	64	5/8			12400
	DF1N6	64	3/4			18350
Heavy square nut	**DF2N4**	64	5/8			12400
	DF2N6	64	3/4			18350
	DF2N9	64	1			53300
Washernut	**DF14S1**	65	1/2	1-1/2		7800
	DF14S2	65	5/8	1-7/8		12400
	DF14S3	65	3/4	2-1/4		18350
MF Locknuts	**DF3N4**	66	5/8			
	DF3N6	66	3/4			
Round washers	**DF1W1**	67	3/8	1		
	DF1W2	67	1/2	1-3/8		
	DF1W3	67	5/8	1-3/4		
	DF1W4	67	3/4	2		
Square washers	**DF2W1**	68	1/2		2 x 2 x 1/8	
	DF2W2	68	5/8		2 x 2 x 1/8	
	DF2W4	68			2-1/4 x 2-1/4 x 3/16	
	DF2W5	68	3/4		2-1/4 x 2-1/4 x 3/16	
	DF2W7	68			3 x 3 x 1/4	
Square curved washers	**DF4W1**	69	5/8		2-1/4 x 2-1/4 x 3/16	
	DF4W2	69			2-1/2 x 2-1/2 x 3/16	
	DF4W4	69			3 x 3 x 1/4	
	DF4W5	69	3/4		3 x 3 x 1/4	
	DF4W9	69			3-1/4 x 3-1/4 x 1/4	
	DF4W17	69	7/8		4 x 4 x 1/4	

Screws

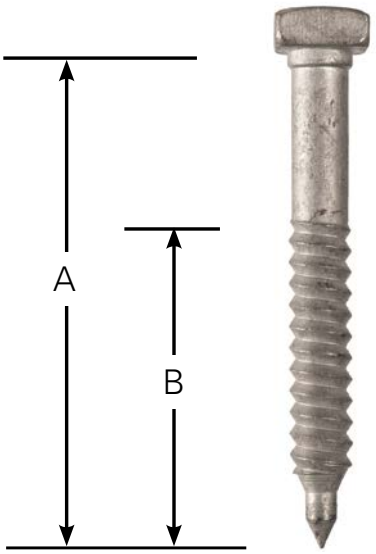


Figure 70. Fetter drive

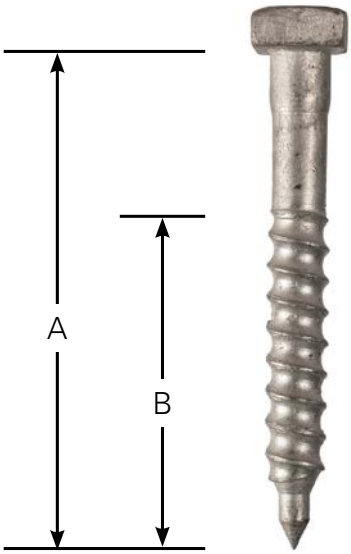


Figure 71. Twist drive

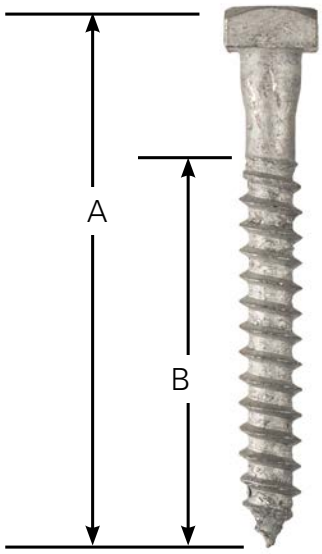


Figure 72. Gimlet point

Table 97. Screw specifications

Product description	Catalog number	Figure	Screw length—A (inches)	Thread length—B (inches)	Tensile strength (lb)
3/8" Diameter fetter drive	**DF6L250**	70	2-1/2	1-3/4	3500
	DF6L3	70	3	2	
1/2" Diameter fetter drive	**DF9L4**	70	4	2-1/2	6500
1/2" Diameter twist drive	**DF12L4**	71	4	2-1/2	6500
1/4" Diameter gimlet point	**DF1L2**	72	2	1-1/2	1500
	DF1L250	72	2-1/2	1-3/4	1500
	DF1L3	72	3	2	1500

Guy hooks

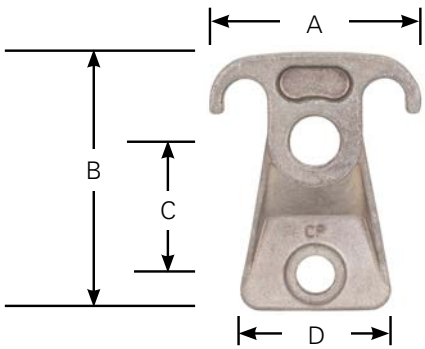


Figure 73. Aluminum attachment

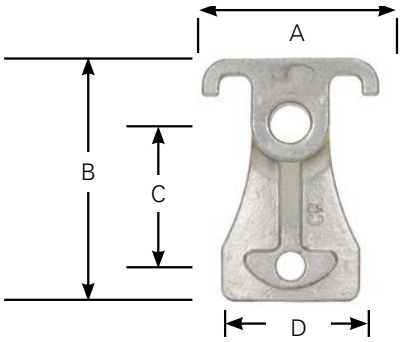


Figure 74. Iron attachments

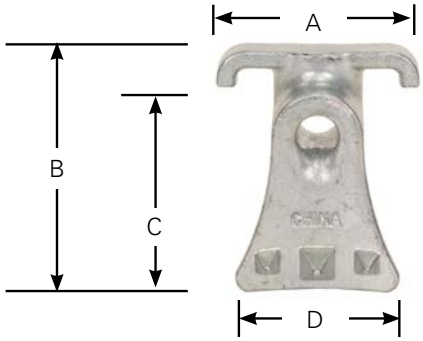


Figure 75. Iron attachments – spur

Table 98. Guy hook specifications

Product description	Catalog number	Figure	Upper hole diameter (inches)	Lower hole diameter (inches)	A (inches)	B (inches)	C (inches)	D (inches)	Tensile strength (lb)
Aluminum attachments	**DG21A1**	73	3/4	5/8	3-3/8	4-1/4	2-1/4	2-7/16	12400
Iron attachments	**DG21H2**	74	11/16	9/16	3-3/8	4-3/4	2-13/16	2-3/4	13550
	DG21H3	74	13/16	9/16	3-3/8	4-3/4	2-13/16	2-3/4	20050
Iron attachments - spur	**DG22H2**	75	11/16	Spur	3-3/8	4	3-1/2	2-3/4	13550
	DG22H3	75	13/16	Spur	3-3/8	4	3-1/2	2-3/4	20050

Static-proof spring

Eliminates interference caused by loose hardware.

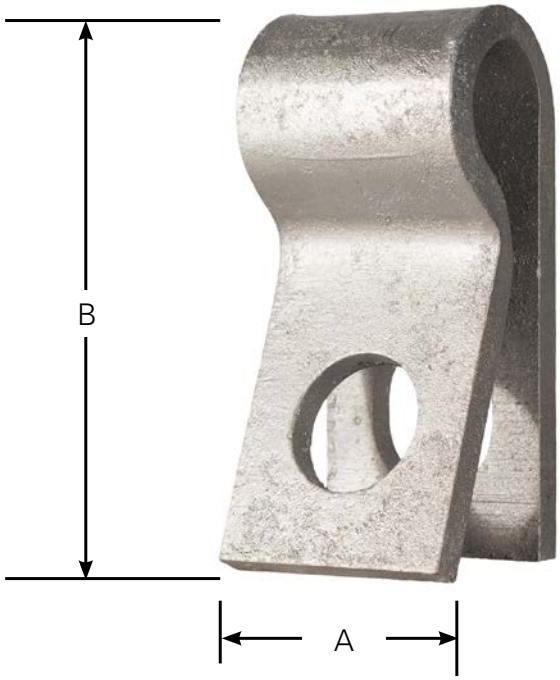


Figure 76. Static proof spring

Table 99. Static-proof spring

Catalog number	Dimensions (inches)		Accommodates bolt dia. (inches)
	A	B	
DF17W2	1	2-1/2	1/2
DF17W3	1-3/4	3-3/4	5/8
DF17W4	1-3/4	3-3/4	3/4
DF17W5	1-3/4	3-3/4	7/8

Adjustable pole bands

Provides attachment points for guys and suspension insulators. Rated at 20,000 lb ultimate tensile strength.

Figure 77. Pole band

Table 100. Adjustable pole bands

Catalog number	Pole diameter range (inches)
DG40B1	7 to 9-1/2
DG40B2	8 to 11

Pole eye plates

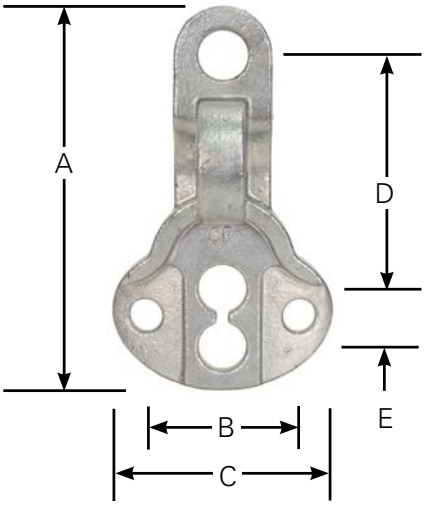


Figure 78. DG30P4—Used for guying or dead-ending

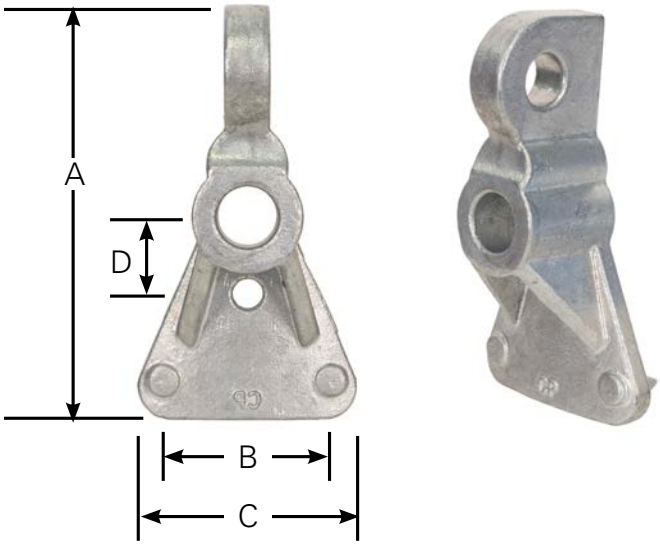


Figure 79. DG30P5—Pole eye plate

Table 101. Pole eye plates

Catalog number	Upper mounting hole dia. (inches)	Clevis pin hole dia. (inches)	Dimensions (inches)					Ultimate strength (lb)
			A	B	C	D	E	
DG30P4	13/16	13/16	6-9/16	2-5/8	3-13/16	4	1	21,000
DG30P5	15/16	13/16	6-1/2	2-11/16	3-1/2	1-1/4	N/A	21,000

Figure 80. Single strand eyenut

Figure 81. Oval eyenut

Figure 82. Eyelet

Table 102. Eyenut and eyelet specifications

Product description	Catalog number	Figure	Accomodates bolt dia. (inches)	Mounting bolt hole size (inches)	Tensile strength (lb)
Single Strand Eyenut	**DG1E1**	80	5/8	—	12,400
Oval Eyenut	**DG2E3**	81	5/8	—	12,400
Eyelet	**DG6E1**	82	5/8	3/4 x 1-1/16	12,400

Guy grip/pole eye combo

Multi-functional design providing the benefits of both a guy hook and a pole eye plate.

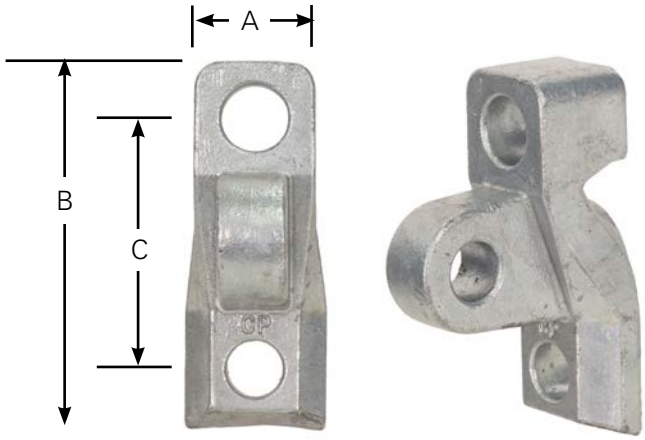


Figure 83. DG30G2

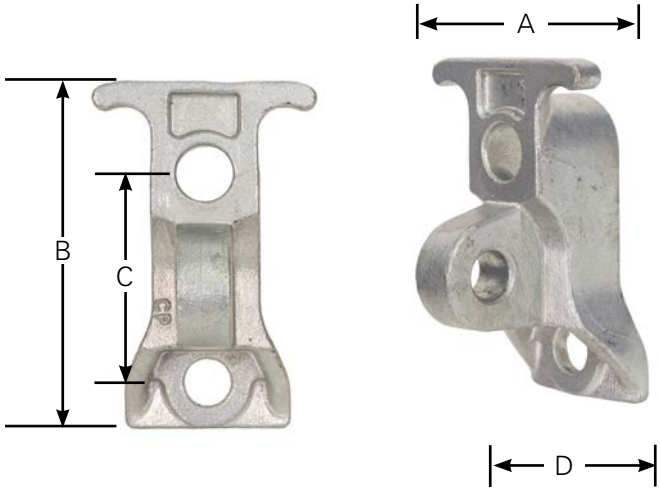


Figure 84. DG30G4

Table 103. Guy grip/pole eye dimensions

Catalog number	Mounting hole diameters (inches)		Clevis pin hole dia. (inches)	Dimensions (inches)				Ultimate strength (lb)
	Upper	Lower		A	B	C	D	
DG30G2	13/16	11/16	11/16	1-1/2	4-1/2	3	1-3/4	15,000
DG30G4	3/4	11/16	11/16	3-1/4	5	3	2-7/16	21,000

Suspension/messenger clamp

Tangent clamp mounted through center hole. Includes two track bolts and regular square nuts.

Table 104. Suspension/messenger clamp dimensions

Catalog number	Dimensions (inches)			
	Length	Width	Mounting hole dia.	Accommodate wire sizes
DJ2C7	5 3/4	1-11/16	11/16 15/16 slot	1/4 to 7/16

Figure 85. DJ2C7

Secondary/deadend insulator clevises

For secondary takeoffs or deadending at pole or crossarm.

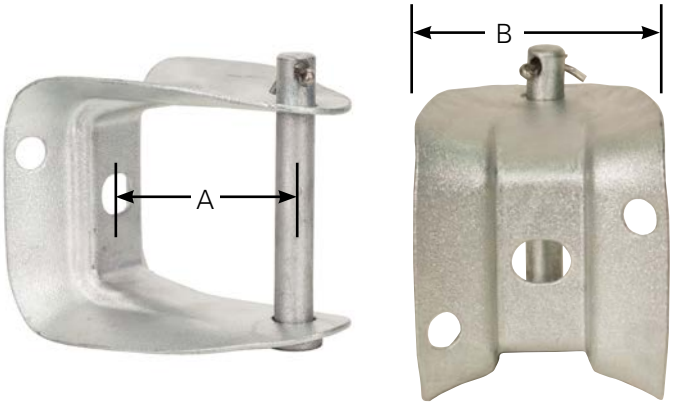


Figure 86. DC2C series

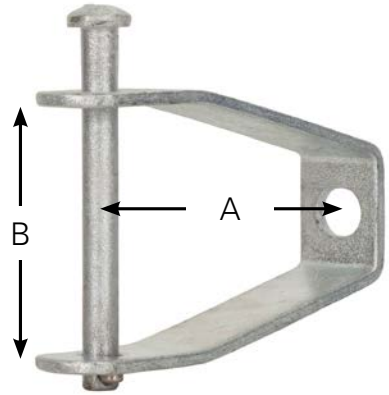


Figure 87. DC3F series

Table 105. Secondary/deadend insulator clevises

Catalog number	Dimensions (inches)				
	A	B	Pin dia.	Mounting holes	Tensile strength (lb)
DC2C1	4	3-1/4	3/4	(1) 11/16 x 7/8 (2) 9/16	4,000
DC3F1	4-1/4	2-3/8	9/16	(1) 11/16 x 13/16	2,000
DC3F6	5	3-3/8	9/16	(1) 11/16 x 13/16	4,000

Single upset insulator bolts

For side of pole installation of conductors.
Shank diameter is 5/8″, 13550 lb tensile strength.

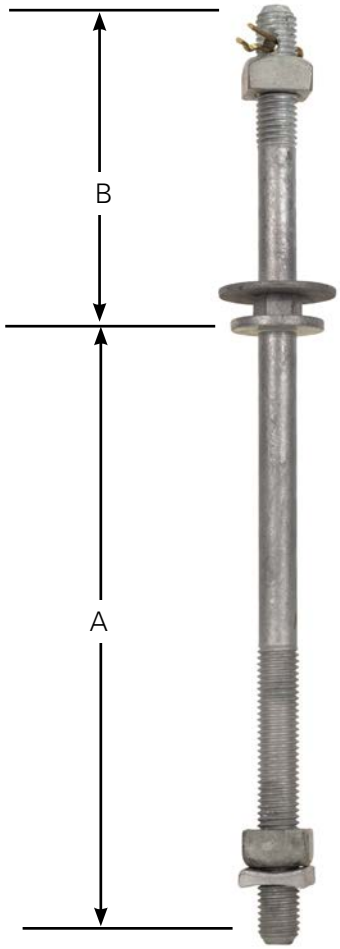


Figure 88. DC2E series

Table 106. Single upset insulator bolts

Catalog number	Dimensions (inches)		
	A Shank length	B	Thread length
DC2E4	9	4-3/4	4-1/4
DC2E5	10	4-3/4	4-1/4
DC2E14	12	4-3/4	4-1/4

Swinging clevis

Used where flexible mounting allows clevis to conform to any tension angle.

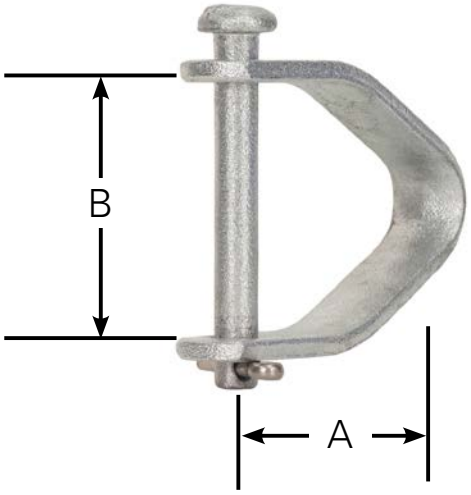


Figure 89. DC4S series

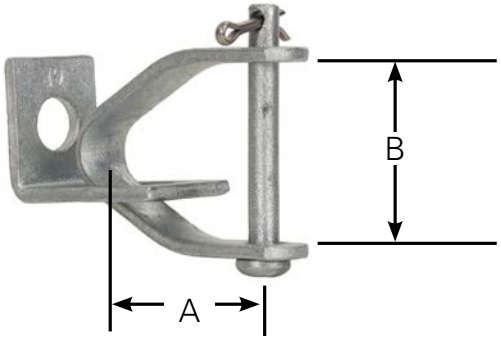


Figure 90. DC7S series

Table 107. Swinging clevis

Catalog number	Dimensions (inches)				Ultimate tensile strength (lb)
	A	B	Pin dia.	Mounting holes	
DC4S1	5	3-3/8	5/8	–	4,000
DC7S1	5	2-1/4	3/8	11/16	2,000
DC7S2	2-7/8	2-1/4	3/8	–	2,000

Anchor shackle

Interconnection applications include attachment of suspension insulators to towers, poles and crossarms.

Figure 91. DC7J1

Clevis thimble with side pulling eye

Used for guying and deadending applications, with a side pulling eye for tensioning guy wire or conductor.

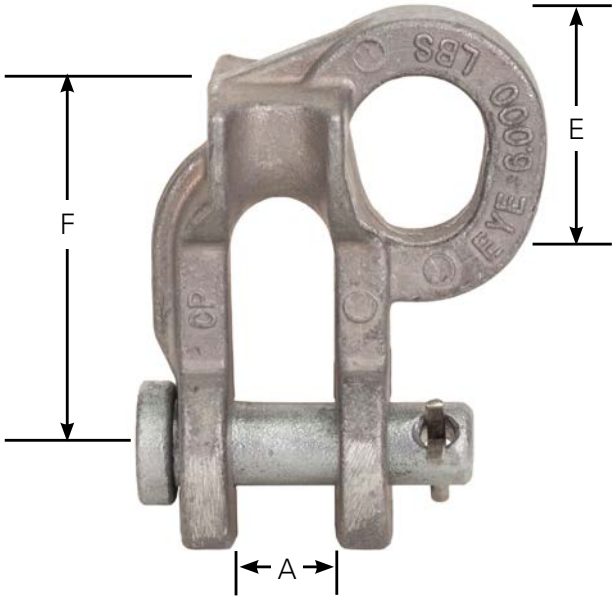


Figure 92. DC9A series

Table 108. Clevis thimble with side pulling eye

	Conductor range		Ultimate tensile strength (lb)		Dimensions (inches)					
Catalog number	ACSR	Guy wire (inches)	Thimble	Eye	A groove dia.	B seat dia.	C	D	E	F
DC9A10	6 - 336.4	3/16 to 5/16	10,000	6,000	3/4	1-1/2	2-1/8	5/8	1-1/2	2-7/8
DC9A12	6 - 477	3/16 to 3/8	12,000	7,000	7/8	1-1/2	2-1/8	5/8	1-1/2	2-7/8

Pole-top insulator bracket

For pole-top mounting of distribution post-type insulators.

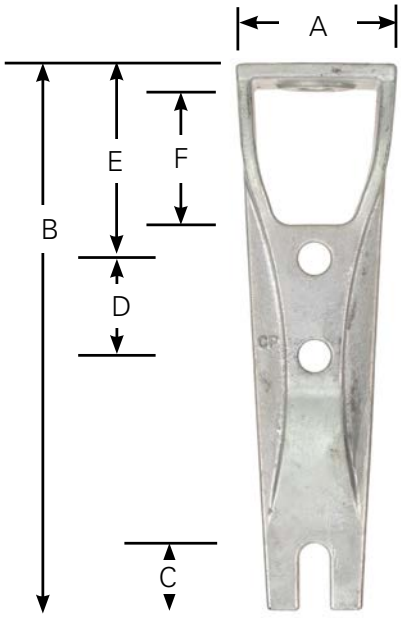


Figure 93. DC126B1

Table 109. Pole-top insulator bracket

Catalog number	Dimensions (inches)						Mounting holes	Ultimate tensile strength (lb)
	A	B	C	D	E	F		
DC126B1	4	14	2	2-1/2	4-3/4	3-1/2	0.82	40,000

Line-post insulator studs

For steel crossarms.

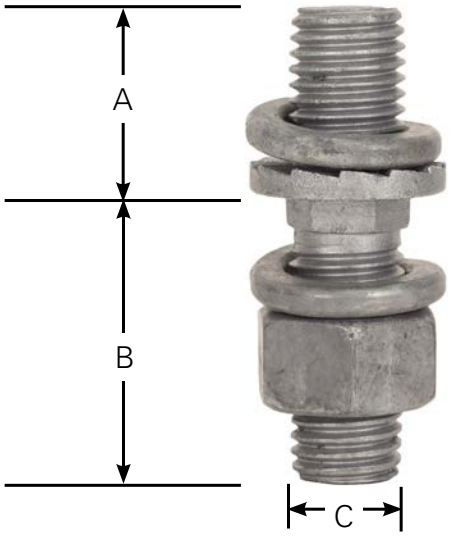


Figure 94. DP30M series

Table 110. Line-post insulator studs

Catalog number	Dimensions (inches)			Hardware included
	A	B	C	
DP30M1	1-1/8	1-3/4	5/8	(1) Reg. hexnut and (2) spring lockwashers
DP30M3	1-1/8	1-3/4	3/4	(1) Reg. hexnut and (2) spring lockwashers

Crossarm clamp

A strong crossarm pin with nylon alloy insulator threads designed for straight, angle or corner construction on flat crossarms.

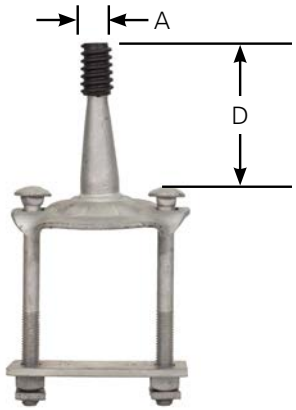


Figure 95. DP2C series

Table 111. Crossarm clamp

	Dimensions (inches)	
Catalog number	**A shaft height (inches)**	**D thread diameter (inches)**
DP2C1	5-1/2	1
DP2C11 ①	6-3/4	1-3/8

① Heavy-duty type; suitable for converting to higher system voltages on existing crossarms.

Low-voltage crossarm pins

For supporting line wires, leads and jumpers on poles and crossarms.

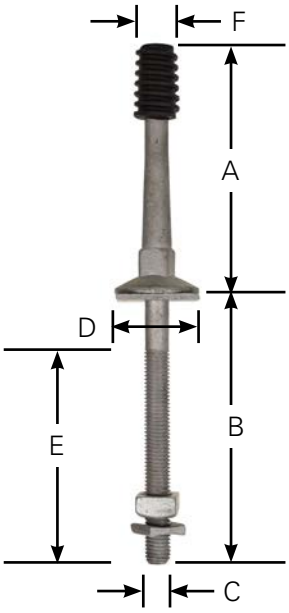


Figure 96. DP2S series

Table 112. Low-voltage crossarm pins

	Dimensions (inches)						
Catalog number	**A shaft height**	**B shank length**	**C shank dia.**	**D base dia.**	**E min. thread length**	**F thread dia.**	**Additional hardware included**
DP2S1	5	6	5/8	2	4-1/2	1	(1) 2" sq. washer; (1) MF locknut; (1) Regular sq. nut

High-voltage crossarm pins

Designed to take the heaviest strains on transmission and distribution lines.

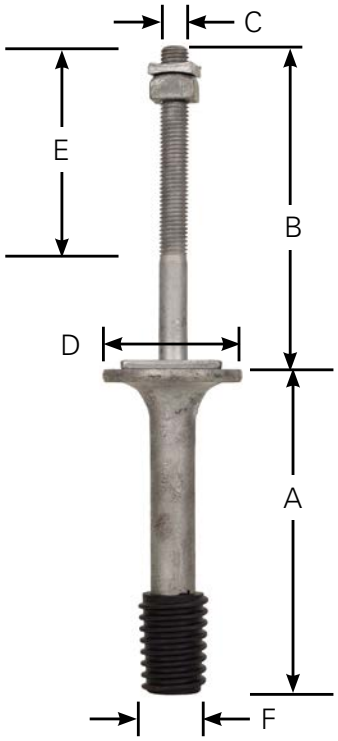


Figure 97. DP3T series

Table 113. High-voltage crossarm pins

	Dimensions (inches)						
Catalog number	**A shaft height**	**B shank length**	**C shank dia.**	**D base dia.**	**E min. thread length**	**F thread dia.**	**Additional hardware included**
DP3T1	7	7	5/8	2-3/4	4-3/8	1-3/8	(1) 2" sq. washer; (1) MF locknut; (1) Regular sq. nut

Insulator adapter pin

Used to provide a convenient insulator mounting position for downleads and jumpers.

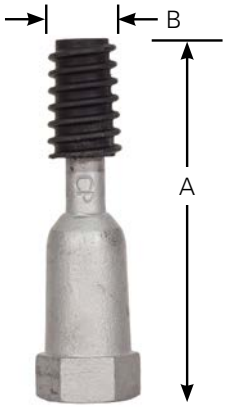
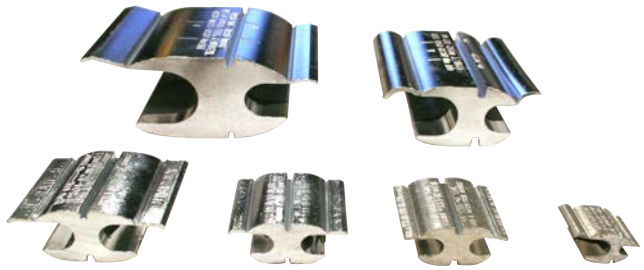


Figure 98. DP10A2 series

Table 114. Insulator adapter pin

	Dimensions (inches)	
Catalog number	**A length**	**B thread dia.**
DP10A1	5-1/2	1
DP10A2	5-1/2	1-3/8

Connectors



Ultra range Squeezon connectors

Ultra range aluminum Squeezon connectors combine the original Kearney "H-Shape" with external slots to accommodate an extended range of conductor sizes. The complete conductor range from #6 solid to 4/0 ACSR is covered by only seven sizes of ultra range connectors, which make up the seven connector series. The conductor grooves have smooth unbroken surfaces to provide maximum contact and minimize voids.

Every Squeezon connector meets the Class A requirements for electrical connectors specified in ANSI C119.4 (TDJ-162). These tests are made for resistance, temperature rise, and mechanical requirements.

For more information on Squeezon connectors, consult catalog CA325010EN.

Features and design details

Squeezons feature patented external slots that control the movement of metal during compression. During compression, the metal is moved into the conductor grooves to provide a predetermined pressure on the conductors. Complete compression closes the external slots to the degree necessary to compensate for the sizes of the conductors.

Other features of Squeezons include:

- Electrical conductor grade soft aluminum
- Snap open packaging
- Die versatility—designed for industry standard dies
- Factory installed Kearnalex inhibitor
- Optional connector covers

Squeezon selection

Selector chart—select wires to be connected and follow horizontal and vertical lines to the intersecting point.

Table 115. Squeezon selector chart

Kearney ultra range squeezon connector selector chart

LINE

TAP

Compact stranded					6	4-7	4	3 2-7	2 1-7	1	1/0	2/0-7	2/0	3/0-7	3/0	4/0	250	266
	Compact ACSR				6		4-6/1	4-7/1 3	2	1		1/0	2/0		3/0		4/0	266
		Solid			6	4	3	2	1	1/0		2/0	3/0		4/0	250	266	300
			Stranded		6		4	3	2	1-7 1-19	1-3	1/0	2/0		3/0		4/0	
				ACSR		6	4-6/1	4-7/1	3	2	1		1/0	2/0		3/0		4/0
6	6	6	6															
4-7		4		6					1 506-82 "O" Die or 2 508-82 "O" Die									
4	4-6/1	3	4	4-6/1														
3 2-7	4-7/1 3	2	3	4-7/1		1 506-82 "O" Die					2 508-82 "O" Die		2 or 3	3 502-82 "D" Die			5 503-82 "D" Die	
2 1-7	2	1	2	3														
1	1	1/0	1-7	2														
1/0			1-3	1											4 or 6		6 505-82 "D" Die	
2/0-7	1/0	2/0	1/0															
2/0	2/0	3/0	2/0	1/0								4 504-82 "D" Die						
3/0-7				2/0														
3/0	3/0	4/0	3/0															
4/0		250		3/0													7 507-82 "D" Die	
250	4/0	266	4/0															
266	266	300		4/0														

Catalog numbers and details

Table 116. Standard ultra range Squeezon connectors

Seven connector series #	Catalog number	Groove	Standard conductor			Compact conductor		Wire dia. range		Indents			
			ACSR and aluminum alloy	Aluminum or copper				Max.	Min.				
				Stranded	Solid	ACSR	Stranded	(inches)		Die	O	WH	Length
3	**502-82**	A B	1/0, 2/0 s#6, 4, 3, 2	2/0, 3/0 #6, 4, 3, 2, 1-19	3/0, 4/0 #6, 4, 3, 2, 1, 1/0	2/0, 3/0 #6, 4, 3, 2, 1	3/0 #6, 4, 3, 2, 1	0.470 0.332	0.398 0.162	D D3	4	2	1-7/8"
5	**503-82**	A B	3/0, 4/0 #6, 4, 3, 2	4/0 #6, 4, 3, 2, 1-19	250, 266, 300 #6, 4, 3, 2, 1, 1/0	4/0, 266-16/1 #6, 4, 3, 2, 1	4/0, 250, 266 #6, 4, 3, 2, 1	0.563 0.332	0.480 0.162	D D3	5	2	1-7/8"
4	**504-82**	A B	#1, 1/0, 2/0 #1, 1/0, 2/0	#1-3, 1/0, 2/0, 3/0 #1-3, 1/0, 2/0, 3/0	2/0, 3/0, 4/0 2/0, 3/0, 4/0	1/0, 2/0, 3/0 1/0, 2/0, 3/0	1/0, 2/0, 3/0 1/0, 2/0, 3/0	0.470 0.470	0.338 0.338	D D3	5	2	1-7/8"
6	**505-82**	A B	3/0, 4/0 #1, 1/0, 2/0	3/0, 4/0 #1-3, 1/0, 2/0	250, 266, 300 2/0, 3/0	3/0, 4/0, 266-18/1 1/0, 2/0	4/0 250, 266 1/0, 2/0, 3/0	0.563 0.447	0.461 0.338	D D3	7	3	2-1/2"
1	**506-82**	A B	#6, 4, 3, 2 #6, 4, 3, 2	#6, 4, 3, 2,1 #6, 4, 3, 2, 1	#6, 4, 3, 2, 1, 1/0 #6, 4, 3, 2, 1, 1/0	#6, 4, 3, 2, 1 #6, 4, 3, 2, 1	#6, 4, 3, 2, 1 #6, 4, 3, 2, 1	0.332 0.332	0.162 0.162	O	4	2	1-1/2"
7	**507-82**	A B	3/0, 4/0 3/0, 4/0	3/0, 4/0 3/0, 4/0	250, 266, 300 250, 266, 300	3/0, 4/0, 266-18/1 3/0, 4/0, 266-18/1	4/0, 250, 266 4/0, 250, 266	0.563 0.563	0.461 0.461	D D3	7	3	2-1/2"
2	**508-82**	A B	#4, 3, 2, 1, 1/0 #6, 4, 3, 2	#3-3, 2, 1, 1/0, 2/0 #6, 4, 3, 2, 1-19	#1, 1/0, 2/0, 3/0 #6, 4, 3, 2, 1, 1/0	#2, 1, 1/0, 2/0 #6, 4, 3, 2, 1	#2, 1, 1/0, 2/0 #6, 4, 3, 2, 1	0.419 0.332	0.250 0.162	O	5	2	1-3/4"

Table 117. Standard lighting ultra range Squeezon connectors

Catalog number alloy	Groove	Standard conductor			Compact conductor		Wire dia. range				
		ACSR and aluminum conductors	Aluminum or copper				Max.	Min.			
			Stranded	Solid	ACSR	Stranded	(inches)		Die	Indents	Length
420-82	A B	— —	#14, 12, 10, 6 #18, 16, 14, 12, 10, 8	#14, 12, 10, 8 #18, 16, 14, 12, 10, 8	— —	#14,12,10, 8 #18, 16, 14, 12, 10, 8	0.160 0.160	0.064 0.064	O Tool 5/8" Die	3	5/8"
421-82	A B	#6, 4, 3 —	#6, 4, 3, 2 #14, 12, 10, 9, 8	#6, 4, 3, 2, 1 #14, 12, 10, 8, 7	#6, 4, 3, 2 —	#4, 3, 2 #8	0.298 0.146	0.182 0.064	O Tool 5/8" Die	3	13/16"
424-82 ①	A B C	#4, 3, 2, 1, 1/0 — —	#3, 2, 1, 1/0, 2/0 #10, 9, 8 #12	#2, 1/0, 2/0, 3/0 #10, 8, 7, 6 #14, 12, 10	#4, 3, 2, 1, 1/0, 2/0 — —	#4, 3, 2, 1, 1/0, 2/0 #8 —	0.419 0.162 0.101	0.250 0.101 0.064	O Tool "O" Die	3	1-1/16"

① Catalog No. 424-82 has two tap grooves either of which may be used separately without a conductor in the other groove.

Table 118. "O" size ultra range Squeezon connectors

Catalog number	Groove	Standard conductor: ACSR and aluminum alloy conductors	Standard conductor: Aluminum or copper: Stranded	Standard conductor: Aluminum or copper: Solid	Compact conductor: ACSR	Compact conductor: Stranded	Wire dia. range: Max. (inches)	Wire dia. range: Min. (inches)	Die	Indents: O	Indents: WH	Length
333-81	A	#6, 4	#6, 4, 3-7	#6, 4, 3, 2	#6, 4, 3	#6, 4	0.260	0.162	0	4	2	1"
	B	#6, 4	#6, 4, 3-7	#6, 4, 3, 2	#6, 4, 3	#6, 4	0.260	0.162				1-7/16"

Table 119. "N" size ultra range Squeezon connectors

Catalog number	Groove	Standard conductor: ACSR and aluminum alloy conductors	Standard conductor: Aluminum or copper: Stranded	Standard conductor: Aluminum or copper: Solid	Compact conductor: ACSR aluminum alloy cond.	Compact conductor: Stranded	Wire dia. range: Max. (inches)	Wire dia. range: Min. (inches)	Die	Indents WH	Length
489-82	A	266, 300, 336, 397, 477-18/1	250, 266, 300, 336, 350, 397,	336, 397, 450, 477, 500	336-18/1 397-18/1 477-18/1 477-18/1 556-18/1	300, 336, 350, 397, 477, 556 477, 500, 556	0.814	0.573	N	3	3-1/2"
	B	336-26/7, 336-30/7, 397 477-18/1	400, 450, 477, 397, 400, 450, 477, 500	500			0.814	0.707			
494-82	A	266, 300, 336, 397, 477-18/1	250, 266, 300, 336, 350, 397, 400, 450, 477, 500	336, 397, 450, 477, 500	336-18/1, 397-18/1, 477-18/1, 556-18/1, 336-18/1, 397-18/1	300, 336, 350, 397, 477, 556	0.814	0.573	N	3	3-1/2"
	B	266, 336-18/1	250, 266, 300, 336, 350	336, 350, 397, 450, 477		300, 336, 350, 397	0.690	0.573			
492-82	A	266, 300, 336, 397, 477-18/1	250, 266, 300, 336, 350, 397, 400, 450, 477, 500	336, 397, 450, 477	336-18/1, 397-18/1, 477-18/1, 556-18/1, 2/0, 3/0, 4/0, 266-18/1	300, 336, 350, 397, 477, 556	0.814	0.573	N	3	3-1/2"
	B	2/0, 3/0, 4/0	2/0, 3/0, 4/0	4/0, 250, 266, 300		3/0, 4/0, 250 266	0.563	0.410			
491-82	A	4/0, 266, 300, 4/0, 250, 266, 336, 397, 477-18/1	300, 336, 397, 300, 336, 350, 397, 450, 477, 500	4/0, 266-18/1, 477, 500	250, 300, 336, 336-18/1, 397-18/1, 477-18/1, 556-18/1 #3, 2, 1/0	397, 477, 500, 556	0.814	0.517	N	2	2"
	B	#4, 3, 2, 1, 1/0	#3, 2, 1, 1/0	#1, 1/0, 2/0, 3/0		#2, 1, 1/0, 2/0	0.409	0.250			
490-82	A	4/0, 266, 300, 336, 397, 477-18/1	4/0, 250, 266, 300, 336, 350, 397, 450, 477, 500	300, 336, 397, 477, 500	4/0, 266-18/1, 336-18/1, 397-18/1, 477-18/1, 556-18/1 #6, 4, 3, 2	250, 300, 336, 397, 477, 500, 556	0.814	0.517	N	2	2"
	B	#6, 5, 4, 3	#7, 6, 5, 4, 3, 2	#6, 5, 4, 3, 2, 1		#6, 4, 2	0.298	0.162			

Note: Conductor sizes listed include all strandings except where otherwise shown.

All "R" die Squeezon connectors must be installed with a 15-ton or greater capacity tool.

Table 120. "R" size ultra range Aqueezon connectors

		Standard conductor			Compact conductor		Wire dia. range						
			Aluminum or copper				Groove A		Groove B				
Catalog number	Groove	ACSR and aluminum alloy conductors	Stranded	Solid	ACSR	Stranded	Max. (inches)	Min.	Max. (inches)	Min.	Die	Indents	Length
603-82	A	300, 336, 397, 477, 566-18/1	336, 350, 397, 400, 450, 477, 500, 550, 556, 600	—	397, 477, 566, 636	477, 500, 556, 636	0.893	0.666	0.684	0.398	R or Z or CZ	3	3-1/2"
	B	1/0, 2/0, 3/0, 4/0, 266, 336-18/1	2/0, 3/0, 4/0, 250, 266, 300, 336, 350	3/0, 4/0, 250, 266, 300, 336, 350	2/0, 3/0, 4/0, 266, 336, 397-18/1	3/0, 4/0, 250 266, 300, 336, 350, 397							
604-82	A	300, 336, 397, 477, 556-18/1	336, 350, 397, 400, 450, 477, 500, 550, 556, 600	—	397, 477, 566,	477, 500, 556,	0.893	0.666	0.893	0.666	R or Z or CZ	4	4-5/8"
	B	300, 336, 397, 477, 556-18/1	336, 350, 397, 400, 450, 477, 500, 550, 556, 600	—	397, 477, 556, 636	477, 500, 556, 636							
605-82	A	477, 30/7, 556 605, 636, 653, 666, 715, 795-26/7	600, 636, 700, 715, 750, 795, 800, 874, 900\	—	—	—	1.108s	0.879	0.684	0.398	R or Z or CZ	3	3-1/2"
	B	1/0, 2/0, 3/0, 4/0, 266, 336-18/1	2/0, 3/0, 4/0, 250, 266, 300, 336, 350	3/0, 4/0, 250, 266, 300, 336, 350	2/0, 3/0, 4/0, 266, 336, 397-18/1	3/0, 4/0, 250, 266, 300, 336, 350, 397							
606-82	A	477, 30/7, 556 605, 636, 653, 666, 715, 795-26/7	600, 636, 700, 715, 750, 795, 800, 874, 900	—	—	—	1.108	0.879	0.893	0.666	R or Z or CZ	3	4-5/8"
	B	300, 336, 397, 477, 556-18/1	336, 350, 397, 400, 450, 477, 500, 550, 556, 600	—	397, 477, 556, 636	477, 500, 556, 636							
607-82	A	477, 30/7, 556 605, 636, 653, 666, 715,	600, 636, 700, 715, 750, 795, 800, 874, 900	—	795, 874, 954	795, 874, 954, 1000	1.152	0.879	10.152	0.879	R or Z or CZ	4	4-5/8"
	B	477, 30/7, 556,605, 636, 653, 666, 715, 795, 954-36/1	600, 636, 700, 715, 750, 795, 800, 874, 900, 954, 1000	—	795, 874, 954	795, 874, 954, 1000							

Ultra range copper Squeezon connectors

Range

Seven ultra range copper Squeezon connectors cover the range of wire sizes from #8 solid minimum through 4/0 stranded maximum.

Design advantages

The side slots, similar to those on ultra range aluminum Squeezon connectors, provide a wide conductor range and reduce the handle load on those connectors that can be applied with mechanical type tools.

Quality material specifications

These connectors are made of pure electrolytic copper, annealed dead soft for easy compression and maximum conductivity.

Ultra range copper Squeezon connectors

Table 121. "B", "BKT", "D", "K", "O" and "T" size ultra range Squeezon connectors

Catalog number	Groove	Copper		Copperweld		Wire dia. range (inches)			Die		Indents	
		Solid	Stranded	Solid	Stranded	Type A	Max.	Min.	O tool	WH tool	O tool	WH tool
301-82	A B	#4, 6, 8 #4, 6, 8	#6, 8 #6, 8	#4, 6, 8 #4, 6, 8	3-#12 3-#12	#8 #8	0.204 0.204	0.128 0.128	B, T	B-K-T KBKT (Burndy)	3	1
302-82	A B	#2, 4, 6 #2, 4, 6	#4, 6 #4, 6	#2, 4, 6 #2, 4, 6	3-#9, 10, 12 3-#9, 10, 12	#6, 8 #6, 8	0.258 0.258	0.162 0.162	K	B-K-T	3	1
303-82	A	2/0, 1/0	1/0, 1, 2	2/0, 1/0	7-#8, 9, 10 3-#6, 7	#2, 4	0.373	0.292	—	O	—	1
	B	2/0, 1/0	1/0, 1, 2	2/0, 1/0	7-#8, 9, 10 3-#6, 7	#2, 4	0.373	0.292				
304-82	A	2/0, 1/0, #1, 2	1/0 #1, 2	2/0, 1/0, #1, 2	7-#8, 9, 10 3-#6, 7, 8	#2, 4	0.373	0.258	—	O	—	1
	B	#2, 4, 6	#4, 6	#2, 4, 6	3-#9, 10, 12	#6, 8	0.258	0.162				
307-82	A	4/0-250	4/0, 3/0, 2/0	—	7-#6 (1/2) 7-#7 (7/16)	—	0.528	0.414	—	D	—	1
	B	4/0-250	4/0, 3/0, 2/0	—	7-#6 (1/2) 7-#7 (7/16)	—	0.528	0.414	—	D3 (Burndy)		
308-82	A	4/0-250	4/0, 3/0, 2/0	—	7-#6 (1/2) 7-#7 (7/16)	—	0.528	0.414	—	D	—	1
	B	2/0, 1/0 #1, 2	1/0 #1, 2	2/0, 1/0 #1, 2	7-#8, 9, 10 3-#6, 7, 8	#2, 4	0.373	0.258	—	D3 (Burndy)		
309-82	A	4/0-250	4/0, 3/0, 2/0	—	7-#6 (1/2) 7-#(7/16)	—	0.528	0.414	—	D	—	1
	B	2, 4, 6	4, 6	2, 4, 6	3-#9, 10, 12	#6, 8	0.258	0.162	—	D3 (Burndy)		

Appendix 1

Fuse curve references

Fuse name	Fuse rating	Tin/silver	"R" number
C link		Tin	R240-91-8
CMU (612*)	17 kV		R240-91-155
CMU (612*, 613*and 614*)			R240-91-152
CMU (613* and 614*)	27 and 38 kV		R240-91-158
CMU (702*)	17 kV		R240-91-156
CMU (702*, 703* and 704*)			R240-91-153
CMU (703* and 704*)	27 and 38 kV		R240-91-159
CMU (712*)	17 kV		R240-91-154
CMU (712*, 713* and 714*)			R240-91-151
CMU (713* and 714*)	27 and 38 kV		R240-91-157
Companion II (2R1 in CYM TCC)	8.3, 15.5 and 23 kV		R240-91-165
D link (RTE15517 and 58B)			R240-91-16
DS Bay-O-Net (RTE15517 and 58B - 358C)			R240-91-51
Dual element Bay-O-Net (RTE39029 and 30B - 108C)			R240-91-57
EH link			R240-91-7
EK link		Tin	R240-91-5
ELF	15 kV		R240-91-43
ELF	23 kV		R240-91-44
ELF	8.3 kV		R240-91-42
ELF (peak let-thru)	8.3, 15.5 and 23 kV		423922B00
ELF (tandem)			R240-91-46
ELF-LR	8.3/13.17 kV and 17.2/23 kV		R240-91-47
ELF-LR (min melt/max clear)	17.2/23 kV		R240-91-72
ELF-LR (peak let-through)	17.2/23 kV		R240-91-48
ET link		Tin	R240-91-6
FL1A		Tin	R240-91-12
FL8 and FL23R			R240-91-58
H link			R240-91-3
K link		Silver	R240-91-4
Kearney dual element (124080)			K-124080 B
Kearney dual element (124090)			124090 A
Kearney dual element (124092)			124092 A
Kearney K link			K-31000 A
Kearney KS link			K-21000 A
Kearney N link (200)			K-11000 A
Kearney QA link			K-6010-32A
Kearney SQ link			SQA
Kearney T link			K-51000 A
Kearney X link			K-41000 A
K-limiter	8.3 and 15.5 kV		R240-91-113
K-link		Tin	R240-91-1
N link		Tin	R240-91-9

Fuse name	Fuse rating	Tin/silver	"R" number
NX	23 kV		R240-91-34
NX	27 and 38 kV		R240-91-35
NX	4.3 kV		R240-91-30
NX	5.5 kV		R240-91-31
NX	8.2 kV		R240-91-32
NXC	23 kV		R240-91-39
NXC	8.3 kV		R240-91-37
S link		Tin	R240-91-15
T link		Tin	R240-91-2
X-Limiter	4.3 kV		R240-91-105
X-Limiter	5.5 kV		R240-91-107
X-Limiter (301M and 301C)	8.3, 15.5 and 23 kV		R240-91-109
X-Limiter (308M and 308C)	8.3, 15.5 and 23 kV		R240-91-111
X-Limiter (full range "E")	8.3, 15.5 and 23 kV		R240-91-130
X-Limiter (full range parallel)	8.3, 15.5 and 23 kV		R240-91-110
X-Lmiter (hinged)			R240-91-150
X-Limiter (parallel mounted)	4.3 and 5.5 kV		R240-91-106
X-Limiter (unitized)			R240-91-112

Note: "*" = XXX (current rating); e.g., CMU(612*) CMU612005 (5 A fuse).

Appendix 2

Product to part number, catalog number and manual reference

Product description	Part number series prefix	Catalog number	Manual
HX open distribution cutout	144, 146, 148	CA132055EN	MN132012EN
HX-CB loadbreak fuse cutout	144, 146, 148	CA132056EN	MN132011EN
UltraSIL polymer-insulated and porcelain loadbreak type LB open distribution cutout	YS4B, YS9C, YK4B, YL9C	CA132035EN	MN132007EN
UltraSIL polymer-insulated and porcelain type L open distribution cutout	S4B, S9D, L4B, L9C	CA132026EN	MN132007EN
UltraSIL polymer-insulated CMU outdoor fuse open distribution cutout	S4CMU, S9CMU	CA132065EN	MN132034EN
Arrester/flipper fuse combinations	AM21, arrester suffix K1C1D1A	CA235021EN	MN235018EN
UltraSIL polymer-housed Evolution (10 kA) IEEE surge arresters	URT	CA235018EN	MN235006EN
UltraSIL polymer-housed VariSTAR IEEE normal-duty, heavy-duty and riser pole surge arresters	UNS, UHS, URS	CA235005EN	MN235006EN
VariSTAR composite light-duty under-oil (CLU) MOV arrester	CLU	CA235023EN	MN235023EN
UltraSIL polymer-housed VariSTAR surge arresters 5 kA and 10 kA class 1 IEC	UNS, UHS	CA235029EN	MN235005EN
VariSTAR type AZU heavy-duty distribution-class under-oil MOV surge arrester	AZU	CA235016EN	MN235025EN
UltraSIL polymer-housed VariSTAR station-class surge arresters	USAA, UHAA, UXAA	CA235013EN	MN235007EN
UltraSIL polymer-housed VariSTAR type UI intermediate-class surge arresters	UIAA	CA235012EN	MN235001EN
UltraSIL polymer-housed VariSTAR directionally vented high-strength station arresters	UHAF, UXLG	CA235035EN	MN235026EN
UltraSIL polymer-housed VariSTAR UXL high-strength station-class surge arresters	UXLB, UXLC	CA235019EN	MN235008EN
VariSTAR type AZE station-class porcelain house station-arresters	AZES, AZEH, AZEX	CA235022EN	MN235022EN
UltraSIL polymer-housed VariSTAR type U2 IEC class 2 station-arresters	U2	CA235033EN	MN235010EN
UltraSIL polymer-housed VariSTAR type U3 IEC class 3 station-arresters	U3	CA235034EN	MN235011EN
UltraSIL polymer-housed VariSTAR type U4 IEC class 4 station-arresters	U4	CA235024EN	MN235011EN
VariSTAR type AZG2 porcelain-housed IEC class 2 station-arresters	AZG2	CA235030EN	
VariSTAR type AZG3 porcelain-housed IEC class 3 station-arresters	AZG3	CA235031EN	
VariSTAR type AZG4 porcelain-housed IEC class 4 station-arresters	AZG4	CA235032EN	
D-73P disconnect and bypass switches	D73	CA008005EN	MN008004EN and MN008005EN
Oil circuit recloser, station disconnect and current transformer bypass switches	125, 126, 127, 171, 172	CA008006EN	
3D-73P three-phase bypass switch	3D73	CA008010EN	
M-Force three-phase switch	M1, M2, M3	CA008004EN	MN008003EN
Edison fuse links	FL	CA132008EN	
Kearney fuse links	11, 12, 21, 31, 32, 41, 42, 51, 52, 64, 68, -SQ	CA132031EN	
Companion II back-up current-limiting fuse	FAH..KV	CA132021EN	MN132009EN
ELF current-limiting dropout fuse	FAK..W	CA132027EN	MN132028EN
ELF-LR current-limiting fuse	FAK71W, FAK81W	CA132044EN	MN132016EN
K-Limiter high ampere Companion II fuse	43K, 83K, 155K	CA132059EN	MN132010EN
NXC full-range current-limiting capacitor fuse	FA5J, FA6J, FA7J	CA132047EN	MN132014EN
Tandem ELF current-limiting dropout fuse	T4B25, T4C25, T9C25, T9D25	CA132028EN	MN132029EN
X-Limiter hinge-mounted current-limiting fuse	83F, 15F, 23F	CA132054EN	MN132018EN
CMU medium-voltage power fuses	CMU	CA132038EN	MN132032EN
Pole-line hardware	DC, DF, DG, DJ, DP	CA325002EN	
Kearney connectors, tee tap terminals and cast stirrups	3..82, 4..82, 5..82, 6..82	CA325010EN	
Aqua seal material and airseal compound-insulating and sealing materials	104, 184	CA325003EN	
Kearney compression tools, cutters and accessories	OS, O	CA325006EN	
Splices	OH, HR, 58, 367, 1019, 3081, 136700	CA325007EN	
Terminals	1047, 4871, 13671	CA325008EN	
Wire clips, grips and grounding lugs	19229, 1232, 5730	CA325009EN	

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