

Surge Arresters

Electrical Apparatus

235-99

UltraSIL Polymer-Housed Evolution (10 kA) Surge Arresters

GENERAL

Cooper Power Systems set the standard for design, manufacturing and delivery of polymeric distribution arresters with the UltraSIL™ polymer-housed arrester family. The UltraSIL polymer-housed Evolution™ surge arrester incorporates the industry recognized superior polymer-housing material – silicone rubber.

The Evolution surge arrester uses specially formulated and highly durable Metal Oxide Varistors (MOVs) in combination with a proprietary insulating ceramic ring assembly. The mating of these two proven technologies allows Cooper Power Systems to offer a distribution class arrester with riser-pole protective characteristics and infinite TOV capability. The Evolution surge arrester offers significant improvements in protective characteristics and 60 Hz temporary over voltage (TOV) capability for all common over-head and riser-pole applications.

CONSTRUCTION

The patented construction of the Evolution surge arrester comprises the arrester module assembly encapsulated in a high-strength composite matrix insulating material. The components of the arrester module assembly consist of Metal Oxide Varistors (MOVs) in series with a proprietary insulating ceramic ring assembly. The insulating ceramic ring assembly withstands system voltage during steady state conditions and reduces electrical stress across the MOV disks.

The components of the arrester module assembly are encapsulated on our fully automated assembly line using strict quality control processes. The composite matrix is cured to the arrester module assembly to form a solid insulation system, which is then inserted and bonded to the industry leading track resistant UltraSIL polymer-housing material.

The composite-bonded module assembly provides a secondary moisture seal underneath the primary seal of the UltraSIL polymer-housing material. The combinations of these technologies allow the Evolution surge arrester to be impervious to moisture and capable of withstanding extreme



Figure 1.
10 kV UltraSIL Polymer-Housed Evolution Heavy-Duty Distribution-Class Surge Arrester (shown with CooperGuard shield).

electrical, environmental and cantilever load conditions. The composite wrapped module assembly used in the Evolution surge arrester represents a quantum leap in polymer arrester technology.

Following assembly, each arrester is subjected to a battery of electrical tests to assure the highest quality and in-service field performance.

FEATURES

The Evolution surge arrester exceeds protective levels offered by standard metal oxide varistor arresters and helps compensate for two variables related to installation practices and equipment protection:

- Excessive Lead Length
- Aged Equipment Insulation

UltraSIL polymer-housing material has undergone a wide range of design tests to determine the optimum shed configuration. In addition, long term

environmental testing has verified the lifetime superiority of silicone rubber when compared to other polymeric insulating materials.

Independent laboratory tests have verified the superiority of polymer-housing material in terms of non-wetting surfaces, resistance to UV degradation and surface tracking, performance in contaminated environments, chemical inertness, temperature stability and other important insulating properties. UltraSIL polymer-housing material will not support biological growth (algae and mildew), is non-flammable and will not support combustion.

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.

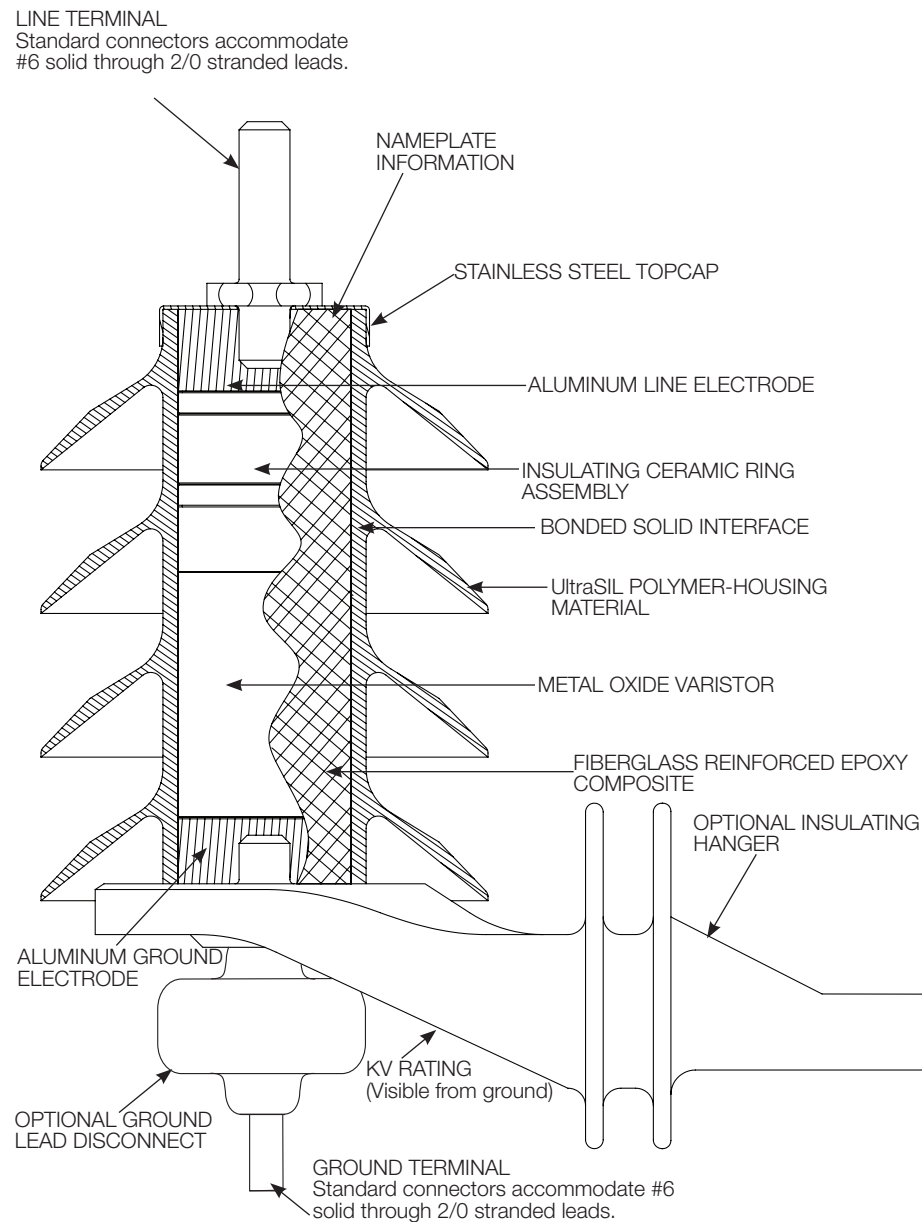


Figure 2.
Cutaway illustration of the Evolution Distribution Surge Arrester.

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.

An optional universal wildlife protector has two self-adjusting "valve" style openings which vary from 0 to 0.75" in diameter, thus allowing for a large variety of conductor/insulation sizes while providing optimum wildlife protection. (See page 10, Figure 8 for a

dimensional diagram.)

Customers looking to improve system reliability may specify the CooperGuard™ shield to minimize wildlife related outages. The CooperGuard shield is easily retrofitted to existing arresters installations and provides increased electrical insulation for the high-voltage terminal of the arrester. The flexible design of the CooperGuard shield allows insertion of the lead wire through the bottom of the integral molded flanges. The access holes molded above the flanges will allow conductor sizes ranging from 0 to 0.50" in diameter (OD).

The CooperGuard shield geometry allows water to shed away from the surface area of the animal guard while minimizing ice build up and maintaining flexibility through extreme operating temperatures. (Refer to page 10, Figure 9 for a dimensional diagram.)

OPERATION

The operation of Evolution surge arresters differs from conventional metal oxide arresters. During steady-state conditions, the insulating ceramic ring assembly withstands system voltage while reducing electrical stress on the MOV disks. When surges occur, the insulating ceramic ring assembly sparks over, leaving only the MOV disks in the circuit. The result is much lower discharge voltages as compared to standard heavy duty and riser pole metal oxide arresters. The added insulating ceramic ring assembly extends TOV capability for levels up to 1.78 P/U forever. Improving the Evolution surge arrester's resistance to overvoltage conditions reduces system maintenance related to arresters and helps improve system reliability.

DESIGN TESTING

The housing material, internals and hardware work together as a system and must stand up to years of exposure to environmental extremes. To assure a superior level of performance, both the components and assembled arrester units have been subjected to a program of testing that accurately simulates years of exposure to actual field conditions. Testing includes:

- IEEE Std C62.11™ standard testing – Full certification to performance requirements by an independent laboratory. A certified test report is available under CP0804.

Additional design verification testing of the Evolution surge arrester includes:

- UV testing
- Full dielectric testing
- Wet Arc Tracking Resistance
- Thermal Shock test
- 1000 Hours Accelerated Aging Test with Exposure to Salt Fog
- 5000 Hours Weather Aging Test
- Moisture Ingress Test
- Tracking Wheel test
- Coefficients of expansion for materials compatibility
- Cantilever test
- Terminal and Isolator Torque test
- Hanger Mechanical Shock test

To demonstrate the resistance of a composite wrapped module to

moisture ingress Cooper Power Systems performed the Water Immersion Test on the Evolution surge arrester without the polymer-housing material. This test was completed in accordance with IEEE Std C62.11™-2005 standard, Section 8.22, and IEC 60099-4, Ed 2 2004. The arrester sample passed the test by demonstrating less than 5% change in residual voltage, less than 20% change in power loss, less than 10pC of internal partial discharge with no signs of physical damage. A test report is available upon request.

PRODUCTION TESTS

A complete production test program ensures a quality product. Each metal oxide varistor receives a series of electrical tests. Quality is demonstrated by a series of destructive tests performed on every batch of varistors. Listed are the production tests performed on the varistors:

- 100% Physical Inspection
- 100% Discharge Voltage test
- 100% V_{1mA/cm^2}
- 100% Leakage Current at 80% of V_{1mA/cm^2} Voltage
- Batch High-current, Short-duration test
- Batch Thermal Stability test

■ Batch Aging test

Each fully assembled arrester must pass the following production tests:

- 100% Physical Inspection
- 100% Partial Discharge Inception Voltage test
- 100% 60 Hz Sparkover Level test

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. Table 1 provides a general application guide for the selection of the proper arrester rating for a given system voltage and system grounding configuration as outlined in the IEEE Std C62.22™ standard application guide.

Under fault conditions and other system anomalies, higher voltages can be experienced by the arrester. To ensure that the arrester ratings will not be exceeded, Cooper Power Systems application engineers are available to make recommendations. The following information is normally required:

1. System maximum operating voltage.
2. System grounding conditions.
 - A. For four-wire circuits, grounding conditions depend upon whether the system is multi-grounded, whether it has a neutral impedance and whether common primary and secondary neutrals are used.
 - B. For three-wire circuits, grounding conditions depend upon whether the system is solidly grounded at the source, grounded through neutral impedance at the source transformers or ungrounded.

Consult your Cooper Power Systems representative to have your individual system application needs studied.

TABLE 1
Commonly Applied Voltage Ratings of Evolution Surge Arresters

System Voltage (kV rms)		Recommended Arrester Rating per IEEE Std C62.22™ standard (kV rms)					
Nominal	Maximum	Four-Wire Wye Multi-Grounded Neutral		Three-Wire Wye Solidly Grounded Neutral		Delta and Ungrounded Wye	
		Standard MOV Arrester	URT	Standard MOV Arrester	*URT	Standard MOV Arrester	*URT
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	—	—	—	—

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

PERFORMANCE TEST CHARACTERISTICS

Evolution distribution class surge arresters withstand the following design tests as described by IEEE Std C62.11™ standard:

- **Duty Cycle:**
22 current surges of 10 kA crest, 8/20 μ s waveshape.
- **High-Current, Short-Duration Discharge:**
2 current surges of 100 kA crest, 4/10 μ s waveshape.
- **Low-Current, Long-Duration Discharge:**
20 current surges of 250 A crest 2000 μ s duration rectangular wave.

Following each of these tests, the arresters remain thermally stable as verified by:

- Continually decreasing power values during a thirty minute power monitoring period.
- No evidence of physical or electrical deterioration.
- The 10 kA discharge voltages measured after each test changed less than 10% from the initial values.

In addition, full IEEE Std C62.11™ standard certification has been completed and verified.

FAULT CURRENT WITHSTAND TESTS

Fault current withstand tests demonstrate the ability to withstand fault currents for specific durations without expelling any internal components. All Evolution distribution class surge arrester designs have been tested in accordance with the requirements listed in IEEE Std C62.11™ standard, and are non-fragmenting to the levels shown in Table 2.

TABLE 2
Fault Current Withstand Tests

Fault Current Amplitude (kA rms)	Fault Current Duration (cycles)
0.6	60
20.0	12

DIMENSIONS AND CLEARANCES

Outline drawings for several common design options are shown in Figures 3-6. Dimensions for these designs are listed in Table 3.

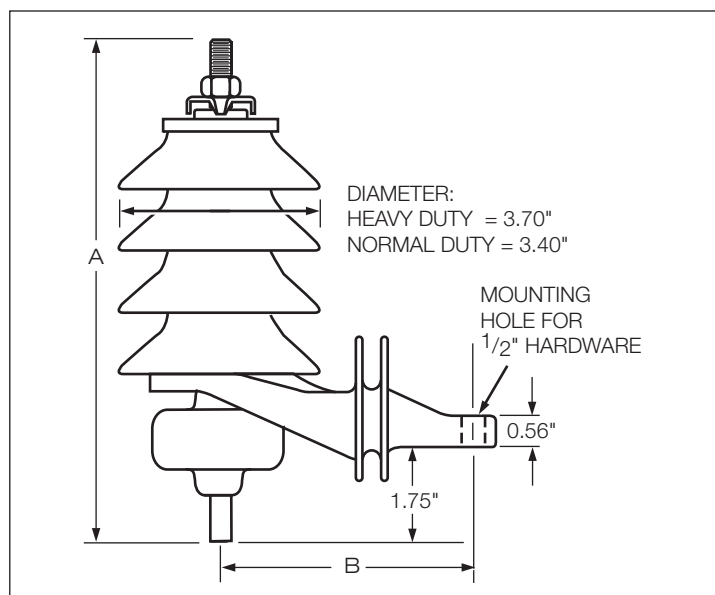


Figure 3.
Evolution surge arrester with isolator and insulated hanger.

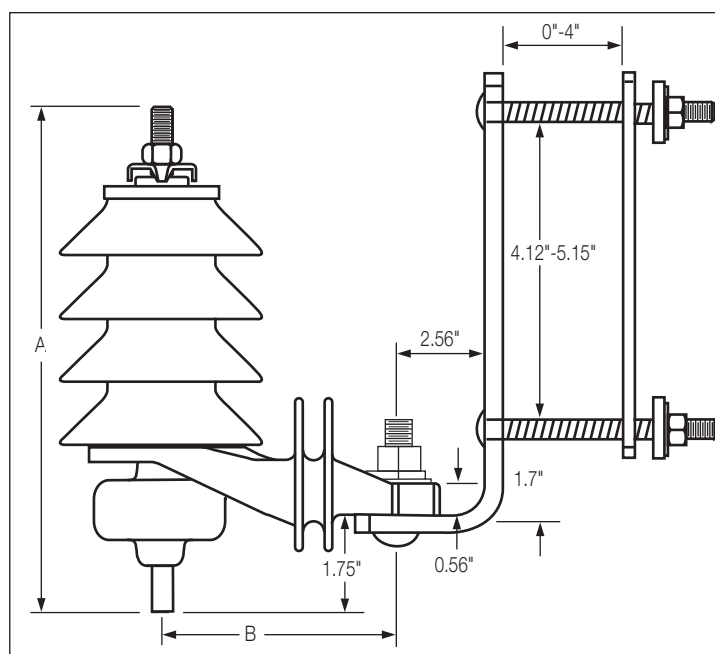


Figure 4.
Evolution surge arrester with isolator, insulated hanger and NEMA cross-arm bracket.

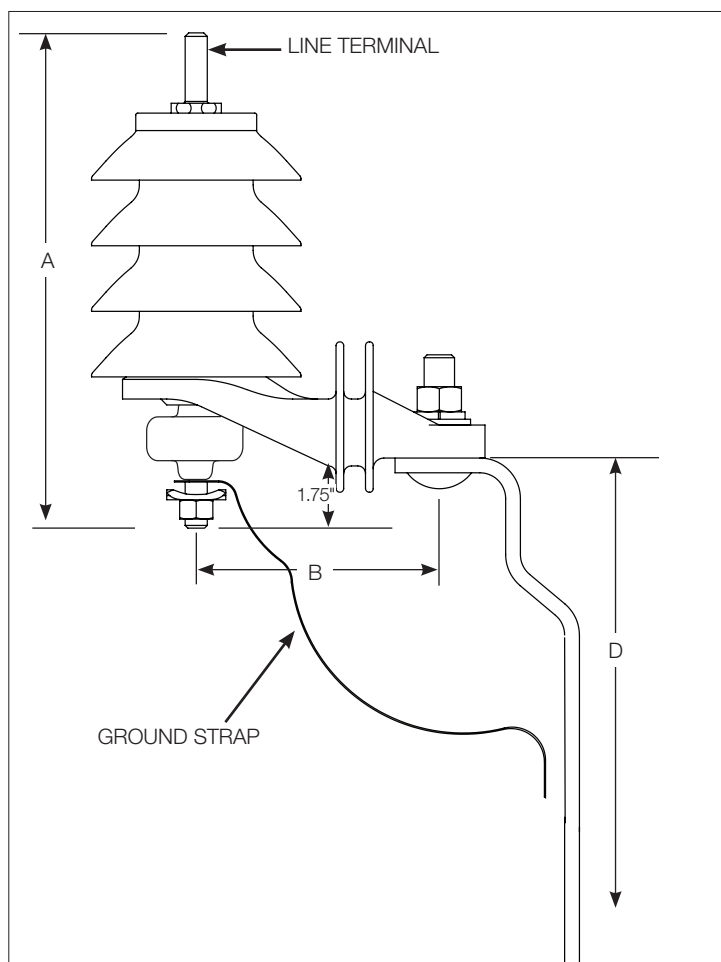


Figure 5.
Evolution surge arrester with isolator, insulated hanger and transformer mounting bracket.

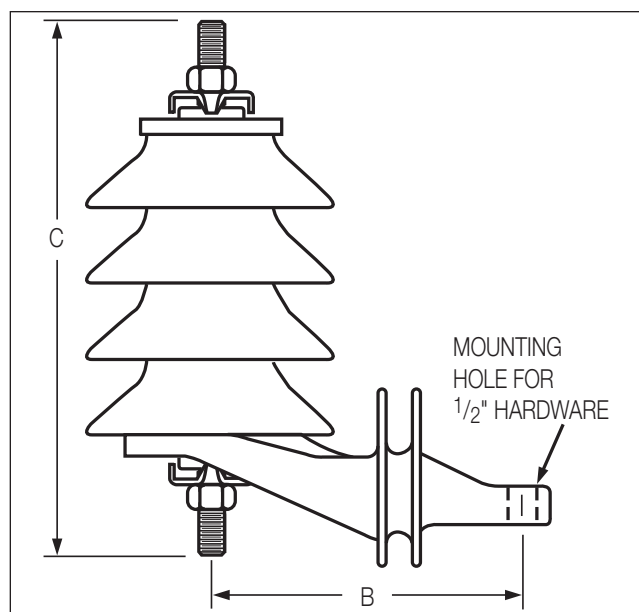


Figure 6.
Evolution surge arrester without isolator including insulated hanger and NEMA cross-arm bracket.

TABLE 3
Dimensional Data – Evolution Surge Arresters

Arrester Rating (kV rms)	Standard Housing Code (Digits 6 & 7)	Dimensions Figures 3-5, page 4 (Inches)				Minimum Recommended Clearances* (in.)	
		A+	B	C+	D	Heavy Duty	
						Phase-to-Ground	Phase-to-Phase
3	04	7.9	4.1	6.5	8.7	3.00	4.25
6	05	9.0	4.1	7.6	8.7	4.00	5.50
9	05	9.0	4.1	7.6	8.7	5.25	7.00
10	05	9.0	4.1	7.6	8.7	5.25	7.00
12	07	11.1	5.0	9.7	8.7	6.00	7.75
15	07	11.1	5.0	9.7	8.7	6.75	8.75
18	08	12.2	5.0	10.8	8.7	9.25	11.25
21	09	13.2	5.0	11.8	8.7	9.25	11.25
24	10	14.3	5.0	12.9	8.7	10.75	13.25
27	11	15.3	5.0	13.9	14.3	10.75	13.25
30	12	16.4	5.0	15.0	14.3	10.75	13.25
33	13	17.5	5.0	16.1	14.3	12.75	16.25
36	14	18.5	5.0	17.1	14.3	12.75	16.25

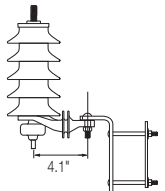
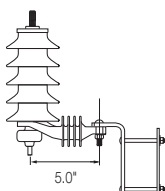
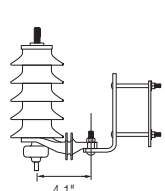
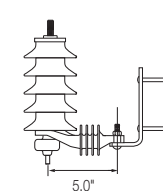
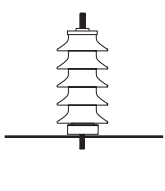
* All clearances are measured from center line of arrester per IEEE Std C62.22™ standard.

+ With optional Wildlife Protector add 0.2 inches.

INSULATION CHARACTERISTICS

The insulation characteristics of the Evolution surge arrester family are shown in Table 4.

TABLE 4
Housing Insulation Withstand Voltages of Evolution Surge Arresters

Arrester Housing Code (Digits 6 & 7)	Creep Distance (in.)	Strike (in.)															
			1.2/50 μ s Impulse (kV crest)	1 min. Dry (kV rms)	10 sec. Wet (kV rms)	1.2/50 μ s Impulse (kV crest)	1 min. Dry (kV rms)	10 sec. Wet (kV rms)	1.2/50 μ s Impulse (kV crest)	1 min. Dry (kV rms)	10 sec. Wet (kV rms)	1.2/50 μ s Impulse (kV crest)	1 min. Dry (kV rms)	10 sec. Wet (kV rms)	1.2/50 μ s Impulse (kV crest)	1 min. Dry (kV rms)	10 sec. Wet (kV rms)
04	10.1	4.2	91	56	36	105	55	39	79	52	34	99	56	39	82	51	33
05	13.0	5.2	104	64	45	117	63	52	89	55	44	109	60	52	90	62	46
06	15.9	6.3	117	78	57	126	86	59	93	61	58	119	80	59	97	72	56
07	18.8	7.3	129	87	68	137	96	71	98	62	59	122	81	63	107	81	69
08	21.7	8.4	140	96	79	148	106	83	104	65	61	126	82	67	118	89	81
09	24.6	9.4	152	105	89	159	116	94	110	68	63	130	83	72	129	98	93
10	27.5	10.5	164	114	100	171	126	105	117	72	67	136	86	78	140	106	105
11	30.4	11.5	176	123	110	183	135	116	125	77	71	142	90	83	152	114	116
12	33.3	12.6	189	131	120	195	144	127	133	82	75	149	94	89	164	122	126
13	36.2	13.6	201	139	130	207	153	137	142	88	81	158	99	96	177	130	136
14	39.1	14.7	215	148	140	220	161	147	152	94	87	167	105	102	190	138	145
15	42.0	15.8	228	155	150	233	170	157	162	101	93	177	112	109	204	146	153
16	44.9	16.8	242	183	158	246	178	167	173	109	101	187	120	117	218	154	162
17	47.8	17.8	255	171	169	259	185	176	185	117	109	199	128	125	233	161	169

PROTECTIVE CHARACTERISTICS

Evolution distribution class surge arresters provide excellent overvoltage protection for electrical equipment throughout distribution systems.

The protective characteristics of the Evolution surge arrester are shown in Table 5.

TABLE 5
Protective Characteristics – Evolution Surge Arrester Heavy Duty (URT)

Arrester Rating (kV rms)	MCOV (kV rms)	Minimum 60 Hz Sparkover (kV crest/√2)	Front-of-wave Protective Level* (kV crest)	3rd Party Front-of- Wave Protective Level** (kV crest)	Maximum Discharge Voltage (kV crest) 8/20 μs Current Wave							Switching Surge kV Crest)
					1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	500 A	
3	2.55	4.54	20.0	—	8.1	8.7	9.3	10.2	11.6	13.5	7.6	
6	5.10	9.08	23.0	—	16.1	17.4	18.6	20.3	23.3	27.0	15.2	
9	7.65	13.6	32.4	—	18.9	20.3	21.8	23.8	27.3	31.6	17.8	
10	8.40	15.0	32.4	24.3	20.1	21.6	23.2	25.4	29.0	33.7	19.0	
12	10.2	18.2	52.4	—	25.2	27.2	29.1	31.8	36.4	42.2	23.8	
15	12.7	22.6	55.4	—	30.5	32.8	35.2	38.5	44.0	51.1	28.8	
18	15.3	27.2	64.8	51.1	37.8	40.8	43.7	47.8	54.6	63.4	35.7	
21	17.0	30.3	64.8	—	40.1	43.2	46.3	50.6	57.9	67.2	37.8	
24	19.5	34.7	87.8	—	46.4	50.0	53.6	58.6	67.0	78	43.8	
27	22.0	39.2	97.2	66.9	53.9	58.0	62.2	68.0	78	90	50.8	
30	24.4	43.4	117.2	—	58.6	63.2	67.7	74	85	98	55.3	
33	27.0	48.1	120.2	—	66.6	71.7	77	84	96	112	62.8	
36	29.0	51.6	129.6	—	70.4	76	81	89	102	118	66.4	

*The Front-of-Wave Protective Level is the larger of the Front-of-Wave Sparkover Voltage (FOW) or Equivalent Front-of-Wave Discharge Voltage (EFOW) per IEEE Std. C62.11-2005 standard. The Front-of-Wave Sparkover Level is based on a voltage waveform having a rate of rise of 100 kV/ μ s for each 12 kV of arrester duty cycle rating. The EFOW is a discharge voltage resulting from a 10 kA current impulse cresting in 0.5 μ s. The Front-of-Wave Protective Level for the Evolution arrester is the FOW Sparkover Level.

**The 3rd Party test report is available on the Cooper Power Systems website as CP1012 and includes test data for standard production 10 kV, 18 kV & 27 kV arresters.

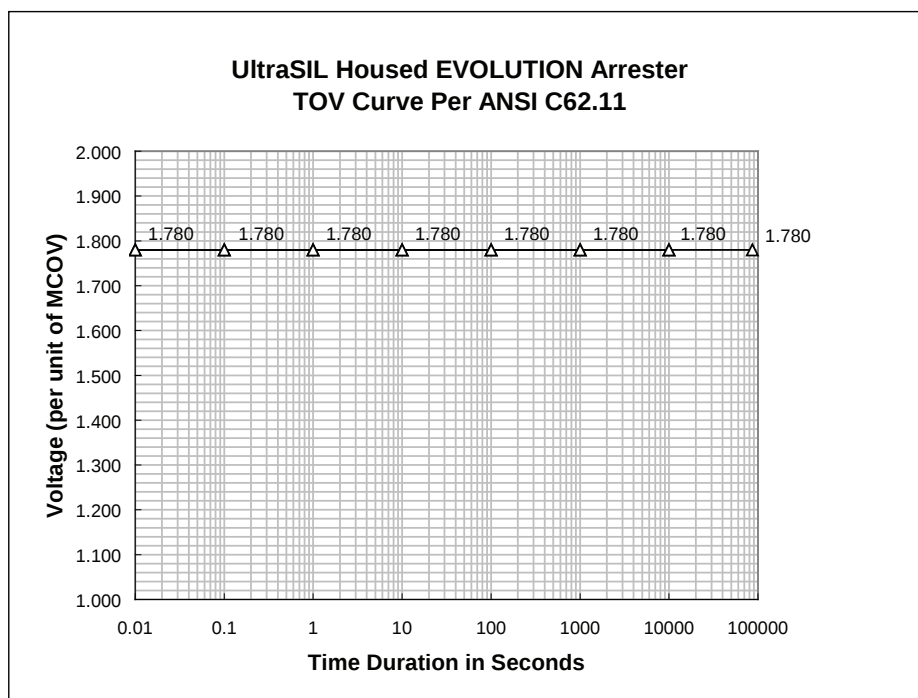


Figure 7.
Temporary overvoltage curve. No prior duty – 60° C ambient.

TEMPORARY OVERVOLTAGE (TOV) CAPABILITY

The ability to withstand 60 Hz overvoltage conditions [Temporary Overvoltage (TOV)] is shown in Figure 7 for all Evolution Distribution Class Surge Arresters. The graph shows for a given voltage magnitude (on a Per Unit of MCOV basis) the time an arrester can survive a TOV condition without going into thermal runaway.

ORDERING INFORMATION

Cooper Power Systems Evolution surge arresters can be ordered in a variety of customer defined options. Table 6 below lists standard part numbers for our most common design options (see illustrations on page 4, Figures 3-6). For other design options, use Table 7 to customize the arrester to specific needs. For further options

contact your Cooper Power Systems sales engineer.

TABLE 6
Catalog Numbers-Evolution Distribution Class Surge Arresters

Arrester Rating (kV rms)	With Isolator and Insulated Hanger (Figure 3)	With Isolator, Insulated Hanger and NEMA Cross-Arm Bracket (Figure 4)	With Isolator, Insulated Hanger and Transformer Mounting Bracket (Figure 5)	With Insulating Hanger Without Isolator (Figure 6)
3	URT0304-0A1A-1A1A	URT0304-0A1A-1B1A	URT0304-0A1C-1C1C	URT0304-0A0A-1A1A
6	URT0605-0A1A-1A1A	URT0605-0A1A-1B1A	URT0605-0A1C-1C1C	URT0605-0A0A-1A1A
9	URT0905-0A1A-1A1A	URT0905-0A1A-1B1A	URT0905-0A1C-1C1C	URT0905-0A0A-1A1A
10	URT1005-0A1A-1A1A	URT1005-0A1A-1B1A	URT1005-0A1C-1C1C	URT1005-0A0A-1A1A
12	URT1207-0A1A-1A1A	URT1207-0A1A-1B1A	URT1207-0A1C-1C1C	URT1207-0A0A-1A1A
15	URT1507-0A1A-1A1A	URT1507-0A1A-1B1A	URT1507-0A1C-1C1C	URT1507-0A0A-1A1A
18	URT1808-0A1A-1A1A	URT1808-0A1A-1B1A	URT1808-0A1C-1C1C	URT1808-0A0A-1A1A
21	URT2109-0A1A-1A1A	URT2109-0A1A-1B1A	URT2109-0A1C-1C1C	URT2109-0A0A-1A1A
24	URT2410-0A1A-1A1A	URT2410-0A1A-1B1A	URT2410-0A1C-1C1C	URT2410-0A0A-1A1A
27	URT2711-0A1A-1A1A	URT2711-0A1A-1B1A	URT2711-0A1C-1C1C	URT2711-0A0A-1A1A
30	URT3012-0A1A-1A1A	URT3012-0A1A-1B1A	URT3012-0A1C-1C1C	URT3012-0A0A-1A1A
33	URT3313-0A1A-1A1A	URT3313-0A1A-1B1A	URT3313-0A1C-1C1C	URT3313-0A0A-1A1A
36	URT3614-0A1A-1A1A	URT3614-0A1A-1B1A	URT3313-0A1C-1C1C	URT3614-0A0A-1A1A

Note 1: Digits 2 & 3 Options "RT" replaces Normal-Duty, Heavy-Duty & Riser-Pole.

Note 2: All catalog numbers listed above include a universal wildlife protector; catalog number AV346X1.

TABLE 7
UltraSIL Polymer-Housed Evolution Distribution Class Surge Arrester UltraQUIK Catalog Numbering System

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

Catalog Number Digits:

1 = "U", UltraSIL Polymer-Housed Evolution Surge Arrester

2 & 3 = RT

4 & 5 = Arrester Rating: **03** = 3 kV (2.55 kV) **12** = 12 kV (10.2 kV) **21** = 21 kV (17.0 kV) **30** = 30 kV (24.4 kV)
Duty Cycle (MCOV) **06** = 6 kV (5.1 kV) **15** = 15 kV (12.7 kV) **24** = 24 kV (19.5 kV) **33** = 33 kV (27.0 kV)
 09 = 9 kV (7.65 kV) **18** = 18 kV (15.3 kV) **27** = 27 kV (22.0 kV) **36** = 36 kV (29.0 kV)
 10 = 10 kV (8.4 kV)

6 & 7 = Housing Code: Select from Table below.

AVAILABLE HOUSINGS PER ARRESTER RATING

***** = Standard Creepage Housing **O** = Optional Creepage Housings

Digits 6 & 7	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Creep Length	10.1"	13.0"	15.9"	18.8"	21.7"	24.6"	27.5"	30.4"	33.3"	36.2"	39.1"	42.0"	44.9"	47.8"
Arrester Rating (kV rms)														
3	*													
6		*	O											
9		*	O	O	O									
10		*	O	O	O									
12				*	O	O	O							
15				*	O	O	O	O						
18					*	O	O	O	O					
21						*	O	O	O	O	O			
24							*	O	O	O	O			
27								*	O	O	O	O		
30									*	O	O	O	O	
33										*	O	O	O	O
36											*	O	O	O

8 = Line Terminal Wire: **0** = No Line Terminal Wire

1 = 12", #6 AWG Insulated Wire, Stripped 1.25" both ends

4 = 18", #6 AWG Insulated Wire, Stripped 1.25" both ends

7 = 30", #6 AWG Insulated Wire, Stripped 1.25" both ends

2 = 12", #6 AWG Insulated Wire, 1 ring terminal/1 end stripped 1.25"

5 = 18", #6 AWG Insulated Wire, 1 ring terminal/1 end stripped 1.25"

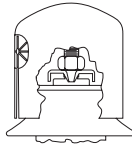
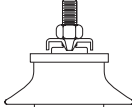
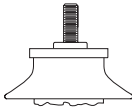
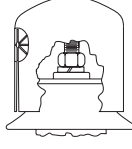
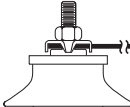
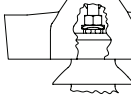
8 = 30", #6 AWG Insulated Wire, 1 ring terminal/1 end stripped 1.25"

3 = 12", #6 AWG Insulated Wire, 2 ring terminals

6 = 18", #6 AWG Insulated Wire, 2 ring terminals

9 = 30", #6 AWG Insulated Wire, 2 ring terminals

9 = Line Terminal Options

 A = Silicon Bronze Nut, Stainless Steel Wire Clamp & Universal Wildlife Protector. Reference Figure 8 for dimensional information.	 B = Silicon Bronze Nut & Stainless Steel Wire Clamp	 C = No Hardware	 D = Silicon Bronze Nut, Lock Washer, Flat Washer & Universal Wildlife Protector (For leads with ring terminals) Reference Figure 8 for dimensional information.	 K = Silicon Bronze Nut, Stainless Steel Wire Clamp, and Flipper Fuse Kit AM21A1 (See Page 10)	 X = Silicon Bronze Nut, Stainless Steel Wire Clamp and CooperGuard. Reference Figure 9 for dimensional information.
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10 = Isolator

0 = No Isolator ($\frac{3}{8}$ " Stainless Steel Grounding Stud only)

2 = Red Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

4 = Blue Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

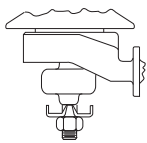
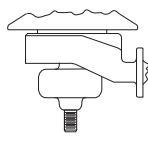
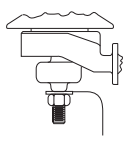
6 = Orange Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

1 = Black Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

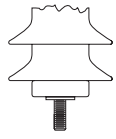
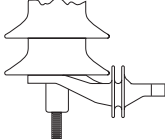
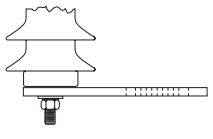
3 = Yellow Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

5 = White Isolator with $\frac{3}{8}$ " Stainless Steel Grounding Stud

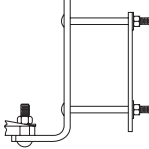
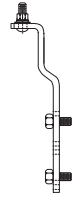
11 = Ground Terminal Options

 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 & Silicon Bronze Nut (Shown with optional Isolator and Insulated Hanger)	 D = Stainless Steel Washer, Lock Washer, Silicon Bronze Nut
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12 = Base Configuration Options

 0 = Insulated Base (Base Mounted Arrestor)	 1 = Insulated Hanger (Shown with optional Isolator)	 2 = Insulated Base With Conductive Mounting Strap (Requires "D" in Digit 11)
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13 = Mounting Bracket Options

A = Without an Additional Mounting Bracket	 B = NEMA Cross-Arm Bracket (Arrestor Mounting Hardware Included) (Requires "1" or "2" in Digit 12) (Refer to Figures 10 for dimensional information.)	 C = Transformer Bracket (Arrestor Mounting Hardware Included) (Requires "1" or "2" in Digit 12) (Refer to Figures 11 and 12 for dimensional information.)	 D = Option C plus Transformer Mounting Hardware (2 each - $\frac{1}{2}$" 13-UNC x $\frac{3}{4}$" Bolts, Flat Washers, and Lock Washers) (Requires "1" or "2" in Digit 12)
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14 = Nameplate Information: 1 = IEEE Std C62.11™ standard Required Data**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. Full pallet quantities only: 3-10 kV = 90, 12-18 kV = 72, 21-24 kV = 40.

AVAILABLE ACCESSORIES FOR
THE EVOLUTION SURGE ARRESTER

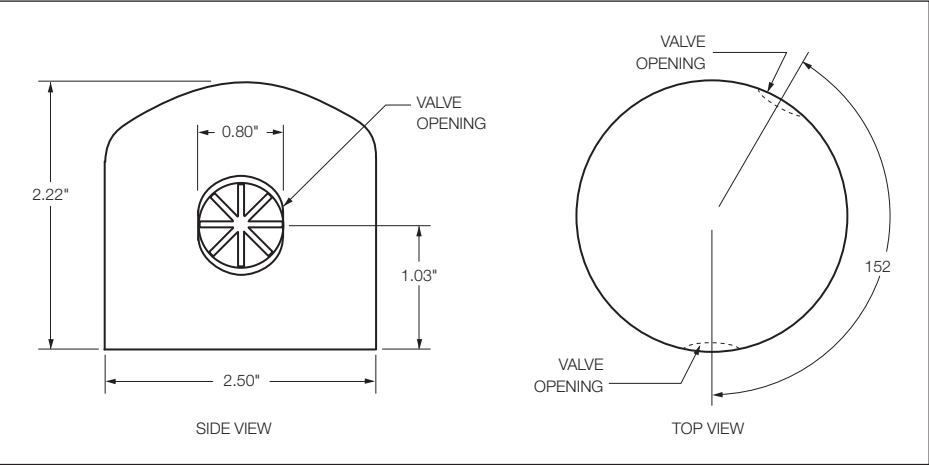


Figure 8.
Universal wildlife protector (catalog number AV346X1).

Open Link Flipper Fuse Kit

Customers who need an open-link flipper fuse kit without an arrester, can order this assembly separately. The kit includes the flipper arms (for the transformer bushing and arrester line terminal) and an optional bushing insulator cap. Table 8 lists the part numbers to order the flipper fuse kit. To order an Evolution surge arrester with flipper fuse assembly AM21A1, insert a “K” in digit 9 of the catalog number.

TABLE 8
Flipper Fuse Kit Catalog Numbers

Description	Catalog Number
Flipper Fuse Kit with Bushing Wildlife Protector	AM21A1
Flipper Fuse Kit without Bushing Wildlife Protector	AM21A2

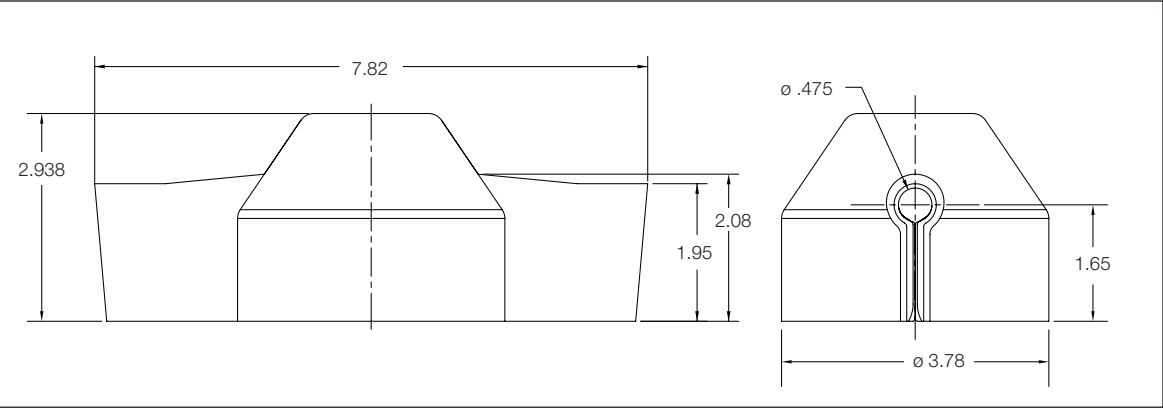


Figure 9.
CooperGuard wildlife protector (catalog number AV698X1). (All dimensions in inches.)

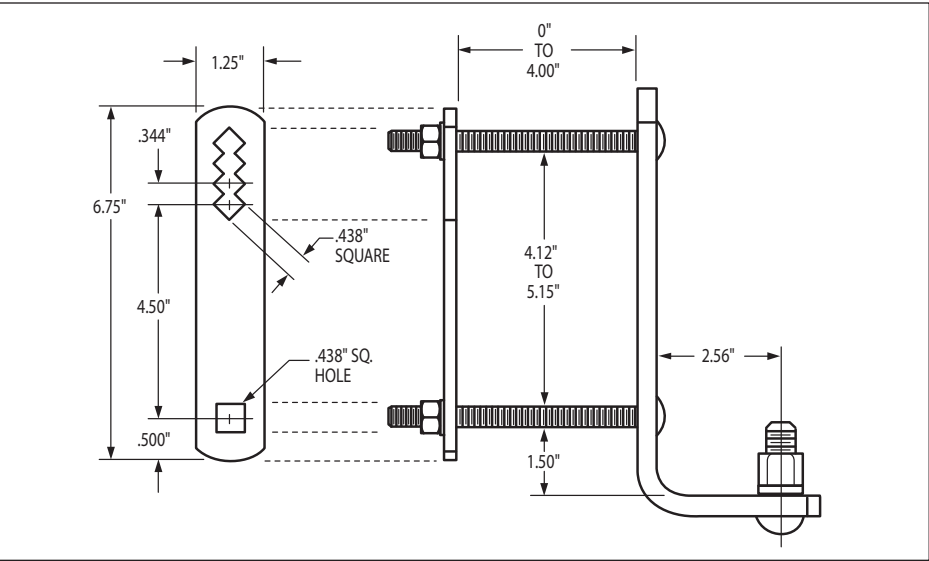


Figure 10.
NEMA cross-arm bracket (catalog number AM35A1).

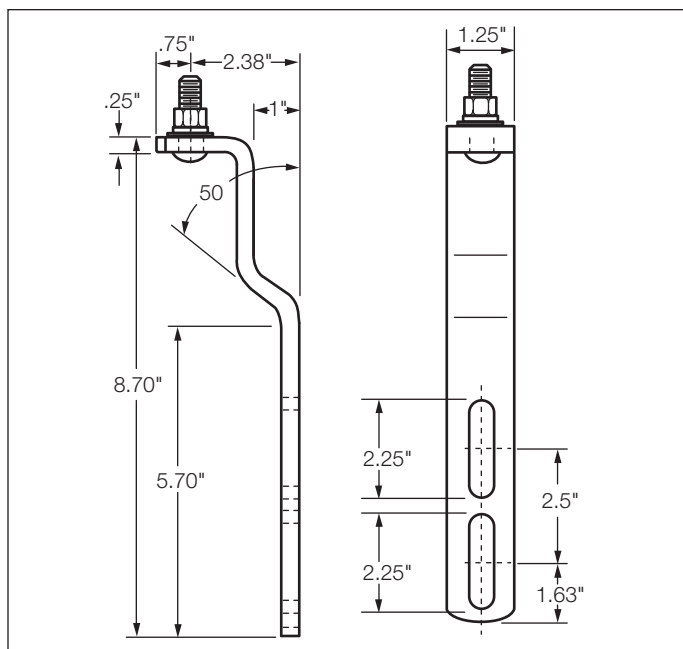


Figure 11.
Standard transformer mounting bracket for 3-24 kV arrester (catalog number AM36A2). Can be specified with a "C" in Digit 13. (All dimensions in inches.)

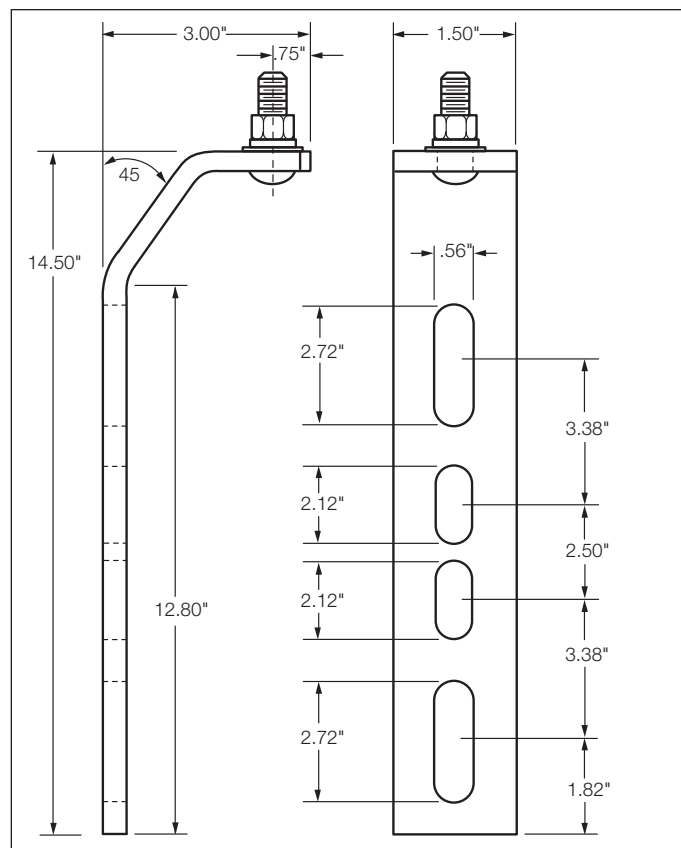


Figure 13.
Standard transformer mounting bracket for 27-36 kV arrester (catalog number AH46A2). Can be specified with a "C" in Digit 13. (All dimensions in inches.)

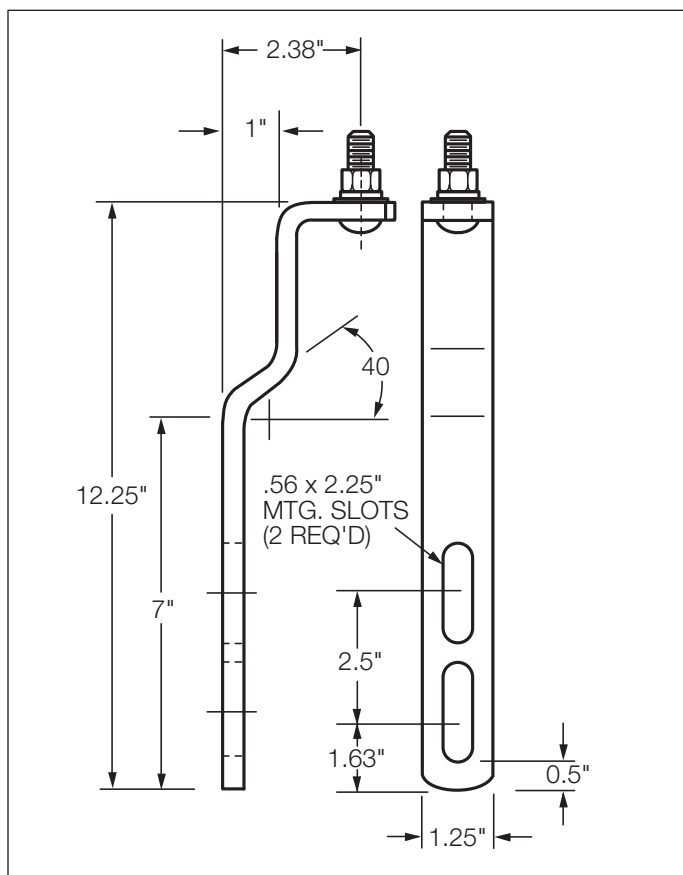


Figure 12.
Optional transformer mounting bracket (catalog number AM36A3). Can be specified with an "N" in Digit 13. (All dimensions in inches.)

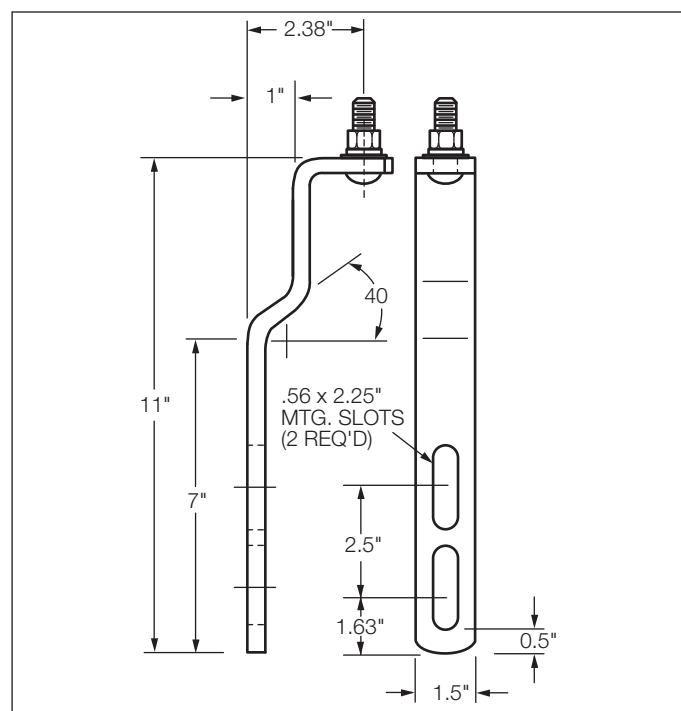


Figure 14.
Optional transformer mounting bracket (catalog number AM36A1). Can be specified with an "S" in Digit 13. (All dimensions in inches.)

