

UltraSIL™ polymer-housed VariSTAR™ type U3 surge arrester for systems through 275 kV IEC 10 kA; line discharge Class 3

General

Eaton's Cooper Power Systems has set a new standard of excellence for polymer-housed station-class surge arresters. Enhancements in arrester design allow Eaton's Cooper Power Systems to offer increased cantilever strength and improved energy handling capability. The UltraSIL™ polymer-housed VariSTAR™ Type U3 station-class arresters incorporate the industry recognized superior silicone rubber housing with a unique high creep alternating shed profile designed to withstand the most extreme environments. The "standard" silicone rubber housing is designed with a minimum specific creepage distance of 31 mm/kV L-L, which meets category IV (Very Heavy) pollution level according to the IEC standard. This housing is applied over a gapless MOV internal design.

Eaton's Cooper Power Systems Type U3 arresters meet or exceed the requirements of IEC 60099-4 Rev 2009.

Construction

The unique construction of UltraSIL polymer-housed Class 3 arresters begins with world class Metal Oxide Varistor (MOV) disks produced at our manufacturing facility in Olean, NY. By manufacturing our own disks we maintain a strict quality control over the entire production process, from initial raw material inspection to final physical and electrical testing of each disk. In addition, by controlling the manufacturing process of both disks and arresters, we achieve the optimal combination. Eaton's Cooper Power Systems produces MOV disks of unsurpassed quality through continuous improvements in disk formulation and manufacturing technology. The end result is a long history of in-service use with outstanding durability and protective capability.

Arrester production begins by stacking glass-collared MOV disks in series with aluminum end electrodes. Our proprietary process wraps the assembly with a high-strength woven fiberglass-reinforced epoxy composite. When cured, the arrester module is capable of withstanding high electrical and cantilever load conditions.

The UltraSIL silicone rubber housing utilizes an interference fit and is bonded onto the internal module to form a solid, void-free, high-dielectric strength insulation system. Once the housing is in place, each arrester must pass a strict series of electrical tests to insure the highest level of in-service performance.

The silicone rubber housing results in lighter weight than similarly rated porcelain housed arresters. The silicone rubber housing is also less sensitive to physical damage than porcelain. Also, when compared to other polymeric housing materials, silicone rubber generates significantly lower external power losses under contaminated conditions.



**Cooper
Power Systems**
by **EATON**

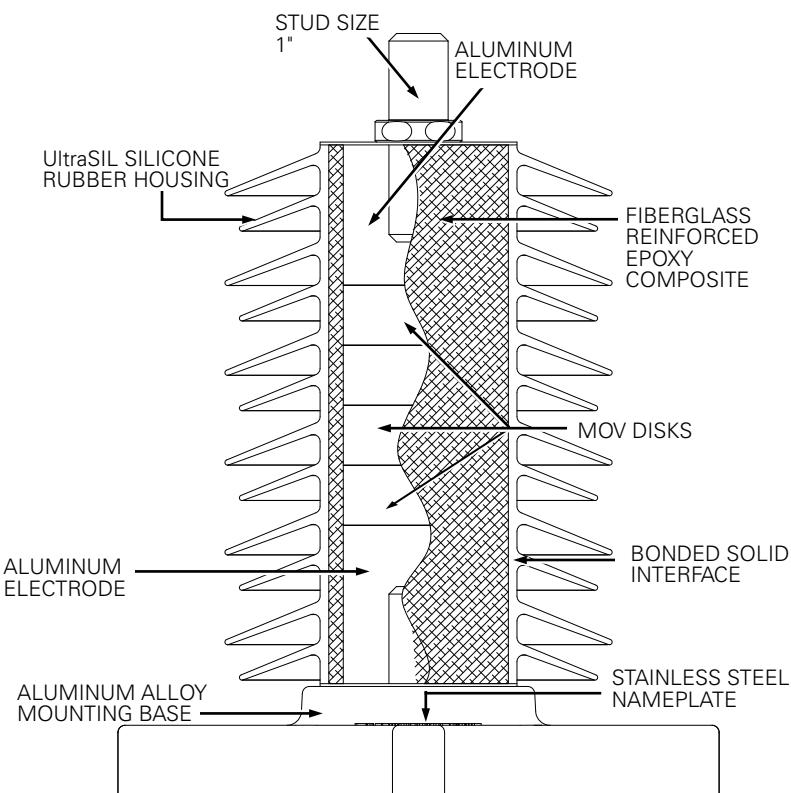


Figure 1. Cutaway illustration of a 10 kV UltraSIL Polymer-Housed VariSTAR Class 3 Arrester.

Features

The UltraSIL silicone rubber housing was chosen for its superior insulation performance when compared to other polymeric housing materials. Long term environmental testing has verified the superiority of UltraSIL silicone rubber when compared to other polymeric insulating materials.

Independent laboratory tests have verified the superior water repellent behavior of silicone rubber, which is responsible for the lower external power losses, higher resistance to UV degradation and surface tracking, superior performance in contaminated environments, and other important insulating properties. Also, UltraSIL silicone rubber has been proven not to support biological growth and is non-flammable.

The basic silicone rubber housed arrester can be customized with a variety of terminal and mounting options which allow users to select the features that meet their application needs. The "standard" silicone rubber housing is designed with a minimum specific creepage distance of 31 mm/kV L-L, but if additional creepage is required, please contact your Eaton's Cooper Power Systems representative for customized options.

Operation

The operation of the VariSTAR arrester is typical of gapless metal oxide arresters. During steady state conditions, line-to-earth voltage is continuously across the arrester terminals. When overvoltages occur, the VariSTAR arrester immediately limits the overvoltage to the required protective level by conducting only the necessary level of surge current to earth. Upon passage of the overvoltage condition, the arrester returns to its initial condition, once again conducting only minimal leakage current.

UltraSIL polymer-housed VariSTAR Class 3 arresters are ideal for the protection of critical substation apparatus in areas of moderate lightning incidence and for protection against switching surges generated on transmission systems.

Table 1. U3 Class 3 Ratings and Characteristics

Arrester Characteristic	Rating	
Arrester Voltage Ratings, U_r	3-240 kV	
Rated Discharge Energy, $\text{kJ/kV of } U_c$	Single Impulse	Double Impulse*
$\text{kJ/kV of } U_r$	6.2	9
$\text{kJ/kV of } U_r$	5.1	7.5
System Frequency (Hz)	50/60	
Nominal Discharge Current (kA)	10	
High Current Withstand, Short Duration Withstand 4/10 μs (kA)	100	
Short-Circuit/Pressure Relief Rating (kA rms sym.)	63	
Cantilever Strength (Nm)	Ultimate	SLL** SSL***
	2300	920 1150
Ambient Temperature ($^{\circ}\text{C}$)	-40 to +40	
Standard Pollution Level (Creep)	Very Heavy (31 mm/kV)	

* Double impulse rating assumes a two shot energy discharge within one minute.

** Specified Long Term Load

*** Specified Short Term Load

Pressure relief tests have been conducted in accordance with IEC 60099-4 to demonstrate the UltraSIL polymer-housed VariSTAR Class 3 arrester's ability to withstand fault currents for specific durations.

Design testing

The housing material, internal components and hardware work as a system to withstand years of exposure to environmental extremes. To assure a superior level of performance, the components and the assembled arrester unit have been subjected to a testing program that accurately simulates years of exposure to field conditions. Tests include:

IEC 60099-4 Testing - Full Certification to performance requirements by an independent laboratory has been completed. A certified test report is available upon request.

Additional design verification of the UltraSIL polymer-housed VariSTAR Class 3 arrester includes testing for:

- Ultraviolet Withstand
- High Voltage Dielectric Integrity
- Wet Arc Tracking Resistance
- Thermal Shock
- Coefficients of Expansion and Materials Compatibility
- Cantilever Strength
- Terminal Torque

For detailed reports please contact your Eaton's Cooper Power Systems sales representative.

Routine tests

A complete automated production test program ensures a quality product. Each metal oxide varistor receives a series of electrical tests. Quality is further demonstrated by tests performed to destruction on samples from every batch of varistors.

Routine tests on the varistor disks performed in accordance with IEC 60099-4:

- 100% Physical Inspection
- 100% Discharge Voltage Test
- 100% V_{ref} at 11 mA
- 100% Watts Loss Measured at 1.05 x MCOV
- 100% Transmission Line Discharge Energy Test
- Batch High-Current, Short-Duration Test
- Batch Thermal Stability Test
- Batch Aging Test

Routine tests on each fully assembled UltraSIL polymer-housed VariSTAR Class 3 arrester, per IEC 60099-4.

- 100% Physical Inspection
- 100% V_{ref} Test
- 100% Watts Loss Test
- 100% Partial Discharge Inception Voltage Test

General application recommendations

The rating of an arrester is the maximum power-frequency line-to-earth voltage at which the arrester is designed to pass the IEC operating duty test. Table 2 provides a general guide for the selection of the proper arrester for a given system voltage. Eaton's Cooper Power Systems application engineers are available to make specific system application recommendations.

Selection of arrester rating

In arrester rating selection it is preferable to determine the lowest arrester rating that will ensure satisfactory operation. This is the optimum solution because the arrester selected will not only provide the greatest margin of insulation protection but also be the most economical choice.

Increasing arrester ratings above the minimum increases the likelihood of the arrester surviving varying system conditions but compromises the protection of equipment insulation. Table 2 lists VariSTAR U3 arrester ratings commonly used on various three-phase systems.

Rating selection should begin with consideration of the maximum system operating voltage. The maximum power frequency voltage expected under normal system conditions (expressed line-to-earth) should not exceed the selected arrester's continuous operating voltage (U_c).

The temporary overvoltage (TOV) capability of the VariSTAR U3 arrester is shown in Figure 2. The curves indicate the arrester's ability to withstand abnormal system power frequency (sinusoidal) overvoltages for various durations. The values shown assume that the arrester has been energized at COV (U_c) prior to an overvoltage event, that the arrester is in an ambient temperature of 60 °C, and that after the overvoltage durations shown, demonstrate that the arrester will thermally recover when once again energized at COV (U_c).

The voltage withstand capability for application on ungrounded systems after IEC high current duty is 1.076 per unit of COV (U_c) for 24 hours. For ungrounded systems utilizing high impedance or resonant grounding and other systems where the line-to-earth

Table 2. Arrester Ratings Commonly Used on Three-Phase Systems

System Voltages L-L (kV)		Arrester Ratings (kV)	
Nominal	Maximum	Grounded Circuits	High-Impedance/Ungrounded Circuits
3.3	3.7	3	6
6.6	7.3	6	9
10.0	11.5	9	12-15
11.0	12.0	9-10	
16.4	18.0	15.0	18-21
22.0	24.0	18-21	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	120-135
132	145	108-120	132-144
155	170	132-144	162-172
220	245	180-198	204-240
275	300	216-240	—

voltages exceed this stated TOV capability, arresters having a COV (U_c) equal to line-to-line voltage may be required.

For non-sinusoidal transient voltages caused by system switching operations a transient network analyzer (TNA) study is recommended; Eaton's Cooper Power Systems engineers are available to make these studies.

Figure 2 also illustrates the arrester's TOV capabilities with and without prior switching surge duties of up to a maximum capability of 6.2 kJ/kV of COV (U_c)-single impulse and 9 kJ/kV of COV (U_c)-double impulse.

To assure proper application the following information is normally required:

1. Maximum system operating voltage.
2. System grounding conditions.
 - a. For four-wire circuits, grounding conditions depend upon whether the system is multi-grounded, whether it has 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 the neutral impedance at the source or grounded through transformers, or ungrounded.

Where unusual conditions exist (high ground resistance, high capacitive load, unusual switching surge duty, etc.), the following supplementary information is required:

- Type of unusual condition
- BIL of equipment and separation distance to protected equipment
- Type of construction (phase spacing, length of line, conductor size, etc.)
- Grounding and phase-sequence components of source impedances
- Phase-sequence components of load impedances
- Available fault current
- Potential for loss of neutral earthing during system events

Performance and protective characteristics

Table 4, "Protective Characteristics of the UltraSIL Polymer-Housed Varistor U3 Surge Arrester" displays the Arrester Rating (U_r), Continuous Operating Voltage (U_c) and the guaranteed protective characteristics.

The Steep Current Impulse protective level is the maximum residual voltage for a 10 kA impulse current that crests in one microsecond. Lightning Impulse Residual Voltages represent the maximum protective levels exhibited by the arrester when discharging lightning currents of the standard 8/20 microsecond waveshape. The maximum Switching Impulse Residual Voltages are based on a switching surge current having a time to crest of 30 microseconds. For all ratings the switching surge energy absorption capability is 6.2 kJ/kV of U_c -single impulse and 9 kJ/kV of U_c -double impulse.

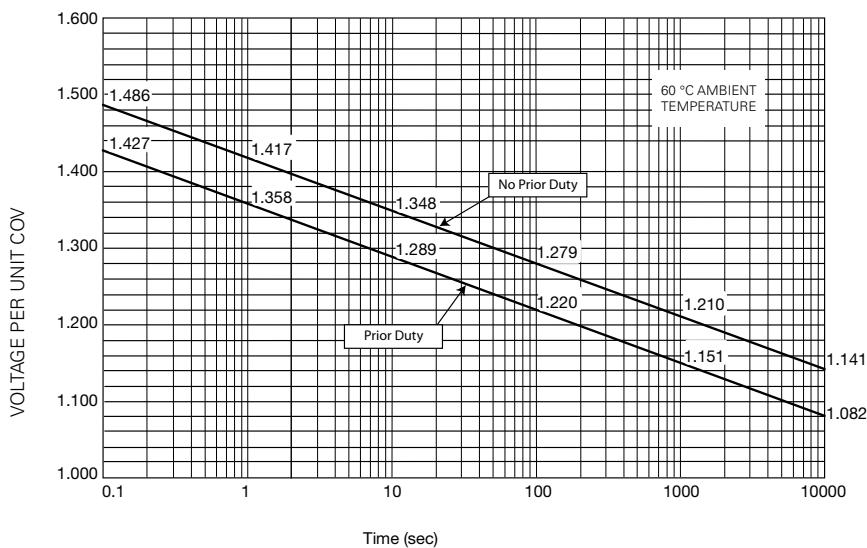


Figure 2. Temporary Overvoltage Capability of VariSTAR U3 Surge Arresters.

Note: The 24-Hour TOV with prior duty is 1.076 per unit of U_c .
The TOV curve in Figure 2 applies to standard electrical build arresters. Consult manufacturer for further information regarding alternate electrical builds.
See Table 4 for Temporary Over Voltage w/Prior Duty (kV) for 1 and 10 second values.

Table 3. Insulation Withstand Voltages

Housing Designation	Housing Leakage Distance - Creep (mm)		Strike (mm)	Insulation Withstand Voltages			
	BIL 1.2/50 Impulse (kV, Pk)	Switching Surge Impulse (kV, crest)		WET 50/60 Hz 60 Sec (kV, rms)	DRY 50/60 Hz 60 Sec (kV, rms)		
08	780	200	119	62	77		
10	975	240	137	71	90		
12	1170	280	158	83	104		
14	1365	319	178	94	118		
16	1560	360	201	104	140		
18	1755	398	218	122	146		
22	2145	477	258	147	166		
24	2340	516	279	160	188		
26	2535	556	298	172	201		
28	2730	594	319	184	215		
30	2925	634	340	197	230		
32	3120	672	361	208	246		
40	3900	875	476	269	312		
44	4290	954	516	294	332		
46	4485	993	537	307	354		
48	4680	1032	558	320	376		
50	4875	1072	577	332	389		
52	5070	1112	596	344	402		
54	5265	1150	617	356	416		
56	5460	1188	638	368	430		
58	5655	1228	659	381	445		
60	5850	1268	680	394	460		
64	6240	1123	631	370	432		
72	7020	1359	758	439	505		
76	7410	1437	798	463	532		
78	7605	1468	809	474	541		
80	7800	1506	830	486	555		
82	7995	1544	851	498	569		
84	8190	1584	872	511	584		
86	8385	1622	893	522	600		
88	8580	1662	914	535	615		
90	8775	1686	931	545	630		
92	8970	1730	955	557	648		
94	9165	1762	973	567	662		
96	9360	1795	992	578	678		
A4	10140	2024	1107	1105	646	742	
A6	10335	2062	1128	1130	658	756	
A8	10335	2062	1128	1130	658	756	
B0	10725	2138	1170	1180	682	784	
B2	10920	2168	1190	1189	693	801	
B4	11115	2208	1211	1211	706	816	
B6	11310	2248	1232	1233	719	831	
B8	11505	2288	1253	1255	732	846	
C0	11700	2320	1271	1269	742	860	

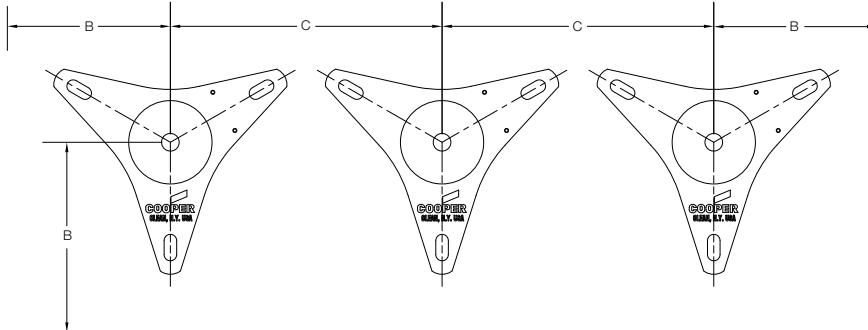
Note: Strike and insulation withstand values for housing codes (60+) include a grading ring.

Table 4. Protective Characteristics of the UltraSIL Polymer-Housed VariSTAR U3 Surge Arrester

Arrester Rating Ur (kV, rms)	Arrester COV Uc (kV, rms)	Steep Current Residual Voltage (kV Crest)	Lightning Impulse Residual Voltage (kV Crest) 8/20 μ s Current Wave						"Switching Impulse Residual Voltage (kV Crest) 30/60 Current Wave"				Temporary Over Voltage w/Prior Duty (kV)	
			1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	125 A	250 A	500 A	1000 A	1 Second	10 Seconds
3	2.55	8.2	6.5	6.9	7.2	7.8	8.4	9.4	5.7	5.9	6.1	6.3	3.5	3.3
6	5.1	16.3	13	13.7	14.3	15.6	16.8	18.8	11.4	11.7	12.1	12.6	6.9	6.6
9	7.65	24.5	19.5	20.6	21.5	23.3	25.2	28.2	17.1	17.6	18.1	18.8	10.4	9.9
10	8.4	26.9	21.4	22.6	23.6	25.6	27.7	30.9	18.8	19.3	19.9	20.7	11.4	10.8
12	10.2	32.6	26	27.4	28.6	31.1	33.6	37.5	22.8	23.4	24.1	25.1	13.9	13.1
15	12.7	40.6	32.4	34.1	35.6	38.7	41.9	46.7	28.4	29.1	30	31.2	17.2	16.4
18	15.3	48.9	39	41.1	42.9	46.6	50.4	56.3	34.2	35.1	36.2	37.6	20.8	19.7
21	17	54.4	43.3	45.6	47.7	51.7	56	62.5	38	39	40.2	41.8	23.1	21.9
24	19.5	62.4	49.7	52.3	54.7	59.3	64.2	71.7	43.6	44.7	46.1	47.9	26.5	25.1
27	22	70.3	56	59	61.7	66.9	72.5	80.9	49.1	50.4	52	54	29.9	28.4
30	24.4	78	62.1	65.5	68.4	74.2	80.4	89.7	54.5	55.9	57.7	59.9	33.1	31.5
33	27.5	87.9	70	73.8	77.1	83.6	90.6	102	61.4	63	65	67.5	37.3	35.4
36	29	92.7	73.8	77.8	81.3	88.2	95.5	107	64.8	66.4	68.6	71.2	39.4	37.4
39	31.5	101	80.2	84.5	88.3	95.8	104	116	70.3	72.2	74.5	77.3	42.8	40.6
42	34	109	86.6	91.2	95.3	104	112	125	75.9	77.9	80.4	83.5	46.2	43.8
45	36.5	117	92.9	97.9	103	111	121	135	81.5	83.6	86.3	89.6	49.6	47
48	39	125	99.3	105	110	119	129	144	87.1	89.3	92.2	95.7	53	50.3
54	42	135	107	113	118	128	139	155	93.8	96.2	99.3	104	57	54.1
60	48	154	123	129	135	146	159	177	108	110	114	118	65.2	61.9
66	53	170	135	143	149	162	175	195	119	122	126	131	72	68.3
72	57	183	146	153	160	174	188	210	128	131	135	140	77.4	73.5
78	62	199	158	167	174	189	205	228	139	142	147	153	84.2	79.9
84	68	218	174	183	191	207	224	250	152	156	161	167	92.3	87.7
90	72	231	184	194	202	219	238	265	161	165	171	177	97.8	92.8
96	76	243	194	204	214	232	251	280	170	174	180	187	103.2	98
	77	247	196	207	216	235	254	284	172	177	182	189	104.6	99.3
108	84	269	214	226	236	256	277	309	188	193	199	207	114.1	108.3
120	98	314	250	263	275	298	323	361	219	225	232	241	133.1	126.3
132	106	339	270	285	298	323	349	390	237	243	251	261	143.9	136.6
138	111	355	283	298	312	338	366	408	248	255	263	273	150.7	143.1
144	115	368	293	309	323	350	379	423	257	264	272	283	156.2	148.2
150	120	384	306	322	337	365	396	442	268	275	284	295	163	154.7
162	130	416	331	349	365	396	429	478	291	298	308	319	176.5	167.6
168	131	419	334	352	368	399	432	482	293	300	310	322	177.9	168.9
172	140	448	357	376	393	426	461	515	313	321	331	344	190.1	180.5
180	144	461	367	387	404	438	475	530	322	330	341	354	195.6	185.6
192	152	486	387	408	427	463	501	559	340	348	360	373	206.4	195.9
198	160	512	408	430	449	487	527	589	358	367	378	393	217.3	206.2
204	165	528	420	443	463	502	544	607	369	378	390	405	224.1	212.7
216	174	556	443	467	488	529	573	640	389	399	412	427	236.3	224.3
228	180	576	459	483	505	548	593	662	402	413	426	442	244.4	232
240	190	608	484	510	533	578	626	699	424	435	449	467	258	244.9

Dimensions and mounting

Figure 3 illustrates an in-line mounting arrangement; the applicable values of "B" and "C" may be found in Table 5. Line and Earth terminal details are shown on pages 10-11, options 14 and 15. Figure 4 shows an outline drawing of the standard U3 UltraSIL polymer-housed VariSTAR Class 3 arrester. The values for dimensions "A" and "D" for all ratings are listed in Table 5.

**Figure 3. Three-phase in-line mounting.**

Note: Refer to Table 5 for Dimensions B and C.

Table 5. Catalog Numbers, Dimensional Information, and Weights for VariSTAR U3 Surge Arresters¹

Arrester Rating Ur (kV, rms)	Arrester COV Uc (kV, rms)	Standard Arrester Catalog Number	Dim. A (mm)	Dim. D (mm)	Dimension B Minimum Phase-to-Earth Clearance* (mm)	Dimension C Minimum Phase-to-Phase Clearance* (mm)	Housing Leakage Distance (mm)	Arrester Mass (kg)
			Reference Figure 4	Reference Figure 3				
3	2.55	U3AA003002A0845AAA	208		140	254	780	
6	5.1	U3AA006005A1045AAA			143	258	975	5
9	7.65	U3AA009007A1045AAA	247		147	261		
10	8.4	U3AA010008A1045AAA			158	272	1170	
12	10.2	U3AA012010A1245AAA	287		176	290		
15	12.7	U3AA015012A1245AAA	287		198	312	1365	6
18	15.3	U3AA018015A1445AAA	326		218	332		
21	17	U3AA021017A1445AAA	326		239	353	1560	7
24	19.5	U3AA024019A1645AAA	366		260	374		
27	22	U3AA027022A1645AAA	366		287	401	1755	8
30	24.4	U3AA030024A1845AAA			300	415		
33	27.5	U3AA033027A1845AAA	405		322	436	2145	
36	29	U3AA036029A1845AAA			344	458		9
39	31.5	U3AA039031A2245AAA	484		366	480	2340	
42	34	U3AA042034A2245AAA			388	502	2535	10
45	36.5	U3AA045036A2445AAA	523		414	528		
48	39	U3AA048039A2645AAA	563		467	581	2730	
54	42	U3AA054042A2645AAA			510	625	2925	
60	48	U3AA060048A2845AAA	602		546	660	3120	11
66	53	U3AA066053A3045AAA	642		589	704	3900	12
72	57	U3AA072057A3245AAA	681	139	642	756	4290	
78	62	U3AA078062A4045AAA	841		677	791	4485	
84	68	U3AA084068A4445AAA	920		712	826	4680	
90	72	U3AA090072A4645AAA	959		721	835	4875	15
96	76	U3AA096076A4845AAA	998		782	896	5070	
96	77	U3AA096077A5045AAA	1038		905	1019	5460	16
108	84	U3AA108084A5245AAA	1078		1191	1521	5850	17
120	98	U3AA120098A5645AAA	1156		1234	1565	6240	
132	106	U3AA132106A6045AAA	1236		1269	1600		22
138	111	U3AA138111A6445AAA	1314		1313	1643	7605	
144	115	U3AA144115A6445AAA	1314		1401	1731	7800	
150	120	U3AA150120A7845AAA	1593		1410	1740	7995	
162	130	U3AA162130A8045AAA	1632		1488	1819	8190	27
168	131	U3AA168131A8245AAA	1671		1523	1854	8385	
172	140	U3AA172140A8445AAA	1711		1594	1924	8580	28
180	144	U3AA180144A8645AAA	1750		1664	1994	8970	
192	152	U3AA192152A8845AAA	1790		1707	2038	9165	
198	160	U3AA198160A9245AAA	1868		1786	2116	10335	31
204	165	U3AA204165A9445AAA	1908		1839	2169	10725	
216	174	U3AA216174AA645AAA	2146		1926	2257	10920	34
228	180	U3AA228180AB045AAA	2224					35
240	190	U3AA240190AB245AAA	2263					36

Notes:

1. Refer to Figure 3 for illustrations of dimensions B and C and Figure 8 for dimensions A and D.

* Phase-to-Phase clearances are expressed as minimum arrester center-to-center distances. Phase-to-Earth clearances are expressed as minimum arrester centerline-to-ground distances.

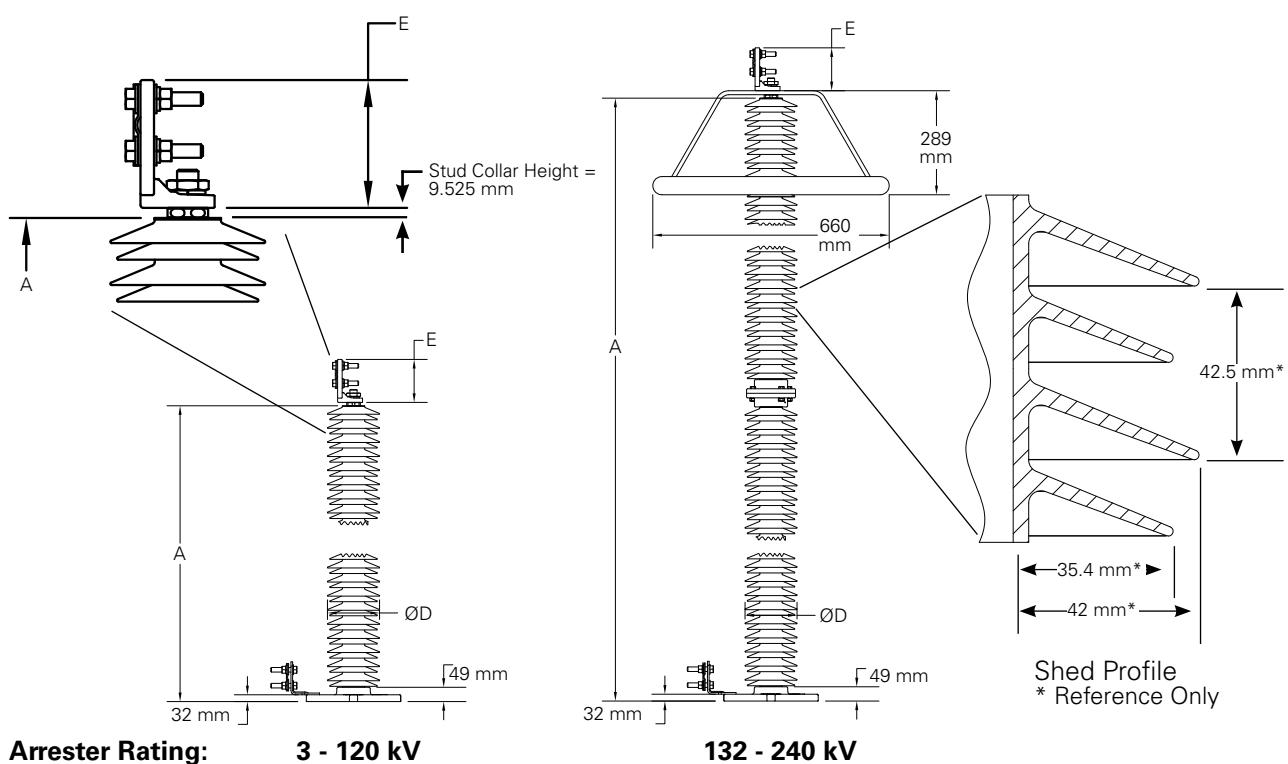


Figure 4. Outline Drawing of Standard UltraSIL Polymer-Housed VariSTAR Type U3 Surge Arresters.

Notes:

Refer to Table 5 for dimensions A. Arresters shown with standard line and earth terminals.

Outlines in Figure 4 and data from Table 5 represent standard arrester catalog numbers. Outline dimensions will vary when optional housing codes are selected. Consult factory for more information.

Refer to Table 6 for dimensions E.

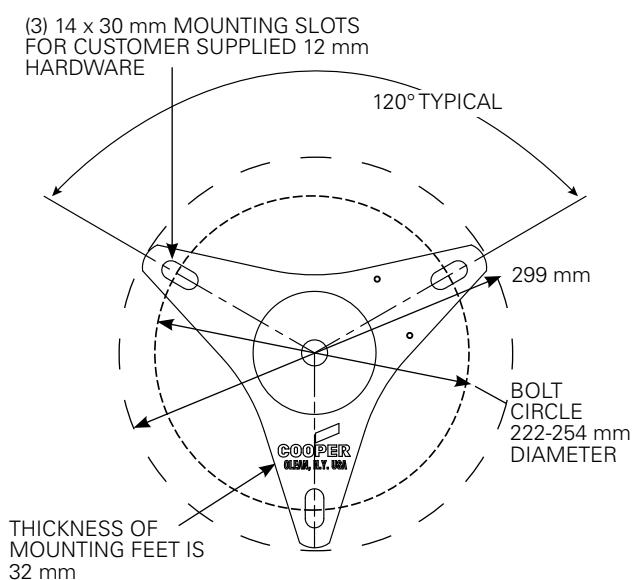


Figure 5. Base mounting.

Terminal option dimensions

Table 6. Terminal Options Dimensions "E"

Catalog Number Digit 14	Description of Line Terminal Option	Dimension (mm)
1	Eyebolt Connector	81
4	NEMA Four-Hole Pad	120
D, H	Cylindrical Stem Connector	156

Note: Refer to Figure 4 for illustration of dimension E.

Isolation bases and surge counters

Table 7. Bases and Counters

Catalog Number	Description of Counters
AM22A1	Counter without Leakage Current Meter
AM22A2	Counter with Leakage Current Meter (0-30 mA)
AM22A3	Counter with Leakage Current Meter (0-50 mA)
AM22A12	AM22A2 with Auxiliary Contact
Description of Bases	
AM23A1	For U2, U3, and U4 arresters rated 120 kV (single section) or below

Table 8. UltraQUIK™ Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters

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

Catalog Number Digits:**1 = "U"** (UltraSIL Housed Arrester)**2 = "3"** (IEC Class 3 Arrester)**3 = "A"** Standard Electrical Build*

* Consult manufacturer for further information regarding alternate electrical builds.

4 = "A" Standard Cantilever Strength Design**5 through 10 = Arrester Rating, U_r (COV, U_c)**

003002 = 3 kV (2.55 kV)	042034 = 42 kV (34.0 kV)	132106 = 132 kV (106 kV)
006005 = 6 kV (5.10 kV)	045036 = 45 kV (36.5 kV)	138111 = 138 kV (111 kV)
009007 = 9 kV (7.65 kV)	048039 = 48 kV (39.0 kV)	144115 = 144 kV (115 kV)
010008 = 10 kV (8.4 kV)	054042 = 54 kV (42.0 kV)	150120 = 150 kV (120 kV)
012010 = 12 kV (10.2 kV)	060048 = 60 kV (48.0 kV)	162130 = 162 kV (130) kV
015012 = 15 kV (12.7 kV)	066053 = 66 kV (53.0 kV)	168131 = 168 kV (131 kV)
018015 = 18 kV (15.3 kV)	072057 = 72 kV (57.0 kV)	172140 = 172 kV (140 kV)
021017 = 21 kV (17.0 kV)	078062 = 78 kV (62.0 kV)	180144 = 180 kV (144 kV)
024019 = 24 kV (19.5 kV)	084068 = 84 kV (68.0 kV)	192152 = 192 kV (152 kV)
027022 = 27 kV (22.0 kV)	090070 = 90 kV (70.0 kV)	198160 = 198 kV (160 kV)
030024 = 30 kV (24.4 kV)	096076 = 96 kV (76.0 kV)	204165 = 204 kV (165 kV)
033027 = 33 kV (27.0 kV)	096077 = 96 kV (77.0 kV)	216174 = 215 kV (174 kV)
036029 = 36 kV (29.0 kV)	108084 = 108 kV (84.0 kV)	228182 = 228 kV (182 kV)
039031 = 39 kV (31.5 kV)	120098 = 120 kV (98.0 kV)	240190 = 240 kV (190 kV)

11 = "A" High Creep UltraSIL Polymer Housing

Table 8. UltraQUIK™ Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (continued)

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

12 and 13 = Housing Code (Select from Table below): O = Standard Housing (31 mm/kV)

Leakage Length (mm)	08	10	12	14	16	18	22	24	26	28	30	32	40	44	46	48	50	52	56	60*	64*	78*	80*	82*	84*	86*	88*	92*	94*	A6*	B0*	B2*
U _r Arrestor Rating (kV rms)	780	975	1171	1365	1560	1755	2145	2340	2535	2730	2925	3120	3900	4290	4485	4680	4875	5070	5460	5850	6240	7605	7800	7995	8190	8385	8580	8970	9165	10335	10725	10920
3	O																															
6		O																														
9		O																														
10		O																														
12			O																													
15			O																													
18				O																												
21					O																											
24						O																										
27							O																									
30								O																								
33									O																							
36									O																							
39										O																						
42										O																						
45											O																					
48												O																				
54												O																				
60												O																				
66													O																			
72													O																			
78														O																		
84															O																	
90																O																
96																	O	O														
108																		O														
120																			O													
132																				O												
138																					O											
144																					O											
150																					O											
162																						O										
168																							O									
172																								O								
180																									O							
192																											O					
198																												O				
204																													O			
216																															O	
228																																O
240																																O

* Arresters equipped with these housing codes ship with a grading ring.

Table 8. Ultraquik Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (continued)

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

14 = Line Terminal Options

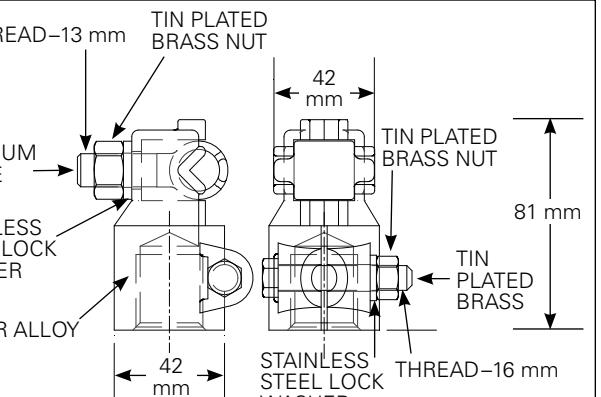
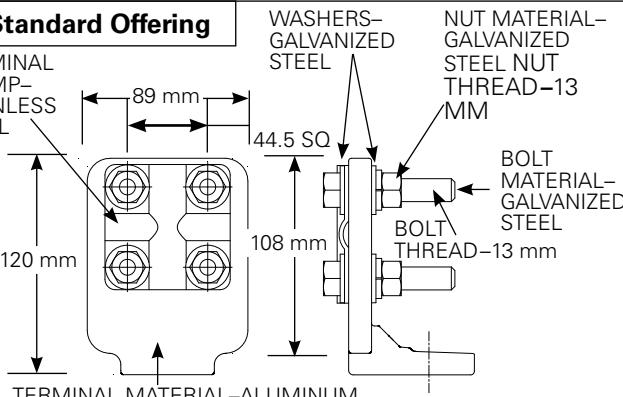
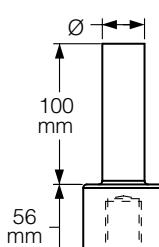
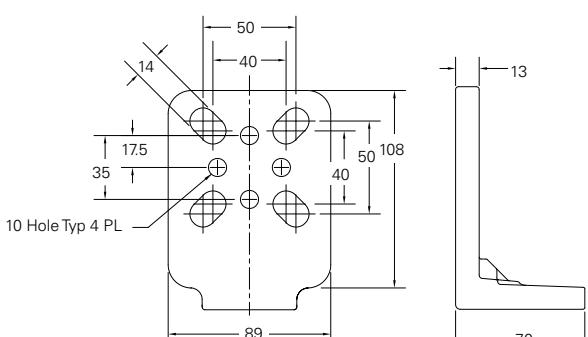
1  <p>1 1 THREAD-13 mm TIN PLATED BRASS NUT ALUMINUM BRONZE STAINLESS STEEL LOCK WASHER COPPER ALLOY 42 mm 81 mm 42 mm TIN PLATED BRASS TIN PLATED BRASS NUT STAINLESS STEEL LOCK WASHER THREAD-16 mm Eyebolt Connector Accepts Copper or Aluminum Conductors from 4 mm dia. (#6) up to 14.6 mm dia. (250 MCM) Ø</p>	4 Standard Offering  <p>4 Standard Offering TERMINAL CLAMP-STAINLESS STEEL WASHERS-GALVANIZED STEEL BOLT MATERIAL-GALVANIZED STEEL NUT MATERIAL-GALVANIZED STEEL NUT THREAD-13 MM BOLT THREAD-13 mm 120 mm 89 mm 44.5 SQ 108 mm TERMINAL MATERIAL-ALUMINUM (Top illustration shows terminal clamp, bottom illustration shows terminal clamp removed)</p>
D or H <p>D = 100 mm X 30 mm Ø Aluminum Cylindrical Stem Connector</p> <p>H = Same as D but with 26 mm Ø</p>  <p>Ø 100 mm 30 mm Ø 56 mm 100 mm</p>	 <p>175 35 14 10 Hole Typ 4 PL 50 40 50 108 40 89 13 70 NEMA® Four-Hole Pad Accepts Conductors 14-29 mm Ø</p>

Table 8. UltraQUIK Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (continued)

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

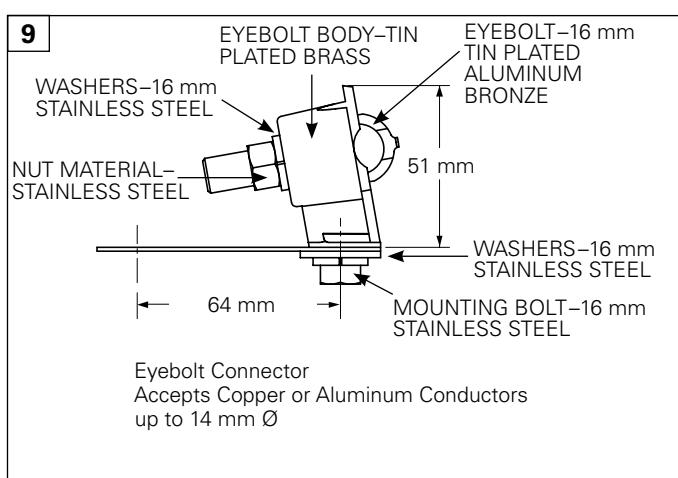
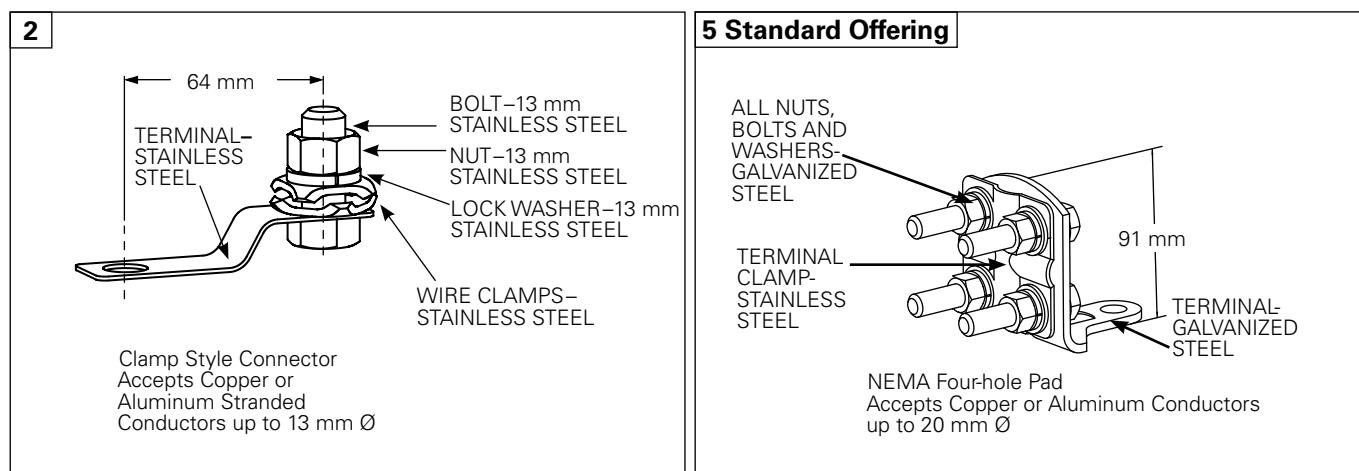
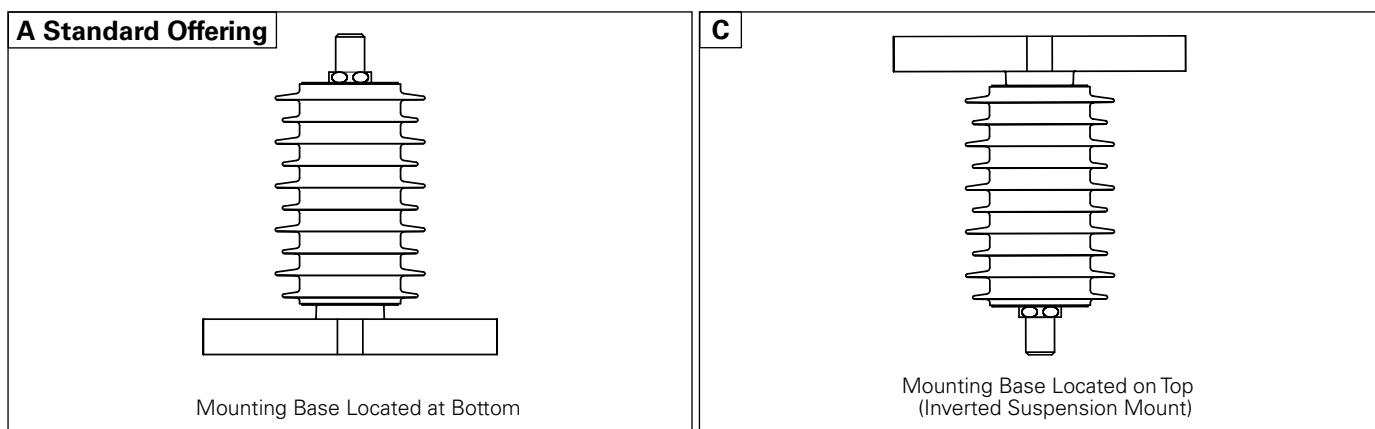
15 = Earth Terminal Options**16 = Mounting Arrangement**

Table 8. UltraQUIK Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (continued)

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

17 = Nameplate Information, See Figures 6 and 7

Nameplate information is per IEC 60099-4 and is available in the following languages.

Specify:

A = English **B** = Spanish **C** = Portuguese

18 = Packaging

Arresters with housing codes 60 or less are shipped complete, ready for installation. Arresters with housing codes greater than 60 are shipped unassembled, requiring assembly during installation.

A = Export packing, cardboard

2 = Export packing, wood crating

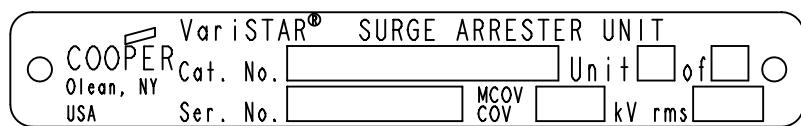
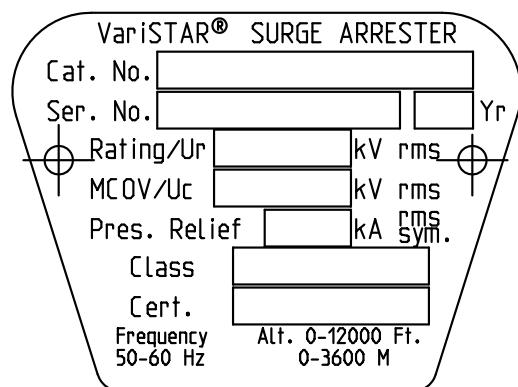


Figure 7. Detail of unit nameplate on arrester base.

Nameplate information

A stainless steel nameplate is attached to the base of every UltraSIL polymer-housed Type U3 arrester. The arrester catalog number, serial number, year of manufacture, Ur, Uc, and pressure relief rating are among the details provided on the nameplate. See Figure 6 for an example of a base nameplate. For multi-unit arresters an additional nameplate is provided on the base as shown in Figure 7.

Figure 6. Arrester base nameplate (English version).

Additional information

IS235-97-1 UltraSIL Polymer-Housed VariSTAR
Type U3/U4 Surge Arrester Installation and
Maintenance Instructions

CP1219 20 kA Class 3 Certified Test Report IEC 60099-4
2009

I235-99 UltraSIL Polymer-Housed VariSTAR Type U4 Surge
Arrester for Systems through 275 kV IEC 20-kA;
Line Discharge Class 3

CP1302 20 kA Class 4 Certified Test Report IEC 60099-4
2009

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Cooper Power Systems Business
2300 Badger Drive
Waukesha, WI 53188
United States
Cooperpower.com

© 2014 Eaton
All Rights Reserved
Printed in USA
Publication No. I235-98

Eaton, Cooper Power Systems, VariSTAR, UltraSIL, and UltraQUIK are valuable trademarks of Eaton in the U.S. and other countries. You are not permitted to use the these trademarks without the prior written consent of Eaton.