COOPER Power Systems

Surge Arresters

UltraSIL Polymer-Housed VariSTAR Type U3 Surge Arrester for Systems through 275 kV IEC 10 kA; Line Discharge Class 3

Electrical Apparatus

I235-93

GENERAL

UltraSIL™ Polymer-Housed VariSTAR™ U3 Surge Arresters offer the latest in metal oxide varistor (MOV) technology for the economical protection of voltage class power and substation equipment. These arresters are gapless and are constructed of a single series column of 63 mm diameter MOV disks. The arrester is designed and tested to the requirements of the International Electrotechnical Commission Standard IEC 60099-4, and is available in ratings suitable for the transient overvoltage protection of electrical equipment on systems through 275 kV.

The UltraSIL Polymer-Housed U3 Surge Arrester incorporates the industry recognized superior polymeric material – Silicone Rubber.

The advantages of polymer-housed arresters – reduced size and weight and enhanced safety – have been refined in this next generation of surge arresters: the UltraSIL Polymer-Housed U3 Surge Arrester from Cooper Power Systems.

TABLE 1
UltraSIL Housed Type U3 Class 3 Ratings and Characteristics

Arrester Characteristic	Rating	
Arrester Voltage Ratings, U_r	3-240 kV	
Rated Discharge Energy	Single Impulse	Double Impulse*
kJ/kV of U_c	5.6	8.5
kJ/kV of U_r	4.5	6.8
System Frequency (Hz)	50/60	
Classifying Current (kA)	10	
High Current Withstand** (kA)	100	
Pressure Relief Rating (kA rms sym.)	63	
Cantilever Strength (Nm)	Ultimate	MPSL (Static)***
	2,300	920

* Double impulse rating assumes a two shot energy discharge within one minute.
** High current, short duration withstand (100 kA, 4/10 µs)
*** MPSL-Maximum permissible service load (static) or maximum working load is 40% of the ultimate.

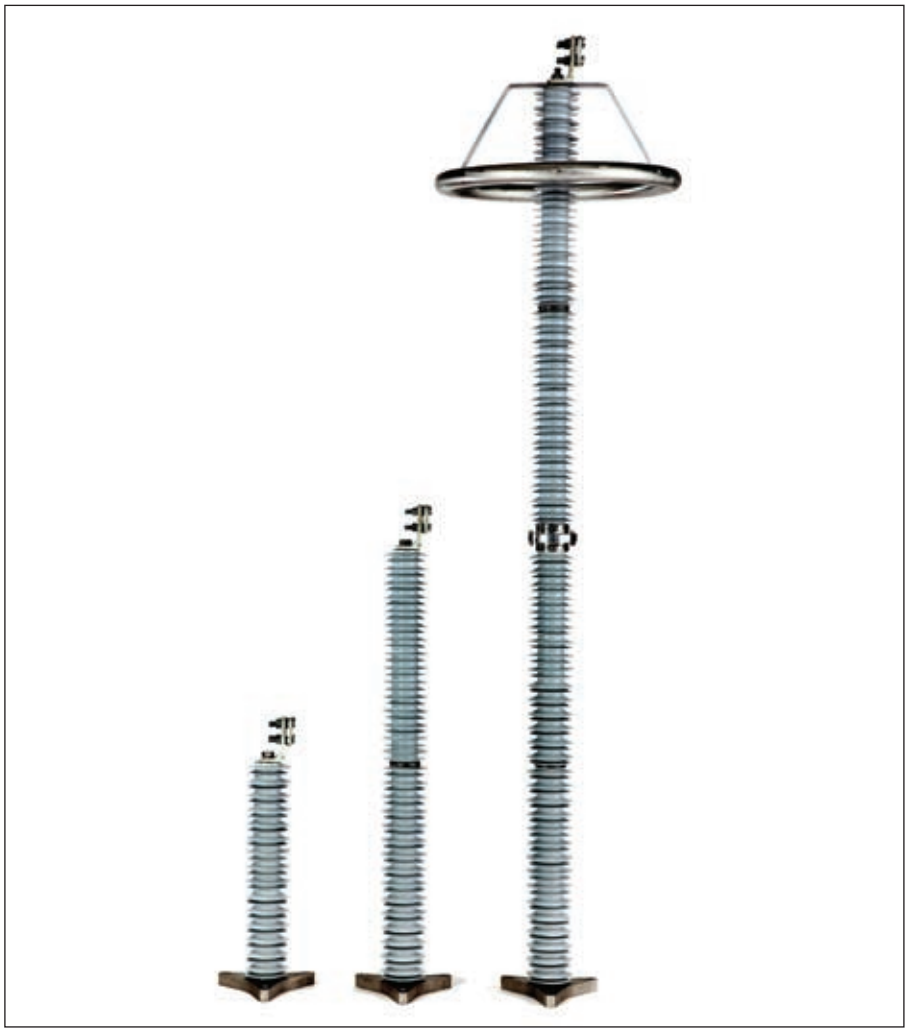


Figure 1.
UltraSIL Polymer-Housed VariSTAR Class 3 Surge Arrester family.

CONSTRUCTION

The unique construction of UltraSIL Polymer-Housed Class 3 Arresters begins with world class Metal Oxide Varistor (MOV) disks produced at our dedicated 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. 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 extreme 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

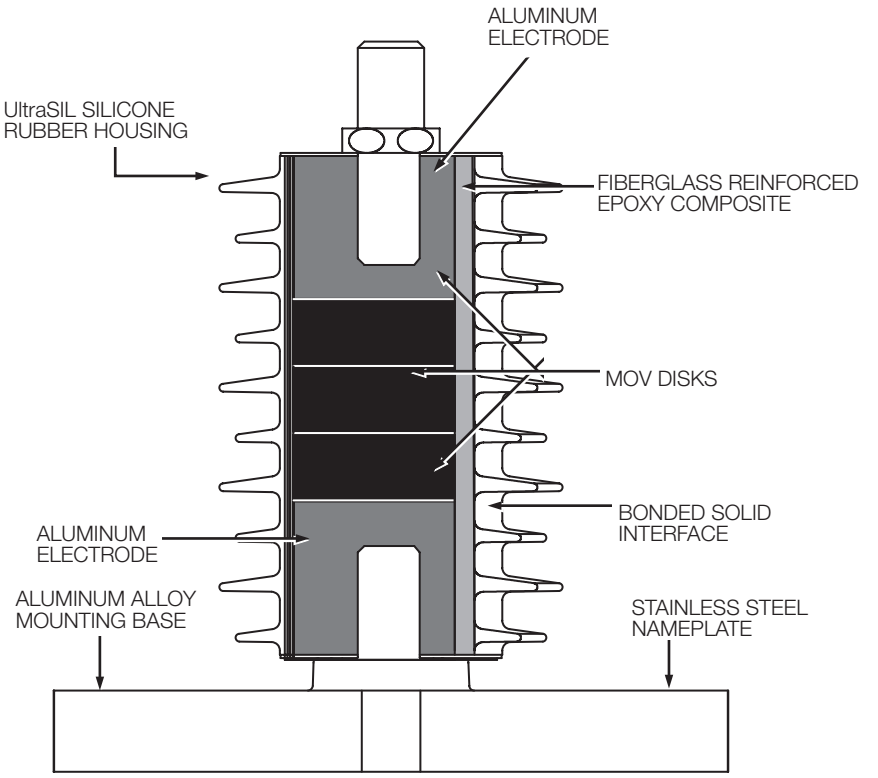


Figure 2.
Cutaway illustration of UltraSIL Housed VariSTAR Class 3 Arrester.

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.

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. Customers who require longer creepage housings can easily select a different housing option through the catalog numbering system. See pages 7-10 for a complete list of available 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.

Pressure relief tests have been conducted in accordance with IEC 60099-4 to demonstrate the UltraSIL 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 and stand up to 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 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 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:

- Physical Inspection
- Residual Voltage Test
- V_{ref} at 6 mA
- Watts Loss at 1.05 x U_C Measured at Ambient Temperature.
- Transmission Line Discharge Energy Test
- Batch High Current, Short Duration
- Batch Thermal Stability Test
- Batch Aging Test

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

- Physical Inspection
- Partial Discharge Test
- Reference Voltage Test
- Watts Loss 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. 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 arrester survival during potential system contingencies 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 3. 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).

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	12-15
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	–

The voltage withstand capability for application on ungrounded systems after IEC high current duty is 1.07 per unit of COV (U_C) for 24 hours. For ungrounded systems, systems utilizing high impedance or resonant grounding and other systems where the line-to-earth 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; Cooper Power Systems engineers are available to make these studies.

Figure 3 also illustrates the arrester's TOV capabilities with and without prior switching surge duties of up to a maximum capability of 5.6 kJ/kV of COV (U_C)-single impulse and 8.5 kJ/kV of COV (U_C)-double impulse.

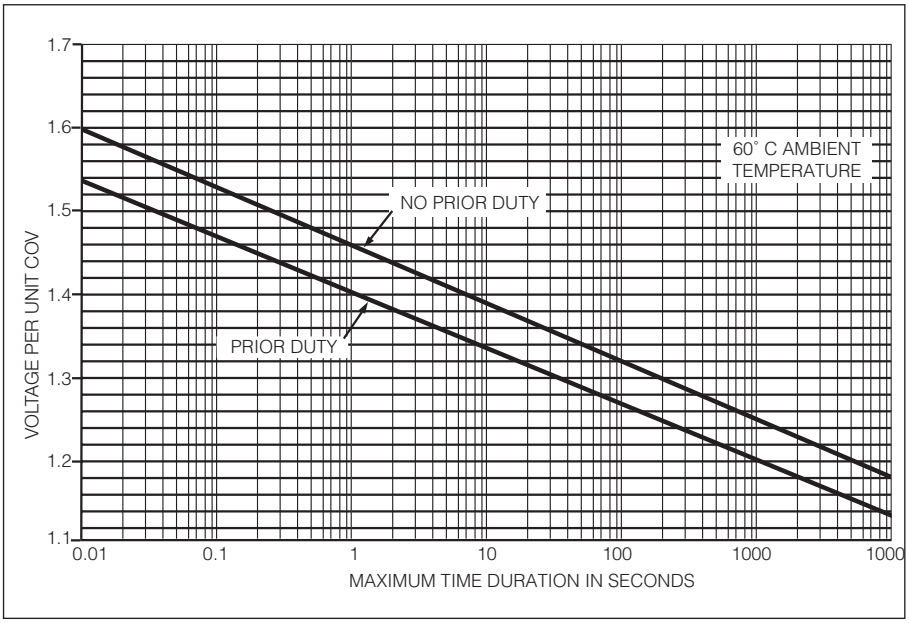


Figure 3.
Temporary Overvoltage Capability of VariSTAR U3 Surge Arresters.

Note: The 24 hour TOV with prior duty is 1.07 per unit of U_C.

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 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 VariSTAR 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 5.6 kJ/kV of U_C-single impulse and 8.5 kJ/kV of U_C-double impulse.

TABLE 3
Insulation Withstand Voltages

Housing Designation	Housing Leakage Distance (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)
8	478	198	130	0	53
10	598	237	149	0	65
12	718	277	171	0	77
14	837	316	193	0	89
16	957	355	214	0	101
18	1076	395	236	0	113
20	1196	434	255	0	121
22	1316	474	279	0	137
24	1435	513	301	0	149
26	1555	553	322	0	161
28	1674	592	344	0	173
30	1794	632	366	0	185
36	2153	787	472	0	226
38	2272	827	491	0	234
40	2392	866	510	0	242
42	2512	906	534	0	258
44	2631	945	558	0	274
46	2751	984	580	0	286
48	2870	1024	602	0	298
50	2990	1063	623	0	310
52	3110	1103	644	0	322
54	3229	1142	666	0	334
56	3349	1182	688	0	346
58	3468	1221	710	0	358
60	3588	1260	732	0	370
62	3708	1182	706	0	350
64	3827	1221	730	0	366
66	3947	1240	754	0	382
68	4066	1279	776	0	394
70	4186	1319	798	0	406
72	4306	1341	821	0	417
74	4425	1381	842	0	429
76	4545	1420	863	0	441
78	4664	1445	890	0	453
80	4784	1485	912	0	465
82	4904	1524	934	0	477
84	5023	1552	957	0	488
86	5143	1591	979	0	500
88	5262	1631	1001	0	512
90	5382	1660	1029	960	521
92	5502	1790	1077	1038	543
94	5621	1829	1099	1059	555
96	5741	1852	1122	1082	566
98	5860	1891	1143	1103	578
A0	5980	1931	1164	1124	590
A2	6100	1970	1185	1145	602
A4	6219	1996	1212	1166	614
A6	6339	2035	1234	1187	626
A8	6458	2074	1256	1208	638
B0	6578	2114	1278	1229	650
B2	6698	2142	1301	1244	661
B4	6817	2181	1323	1265	673
B6	6937	2220	1345	1286	685
B8	7056	2260	1367	1307	697
C0	7176	2289	1395	1314	706

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

Arrester Rating U_r (kV, rms)	Arrester COV U_c (kV, rms)	Steep Current Residual Voltage (kV Crest)	Lightning Impulse Residual Voltage (kV Crest) 8/20 µs Current Wave						Switching Impulse Residual Voltage (kV Crest) 30/60 Current Wave			
			1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	125 A	250 A	500 A	1000 A
3	2.55	8.8	6.7	7.0	7.3	7.9	8.8	10.1	5.9	6.0	6.2	6.4
6	5.10	17.0	13.3	14.0	14.6	15.6	17.3	19.6	11.7	12.0	12.4	12.9
9	7.65	25.3	19.9	21.0	21.8	23.4	25.8	29.1	17.6	18.1	18.6	19.3
10	8.40	27.8	21.9	23.0	23.9	25.7	28.3	31.9	19.4	19.8	20.4	21.2
12	10.2	33.6	26.6	28.0	29.0	31.1	34.3	38.6	23.5	24.1	24.8	25.7
15	12.7	41.8	33.1	34.8	36.2	38.7	42.7	47.9	29.3	30.0	30.9	32.0
18	15.3	50.2	39.9	41.9	43.5	46.6	51.4	57.6	35.3	36.1	37.2	38.5
21	17.0	55.8	44.3	46.6	48.4	51.8	57.0	63.9	39.2	40.2	41.3	42.8
24	19.5	63.9	50.8	53.5	55.5	59.4	65.4	73.2	44.9	46.1	47.4	49.1
27	22.0	72.0	57.3	60.3	62.6	67.0	73.7	82.5	50.7	52.0	53.4	55.4
30	24.4	79.9	63.6	66.9	69.4	74.3	81.8	91.4	56.2	57.6	59.3	61.4
33	27.5	89.9	71.7	75.4	78.2	83.7	92.1	103	63.4	65.0	66.8	69.2
36	29.0	94.8	75.6	79.5	82.5	88.3	97.1	109	66.8	68.5	70.4	73.0
39	31.5	103	82.1	86.3	89.6	95.9	106	118	72.6	74.4	76.5	79.3
42	34.0	112	88.6	93.2	96.7	104	114	127	78.3	80.3	82.6	85.6
45	36.5	119	95.1	100	104	111	122	137	84.1	86.2	88.7	91.9
48	39.0	128	102	107	111	119	131	146	89.9	92.1	94.7	98.2
54	42.0	137	109	115	119	128	141	157	96.8	99.2	102	106
60	48.0	157	125	132	137	146	161	179	111	113	117	121
66	53.0	173	138	145	151	161	178	199	122	125	129	133
72	57.0	187	149	156	162	174	191	213	131	135	138	144
78	62.0	203	162	170	176	189	208	232	143	147	151	156
84	68.0	222	177	186	193	207	228	254	157	161	165	171
90	70.0	229	182	192	199	213	234	262	161	165	170	176
96	76.0	248	198	208	216	231	254	284	175	180	185	191
108	84.0	275	219	230	239	256	281	314	194	198	204	211
120	98.0	319	255	269	279	298	328	366	226	232	238	247
132	106	347	276	290	302	323	355	396	244	250	258	267
138	111	363	289	304	316	338	372	415	256	262	270	280
144	115	376	300	315	327	350	385	430	265	272	279	290
162	130	425	339	356	370	396	435	486	300	307	316	327
168	131	428	341	359	373	399	438	489	302	309	318	330
172	140	457	365	384	398	426	468	523	323	331	340	352
180	144	470	375	395	410	438	482	538	332	340	350	362
192	152	497	396	417	432	463	509	568	350	359	369	383
198	160	523	417	439	455	487	536	598	369	378	389	403
204	165	539	430	452	469	502	552	617	380	390	401	415
216	174	567	453	477	495	529	582	650	401	411	423	438
228	182	594	474	499	518	554	609	680	419	430	442	458
240	190	620	495	521	540	578	636	709	438	449	462	478

Dimensions and Mounting

Figure 4 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 Page 10, options 11 and 12. Figure 8 shows an outline drawing of the standard UltraSIL Polymer-Housed VariSTAR Class 3 Arrester. The values for Dimensions "A" and "D" for all ratings are listed in Table 5.

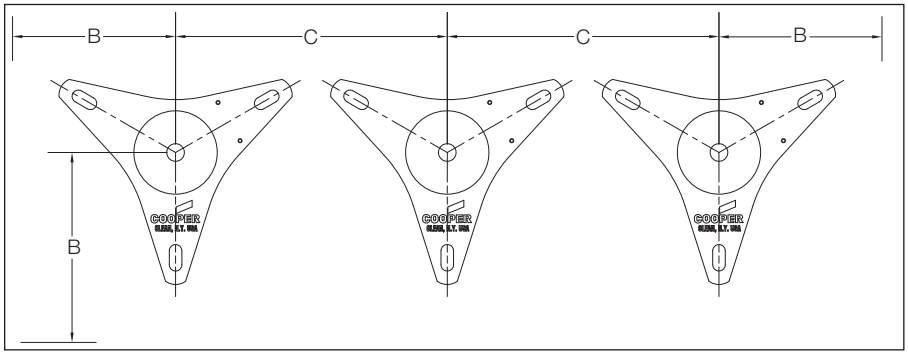


Figure 4.
Three-phase in-line mounting.

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

TABLE 5
Catalog Numbers and Dimensional Information and Weights for VariSTAR U3 Surge Arresters[1]

Arrester Rating U_r (kV, rms)	Arrester COV U_c (kV, rms)	Standard Arrester Catalog Number	Dim. A (mm) (Fig. 8)	Dimension B Minimum Phase-to-Earth Clearance* (mm) (Fig. 4)	Dimension C Minimum Phase-to-Phase Clearance* (mm) (Fig. 4)	Dim. D (mm) (Fig. 8)	Housing Leakage Distance** (mm)	Arrester Mass (kg)
3	2.55	U30030020845AAA	207	95	171	121	478	6.3
6	5.10	U30060051045AAA	246	97	173	121	598	7.1
9	7.65	U30090071045AAA	246	106	183	121	598	7.3
10	8.40	U30100081045AAA	246	110	186	121	598	7.3
12	10.2	U30120101245AAA	285	121	197	121	718	8.1
15	12.7	U30150121445AAA	324	140	216	121	837	8.8
18	15.3	U30180151445AAA	324	163	239	121	837	9.0
21	17.0	U30210171645AAA	364	161	237	121	957	9.5
24	19.5	U30240191845AAA	403	183	259	121	1076	10.3
27	22.0	U30270221845AAA	403	205	282	121	1076	10.5
30	24.4	U30300242045AAA	442	227	303	121	1196	11.3
33	27.5	U30330272245AAA	481	255	331	121	1316	12.0
36	29.0	U30360292245AAA	481	268	345	121	1316	12.0
39	31.5	U30390312245AAA	481	291	367	121	1316	12.2
42	34.0	U30420342445AAA	520	315	391	121	1435	13.0
45	36.5	U30450362645AAA	559	335	411	121	1555	13.7
48	39.0	U30480392645AAA	559	359	435	121	1555	14.0
54	42.0	U30540422845AAA	598	385	462	121	1674	14.7
60	48.0	U30600483045AAA	637	438	515	121	1794	15.7
66	53.0	U30660534045AAA	838	483	559	121	2392	21.6
72	57.0	U30720574445AAA	916	521	597	121	2631	22.9
78	62.0	U30780624845AA1	994	565	641	121	2870	24.6
84	68.0	U30840684845AA1	994	618	694	121	2870	24.8
90	70.0	U30900705045AA1	1033	636	712	121	2990	26.3
96	76.0	U30960765245AA1	1073	689	765	121	3110	26.6
108	84.0	U31080845845AA1	1190	763	839	121	3468	28.8
120	98.0	U31200986045AA1	1229	886	963	121	3588	30.5
132	106	U31321067645AA1	1618	1214	1544	121	4545	40.5
138	111	U31381117845AA1	1657	1258	1589	121	4664	41.4
144	115	U31441157845AA1	1657	1294	1624	121	4664	41.7
162	130	U31621308645AA1	1814	1429	1759	121	5143	44.9
168	131	U31681318645AA1	1814	1438	1768	121	5143	45.1
172	140	U31721408845AA1	1814	1518	1848	121	5143	46.3
180	144	U31801449045AA1	1892	1553	1883	121	5382	47.1
192	152	U3192152A445AA1	2170	1627	1957	121	6219	54.3
198	160	U3198160A845AA1	2249	1697	2027	121	6458	56.0
204	165	U3204165B045AA1	2288	1741	2072	121	6578	57.0
216	174	U3216174B445AA1	2366	1821	2151	121	6817	58.7
228	182	U3228182B645AA1	2405	1895	2225	121	6937	59.7
240	190	U3240190C045AA1	2483	1965	2296	121	7176	61.6

Notes:
1. Refer to Figure 4 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.

** Leakage distances shown are for standard housing – see page 8, digits 9 & 10 for optional housings available.

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
U	3													

Catalog Number Digits:

1 = "U" (UltraSIL Polymer-Housed Arrester)

2 = "3" (IEC Class 3 Arrester)

3 through 8 = Arrester Rating, U_r (COV, U_C)

003002 = 3 kV (2.55 kV)
006005 = 6 kV (5.10 kV)
009007 = 9 kV (7.65 kV)
010008 = 10 kV (8.4 kV)
012010 = 12 kV (10.2 kV)
015012 = 15 kV (12.7 kV)
018015 = 18 kV (15.3 kV)
021017 = 21 kV (17.0 kV)
024019 = 24 kV (19.5 kV)
027022 = 27 kV (22.0 kV)
030024 = 30 kV (24.4 kV)
033027 = 33 kV (27.0 kV)
036029 = 36 kV (29.0 kV)
039031 = 39 kV (31.5 kV)
042034 = 42 kV (34.0 kV)
045036 = 45 kV (36.5 kV)
048039 = 48 kV (39.0 kV)
054042 = 54 kV (42.0 kV)
060048 = 60 kV (48.0 kV)
066053 = 66 kV (53.0 kV)
072057 = 72 kV (57.0 kV)
078062 = 78 kV (62.0 kV)
084068 = 84 kV (68.0 kV)
090070 = 90 kV (70.0 kV)
096076 = 96 kV (76.0 kV)
108084 = 108 kV (84.0 kV)
120098 = 120 kV (98.0 kV)
132106 = 132 kV (106 kV)
138111 = 138 kV (111 kV)
144115 = 144 kV (115 kV)
162130 = 162 kV (130 kV)
168131 = 168 kV (131 kV)
172140 = 172 kV (140 kV)
180144 = 180 kV (144 kV)
192152 = 192 kV (152 kV)
198160 = 198 kV (160 kV)
204165 = 204 kV (165 kV)
216174 = 216 kV (174 kV)
228182 = 228 kV (182 kV)
240190 = 240 kV (190 kV)

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

9 and 10 = Housing Code (Select from Table below): ✶ = Standard Housing
O = Housing Options
+ = Additional Housing Codes Available. Please contact your Cooper Sales Representative for additional information.

U_r Arrester Rating (kV mms)	Digits 9 and 10										
	08	10	12	14	16	18	20	22	24	26	28
	478	598	718	837	957	1076	1196	1316	1435	1555	1674
3	✶										
6		✶	O								
9		✶	O	O							
10		✶	O	O							
12			✶	O	O						
15				✶	O	O					
18				✶	O	O	O				
21					✶	O	O	O			
24						✶	O	O	O		
27						✶	O	O	O	O	
30							✶	O	O	O	O
33								✶	O	O	O
36								✶	O	O	O
39								✶	O	O	O
42									✶	O	O
45										✶	O
48										✶	O
54											✶
60											
66											
72											
78											
84											
90											
96											
108											
120											

Continued on page 9

	Digits 9 and 10														
	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
	3708	3827	3947	4066	4186	4306	4425	4545	4664	4784	4904	5023	5143	5262	5382
90	+	+	+	+	+										
96	+	+	+	+	+										
108		+	+	+	+	+	+	+	+	+	+	+			
120						+	+	+	+	+	+	+	+	+	+
132								✶	O	O	O	O	O	O	O
138									✶	O	O	O	O	O	O
144									✶	O	O	O	O	O	O
162													✶	O	O
168													✶	O	O
172														✶	O
180															✶
192															
198															
204															
216															
228															
240															

Continued on page 9

Notes:
For U_r = 162 kV through 198 kV, Consult factory for housing codes above C0, Maximum available E0 (7592 mm creep),
For U_r = 204 kV through 240 kV, Consult factory for housing codes above C0, Maximum available H2 (9327 mm creep).

Continued from page 8

U_r Arrester Rating (kV mms)	Digits 9 and 10													
	30	36	38	40	42	44	46	48	50	52	54	56	58	60
	1794	2153	2272	2392	2512	2631	2751	2870	2990	3110	3229	3349	3468	3588
3														
6														
9														
10														
12														
15														
18														
21														
24														
27														
30														
33	O													
36	O													
39	O													
42	O													
45	O													
48	O													
54	O	+	+	+	+									
60	✶			+	+									
66				✶	O									
72						✶	O	O	O	O	O			
78								✶	O	O	O	O	O	
84								✶	O	O	O	O	O	
90									✶	O	O	O	O	O
96										✶	O	O	O	O
108													✶	O
120														✶

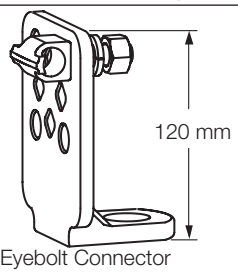
	Digits 9 and 10														
	92	94	96	98	A0	A2	A4	A6	A8	B0	B2	B4	B6	B8	C0
	5502	5621	5741	5860	5980	6100	6219	6339	6458	6578	6698	6817	6937	7056	7176
90															
96															
108															
120	+	+	+	+											
132	+	+	+	+											
138	+	+	+	+											
144	+	+	+	+											
162			+	+	+	+	+	+	+	+	+	+	+	+	+
168			+	+	+	+	+	+	+	+	+	+	+	+	+
172			+	+	+	+	+	+	+	+	+	+	+	+	+
180						+	+	+	+	+	+	+	+	+	+
192							✶	O	O	O	O	O	O	O	O
198									✶	O	O	O	O	O	O
204										✶	O	O	O	O	O
216												✶	O	O	O
228													✶	O	O
240															✶

Notes:
For U_r = 162 kV through 198 kV, Consult factory for housing codes above C0, Maximum Housing code available E2 (7700 mm creep),
For U_r = 204 kV through 240 kV, Consult factory for housing codes above C0, Maximum Housing code available H2 (9300 mm creep).

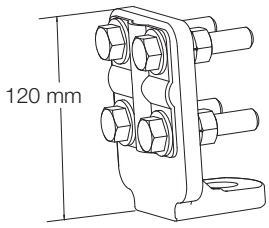
UltraQUIK™ Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (Continued)

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

11 = Line Terminal Options



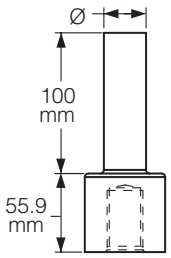
1 = Eyebolt Connector
Accepts Copper or Aluminum Conductors up to 14 mm Ø



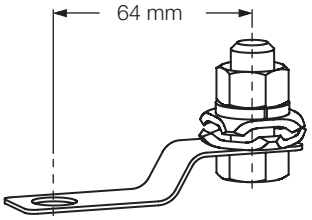
4 = NEMA Four-hole Pad
Accepts Copper or Aluminum Conductors up to 29 mm Ø **(Standard)**

D =
100 mm X 30 mm Ø Aluminum Cylindrical Stem Connector

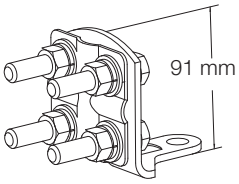
H =
Same as D but with 26 mm Ø



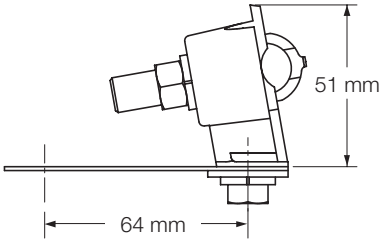
12 = Earth Terminal Options



2 = Clamp Style Connector
Accepts Copper or Aluminum Stranded Conductors up to 13 mm Ø

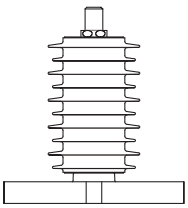


5 = NEMA Four-hole Pad
Accepts Copper or Aluminum Conductors up to 20 mm Ø **(Standard)**

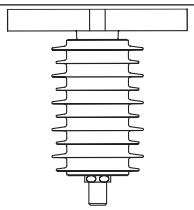


9 = Eyebolt Connector
Accepts Copper or Aluminum Conductors up to 14 mm Ø

13 = Mounting Arrangement



A = Mounting Base Located at Bottom **(Standard)**



C = Mounting Base Located on Top (Inverted Suspension Mount)

14 = 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

15 = 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, individually packed in cartons – Housings 06 through 46.
1 = Export packing, individually packed in cartons – Housings 48 and higher.

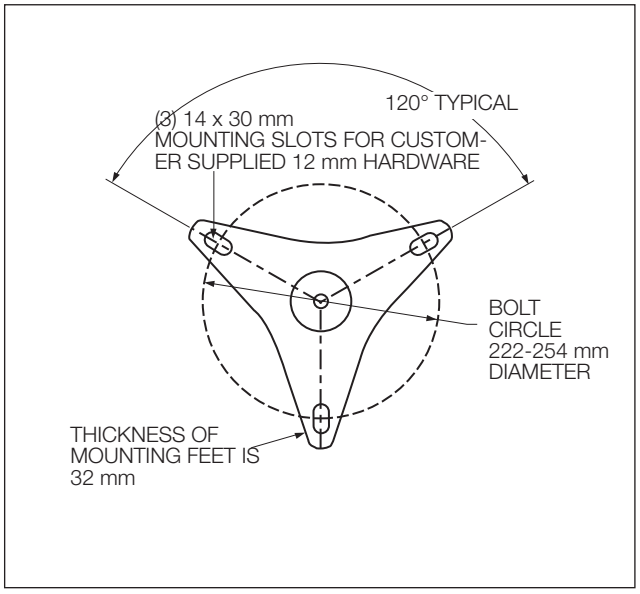


Figure 5.
Base mounting.

ADDITIONAL INFORMATION

TABLE 6
Product Literature

CP0409	Certified Test Report
IS235-96-1	Service and Installation Instructions

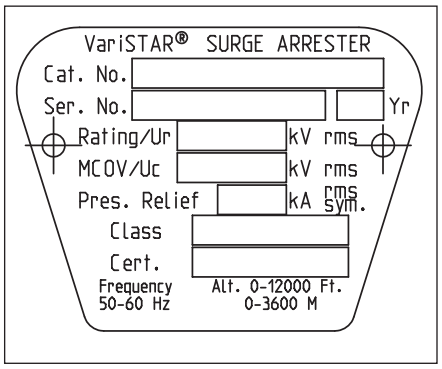


Figure 6.
Arrester base nameplate (English version).

NAMEPLATE INFORMATION

A stainless steel nameplate is attached to the base of every UltraSIL Housed Type U3 Arrester. The arrester catalog number, serial number, year of manufacture, U_r, U_C, 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 with housing codes greater than 60, an additional nameplate is provided on the base as shown in Figure 7.

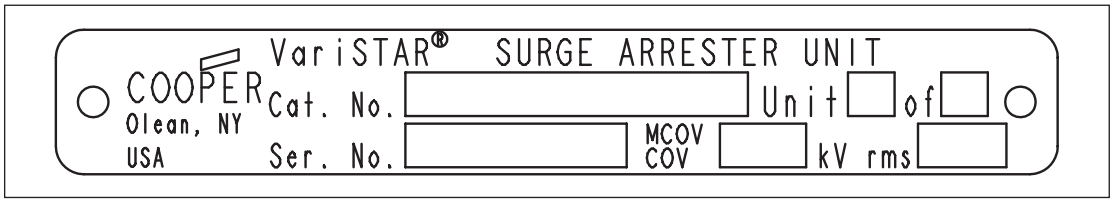


Figure 7.
Detail of unit nameplate on arrester base.

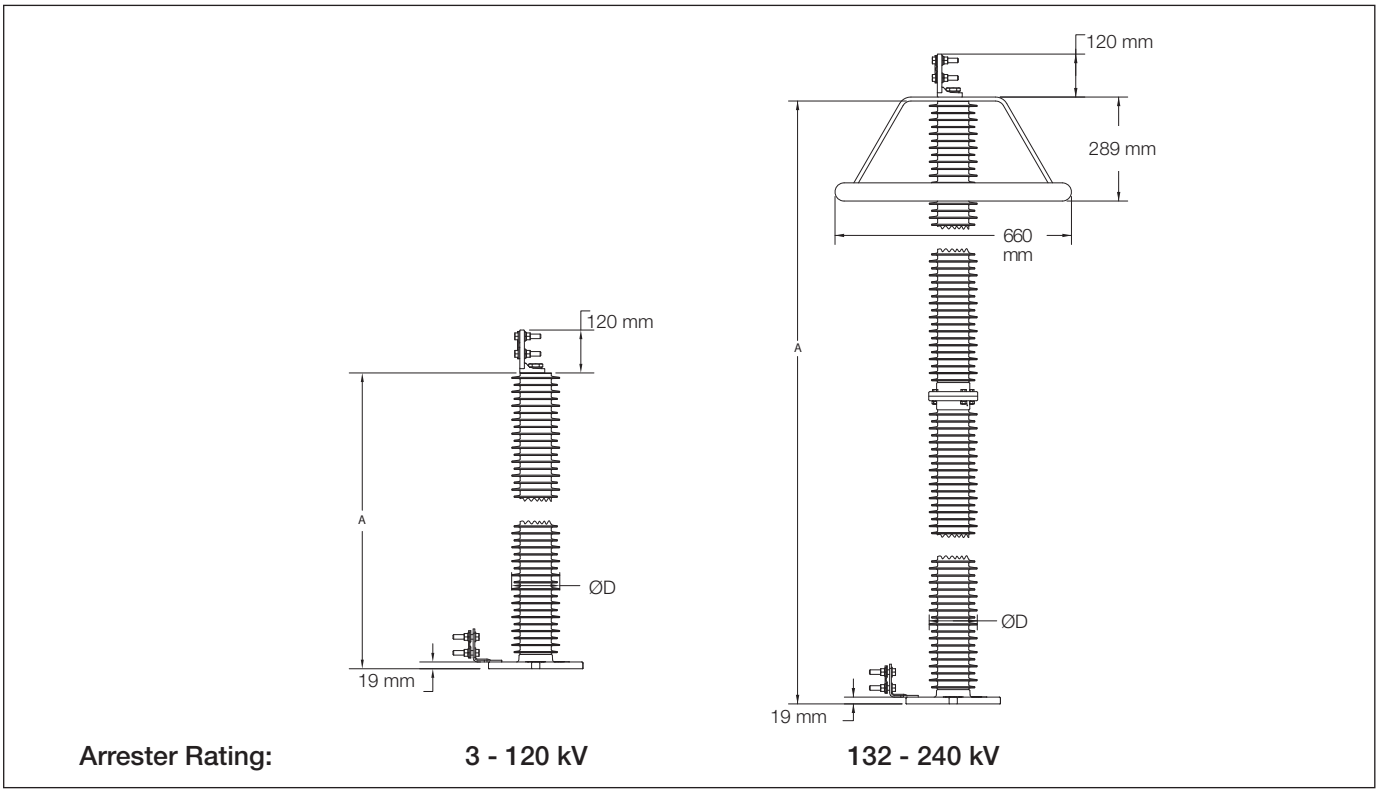


Figure 8.
Outline drawing of Standard VariSTAR UltraSIL Polymer-Housed Type U3 Surge Arresters.

Notes:
Refer to Table 5 for dimensions A and D. Arresters shown with standard line terminal, Option 4 in digit 11 and with standard earth terminal Option 5 in digit 12.
Outlines in Figure 8 represent standard arrester catalog numbers from Table 5. Outline dimensions will vary when optional housing codes are selected from page 8. Consult factory for more information.

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