

# Surge Arresters

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

Electrical Apparatus  
**1235-98**

## GENERAL

Cooper Power Systems has set a new standard of excellence for polymer-housed station-class surge arresters. Enhancements in arrester design allow 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.

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

**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 $U_c$	6.2	9
	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 $\mu$ s (kA)	100		
Short-Circuit/Pressure Relief Rating (kA rms sym.)	65		
Cantilever Strength (Nm)	Ultimate	SLL**	SSL***
	2300	920	1150
Ambient Temperature (°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



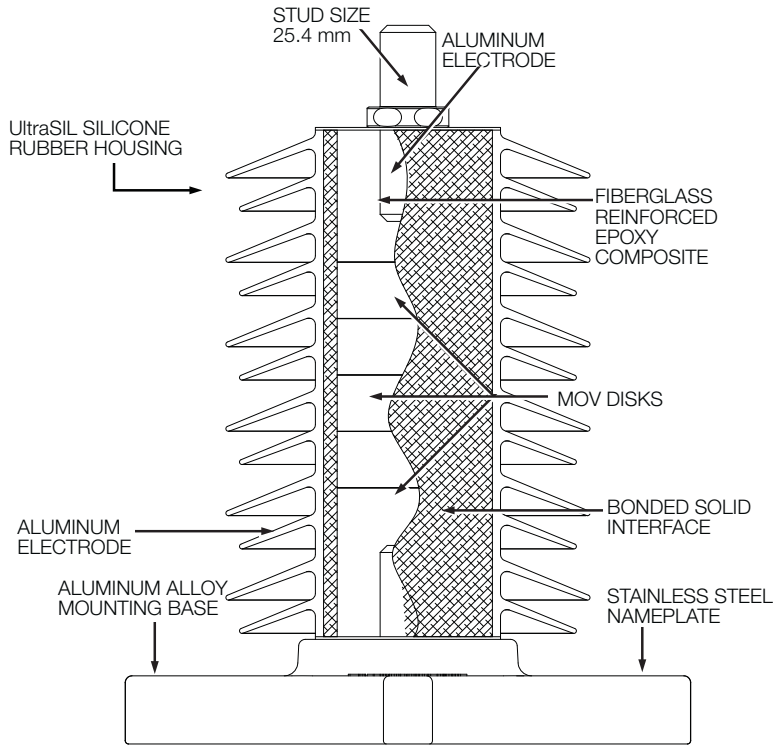
**Figure 1.**  
**UltraSIL Polymer-Housed VariSTAR Class 3 Surge Arrester family.**

## CONSTRUCTION

The unique construction of UltraSIL Polymer-Housed Class 3 Arresters begins with world class Metal Oxide Varistor (MOV) disks produced at our 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 high electrical and cantilever load conditions.



**Figure 2.**  
Cutaway illustration of a 10 kV UltraSIL Polymer-Housed VariSTAR Class 3 Arrester.

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.

## 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 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.

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 600994 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:

- 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. 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.

**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	—

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 ( $U_c$ ).

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 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 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 grounded through transformers, or ungrounded.

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

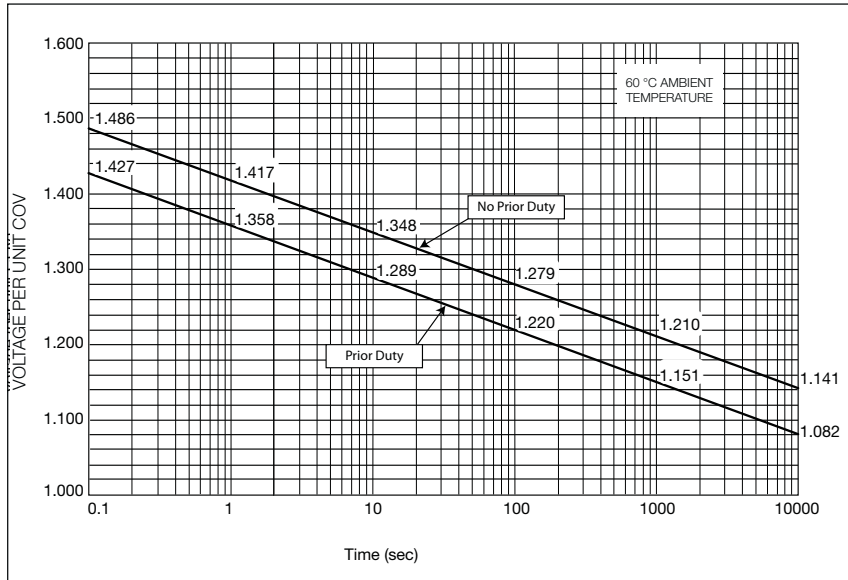
information is required:

- 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 6.2 kJ/kV of  $U_c$ -single impulse and 9 kJ/kV of  $U_c$ -double impulse.



**Figure 3.** 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 3 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

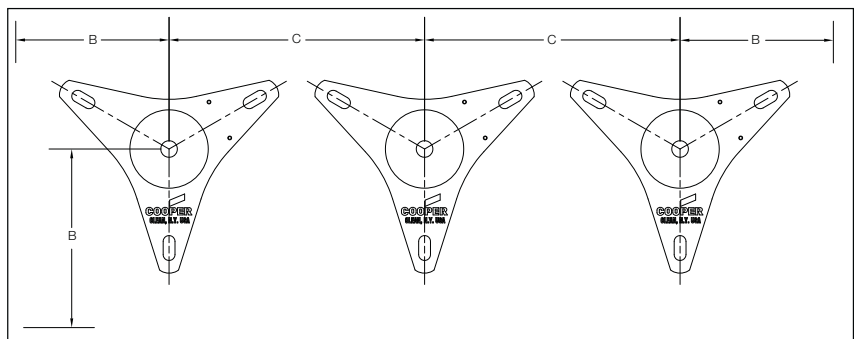
Housing Designation	Housing Leakage Distance -Creep (mm)	Strike (mm)	Insulation Withstand Voltages			
			BIL 1.2/50 $\mu$ s dry Impulse (kV, Pk)	Switching Surge Impulse, 250/2500 $\mu$ s (kV, crest)	WET 50/60 Hz 60 Sec (kV, rms)	DRY 50/60 Hz 60 Sec (kV, rms)
8	780	200	119	N/A	62	77
10	975	240	137		71	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
60	5850	1268	680		394	460
64	6240	1344	722		416	492
78	7605	1668	894		516	603
80	7800	1706	915		528	617
82	7995	1744	936		540	631
84	8190	1784	957		553	646
86	8385	1822	978		564	662
88	8580	1862	999		577	677
92	8970	1938	1041		600	707
94	9165	1978	1062		613	722
A6	10335	2262	1213		700	818
B0	10725	2338	1255		724	846
B2	10920	2376	1276	736	860	

**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 μs 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 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 pages 10-11, options 14 and 15. Figure 5 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 4.**  
Three-phase in-line mounting.

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

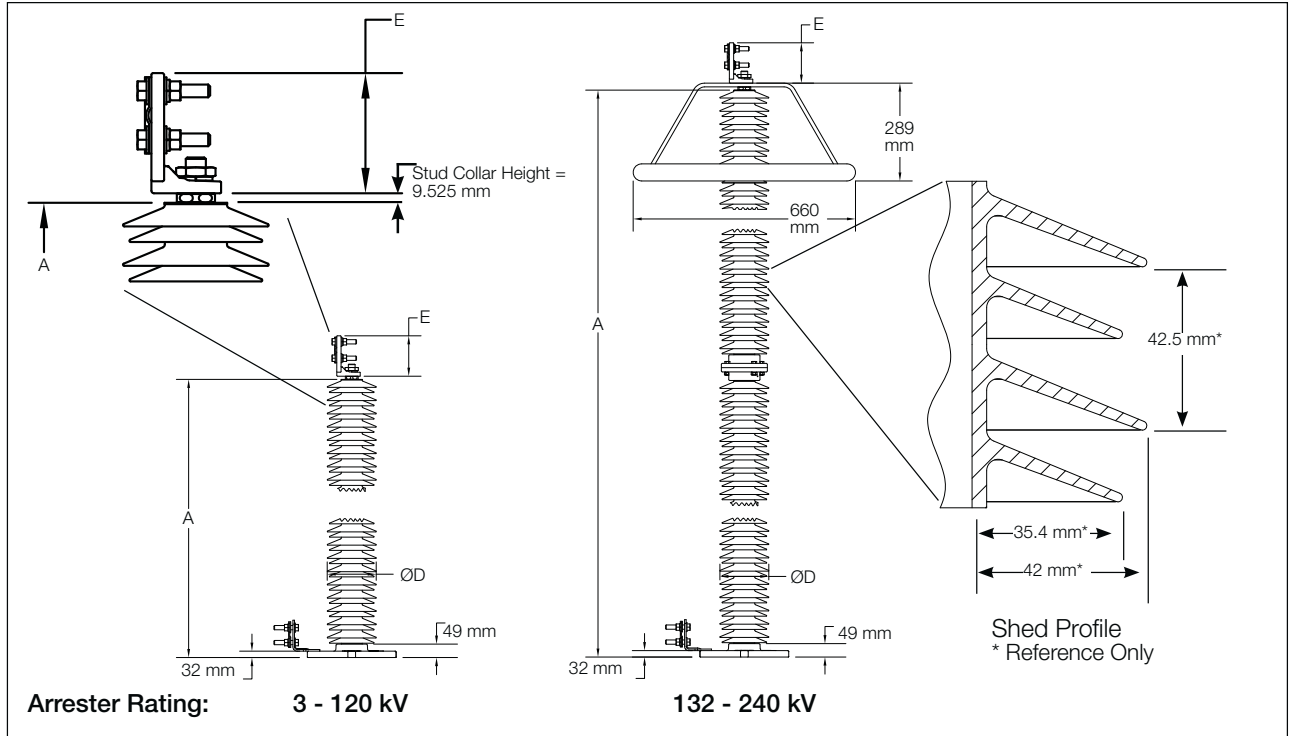
**TABLE 5**  
**Catalog Numbers and Dimensional Information and Weights for VariSTAR U3 Surge Arresters<sup>1</sup>**

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)	Grading Ring Diameter (mm)	Number of Sections
			Reference Figure 5		Reference Figure 4					
3	2.55	U3AA003002A0845AAA	208	139	140	254	780	7	-	1
6	5.1	U3AA006005A1045AAA	247		143	258	975			
9	7.65	U3AA009007A1045AAA			147	261				
10	8.4	U3AA010008A1045AAA			287	158		272		
12	10.2	U3AA012010A1245AAA	176			290	1365			
15	12.7	U3AA015012A1245AAA	326			198		312		
18	15.3	U3AA018015A1445AAA			218	332		1560		
21	17	U3AA021017A1445AAA			366	239	353			
24	19.5	U3AA024019A1645AAA	405			260	374			
27	22	U3AA027022A1645AAA				287	401	2145		
30	24.4	U3AA030024A1845AAA			484	300	415			
33	27.5	U3AA033027A1845AAA	322			436	2340			
36	29	U3AA036029A1845AAA	523			344		458		
39	31.5	U3AA039031A2245AAA			366	480		2535		
42	34	U3AA042034A2245AAA			563	388	502			
45	36.5	U3AA045036A2445AAA	414			528	2730			
48	39	U3AA048039A2645AAA	602			467		581		
54	42	U3AA054042A2645AAA			510	625		2925		
60	48	U3AA060048A2845AAA			546	660	3120			
66	53	U3AA066053A3045AAA	589		704	3900				
72	57	U3AA072057A3245AAA	642		756			4290		
78	62	U3AA078062A4045AAA	677		791		4485			
84	68	U3AA084068A4445AAA	712		826	4680				
90	72	U3AA090072A4645AAA	721		835			4875		
96	76	U3AA096076A4845AAA	782	896	5070					
	77	U3AA096077A5045AAA	905	1019		5460				
108	84	U3AA108084A5245AAA	1191	1521			5850			
120	98	U3AA120098A5645AAA	1234	1565	6240					
132	106	U3AA132106A6045AAA	1269	1600		6240				
138	111	U3AA138111A6445AAA	1313	1643			7605			
144	115	U3AA144115A6445AAA	1401	1731	7800					
150	120	U3AA150120A7845AAA	1410	1740		7995				
162	130	U3AA162130A8045AAA	1488	1819			8190			
168	131	U3AA168131A8245AAA	1523	1854	8385					
172	140	U3AA172140A8445AAA	1594	1924		8580				
180	144	U3AA180144A8645AAA	1664	1994			8970			
192	152	U3AA192152A8845AAA	1707	2038	9165					
198	160	U3AA198160A9245AAA	1786	2116		10335				
204	165	U3AA204165A9445AAA	1839	2170			10725			
216	174	U3AA216174AA645AAA	1926	2257	10920					
228	180	U3AA228180AB045AAA								
240	190	U3AA240190AB245AAA								

**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.



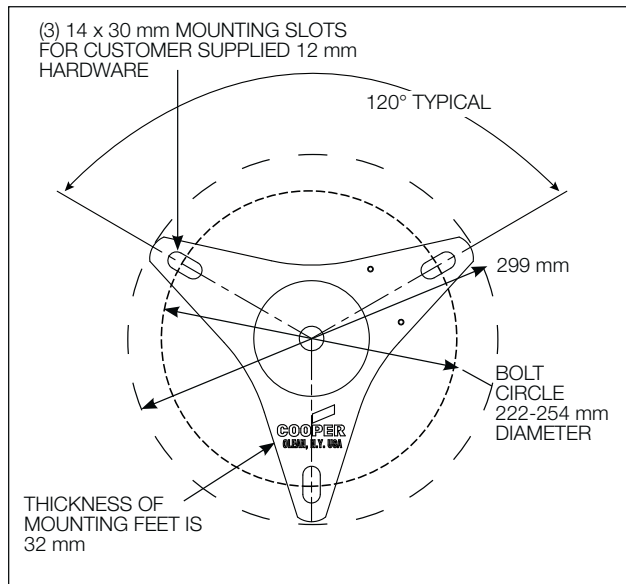
**Figure 5.**  
Outline Drawing of Standard UltraSIL Polymer-Housed VariSTAR Type U3 Surge Arresters.

**Notes:**

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

Outlines in Figure 5 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 6.**  
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 5 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
<b>Description of Bases</b>	
AM23A1	For UI, US, UH, U2, U3, and U4 arresters and AZE-AZG arresters rated 120 kV (single section) or below

**TABLE 8**  
**UltraQUIK™ Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters**

1	U	2	3	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,  $U_c$ )

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

**11 = "A"** Standard High Creep Silicone Rubber Housing



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

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)

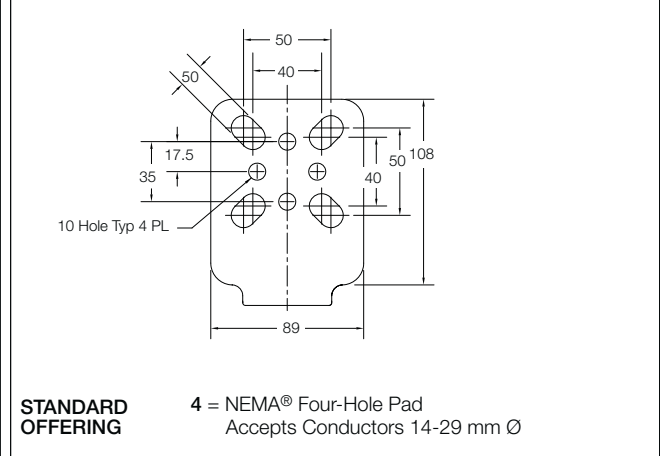
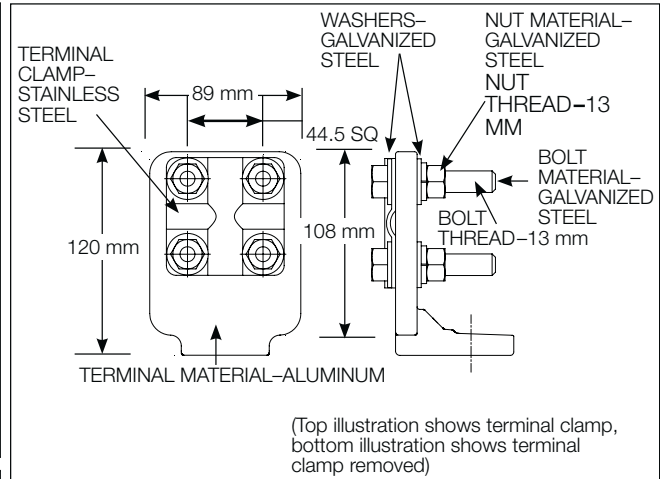
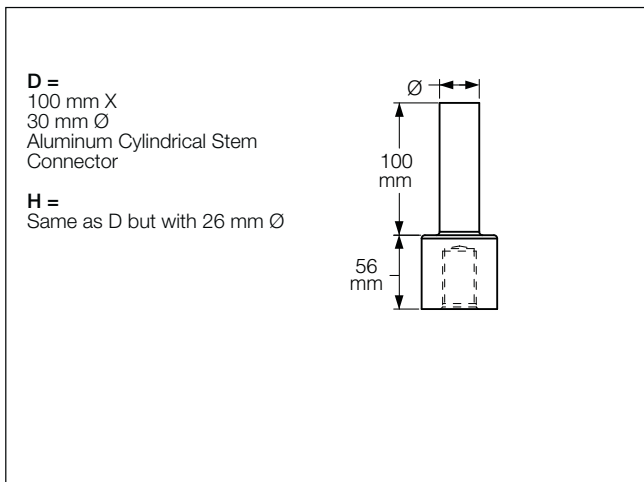
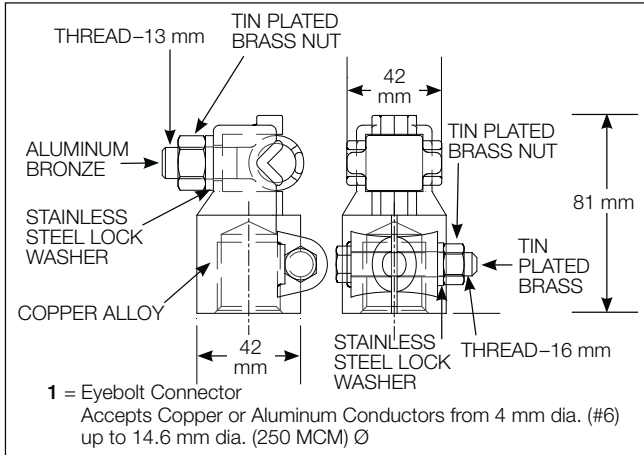
Leakage Length (mm) / U <sub>r</sub> Arrester Rating (kV rms)	08	10	12	14	16	18	22	24	26	28	30	32	40	44	46	48	50	52	56	60*	64*	78*	80*	82*	84*	86*	88*	92*	94*	A6*	B0*	B2*				
	780	975	1171	1365	1560	1755	2145	2340	2535	2730	2925	3120	3900	4290	4485	4680	4875	5070	5460	5850	6240	7605	7800	7995	8190	8385	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 (continued)**  
**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
---	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----

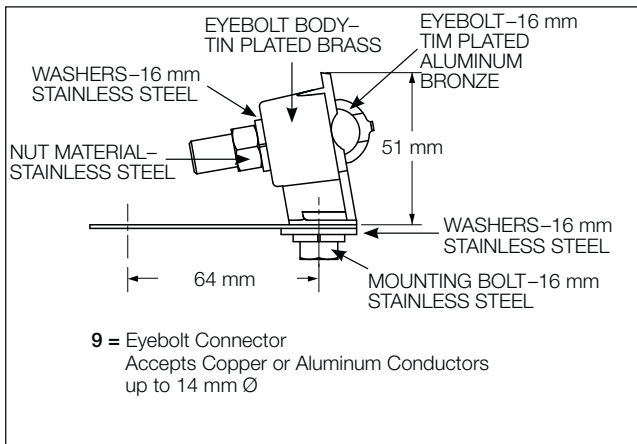
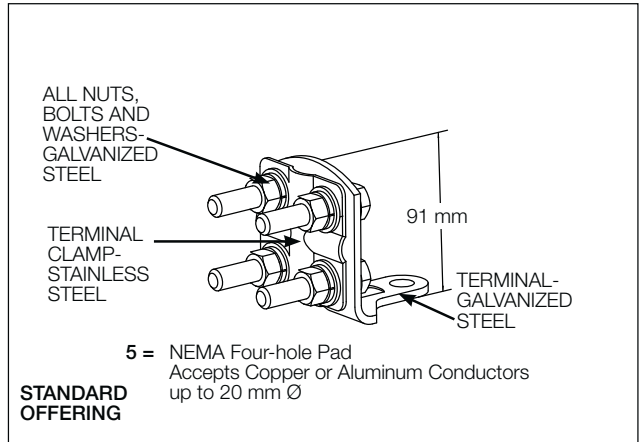
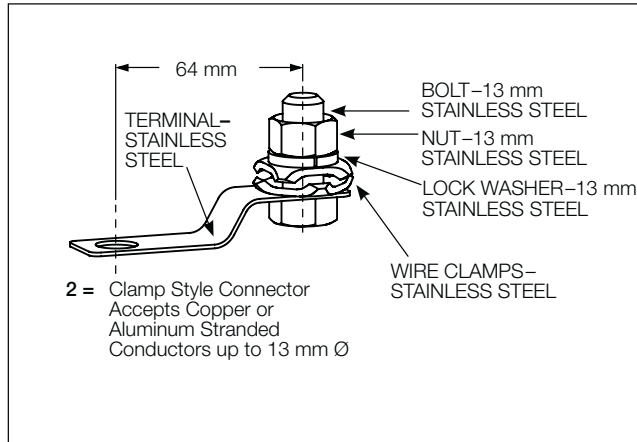
**14 = Line Terminal Options**



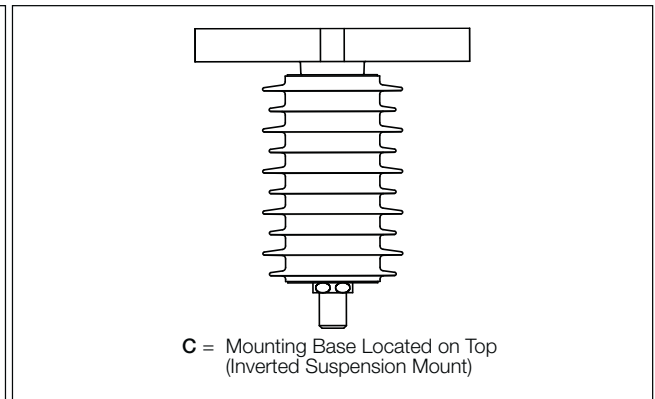
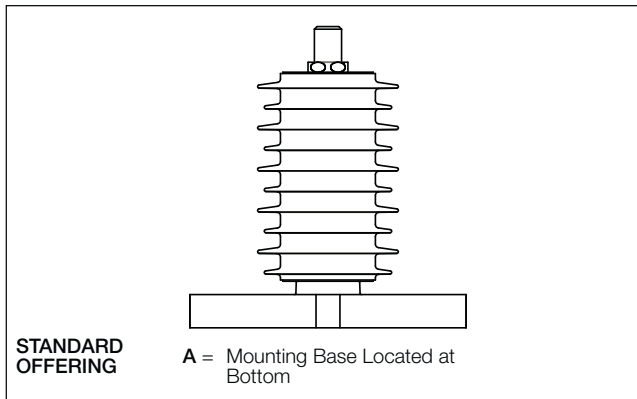
**TABLE 8 (continued)**  
**UltraQUIK Catalog Numbering System for UltraSIL Polymer-Housed VariSTAR Class 3 Arresters (Continued)**

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 (continued)**  
**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
---	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----

**17 = Nameplate Information, See Figures 7 and 8**

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

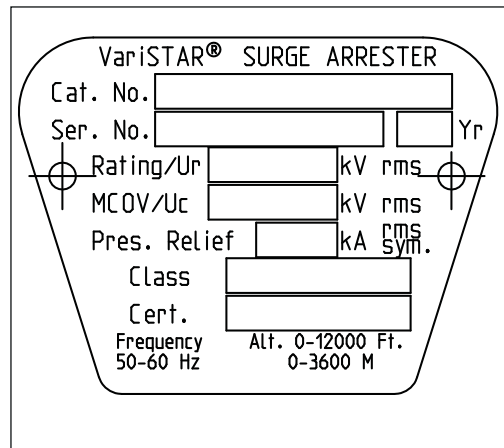
Specify:

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

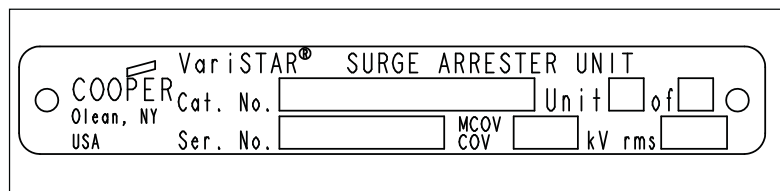
**18 = Packaging**

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.**  
**Arrester base nameplate (English version).**



**Figure 8.**  
**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,  $U_r$ ,  $U_c$ , and pressure relief rating are among the details provided on the nameplate. See Figure 7 for an example of a base nameplate. For multi-unit arresters an additional nameplate is provided on the base as shown in Figure 8.

**ADDITIONAL INFORMATION**

- IS235-97-1 UltraSIL Polymer-Housed VariSTAR Type U3 Surge Arrester Installation and Maintenance Instructions
- CP1219 10 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 10-kVA; Line Discharge Class 3