

UltraSIL™ polymer-housed VariSTAR™ U3AF and U4LG high-strength station-class surge arresters



Powering Business Worldwide

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General

Eaton has set a new standard of excellence for polymer-housed station-class surge arresters. Eaton's composite design provides tremendous mechanical stability with increased cantilever strength in ratings up to 420 KV for grounded neutral circuits. Eaton's Cooper Power™ series UltraSIL™ polymer-housed VariSTAR™ U3AF and U4LG high-strength station-class surge 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 creepage distance for high pollution environments. This housing is molded over a high strength composite hollow tube which encloses the Eaton MOV disks. This unique design provides the highest quality protection with ultra-high cantilever strength and directional venting for the ultimate in substation arrester performance.

Eaton's U3AF and U4LG high-strength arresters meet or exceed the requirements of IEC 60099-4™-2014 standard.

Construction

The unique construction of UltraSIL polymer housed high-strength U3AF and U4LG arresters begin with Eaton world class Metal Oxide Varistor (MOV) disks. Manufacturing our own MOV disks results in strict quality control over the entire production process, from initial raw material selection to final physical inspection and electrical testing of each disk and arrester. In addition, by controlling the manufacturing process of both disks and arresters, we achieve an optimal design and superior quality. Eaton 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 characteristics.

The high-strength station arresters obtain their high strength and stability from a reinforced tube that is bonded to the aluminium cast end fittings and overmolded with Eaton's UltraSIL silicone rubber housing for a void free water tight bond. This produces a high dielectric strength assembly and trouble free service.

The final assembly is subject to extensive testing that meets or exceeds applicable IEC standards.

Features

The UltraSIL silicone rubber housing material was selected for its superior insulation performance as compared to other polymeric housing materials. Long term environmental testing has verified the performance advantages that silicone rubber provides.



Independent laboratory tests have verified the superior water repelling behavior of silicone rubber, which is responsible for lower external losses when wet, higher resistance to UV degradation and surface tracking, superior performance in contaminated environments, and other important insulating properties. Also the UltraSIL silicone rubber does not support biological growth and is flame retardant.

The arrester's aluminum line side casting provides for a NEMA 4-hold pad for connection flexibility for your application. In addition, these end-castings are designed with built in directional venting to protect your valuable substation assets in the unlikely event of an arrester failure end of life event.

Operation

The operation of the U3AF and U4LG high-strength arresters are typical of gapless metal oxide arresters. During steady-state conditions, line-to-ground voltage is applied continuously between the line and ground terminals of the arrester. When overvoltages occur, the arrester immediately limits, or clamps, the overvoltage condition by conducting the surge current to ground. After passage of the surge, the arrester returns to its initial state, conducting minimal leakage current.

U3AF and U4LG high-strength arresters have been tested to a pressure relief rating of 63 kA. Upon high fault current conditions the VariSTAR U3AF and U4LG arrester designs are produced with an integral pressure venting system which will rapidly relieve internal pressure and transfer the internal arc to the outside of the arrester silicone rubber housing through vent ports in the end castings.

When called upon to operate, this integral pressure relief system vents internal pressures in fractions of a cycle without expelling internal parts. In addition, the directional venting feature of these arresters allows the internal pressures to be vented away from valuable substation assets.

U3AF and U4LG high-strength arresters provide reliable protection for substation equipment, capacitor banks, multiple lines, and cable circuits. They are also provide unsurpassed lightning protection.

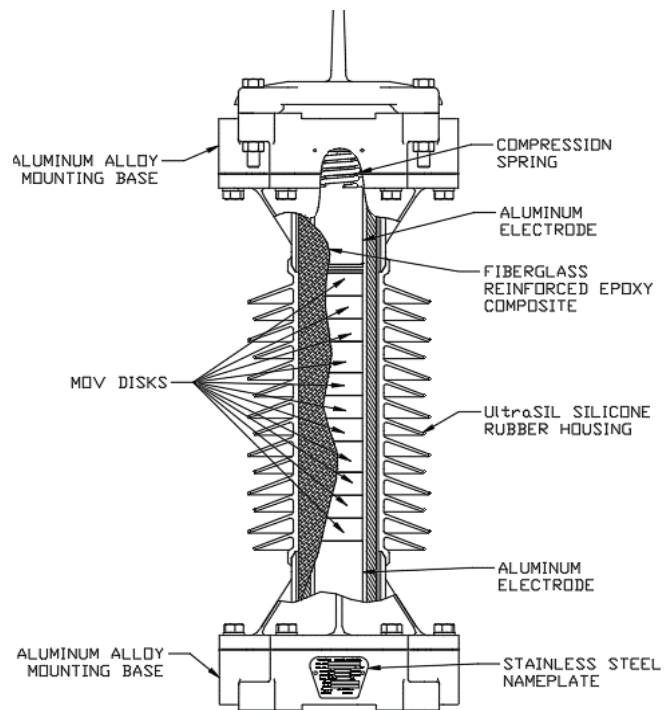


Figure 1. Illustration of 10 kV UltraSIL polymer-housed VariSTAR hollow core arrester.

Table 1. U3AF and U4LG High-Strength arrester ratings and characteristics

Arrester characteristic	Rating		
Arrester voltage ratings (kV)	3-420		
Charge transfer rating			
U3AF	1.6 C		
U4LG	5.2 C		
System frequency (Hz)	50		
Nominal discharge current			
U3AF	10 kA		
U4LG	20 kA		
High current withstand, short duration withstand 4/10 μ s (kA)	100		
Short-circuit/Pressure relief rating (kA rms sym.)	63		
Cantilever strength (Nm)	Ultimate	SLL*	SSL**
U3AF (3-288 kV)	13,800	5,300	6,500
U4LG (3-420 kV)	20,300	8,000	10,000

* Specified Long Term Load

** Specified Short Term Load

Design testing

The housing, internal components, and hardware of an arrester must work together as a system. This system must provide years of service while being subjected to a wide range of environmental and electrical stresses. To ensure a superior level of performance, both arrester components and finished arresters have been subjected to a series of tests that accurately represents years of exposure to actual field conditions. This testing exceeds the requirements of industry standards.

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 Classes SM & SH Arresters include 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 contact your Eaton 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% Residual Voltage Test
- 100% Vref at 17 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 arrester, per IEC 60099-4:

- 100% Physical Inspection
- 100% Vref Test
- 100% Watts Loss Test
- 100% Partial Discharge Inception Voltage Test

General application

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 application guide for the selection of the proper arrester rating for a given system voltage.

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.

Table 2. Arrester ratings commonly used on three-phase systems

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

* Grounded neutral circuits

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 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 (Uc).

The temporary overvoltage (TOV) capability of the VariSTAR arresters are shown in Figures 2 and 2A. 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 (Uc) 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 (Uc).

The voltage withstand capability for application on ungrounded systems after IEC high current duty is 1.076 per unit of COV (Uc) 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 (Uc) 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 engineers are available to make these studies.

Figures 2 and 2A also illustrate the arrester's TOV capabilities with and without prior switching surge duties of up to a maximum capability of 7kJ/kV of arrester rating (Ur) for U3AF and 12 kJ/kV of arrester rating (Ur) for U4LG – 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

Temporary overvoltage (TOV) withstand ability

The U3AF and U4LG high strength arrester's ability to withstand 60 Hz overvoltage conditions (TOV) are shown in Figures 2 & 2A. These graphs illustrate the time an arrester can survive a voltage, and recover, without going into thermal runaway, for a given voltage magnitude (expressed in Per Unit of arrester MCOV).

The graphs in Figures 2 & 2A illustrate the TOV withstand ability, with and without prior duty. The prior duty curve is based upon absorption of rated energy immediately preceding application of the overvoltage.

UltraSIL U3AF VariSTAR Station Arrester TOV Curve

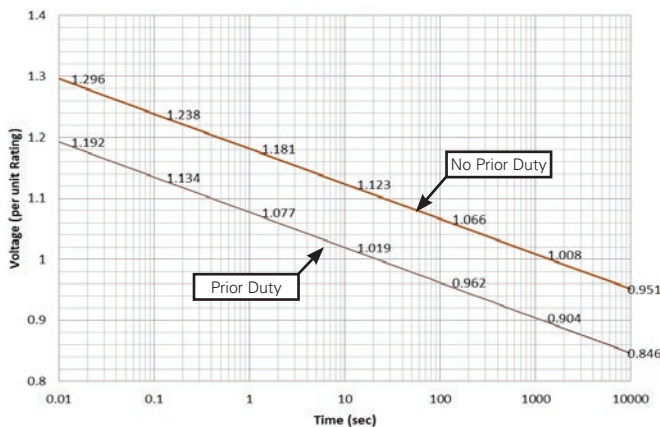


Figure 2. U3AF Temporary overvoltage curve - 60° ambient temperature

UltraSIL U4LG VariSTAR Station Arrester TOV Curve

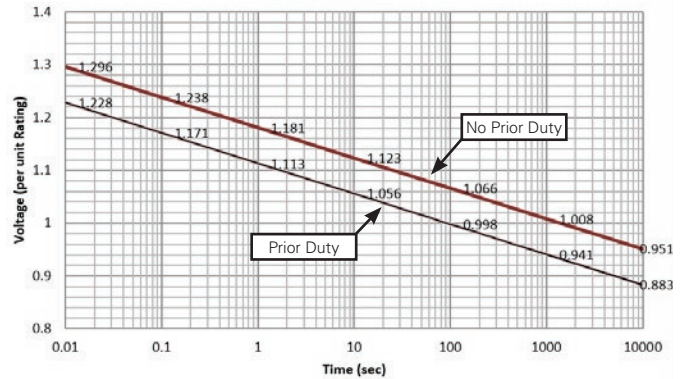


Figure 2A. U4LG Temporary overvoltage curve - 60° ambient temperature.

Mounting information

The standard base of the U3AF and U4LG hollow core arresters is shown in figure 3 mounting base details. Mounting hardware (bolts, nuts, and washers) are not included with the arrester. Contact your Eaton representative to have your individual system application needs reviewed.

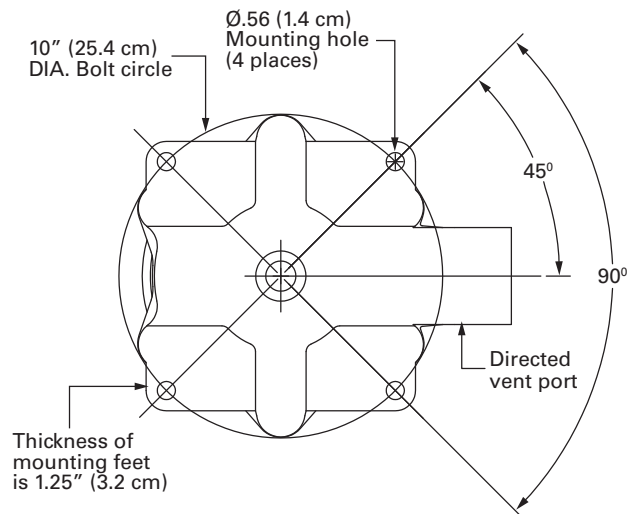


Figure 3. Mounting base details.

Ordering information

Refer to Table 10 for the UltraQUIK catalog numbering system. For additional assistance please contact your Eaton representative.

Protective characteristics - U3AF

All UltraSIL polymer-housed U3AF high-strength arresters provide excellent overvoltage protection for electrical equipment. The specific protective characteristics are shown in Table 3 below.

Table 3. Protective characteristics of the UltraSIL™ polymer-housed U3AF arrester

Arrester rating (kV, rms)	Arrester MCOV (kV rms)	TOV		Front-of-wave protective level (kV Crest)	Maximum discharge voltage (kV Crest) 8/20 μs Current wave						Switching surge protective level (kV Crest)			
		1 Sec	10 Sec		1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	125 A	250 A	500 A	1000 A
3	2.55	3.3	3.1	8.1	6.5	6.8	7.1	7.8	8.4	9.4	5.7	5.8	6	6.3
6	5.1	6.6	6.2	16.3	13	13.7	14.3	15.5	16.8	18.7	11.4	11.7	12	12.5
9	7.65	9.9	9.4	24.4	19.5	20.5	21.4	23.3	25.2	28.1	17.1	17.5	18.1	18.8
10	8.4	10.9	10.3	26.8	21.4	22.5	23.5	25.5	27.7	30.9	18.7	19.2	19.8	20.6
12	10.2	13.2	12.5	32.6	26	27.3	28.6	31	33.6	37.5	22.8	23.3	24.1	25
15	12.7	16.4	15.5	40.6	32.3	34.1	35.6	38.6	41.8	46.7	28.3	29.1	30	31.2
18	15.3	19.8	18.7	48.9	38.9	41	42.9	46.5	50.4	56.2	34.1	35	36.1	37.5
21	17	22	20.8	54.3	43.3	45.6	47.6	51.7	56	62.5	37.9	38.9	40.2	41.7
24	19.5	25.2	23.8	62.3	49.6	52.3	54.7	59.3	64.2	71.7	43.5	44.6	46.1	47.8
27	22	28.4	26.9	70.3	56	59	61.7	66.9	72.4	80.9	49.1	50.4	52	54
30	24.4	31.5	29.8	78	62.1	65.4	68.4	74.2	80.3	89.7	54.4	55.9	57.6	59.9
33	27.5	35.5	33.6	87.9	70	73.7	77.1	83.6	90.5	101	61.4	63	65	67.5
36	29	37.5	35.5	92.7	73.8	77.8	81.3	88.2	95.5	107	64.7	66.4	68.5	71.1
39	31.5	40.7	38.5	101	80.2	84.5	88.3	95.8	104	116	70.3	72.1	74.4	77.3
48	39	50.4	47.7	125	99.2	105	109	119	128	143	87	89.3	92.1	95.7
54	42	54.3	51.4	134	107	113	118	128	138	154	93.7	96.1	99.2	103
60	48	62	58.7	153	122	129	135	146	158	176	107	110	113	118
66	53	68.5	64.8	169	135	142	149	161	174	195	118	121	125	130
72	57	73.6	69.7	182	145	153	160	173	188	209	127	130	135	140
78	62	80.1	75.8	198	158	166	174	188	204	228	138	142	146	152
84	68	87.9	83.2	217	173	182	191	207	224	250	152	156	161	167
90	72	93	88.1	230	183	193	202	219	237	265	161	165	170	177
96	76	98.2	92.9	243	193	204	213	231	250	279	170	174	180	186
108	88	113.7	107.6	281	224	236	247	268	290	323	196	201	208	216
108	84	108.5	102.7	268	214	225	235	255	277	309	187	192	198	206
120	98	126.6	119.9	313	249	263	275	298	323	360	219	224	231	240
132	106	137	129.6	339	270	284	297	322	349	390	237	243	250	260
138	111	143.4	135.8	355	282	298	311	337	365	408	248	254	262	272
144	115	148.6	140.6	367	293	308	322	350	379	423	257	263	272	282
162	130	168	159	415	331	349	364	395	428	478	290	298	307	319
168	131	169.3	160.2	419	333	351	367	398	431	481	292	300	309	321
172	140	180.9	171.2	447	356	375	392	426	461	515	312	320	331	343
180	144	186	176.1	460	366	386	404	438	474	529	321	330	340	353
192	152	196.4	185.9	486	387	408	426	462	500	559	339	348	359	373
198	160	206.7	195.7	511	407	429	448	486	527	588	357	366	378	393
204	165	213.2	201.8	527	420	442	462	502	543	606	368	378	390	405
216	174	224.8	212.8	556	443	467	488	529	573	640	388	398	411	427
228	180	232.6	220.1	575	458	483	505	547	593	662	402	412	425	442
240	190	245.5	232.4	607	483	509	533	578	626	698	424	435	449	466
258	209	270	255.6	668	532	560	586	635	688	768	466	478	494	513
264	212	273.9	259.3	677	539	568	594	644	698	779	473	485	501	520
276	220	284.2	269.1	703	560	590	617	669	724	809	491	504	520	540
288	230	297.2	281.3	735	585	617	645	699	757	845	513	526	543	564

Table 4. Creepage distances and insulation withstand voltages of U3AF high-strength station-class surge arresters

Arrester rating (kV, rms)	Arrester MCOV (kV rms)	Catalog number	Creepage distance (mm)	Strike	1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Switch surge impulse (Kv, rms)	Weight (kg)	Grading ring
3	2.55	U3AF003002A1445AAA	1719	390	221	136	124	N/A	23	No
6	5.1	U3AF006005A1445AAA	1719	390	221	136	124	N/A	23.1	No
9	7.65	U3AF009007A1445AAA	1719	390	221	136	124	N/A	23.3	No
10	8.4	U3AF010008A1445AAA	1719	390	221	136	124	N/A	23.3	No
12	10.2	U3AF012010A1445AAA	1719	390	221	136	124	N/A	23.4	No
15	12.7	U3AF015012A1445AAA	1719	390	221	136	124	N/A	23.5	No
18	15.3	U3AF018015A1445AAA	1719	390	221	136	124	N/A	23.7	No
21	17	U3AF021017A1445AAA	1719	390	221	136	124	N/A	23.7	No
24	19.5	U3AF024019A1445AAA	1719	390	221	136	124	N/A	23.9	No
27	22	U3AF027022A1445AAA	1719	390	221	136	124	N/A	24	No
30	24.4	U3AF030024A1445AAA	1719	390	221	136	124	N/A	24.1	No
33	27.5	U3AF033027A1445AAA	1719	390	221	136	124	N/A	24.3	No
36	29	U3AF036029A1445AAA	1719	390	221	136	124	N/A	24.3	No
39	31.5	U3AF039031A1445AAA	1719	390	221	136	124	N/A	24.5	No
48	39	U3AF048039A2445AAA	2901	603	342	205	172	N/A	28.7	No
54	42	U3AF054042A2445AAA	2901	603	342	205	172	N/A	28.7	No
60	48	U3AF060048A2445AAA	2901	603	342	205	172	N/A	29.1	No
66	53	U3AF066053A2445AAA	2901	603	342	205	172	N/A	29.2	No
72	57	U3AF072057A2445AAA	2901	603	342	205	172	N/A	29.4	No
78	62	U3AF078062A3645AAA	4319	858	488	290	230	N/A	34.1	No
84	68	U3AF084068A3645AAA	4319	858	488	290	230	N/A	34.3	No
90	72	U3AF090072A3645AAA	4319	858	488	290	230	N/A	34.5	No
96	76	U3AF096076A3645AAA	4319	858	488	290	230	N/A	34.7	No
108	88	U3AF108088A4845AAA	5738	1113	635	375	288	N/A	42.1	No
108	84	U3AF108084A4845AAA	5738	1113	635	375	288	N/A	41.9	No
120	98	U3AF120098A4845AAA	5738	1113	635	375	288	N/A	42.5	No
132	106	U3AF132106A4845AAA	5738	995	617	344	317	N/A	42.9	Yes
138	111	U3AF138111A4845AAA	5738	995	617	344	317	Yes	42.9	Yes
144	115	U3AF144115A4845AAA	5738	995	617	344	317	N/A	43.3	Yes
162	130	U3AF162130A6045AAA	7220	1354	833	481	414	N/A	66	Yes
168	131	U3AF168131A6045AAA	7220	1354	833	481	414	N/A	66	Yes
172	140	U3AF172140A7245AAA	8638	1609	979	566	472	N/A	70.8	Yes
180	144	U3AF180144A7245AAA	8638	1609	979	566	472	N/A	71	Yes
192	152	U3AF192152A7245AAA	8638	1609	979	566	472	N/A	71.4	Yes
198	160	U3AF198160A8445AAA	10057	1853	1105	634	547	N/A	76.3	Yes
204	165	U3AF204165A8445AAA	10057	1853	1105	634	547	N/A	76.5	Yes
216	174	U3AF216174A8445AAA	10057	1853	1105	634	547	N/A	76.9	Yes
228	180	U3AF228180A8445AAA	10057	1853	1105	634	547	N/A	77.1	Yes
240	190	U3AF240190A9645AAA	11476	1996	1148	679	528	955	91.7	Yes
258	209	U3AF258209A9645AAA	11476	1996	1148	679	528	955	92.5	Yes
264	212	U3AF264212A9645AAA	11476	1996	1148	679	528	955	92.7	Yes
276	220	U3AF276220A9645AAA	11476	1996	1148	679	528	955	92.9	Yes
288	230	U3AF288230A9645AAA	11476	1996	1148	679	528	955	93.5	Yes

Spacing requirements

Figure 4 illustrates a three-phase in-line mounting arrangement. Dimensions B and C reference minimum phase-to-earth and phase-to-phase distances respectively. These dimensions are listed in Tables 5.

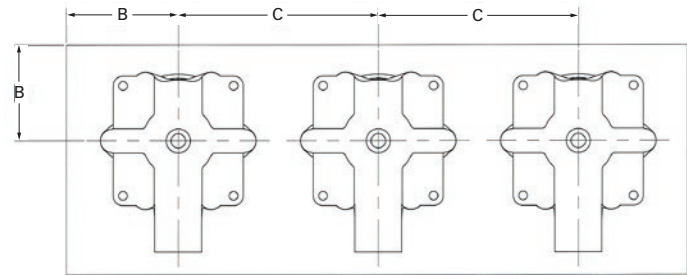


Figure 4. Three-phase In-line mounting arrangement.

Table 5. Dimensions, clearance requirements and weights of U3AF high-strength station-class surge arresters

Arrester Rating Ur (kV, rms)	Arrester MCOV (kV, rms)	Standard arrester catalog number	Dim. A (mm) (Fig. 5)	Dimension B minimum phase-to-earth clearance (mm) (Fig. 4)	Dimension C minimum phase-to-phase clearance (mm) (Fig. 4)	Dim. D (mm) (Fig. 5)	Housing creepage distance (mm)	Arrester mass (kg)
3	2.55	U3AF003002A1445AAA	664	165	305	196	1719	23
6	5.1	U3AF006005A1445AAA	664	165	305	196	1719	23.1
9	7.65	U3AF009007A1445AAA	664	169	309	196	1719	23.3
10	8.4	U3AF010008A1445AAA	664	173	312	196	1719	23.3
12	10.2	U3AF012010A1445AAA	664	183	323	196	1719	23.4
15	12.7	U3AF015012A1445AAA	664	201	341	196	1719	23.5
18	15.3	U3AF018015A1445AAA	664	223	363	196	1719	23.7
21	17	U3AF021017A1445AAA	664	238	378	196	1719	23.7
24	19.5	U3AF024019A1445AAA	664	242	382	196	1719	23.9
27	22	U3AF027022A1445AAA	664	264	404	196	1719	24
30	24.4	U3AF030024A1445AAA	664	285	425	196	1719	24.1
33	27.5	U3AF033027A1445AAA	664	313	452	196	1719	24.3
36	29	U3AF036029A1445AAA	664	326	465	196	1719	24.3
39	31.5	U3AF039031A1445AAA	664	348	487	196	1719	24.5
48	39	U3AF048039A2445AAA	877	413	553	196	2901	28.7
54	42	U3AF054042A2445AAA	877	440	579	196	2901	28.7
60	48	U3AF060048A2445AAA	877	492	632	196	2901	29.1
66	53	U3AF066053A2445AAA	877	536	676	196	2901	29.2
72	57	U3AF072057A2445AAA	877	571	711	196	2901	29.4
78	62	U3AF078062A3645AAA	1132	615	754	196	4319	34.1
84	68	U3AF084068A3645AAA	1132	667	807	196	4319	34.3
90	72	U3AF090072A3645AAA	1132	702	842	196	4319	34.5
96	76	U3AF096076A3645AAA	1132	737	877	196	4319	34.7
108	88	U3AF108088A4845AAA	1387	842	982	196	5738	42.1
108	84	U3AF108084A4845AAA	1387	807	947	196	5738	41.9
120	98	U3AF120098A4845AAA	1387	930	1070	196	5738	42.5
132	106	U3AF132106A4845AAA	1271	1191	1521	660	5738	42.9
138	111	U3AF138111A4845AAA	1271	1234	1565	660	5738	42.9
144	115	U3AF144115A4845AAA	1271	1269	1600	660	5738	43.3
162	130	U3AF162130A6045AAA	1893	1401	1731	660	7220	66
168	131	U3AF168131A6045AAA	1893	1410	1740	660	7220	66
172	140	U3AF172140A7245AAA	2148	1488	1819	660	8638	70.8
180	144	U3AF180144A7245AAA	2148	1523	1854	660	8638	71
192	152	U3AF192152A7245AAA	2148	1594	1924	660	8638	71.4
198	160	U3AF198160A8445AAA	2403	1664	1994	660	10057	76.3
204	165	U3AF204165A8445AAA	2403	1707	2038	660	10057	76.5
216	174	U3AF216174A8445AAA	2403	1786	2116	660	10057	76.9
228	180	U3AF228180A8445AAA	2403	1839	2169	660	10057	77.1
240	190	U3AF240190A9645AAA	2658	2130	2663	1067	11476	91.7
258	209	U3AF258209A9645AAA	2658	2296	2829	1067	11476	92.5
264	212	U3AF264212A9645AAA	2658	2322	2856	1067	11476	92.7
276	220	U3AF276220A9645AAA	2658	2392	2926	1067	11476	92.9
288	230	U3AF288230A9645AAA	2658	2480	3013	1067	11476	93.5

Effective July 2020

Protective characteristics - U4LG

All UltraSIL polymer-housed U4LG high-strength arresters provide excellent overvoltage protection for electrical equipment. The specific protective characteristics are shown in Table 6 below.

Table 6. Protective characteristics of the UltraSIL™ polymer-housed U4LG arrester

Arrester rating (kV, rms)	Arrester MCOV (kV rms)	TOV		Front-of-wave protective level (kV Crest)	Maximum discharge voltage (kV Crest) 8/20 μs Current wave						Switching surge protective level (kV Crest)			
		1 Sec	10 Sec		1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	125 A	250 A	500 A	1000 A
3	2.55	3.4	3.2	7.6	6.2	6.5	6.7	7.3	7.8	8.6	5.5	5.6	5.8	6
6	5.1	6.8	6.5	15.2	12.4	13	13.5	14.5	15.5	17.1	11	11.2	11.6	12
9	7.65	10.2	9.7	22.5	18.3	19.2	19.9	21.5	22.9	25.3	16.2	16.6	17.1	17.7
10	8.4	11.2	10.6	24.7	20.1	21	21.9	23.6	25.2	27.8	17.8	18.2	18.8	19.4
12	10.2	13.6	12.9	30	24.4	25.6	26.6	28.6	30.6	33.7	21.6	22.1	22.8	23.6
15	12.7	17	16.1	37.3	30.4	31.8	33.1	35.6	38.1	42	26.9	27.5	28.4	29.4
18	15.3	20.4	19.4	44.9	36.6	38.3	39.8	42.9	45.9	50.6	32.4	33.2	34.2	35.4
21	17	22.7	21.5	49.9	40.7	42.6	44.2	47.7	51	56.2	36	36.9	38	39.3
24	19.5	26.1	24.7	57.3	46.7	48.8	50.8	54.7	58.5	64.4	41.3	42.3	43.5	45.1
27	22	29.4	27.9	64.6	52.6	55.1	57.3	61.7	66	72.7	46.6	47.7	49.1	50.8
30	24.4	32.6	30.9	71.7	58.4	61.1	63.5	68.4	73.2	80.6	51.7	52.9	54.5	56.4
33	27.5	36.7	34.8	80.8	65.8	68.9	71.6	77.1	82.5	90.9	58.2	59.6	61.4	63.6
36	29	38.7	36.7	85.2	69.4	72.6	75.5	81.4	87	95.8	61.4	62.9	64.8	67
39	31.5	42.1	39.9	92.5	75.4	78.9	82	88.4	94.4	104	66.7	68.3	70.3	72.8
48	39	52.1	49.4	115	93.3	97.7	102	109	117	129	82.6	84.6	87.1	90.1
54	42	56.1	53.2	123	100	105	109	118	126	139	89	91.1	93.8	97.1
60	48	64.1	60.8	141	115	120	125	135	144	159	102	104	107	111
66	53	70.8	67.2	156	127	133	138	149	159	175	112	115	118	122
72	57	76.2	72.2	167	136	143	148	160	171	188	121	124	127	132
78	62	82.8	78.6	182	148	155	161	174	186	205	131	134	138	143
84	68	90.8	86.2	200	163	170	177	191	204	225	144	147	152	157
90	72	96.2	91.2	211	172	180	187	202	216	238	152	156	161	166
96	76	101.5	96.3	223	182	190	198	213	228	251	161	165	170	176
108	88	117.6	111.5	258	211	220	229	247	264	291	186	191	196	203
108	84	112.2	106.4	247	201	210	219	236	252	278	178	182	188	194
120	98	130.9	124.2	288	234	245	255	275	294	324	208	212	219	227
132	106	141.6	134.3	311	254	266	276	297	318	350	224	230	237	245
138	111	148.3	140.6	326	266	278	289	311	333	367	235	241	248	257
144	115	153.6	145.7	338	275	288	299	323	345	380	244	249	257	266
162	130	173.7	164.7	382	311	326	338	365	390	430	275	282	290	300
168	131	175	166	385	313	328	341	367	393	433	277	284	292	303
172	140	187	177.4	411	335	351	364	393	420	463	296	304	313	324
180	144	192.4	182.4	423	345	361	375	404	432	476	305	312	322	333
192	152	203.1	192.6	446	364	381	396	426	456	502	322	330	339	351
198	160	213.8	202.7	470	383	401	416	449	480	529	339	347	357	370
204	165	220.4	209.1	485	395	413	430	463	495	545	349	358	368	381
216	174	232.5	220.5	511	416	436	453	488	522	575	368	377	388	402
228	180	240.5	228.1	529	431	451	469	505	540	595	381	390	402	416
240	190	253.8	240.7	558	455	476	495	533	570	628	402	412	424	439
258	209	279.2	264.8	614	500	524	544	586	627	691	443	453	467	483
264	212	283.2	268.6	623	507	531	552	595	636	700	449	460	473	490
276	220	293.9	278.7	646	526	551	573	617	660	727	466	477	491	508
288	230	307.3	291.4	675	550	576	599	645	690	760	487	499	514	532
312	245	327.3	310.4	720	586	614	638	687	735	810	519	531	547	566
330	267	356.7	338.3	784	639	669	695	749	801	882	565	579	596	617
336	272	363.4	344.6	799	651	681	708	763	816	899	576	590	607	629
360	289	386.1	366.2	849	691	724	752	811	867	955	612	627	645	668
378	306	408.8	387.7	899	732	766	797	858	918	1011	648	664	683	707
396	318	424.8	402.9	934	761	797	828	892	954	1051	673	690	710	735
420	335	447.6	424.4	984	802	839	872	940	1005	1107	709	726	748	774

Table 7. Creepage distances and insulation withstand voltages of U4LG high-strength station-class surge arresters

Arrester Rating (kV, rms)	Arrester MCOV (kV rms)	Catalog number	Creepage distance (mm)	Strike	BIL 1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Switch surge impulse (kV, rms)	Weight(kg)	Grading ring
3	2.55	U4LG003002A1445AAA	1731	386	221	136	124	N/A	29.8	No
6	5.1	U4LG006005A1445AAA	1731	386	221	136	124	N/A	30.1	No
9	7.65	U4LG009007A1445AAA	1731	386	221	136	124	N/A	30.5	No
10	8.4	U4LG010008A1445AAA	1731	386	221	136	124	N/A	30.5	No
12	10.2	U4LG012010A1445AAA	1731	386	221	136	124	N/A	30.7	No
15	12.7	U4LG015012A1445AAA	1731	386	221	136	124	N/A	30.9	No
18	15.3	U4LG018015A1445AAA	1731	386	221	136	124	N/A	31.4	No
21	17	U4LG021017A1445AAA	1731	386	221	136	124	N/A	31.4	No
24	19.5	U4LG024019A1445AAA	1731	386	221	136	124	N/A	31.8	No
27	22	U4LG027022A1445AAA	1731	386	221	136	124	N/A	32.1	No
30	24.4	U4LG030024A1445AAA	1731	386	221	136	124	N/A	32.3	No
33	27.5	U4LG033027A1445AAA	1731	386	221	136	124	N/A	32.7	No
36	29	U4LG036029A1445AAA	1731	386	221	136	124	N/A	32.7	No
39	31.5	U4LG039031A1445AAA	1731	386	221	136	124	N/A	33.2	No
48	39	U4LG048039A2445AAA	2913	598	342	205	172	N/A	40.1	No
54	42	U4LG054042A2445AAA	2913	598	342	205	172	N/A	40.1	No
60	48	U4LG060048A2445AAA	2913	598	342	205	172	N/A	41.1	No
66	53	U4LG066053A2445AAA	2913	598	342	205	172	N/A	41.3	No
72	57	U4LG072057A2445AAA	2913	598	342	205	172	N/A	41.8	No
78	62	U4LG078062A3645AAA	4331	854	488	290	230	N/A	49.1	No
84	68	U4LG084068A3645AAA	4331	854	488	290	230	N/A	49.6	No
90	72	U4LG090072A3645AAA	4331	854	488	290	230	N/A	50	No
96	76	U4LG096076A3645AAA	4331	854	488	290	230	N/A	50.5	No
108	88	U4LG108088A4845AAA	5749	1109	635	375	288	N/A	61.1	No
108	84	U4LG108084A4845AAA	5749	1109	635	375	288	N/A	60.7	No
120	98	U4LG120098A4845AAA	5749	1109	635	375	288	N/A	62	No
132	106	U4LG132106A4845AAA	5749	999	617	344	317	N/A	63	Yes
138	111	U4LG138111A4845AAA	5749	999	617	344	317	N/A	63	Yes
144	115	U4LG144115A4845AAA	5749	999	617	344	317	N/A	63.9	Yes
162	130	U4LG162130A6045AAA	7244	1353	833	481	414	N/A	94	Yes
168	131	U4LG168131A6045AAA	7244	1353	833	481	414	N/A	94	Yes
172	140	U4LG172140A7245AAA	8662	1609	979	566	472	N/A	101.5	Yes
180	144	U4LG180144A7245AAA	8662	1609	979	566	472	N/A	102	Yes
192	152	U4LG192152A7245AAA	8662	1609	979	566	472	N/A	102.9	Yes
198	160	U4LG198160A8445AAA	10080	1853	1105	634	547	N/A	110.9	Yes
204	165	U4LG204165A8445AAA	10080	1853	1105	634	547	N/A	111.3	Yes
216	174	U4LG216174A8445AAA	10080	1853	1105	634	547	N/A	112.3	Yes
228	180	U4LG228180A8445AAA	10080	1853	1105	634	547	N/A	112.7	Yes
240	190	U4LG240190A9645AAA	11498	2006	1148	679	528	955	130.6	Yes
258	209	U4LG258209A9645AAA	11498	2006	1148	679	528	955	132.5	Yes
264	212	U4LG264212A9645AAA	11498	2006	1148	679	528	955	133	Yes
276	220	U4LG276220A9645AAA	11498	2006	1148	679	528	955	133.4	Yes
288	230	U4LG288230A9645AAA	11498	2006	1148	679	528	955	134.8	Yes
312	245	U4LG312245AC045AAA	14411	2530	1447	860	693	1207	173.3	Yes
330	267	U4LG330267AD245AAA	15829	2785	1594	945	751	1327	182.6	Yes
336	272	U4LG336272AD245AAA	15829	2785	1594	945	751	1327	183	Yes
360	289	U4LG360289AE445AAA	17247	3040	1741	1030	809	1447	192	Yes
378	306	U4LG378306AE445AAA	17247	3040	1741	1030	809	1447	193.8	Yes
396	318	U4LG396318AE445AAA	17247	3040	1741	1030	809	1447	195.2	Yes
420	335	U4LG420335AG845AAA	20160	3639	2082	1235	981	1734	231.9	Yes

Spacing requirements

Figure 4 illustrates a three-phase in-line mounting arrangement. Dimensions B and C reference minimum phase-to-earth and phase-to-phase distances respectively. These dimensions are listed in Table 8.

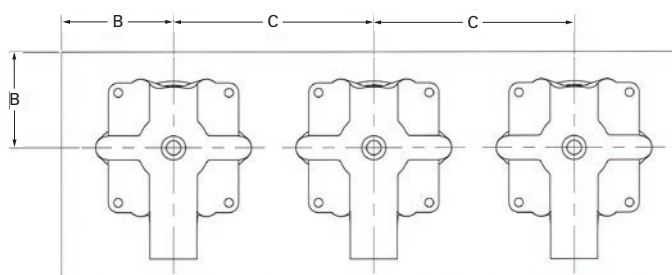


Table 8. Dimensions, clearance requirements and weights of U4LG High-strength station-class surge arresters

Arrester Rating U_r (kV, rms)	Arrester MCOV U_c (kV, rms)	Standard arrester catalog number	Dim. A (mm) (Fig. 5)	Dimension B minimum phase-to-earth clearance* (mm) (Fig. 4)	Dimension C minimum phase-to-phase clearance* (mm) (Fig. 4)	Dim. D (mm) (Fig. 5)	Housing creepage distance (mm)	Arrester mass (kg)
3	2.55	U4LG003002A1445AAA	683	165	305	219	1731	29.8
6	5.1	U4LG006005A1445AAA	683	165	305	219	1731	30.1
9	7.65	U4LG009007A1445AAA	683	166	305	219	1731	30.5
10	8.4	U4LG010008A1445AAA	683	168	308	219	1731	30.5
12	10.2	U4LG012010A1445AAA	683	177	316	219	1731	30.7
15	12.7	U4LG015012A1445AAA	683	191	331	219	1731	30.9
18	15.3	U4LG018015A1445AAA	683	210	349	219	1731	31.4
21	17	U4LG021017A1445AAA	683	223	363	219	1731	31.4
24	19.5	U4LG024019A1445AAA	683	225	365	219	1731	31.8
27	22	U4LG027022A1445AAA	683	245	385	219	1731	32.1
30	24.4	U4LG030024A1445AAA	683	264	403	219	1731	32.3
33	27.5	U4LG033027A1445AAA	683	288	428	219	1731	32.7
36	29	U4LG036029A1445AAA	683	300	440	219	1731	32.7
39	31.5	U4LG039031A1445AAA	683	320	459	219	1731	33.2
48	39	U4LG048039A2445AAA	896	379	518	219	2913	40.1
54	42	U4LG054042A2445AAA	896	402	542	219	2913	40.1
60	48	U4LG060048A2445AAA	896	450	589	219	2913	41.1
66	53	U4LG066053A2445AAA	896	489	629	219	2913	41.3
72	57	U4LG072057A2445AAA	896	520	660	219	2913	41.8
78	62	U4LG078062A3645AAA	1153	560	700	219	4331	49.1
84	68	U4LG084068A3645AAA	1153	607	747	219	4331	49.6
90	72	U4LG090072A3645AAA	1153	639	778	219	4331	50
96	76	U4LG096076A3645AAA	1153	670	810	219	4331	50.5
108	88	U4LG108088A4845AAA	1407	765	904	219	5749	61.1
108	84	U4LG108084A4845AAA	1407	733	873	219	5749	60.7
120	98	U4LG120098A4845AAA	1407	843	983	219	5749	62
132	106	U4LG132106A4845AAA	1271	1097	1427	660	5749	63
138	111	U4LG138111A4845AAA	1271	1136	1466	660	5749	63
144	115	U4LG144115A4845AAA	1271	1168	1498	660	5749	63.9
162	130	U4LG162130A6045AAA	1912	1286	1616	660	7244	94
168	131	U4LG168131A6045AAA	1912	1294	1624	660	7244	94
172	140	U4LG172140A7245AAA	2169	1365	1695	660	8662	101.5
180	144	U4LG180144A7245AAA	2169	1396	1726	660	8662	102
192	152	U4LG192152A7245AAA	2169	1459	1789	660	8662	102.9
198	160	U4LG198160A8445AAA	2424	1522	1852	660	10080	110.9
204	165	U4LG204165A8445AAA	2424	1561	1892	660	10080	111.3
216	174	U4LG216174A8445AAA	2424	1632	1962	660	10080	112.3
228	180	U4LG228180A8445AAA	2424	1680	2010	660	10080	112.7
240	190	U4LG240190A9645AAA	2678	1961	2495	1067	11498	130.6
258	209	U4LG258209A9645AAA	2678	2111	2644	1067	11498	132.5
264	212	U4LG264212A9645AAA	2678	2135	2668	1067	11498	133
276	220	U4LG276220A9645AAA	2678	2198	2731	1067	11498	133.4
288	230	U4LG288230A9645AAA	2678	2276	2810	1067	11498	134.8
312	245	U4LG312245AC045AAA	3577	2560	3258	1397	14411	173.3
330	267	U4LG330267AD245AAA	3831	2733	3431	1397	15829	182.6
336	272	U4LG336272AD245AAA	3831	2772	3471	1397	15829	183
360	289	U4LG360289AE445AAA	4085	2906	3605	1397	17247	192
378	306	U4LG378306AE445AAA	4085	3040	3738	1397	17247	193.8
396	318	U4LG396318AE445AAA	4085	3134	3833	1397	17247	195.2
420	335	U4LG420335AG845AAA	4984	3484	4399	1829	20160	231.9

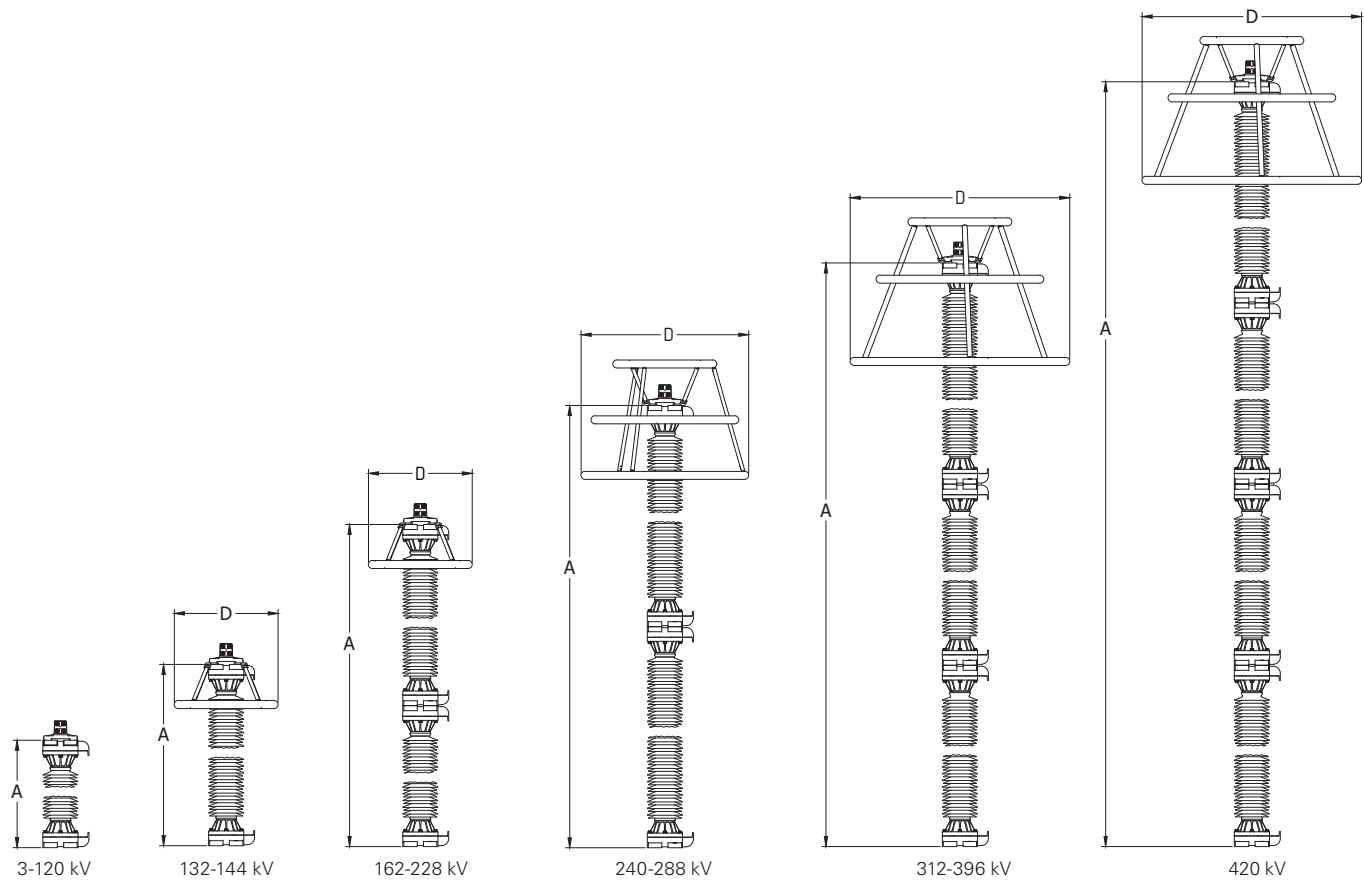


Figure 5. Outline drawing of standard ultrasil polymer-housed station-class arresters.

Note: Dimensions shown in Tables 5 and 8. Arresters are shown without line and earth terminals.

**Table 9. Catalog numbers for standard configuration type
U3AF and U4LG surge arresters**

Arrester rating Ur (kV, rms)	Arrester COV Uc (kV, rms)	U3AF	U4LG
3	2.55	U3AF003002A1445AAA	U4LG003002A1445AAA
6	5.1	U3AF006005A1445AAA	U4LG006005A1445AAA
9	7.65	U3AF009007A1445AAA	U4LG009007A1445AAA
10	8.4	U3AF010008A1445AAA	U4LG010008A1445AAA
12	10.2	U3AF012010A1445AAA	U4LG012010A1445AAA
15	12.7	U3AF015012A1445AAA	U4LG015012A1445AAA
18	15.3	U3AF018015A1445AAA	U4LG018015A1445AAA
21	17	U3AF021017A1445AAA	U4LG021017A1445AAA
24	19.5	U3AF024019A1445AAA	U4LG024019A1445AAA
27	22	U3AF027022A1445AAA	U4LG027022A1445AAA
30	24.4	U3AF030024A1445AAA	U4LG030024A1445AAA
33	27.5	U3AF033027A1445AAA	U4LG033027A1445AAA
36	29	U3AF036029A1445AAA	U4LG036029A1445AAA
39	31.5	U3AF039031A1445AAA	U4LG039031A1445AAA
48	39	U3AF048039A2445AAA	U4LG048039A2445AAA
54	42	U3AF054042A2445AAA	U4LG054042A2445AAA
60	48	U3AF060048A2445AAA	U4LG060048A2445AAA
66	53	U3AF066053A2445AAA	U4LG066053A2445AAA
72	57	U3AF072057A2445AAA	U4LG072057A2445AAA
78	62	U3AF078062A3645AAA	U4LG078062A3645AAA
84	68	U3AF084068A3645AAA	U4LG084068A3645AAA
90	72	U3AF090072A3645AAA	U4LG090072A3645AAA
96	76	U3AF096076A3645AAA	U4LG096076A3645AAA
108	88	U3AF108084A4845AAA	U4LG108084A4845AAA
108	84	U3AF108088A4845AAA	U4LG108088A4845AAA
120	98	U3AF120098A4845AAA	U4LG120098A4845AAA
132	106	U3AF132106A4845AAA	U4LG132106A4845AAA
138	111	U3AF138111A4845AAA	U4LG138111A4845AAA
144	115	U3AF144115A4845AAA	U4LG144115A4845AAA
162	130	U3AF162130A6045AAA	U4LG162130A6045AAA
168	131	U3AF168131A6045AAA	U4LG168131A6045AAA
172	140	U3AF172140A7245AAA	U4LG172140A7245AAA
180	144	U3AF180144A7245AAA	U4LG180144A7245AAA
192	152	U3AF192152A7245AAA	U4LG192152A7245AAA
198	160	U3AF198160A8445AAA	U4LG198160A8445AAA
204	165	U3AF204165A8445AAA	U4LG204165A8445AAA
216	174	U3AF216174A8445AAA	U4LG216174A8445AAA
228	180	U3AF228180A8445AAA	U4LG228180A8445AAA
240	190	U3AF240190A9645AAA	U4LG240190A9645AAA
258	209	U3AF258209A9645AAA	U4LG258209A9645AAA
264	212	U3AF264212A9645AAA	U4LG264212A9645AAA
276	220	U3AF276220A9645AAA	U4LG276220A9645AAA
288	230	U3AF288230A9645AAA	U4LG288230A9645AAA
312	245	-	U4LG312245AC045AAA
330	267	-	U4LG330267AD245AAA
336	272	-	U4LG336272AD245AAA
360	289	-	U4LG360289AE445AAA
378	306	-	U4LG378306AE445AAA
396	318	-	U4LG396318AE445AAA
420	335	-	U4LG420335AG845AAA

Table 10. UltraQUIK catalog numbering system for UltraSIL polymer-housed high-strength station-class arresters

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

Catalog number digits:**1 = U** UltraSIL Polymer-housed arrester**2 = 3** IEC class SM**4** IEC class SH**3 = A** Standard electrical build (1.6 C Charge Transfer)**L** High electrical build (5.2 C Charge Transfer)***4 = F** = 13,800 Nm Cantilever strength ultimate**G** = 20,300 Nm Cantilever strength ultimate**5 Through 10 =** Arrester rating: Duty-cycle (MCOV)

003002 = 3 kV (2.55 kV)	048039 = 48 kV (39.0 kV)	144115 = 144 kV (115 kV)	288230 = 288 kV (230 kV)
006005 = 6 kV (5.10 kV)	054042 = 54 kV (42.0 kV)	162130 = 162 kV (130 kV)	312245 = 312 kV (245kV)*
009007 = 9 kV (7.65 kV)	060048 = 60 kV (48.0 kV)	168131 = 168 kV (131 kV)	330267 = 330 kV (267kV)*
010008 = 10 kV (8.4 kV)	066053 = 66 kV (53.0 kV)	172140 = 172 kV (140 kV)	336269 = 336 kV (269 kV)*
012010 = 12 kV (10.2 kV)	072057 = 72 kV (57.0 kV)	180144 = 180 kV (144 kV)	360289 = 360 kV (289 kV)*
015012 = 15 kV (12.7 kV)	078062 = 78 kV (62.0 kV)	192152 = 192 kV (152 kV)	378306 = 378 kV (306 kV)*
018015 = 18 kV (15.3 kV)	084068 = 84 kV (68.0 kV)	198160 = 198 kV (160 kV)	396318 = 396 kV (318 kV)*
021017 = 21 kV (17.0 kV)	090070 = 90 kV (70.0 kV)	204165 = 204 kV (165 kV)	420033 = 420 kV (335 kV)*
024019 = 24 kV (19.5 kV)	096076 = 96 kV (76.0 kV)	216174 = 216 kV (174 kV)	
027022 = 27 kV (22.0 kV)	096077 = 96 kV (77.0 kV)	228180 = 228 kV (180 kV)	
030024 = 30 kV (24.4 kV)	108084 = 108 kV (84.0 kV)	240190 = 240 kV (190 kV)	
033027 = 33 kV (27.0 kV)	120098 = 120 kV (98.0 kV)	258209 = 258 kV (209 kV)	
036029 = 36 kV (29.0 kV)	132106 = 132 kV (106 kV)	264212 = 264 kV (212 kV)	
039031 = 39 kV (31.5 kV)	138111 = 138 kV (111 kV)	276220 = 276 kV (220 kV)	

* Only available in U4LG configurations

11 = "A" Standard high creep UltraSIL Polymer-Housing

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

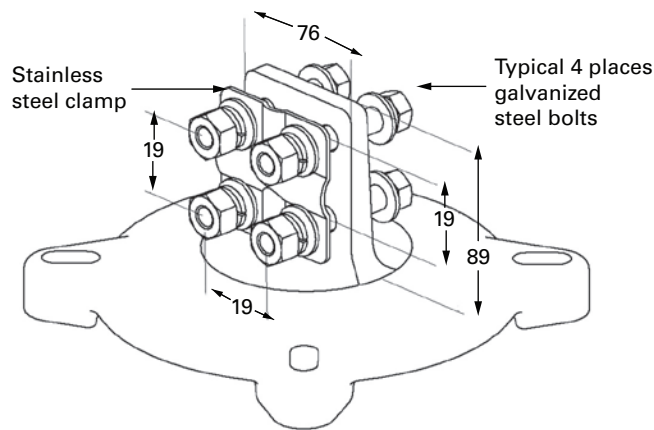
Housing codes:

Arrester rating	Digits 12 & 13	U3AF leakage distance (mm)	U4LG leakage distance (mm)
3 - 39 kV	14	1719	1731
48 - 72 kV	24	2901	2913
78 - 96 kV	36	4319	4331
108 - 144 kV	48	5738	5749
162 - 168 kV	60	7220	7244
172 - 192 kV	72	8638	8662
198 - 228 kV	84	10057	10080
240 - 288 kV	96	11476	11498
312 kV	C0	-	14411
330 - 336 kV	D2	-	15829
360 - 396 kV	E4	-	17247
420 kV	G8	-	20160

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

14: Line terminal options

Standard offering-Select 4

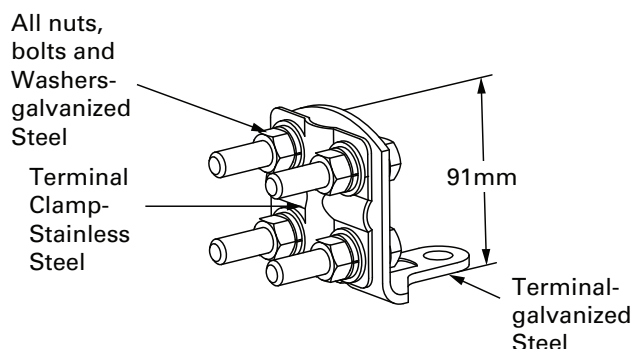


NEMA® Four-hole aluminum alloy pad and stainless terminal clamp accepts copper or aluminum conductors up to 29 mm Ø

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

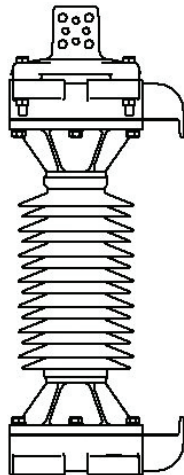
15 = Earth terminal options

Standard offering-Select 5



NEMA® Four-hole Pad
Accepts copper or aluminum conductors
up to 21 mm Ø

16 = Base mounting arrangement



Standard offering-Select A

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 = "A" = Export packing, cardboard
"2" = Export packing wood crating

Figure 6. Detail of base nameplate.

Figure 7. Detail of section nameplate.

Nameplate information

A stainless steel nameplate per Figure 6 is attached to the base of every UltraSIL polymer-housed U3AF and U4LG high-strength arrester. The arrester catalog number, serial number, year of manufacture, Ur, Uc, and pressure relief rating are among the details provided on the nameplate. For multi-unit arresters equal or higher than 162 kV, an additional unit nameplate is provided on each arrester section as shown in Figure 7.

Additional information

- MN235027EN MN235027EN UltraSIL polymer-housed VariSTAR high-strength station-class surge arrester installation and maintenance instructions
- CT235009EN CT235009EN UltraSIL polymer-housed VariSTAR U3AF high-strength station-class surge arrester certified test report
- CT235010EN CT235010EN UltraSIL polymer-housed VariSTAR U4LG high-strength station-class surge arrester certified test report

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