UltraSIL™ Polymer-Housed VariSTAR™ HC High-Strength Hollow Core Station-Class Surge Arresters Installation and Maintenance Instructions

Powering Business Worldwide

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Safety for life

Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally-approved safety procedures and safety instructions when working around high-voltage lines and equipment, and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally-approved safety procedures when working around high- and low-voltage lines and equipment. G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling, or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally-approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury, and equipment damage. G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage. G122.2

⚠ CAUTION

UltraSIL Polymer-Housed VariSTAR UHAF and UXLG High-Strength Station-Class Surge Arresters are designed to be operated in accordance with safe operating procedures. These instructions are not intended to supersede or replace proper safety and operating procedures. Read all instructions before installing the arrester.

Surge arresters should be installed and serviced only by personnel familiar with good safety practice and the handling of high-voltage electrical equipment.

Product information

Introduction

UltraSIL™ Polymer-Housed VariSTAR™ UHAF and UXLG High-Strength Hollow Core Station-Class Surge Arresters incorporate the latest in metal oxide varistor (MOV) technology. These arresters are constructed of a single column of MOV disks. They are used for overvoltage protection of high voltage equipment, either indoors or outdoors. These arresters are designed and tested to meet or exceed the requirements set forth in IEEE Std C62.11™ -2012 standard.

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Eaton's Cooper Power series product sales representative.

Acceptance and initial inspection

The factory takes special precautions to ship the arresters in well-designed containers that reduce the possibility of damage, which may occur during transit. Carefully inspect each arrester for physical damage. In case of improper handling or shipping damage, immediately file a claim with the carrier and promptly notify Eaton or your local representative.

⚠ CAUTION

Do not attempt to install arresters that have evidence of damage.

Handling and storage

If the arrester is to be stored before installation, provide a clean, dry storage area. Locate the arrester so as to minimize the possibility of physical damage.

Quality standards

ISO 9001 Certified Quality Management System

General application recommendations

Eaton's Cooper Power series product application engineers are available to make specific application recommendations.

Identification

A nameplate attached to the base of each arrester indicates its catalog number, voltage rating, maximum continuous operating voltage (MCOV), rated frequency, pressure-relief current rating, class, reference to the type test standard, altitude range, serial number, and year of manufacture. Refer to Figure 1 for an example of a blank arrester base nameplate.

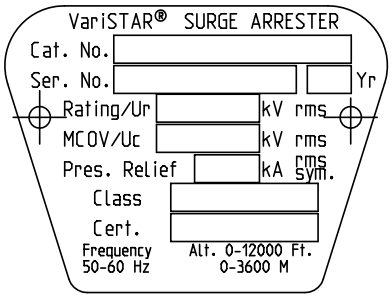

Figure 1. Detail of blank arrester base nameplate

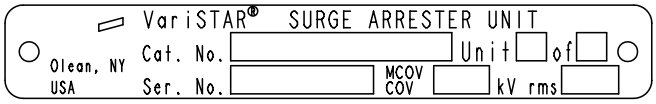

Figure 2. Detail of blank arrester unit nameplate

For multi-unit arresters rated above 120 kV an additional nameplate is provided on the base that includes information regarding the catalog number, serial number, unit identification, and unit MCOV. Refer to Figure 2. Information regarding unit identification is etched on a unit nameplate located on the arrester flange assembly for each arrester section.

⚠ CAUTION

Always handle surge arresters carefully. A damaged arrester may cause catastrophic failure upon energization.

Lifting instructions

UHAF and UXLG high-strength surge arrester sections must be lifted vertically by the line terminal or upper casting. Use of a lifting strap (user supplied) is recommended.

Figure 3. Detail of recommended lifting instructions

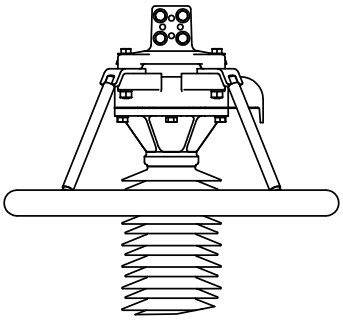

Figure 4. Detail of grading ring placement

⚠ WARNING

Use only the grading ring supplied with the arrester. No other manufacturer's grading ring can be substituted.

Grading ring

Arrester ratings from 132 kV through 396 kV will be supplied with a grading ring. When a grading ring is supplied, it must be placed on the arrester to guarantee correct operating performance. Refer to Figure 4 for correct placement of the grading ring.

Installation instructions

Arresters 3 kV through 120 kV

UHAF and UXLG high-strength surge arresters are shipped assembled for ratings 3 kV through 120 kV. For these arresters choose a permanent installation location so that the arresters will be installed as close as possible (electrically) to the equipment being protected. Minimum clearance distances between any line potential surface to an arrester, and to any ground plane are listed in Tables 1 and 2. Figure 7 shows the minimum phase-to-ground and minimum phase-to-phase clearances. Refer to Tables 1 and 2 and Figure 8 for standard arrester dimension and weight information.

Packaged components (3-120 kV rated)

- Assembled arrester ready for installation.
- The ground terminal connectors are shipped unattached in the box, and should be assembled after the arrester is installed.

Detailed assembly instructions

1. After the arrester is in place and ready to be secured, the ground terminal connector should be placed so that the mounting hole, found on the connector, is directly over one of the four mounting holes on the base of the arrester.
2. One of the bolts (user-supplied) used to secure the arrester; should run through the hole of the ground connector, the mounting hole of the arrester, and the structure the arrester is attached to.
3. Secure the arrester to the structure with the hex nuts (user-supplied).
4. Secure the line terminal clamp hardware to the upper casting.
   Note: The recommended minimum torque level for the terminal clamp hardware is 30 ft-lbs.

Arresters 132 kV through 360 kV or housing codes greater than 64

UHAF and UXLG high-strength surge arresters are shipped unassembled for ratings 132 kV through 396 kV. These arresters are also supplied with a grading ring, that is packaged with the arrester and is illustrated in Figure 5. For these arresters, choose a permanent installation structure so that arresters will be installed as close as possible (electrically) to the equipment being protected. Minimum clearance distances between any line potential surface to an arrester and to any ground plane are listed in Tables 1 and 2. Figure 7 shows the minimum phase-to-ground and minimum phase-to-phase clearances. Refer to Tables 1 and 2 and Figure 7 for standard arrester dimension and weight information.

Multi-unit arresters must be erected with the units in the correct order as shown in Figure 5. All units in a multi-unit arrester have the same serial number and are marked with the appropriate unit number. Refer to the unit nameplate on the base of the arrester for the correct placement order.

Packaged components (132-396 kV rated)

Unit A Arrester identified as unit 1 of 2 on the unit nameplate located on the flange connector and with mounting base attached.

Unit B Arrester identified as unit 2 of 2 on the unit nameplate located on the flange connector.

A single grading ring is provided for arrester ratings 132 kV through 396 kV. Line and ground terminal connectors and flange connecting hardware are supplied separately in a bag.

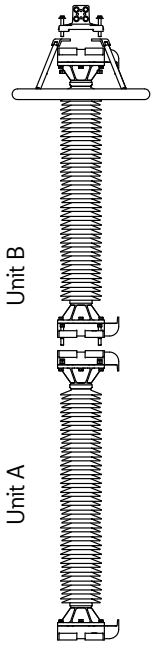

Figure 5. Detail of arrester assembly

Detailed assembly instructions

Multi-unit arresters should be assembled where they are being installed. The recommended installation is shown below.

1. After Unit A is in place and ready to be secured, the ground terminal connector should be placed so that the mounting hole, found on the connector, is directly over one of the four mounting holes on the base of the arrester.
2. The bolt (user-supplied) used to secure the arrester is then run through the hole of the connector, the mounting slot, and the structure the arrester is attached to.
3. Secure the arrester to the structure with mounting hardware (user-supplied).

4. Attach Unit B onto Unit A using four (4) sets of connecting hardware supplied, which includes bolts, lock washer and nuts with a MAXIMUM ALLOWABLE torque of 15 ft-lbs. Applying too much torque will strip the threads.

⚠ WARNING

Do not attempt to lift an arrester assembly of more than 4 units at one time.

⚠ CAUTION

While torquing the nut, do not use the grading ring as a support.

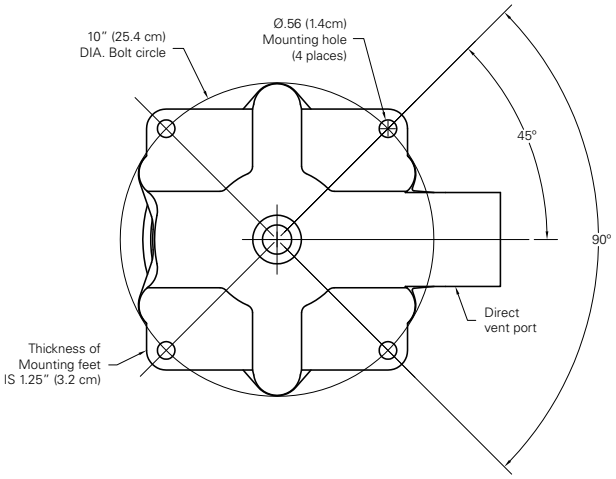

Figure 6. Mounting base details

5. Position the supplied grading ring onto the top unit as shown in Figure 4. Next, position the line terminal connector followed by the supplied lock washers and nuts as shown in Figure 4. Secure until tight.

Note: Recommended minimum torque level for the terminal clamp hardware is 30 ft-lbs.

⚠ CAUTION

The values shown in Tables 1 and 2 are the minimum clearances recommended by Eaton. These minimum clearances may be increased to meet local or system requirements for spacing of energized equipment. Safe operating practices must always be followed.

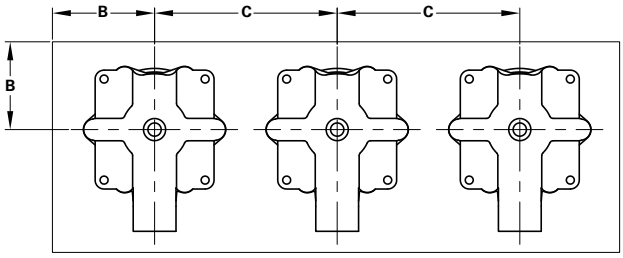

Figure 7. Three-phase in-line mounting arrangement

Note: Refer to Tables 1 and 2 for Dimensions "B" and "C."

Mechanical Strength

⚠ CAUTION

Make electrical connections so that no mechanical stress is applied to the arrester.

UHAF high-strength surge arresters (3-288 kV) have an ultimate cantilever strength rating of 120,000 and a maximum working load rating of 48,000 in-lbs. UXLG high-strength surge arresters (3-396 kV) have an ultimate cantilever strength rating of 200,000 in-lbs and a maximum working load rating of 80,000 in-lbs.

In order to achieve rated cantilever strength use a 10" bolt circle mounting diameter and 0.5" hardened bolts with flat washers.

Base or Foundation Mounting

Pier footings should extend below the frost line. Elevate the foundation sufficiently above the ground line for personnel safety and to prevent contamination from ground splash, drifting snow, flood water, or other contaminating conditions. If the top of the foundation is not level, shims will be required for leveling. Layout mounting dimensions for the arrester mounting base are shown in Figure 7.

Bracket or Structure Mounting

When bolting arresters directly to structures or mounting brackets, the assembly should be rigid enough to prevent mechanical failure.

Electrical connections

Install the arrester as close as possible (electrically) to the apparatus being protected. Line and ground connections must be short and direct. Make the ground connection to a solid, effective, and permanent low-resistance ground.

Note: Equipment protection will be improved by interconnecting the arrester ground connections with the transformer tank and system neutral whenever possible.

Line terminal connector

The standard cast line terminal is suitable for copper or aluminum conductors through 1.15" diameter (1000 MCM). Consult catalog for information on other line terminal options.

Ground terminal connector

Connect the ground terminal connector to the common ground system with as short a conductor as possible. The ground terminal can be attached to any of the bottom base mounting bolts (not supplied). The standard ground terminal (with clamp) accommodates copper or aluminum conductor through 0.82" dia. (500 MCM). Consult catalog for information on other ground terminal options.

⚠ CAUTION

Before working on arresters, disconnect all line leads. Consider any part of an arrester dangerous when connected to the line, including a base not solidly grounded.

Maintenance

All UHAF and UXLG high-strength surge arresters, when properly applied, require no special maintenance under normal operating conditions. If the arrester is installed in an area of severe contamination, keep the arrester housing clean by washing periodically. Arresters must be spray washed evenly in order to avoid overheating. Do not use high pressure water or abrasive cleaning materials. Keep all line and ground terminals secure.

⚠ WARNING

Arresters can be washed while energized provided standard live washing procedures are followed.

Dimensions, clearances, and weights

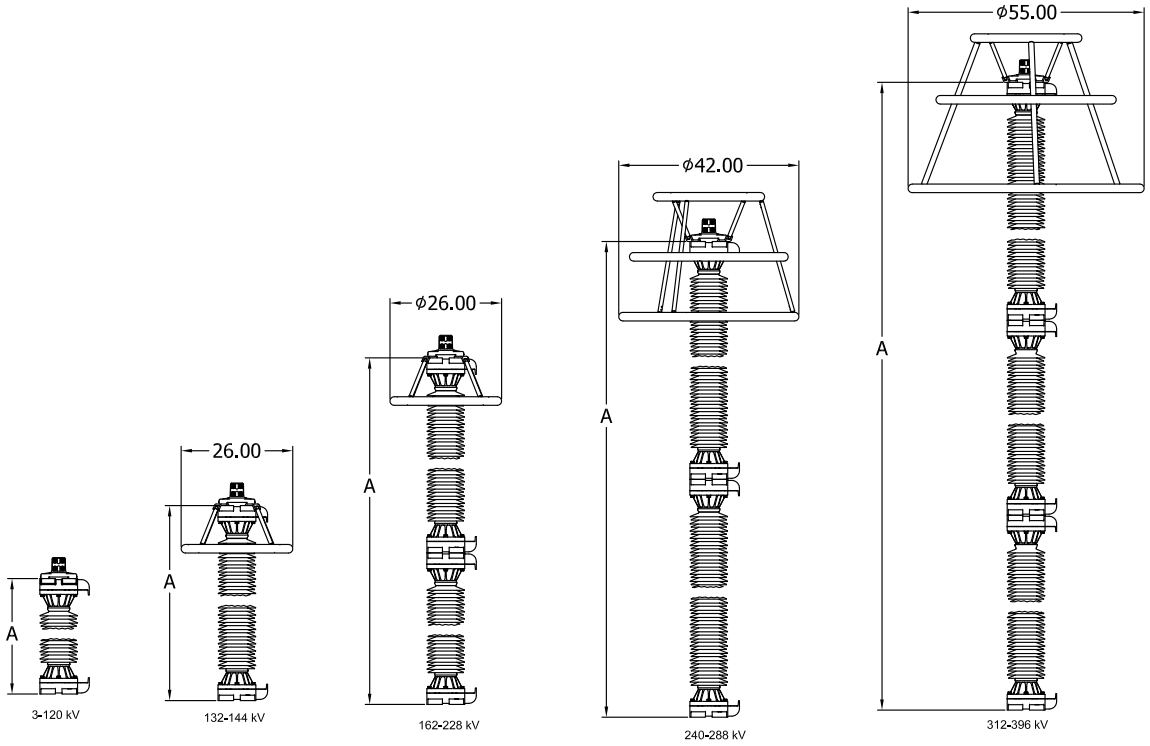

Figure 8. Standard UltraSIL polymer-housed type UHAF and UXLG arrester dimensions

Note: Refer to Table 1 and Table 2 for dimension "A" Outlines in Figure 8 represent standard arrester catalog numbers without line and ground terminals shown. Outline dimensions will vary with non-standard configurations. Consult factory for more information.

Table 1. Dimensions, Clearance Requirements and Weights of UHAF High-Strength Hollow Core Station-Class Surge Arresters

Arrester Rating (kV, rms)	Catalog Number	Figure 8 Dim. "A"(inches)	Figure 7 Dim. "B" Minimum Phase-To-Ground Clearance (inches)	Figure 7 Dim. "C" Minimum Phase-to-Phase Cearance (inches)	Creepage Distance (inches)	1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Weight(lbs)
3	UHAF003002A1445A11	26.1	6.5	12	67.7	221	136	124	50.1
6	UHAF006005A1445A11	26.1	6.5	12	67.7	221	136	124	50.4
9	UHAF009007A1445A11	26.1	6.6	12.1	67.7	221	136	124	50.8
10	UHAF010008A1445A11	26.1	6.8	12.3	67.7	221	136	124	50.8
12	UHAF012010A1445A11	26.1	7.2	12.7	67.7	221	136	124	51
15	UHAF015012A1445A11	26.1	7.9	13.4	67.7	221	136	124	51.2
18	UHAF018015A1445A11	26.1	8.8	14.3	67.7	221	136	124	51.6
21	UHAF021017A1445A11	26.1	9.4	14.9	67.7	221	136	124	51.6
24	UHAF024019A1445A11	26.1	9.5	15	67.7	221	136	124	52.1

Table 1. Dimensions, Clearance Requirements and Weights of UHAF High-Strength Hollow Core Station-Class Surge Arresters

Arrester Rating (kV, rms)	Catalog Number	Figure 8 Dim. "A"(inches)	Figure 7 Dim. "B" Minimum Phase-To-Ground Clearance (inches)	Figure 7 Dim. "C" Minimum Phase-to-Phase Cearance (inches)	Creepage Distance (inches)	1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Weight(lbs)
27	UHAF027022A1445A11	26.1	10.4	15.9	67.7	221	136	124	52.4
30	UHAF030024A1445A11	26.1	11.2	16.7	67.7	221	136	124	52.5
33	UHAF033027A1445A11	26.1	12.3	17.8	67.7	221	136	124	52.9
36	UHAF036029A1445A11	26.1	12.8	18.3	67.7	221	136	124	52.9
39	UHAF039031A1445A11	26.1	13.7	19.2	67.7	221	136	124	53.4
48	UHAF048039A2445A11	34.5	16.3	21.8	114.2	342	205	174	62.7
54	UHAF054042A2445A11	34.5	17.3	22.8	114.2	342	205	174	62.7
60	UHAF060048A2445A11	34.5	19.4	24.9	114.2	342	205	174	63.6
66	UHAF066053A2445A11	34.5	21.1	26.6	114.2	342	205	174	63.8
72	UHAF072057A2445A11	34.5	22.5	28	114.2	342	205	174	64.3
78	UHAF078062A3645A11	44.6	24.2	29.7	170	488	290	240	74.6
84	UHAF084068A3645A11	44.6	26.3	31.8	170	488	290	240	75
90	UHAF090072A3645A11	44.6	27.6	33.1	170	488	290	240	75.5
96	UHAF096076A3645A11	44.6	29	34.5	170	488	290	240	75.9
108	UHAF108088A4845A11	54.6	33.2	38.7	225.9	635	375	305	92.2
108	UHAF108084A4845A11	54.6	31.8	37.3	225.9	635	375	305	91.7
120	UHAF120098A4845A11	54.6	36.6	42.1	225.9	635	375	305	93
132	UHAF132106A4845A11	54.6	46.9	59.9	225.9	617	344	324	94
138	UHAF138111A4845A11	54.6	48.6	61.6	225.9	617	344	324	94
144	UHAF144115A4845A11	54.6	50	63	225.9	617	344	324	94.8
162	UHAF162130A6045A11	79.1	55.2	68.2	284.2	833	481	423	144.3
168	UHAF168131A6045A11	79.1	55.5	68.5	284.2	833	481	423	144.3
172	UHAF172140A7245A11	89.1	58.6	71.6	340.1	979	566	489	154.9
180	UHAF180144A7245A11	89.1	60	73	340.1	979	566	489	155.3
192	UHAF192152A7245A11	89.1	62.7	75.7	340.1	979	566	489	156.2
198	UHAF198160A8445A11	99.2	65.5	78.5	395.9	1105	634	564	167
204	UHAF204165A8445A11	99.2	67.2	80.2	395.9	1105	634	564	167.5
216	UHAF216174A8445A11	99.2	70.3	83.3	395.9	1105	634	564	168.4
228	UHAF228180A8445A11	99.2	72.4	85.4	395.9	1105	634	564	168.8
240	UHAF240190A9645A11	109	83.8	105	451.8	1148	679	556	201.1
258	UHAF258209A9645A11	109	90.4	111	451.8	1148	679	556	202.8
264	UHAF264212A9645A11	109	91.4	112	451.8	1148	679	556	203.3
276	UHAF276220A9645A11	109	94.2	115	451.8	1148	679	556	203.8
288	UHAF288230A9645A11	109	97.6	119	451.8	1148	679	556	205.1

* Phase-to-Ground clearances are expressed as minimum arrester centerline-to-ground distances. Phase-to-Phase clearances are expressed as minimum arrester centerline-to-centerline distances. Phase-to-Phase and Phase-to-Ground clearances are based upon arrester protective characteristics and should be adjusted accordingly to meet local clearance requirements for energized equipment.

Table 2. Dimensions, Clearance Requirements and Weights of UXLG High-Strength Hollow Core Station-Class Surge Arresters

Arrester Rating (kV, rms)	Catalog Number	Figure 8 Dim. "A"(inches)	Figure 7 Dim. "B" Minimum Phase-To-Ground Clearance (inches)	Figure 7 Dim. "C" Minimum Phase-to-Phase Cearance (inches)	Creepage Distance (inches)	1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Weight(lbs)
3	UXLG003002A1445A11	26.9	6.5	12	68.1	221	136	124	65.2
6	UXLG006005A1445A11	26.9	6.5	12	68.1	221	136	124	65.8
9	UXLG009007A1445A11	26.9	6.5	12	68.1	221	136	124	66.6
10	UXLG010008A1445A11	26.9	6.6	12.1	68.1	221	136	124	66.6
12	UXLG012010A1445A11	26.9	7	12.5	68.1	221	136	124	67.2
15	UXLG015012A1445A11	26.9	7.5	13	68.1	221	136	124	67.6
18	UXLG018015A1445A11	26.9	8.3	13.8	68.1	221	136	124	68.6
21	UXLG021017A1445A11	26.9	8.8	14.3	68.1	221	136	124	68.6
24	UXLG024019A1445A11	26.9	8.9	14.4	68.1	221	136	124	69.6
27	UXLG027022A1445A11	26.9	9.6	15.1	68.1	221	136	124	70.3
30	UXLG030024A1445A11	26.9	10.4	15.9	68.1	221	136	124	70.6
33	UXLG033027A1445A11	26.9	11.3	16.8	68.1	221	136	124	71.6
36	UXLG036029A1445A11	26.9	11.8	17.3	68.1	221	136	124	71.6
39	UXLG039031A1445A11	26.9	12.6	18.1	68.1	221	136	124	72.7
48	UXLG048039A2445A11	35.3	14.9	20.4	114.7	342	205	174	87.9
54	UXLG054042A2445A11	35.3	15.8	21.3	114.7	342	205	174	87.9
60	UXLG060048A2445A11	35.3	17.7	23.2	114.7	342	205	174	90
66	UXLG066053A2445A11	35.3	19.3	24.8	114.7	342	205	174	90.5
72	UXLG072057A2445A11	35.3	20.5	26	114.7	342	205	174	91.6
78	UXLG078062A3645A11	45.4	22	27.5	170.5	488	290	240	107.7
84	UXLG084068A3645A11	45.4	23.9	29.4	170.5	488	290	240	108.7
90	UXLG090072A3645A11	45.4	25.1	30.6	170.5	488	290	240	109.7
96	UXLG096076A3645A11	45.4	26.4	31.9	170.5	488	290	240	110.7
108	UXLG108088A4845A11	55.4	30.1	35.6	226.4	635	375	305	134.2
108	UXLG108084A4845A11	55.4	28.9	34.4	226.4	635	375	305	133.2
120	UXLG120098A4845A11	55.4	33.2	38.7	226.4	635	375	305	136.2
132	UXLG132106A4845A11	55.4	43.2	56.2	226.4	617	344	324	138.3
138	UXLG138111A4845A11	55.4	44.7	57.7	226.4	617	344	324	138.3
144	UXLG144115A4845A11	55.4	46	59	226.4	617	344	324	140.3
162	UXLG162130A6045A11	80.7	50.6	63.6	285.2	833	481	423	206
168	UXLG168131A6045A11	80.7	50.9	63.9	285.2	833	481	423	206
172	UXLG172140A7245A11	90.8	53.7	66.7	341	979	566	489	222.8
180	UXLG180144A7245A11	90.8	55	68	341	979	566	489	223.7
192	UXLG192152A7245A11	90.8	57.4	70.4	341	979	566	489	225.8
198	UXLG198160A8445A11	101	59.9	72.9	396.9	1105	634	564	243.3
204	UXLG204165A8445A11	101	61.5	74.5	396.9	1105	634	564	244.3
216	UXLG216174A8445A11	101	64.3	77.3	396.9	1105	634	564	246.4
228	UXLG228180A8445A11	101	66.1	79.1	396.9	1105	634	564	247.4
240	UXLG240190A9645A11	111	77.2	98.2	452.7	1148	679	556	286.9
258	UXLG258209A9645A11	111	83.1	104	452.7	1148	679	556	290.9
264	UXLG264212A9645A11	111	84	105	452.7	1148	679	556	292
276	UXLG276220A9645A11	111	86.5	108	452.7	1148	679	556	293
288	UXLG288230A9645A11	111	89.6	111	452.7	1148	679	556	296

Table 2. Dimensions, Clearance Requirements and Weights of UXLG High-Strength Hollow Core Station-Class Surge Arresters

Arrester Rating (kV, rms)	Catalog Number	Figure 8 Dim. "A"(inches)	Figure 7 Dim. "B" Minimum Phase-To-Ground Clearance (inches)	Figure 7 Dim. "C" Minimum Phase-to-Phase Cearance (inches)	Creepage Distance (inches)	1.2/50 Impulse (kV, crest)	60Hz, dry 60 seconds (kV, rms)	60Hz, wet 10 seconds (kV, rms)	Weight(lbs)
312	UXLG312245AC045A11	146	101	128	567.4	1447	860	713	380.4
330	UXLG330267AD245A11	156	108	135	623.2	1594	945	778	400.9
336	UXLG336272AD245A11	156	109	137	623.2	1594	945	778	401.9
360	UXLG360289AE445A11	166	114	142	679.1	1741	1030	843	421.6
378	UXLG378306AE445A11	166	120	147	679.1	1741	1030	843	425.6
396	UXLG396318AE445A11	166	123	151	679.1	1741	1030	843	428.7

* Phase-to-Ground clearances are expressed as minimum arrester centerline-to-ground distances. Phase-to-Phase clearances are expressed as minimum arrester centerline-to-centerline distances. Phase-to-Phase and Phase-to-Ground clearances are based upon arrester protective characteristics and should be adjusted accordingly to meet local clearance requirements for energized equipment.

Notes

Notes

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