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

Powering Business Worldwide

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Contents

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.

CAUTION

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 UXL 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™ UXL High-Strength Station-Class Surge Arresters incorporate the latest in metal oxide varistor (MOV) technology. These arresters are constructed of a single series 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 process described nor 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 for an appreciable time 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 nameplate.

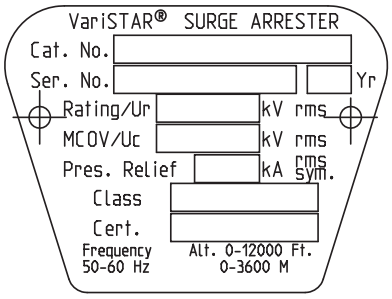

Figure 1. Detail of blank unit nameplate on arrester base

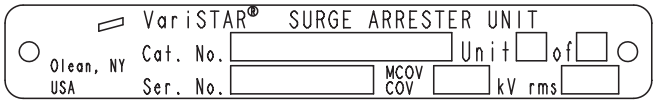

Figure 2. Detail of blank arrester nameplate

For multi-unit arresters rated above 120 kV or housing codes above 60 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

UXL high-strength surge arresters must be lifted vertically by the line terminal. Use of a lifting strap (user supplied) is recommended. Refer to Figure 3 for detailed lifting instructions.

Figure 3. Detail of recommended lifting instructions

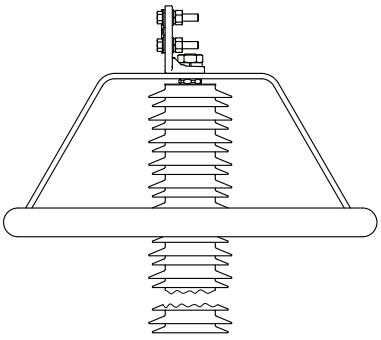

Figure 4. Detail of grading ring placement

⚠ 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 240 kV (housing codes greater than 60) 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

UXL high-strength surge arresters are shipped assembled for ratings 3 kV through 120 kV (or housing codes 64 or less). 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 Table 1. Figure 6 shows the minimum phase-to-ground and minimum phase-to-phase clearances. Refer to Table 1 and Figure 7 for standard arrester dimension and weight information.

Packaged components (3-120 kV rated)

- Assembled arrester ready for installation.
- The line and 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 three mounting slots 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 the hex nuts (user-supplied).

4. Position the line terminal connector on the top of the arrester. Secure the supplied lock washer and nut until tight.

Note: The recommended minimum torque level for the 20 mm or 1.0" terminal nut is 100 ft-lbs.

The recommended minimum torque level for the terminal clamp hardware is 30 ft-lbs.

The recommended maximum torque level for the eyebolt connector clamping nut is 20 ft-lbs.

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

UXL high-strength surge arresters are shipped unassembled for ratings 132 kV through 360 kV (housing codes greater than 64). 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 location 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 Table 1. Figure 6 shows the minimum phase-to-ground and minimum phase-to-phase clearances. Refer to Table 1 and Figure 8 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 (132-360 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 360 kV. Line and ground terminal connectors and mounting hardware are supplied separately in a bag.

⚠ CAUTION

Do not attempt to remove the large bolts on either end of the arrester. They are integral to the moisture seal of the arrester. If required, loosen the top bolt to allow orientation of the line terminal connector to the desired position; then secure until tight.

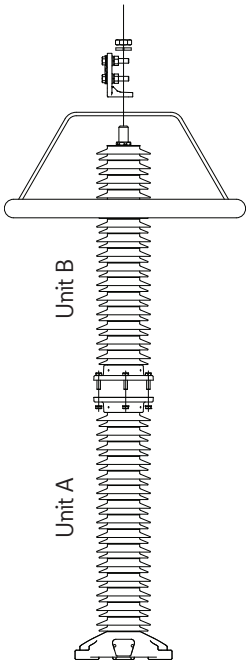

Figure 5. Detail of arrester assembly

Packaged components (240-360 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 360 kV. Line and ground terminal connectors and mounting hardware are supplied separately in a bag.

Detailed assembly instructions

Multi-unit arresters can be assembled prior to installation into a permanent location if desired; however, 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 three mounting slots on the base of the arrester.
2. The bolt (user-supplied) used to secure the arrester is then run through the holes 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 8 mm hardware, 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.

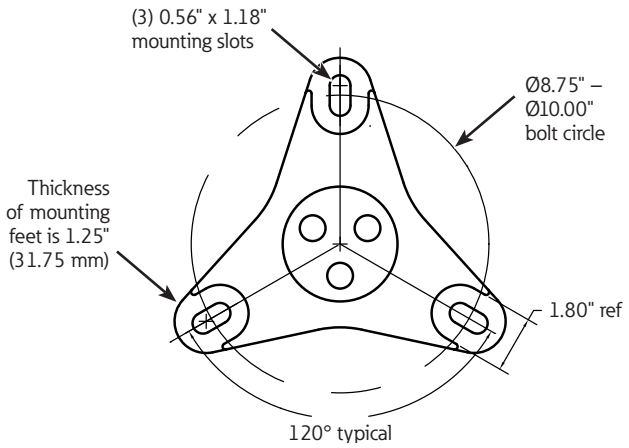

Figure 6. Mounting base details

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

Note: Recommended minimum torque level for the 20 mm or 1.0" terminal nut is 100 ft-lbs.

⚠ CAUTION

The values shown in Table 1 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.

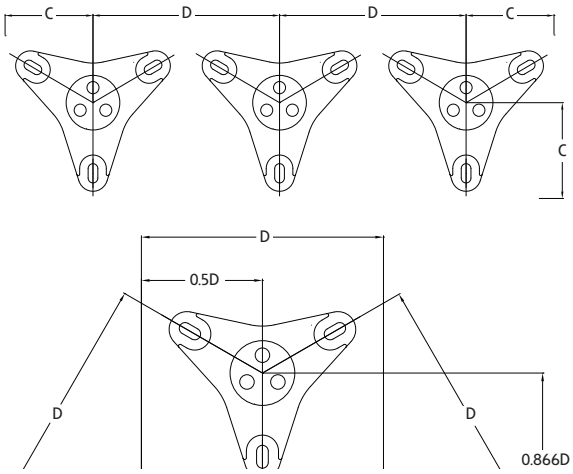

Figure 7. Three-phase in-line mounting arrangement

Note: Refer to Table 1 for Dimensions "C" and "D."

Mechanical Strength

⚠ CAUTION

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

UXLB high-strength surge arresters (3-360 kV) have an ultimate cantilever strength rating of 80,000 in-lbs and a maximum recommended working load rating of 32,000 in-lbs. UXLC high-strength surge arresters (132-360 kV) have an ultimate cantilever strength rating of 92,000 in-lbs and a maximum recommended working load rating of 36,800 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.

Suspension Mounting

Eaton offers more flexibility for customers to mount arresters in the field. UXL high-strength surge arresters can be configured in the underhung position (suspension mount)

at the plant or with a unique new option assembled in the field in the underhung position. For additional information regarding suspension mounting, contact your Eaton's Cooper Power series product factory representatives.

Note: It is important to remember arrester sheds must be angled downwards to prevent collection of water when installed in the underhung (suspension mount) position.

Horizontal Mounting

UXL high-strength surge arresters can be horizontal mounted through an arrester rating of 240 kV (housing codes 64 or less).

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.

⚠ CAUTION

To prevent strains on the arrester when suspension-mounting, suspend it freely. Always make flexible connections to line and earth terminals.

Line terminal connector

Refer to detailed assembly instructions on page 2 and page 3. After installation and adjustment of the line terminal to the desired position, secure until tight.

When the line conductor is to be connected, assemble the clamp with lock washers and nuts (supplied).

The standard line terminal (with appropriate side of clamp) are 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 UXL 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

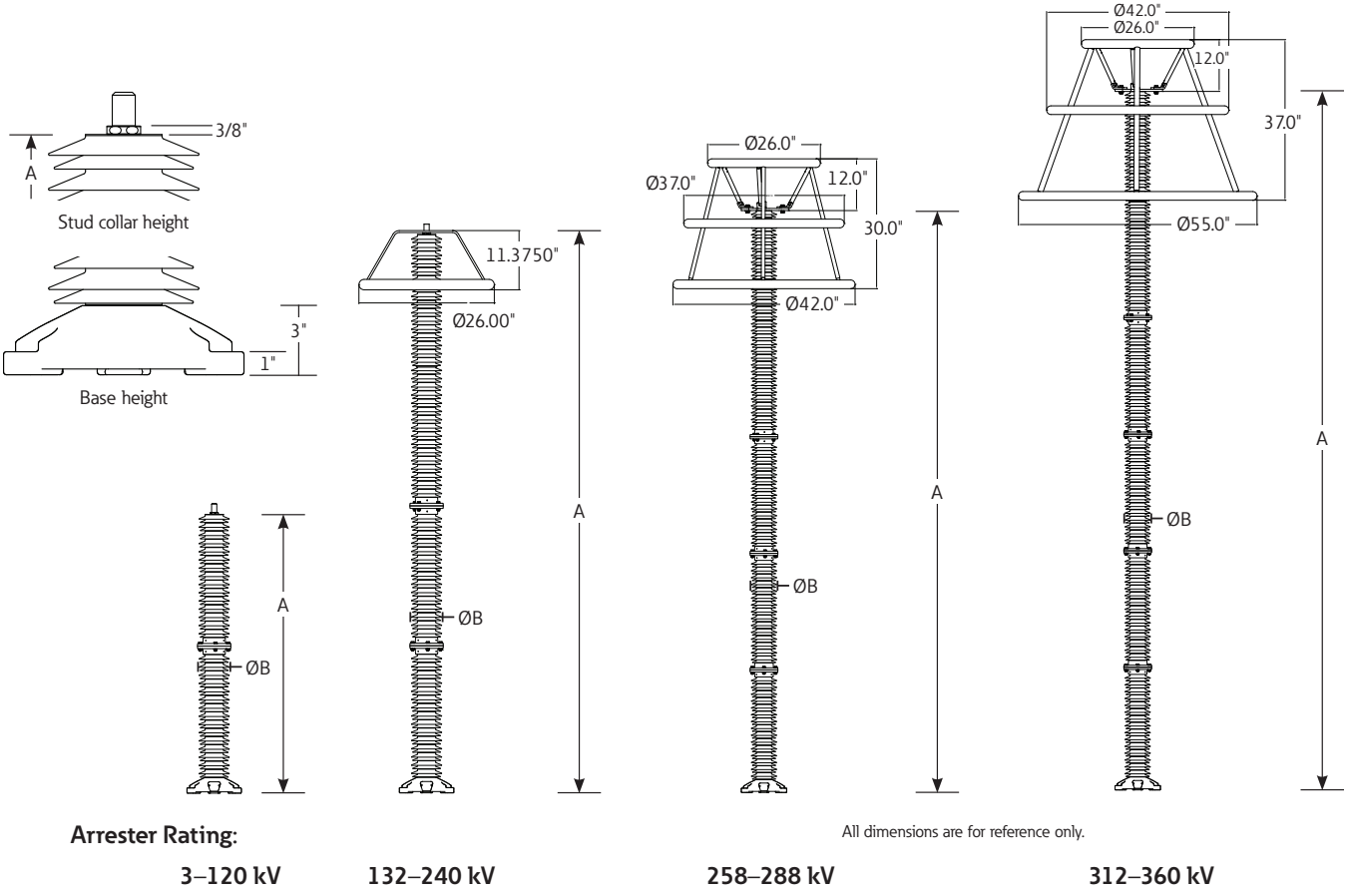

Figure 8. Standard UltraSIL polymer-housed type UXL arrester dimensions

Note: Refer to Table 1 and Table 2 for dimensions "A" and "B" Outlines in Figure 8 represent standard arrester catalog numbers from catalog CA235019EN 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 UXLB High-Strength Station-Class Surge Arresters

Arrester Rating (kV, rms)	Arrester MCOV (kV rms)	Catalog Number	Dimension A (in) Figure 8	Dimension B Diameter (in) Figure 8	Dimension C Minimum Phase-To-Ground Clearance (in) Figure 7	Dimension D Minimum Phase-to-Phase Clearance (in) Figure 7	Weight (lbs)
3	2.55	UXLB003002A1045A11	10.8	6.4	6.5	12	22
6	5.1	UXLB006005A1245A11	12.4	6.4	6.5	12	24.3
9	7.65	UXLB009007A1245A11	12.4	6.4	6.5	12	26.5
10	8.4	UXLB010008A1245A11	12.4	6.4	6.6	12.1	26.5
12	10.2	UXLB012010A1445A11	13.9	6.4	7	12.5	26.5
15	12.7	UXLB015012A1445A11	13.9	6.4	7.5	13	28.7
18	15.3	UXLB018015A1645A11	15.5	6.4	8.3	13.8	31
21	17	UXLB021017A1645A11	15.5	6.4	8.8	14.3	31
24	19.5	UXLB024019A1845A11	17	6.4	8.9	14.4	33
27	22	UXLB027022A1845A11	17	6.4	9.6	15.1	33

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

Arrester Rating (kV, rms)	Arrester MCOV (kV rms)	Catalog Number	Dimension A (in) Figure 8	Dimension B Diameter (in) Figure 8	Dimension C Minimum Phase-To-Ground Clearance (in) Figure 7	Dimension D Minimum Phase-to-Phase Clearance (in) Figure 7	Weight (lbs)
30	24.4	UXLB030024A2045A11	18.6	6.4	10.4	15.9	35
33	27.5	UXLB033027A2245A11	20.2	6.4	11.3	16.8	38
36	29	UXLB036029A2245A11	20.2	6.4	11.8	17.3	38
39	31.5	UXLB039031A2445A11	21.7	6.4	12.6	18.1	42
42	34	UXLB042034A2445A11	21.7	6.4	13.4	18.9	42
45	36.5	UXLB045036A2645A11	23.3	6.4	14.1	19.6	44
48	39	UXLB048039A2845A11	24.8	6.4	14.9	20.4	46
54	42	UXLB054042A2845A11	24.8	6.4	15.8	21.3	46
60	48	UXLB060048A3245A11	27.9	6.4	17.7	23.2	51
66	53	UXLB066053A3245A11	27.9	6.4	19.3	24.8	53
72	57	UXLB072057A4445A11	37.3	6.4	20.5	26	68
78	62	UXLB078062A4645A11	38.8	6.4	22	27.5	71
84	68	UXLB084068A4845A11	40.4	6.4	23.9	29.4	73
90	72	UXLB090072A5045A11	41.9	6.4	25.1	30.6	75
96	76	UXLB096076A5245A11	43.5	6.4	26.4	31.9	77
108	84	UXLB108084A5645A11	46.6	6.4	28.9	34.4	84
120	98	UXLB120098A6445A11	52.8	6.4	33.2	38.7	99
132	106	UXLB132106A6445A11	52.8	6.4	43.2	56.2	99
138	111	UXLB138111A8045A11	65.3	6.4	44.7	57.7	119
144	115	UXLB144115A8045A11	65.3	6.4	46	59	119
162	130	UXLB162130A8645A11	70	6.4	50.6	63.6	128
168	131	UXLB168131A8645A11	70	6.4	50.9	63.9	128
172	140	UXLB172140A9245A11	74.6	6.4	53.7	66.7	137
180	144	UXLB180144AA445A11	84	6.4	55	68	152
192	152	UXLB192152AB045A11	88.6	6.4	57.4	70.4	159
198	160	UXLB198160AB245A11	90.2	6.4	59.9	72.9	161
204	165	UXLB204165AB445A11	91.8	6.4	61.5	74.5	163
216	174	UXLB216174AB645A11	93.3	6.4	64.3	77.3	168
228	180	UXLB228180AB845A11	94.9	6.4	66.1	79.1	170
240	190	UXLB240190AC645A11	101	6.4	69.2	82.2	179
258	209	UXLB258209AC845A11	128	6.4	83.1	104	205
264	212	UXLB264212AC845A11	128	6.4	84	105	205
276	220	UXLB276220AE845A11	143	6.4	86.5	108	229
288	230	UXLB288230AF245A11	146	6.4	89.6	111	236
312	245	UXLB312245AF645A11	149	6.4	101	128	245
330	267	UXLB330267AH245A11	162	6.4	105	132	267
336	269	UXLB336269AH245A11	162	6.4	105	133	267
360	289	UXLB360289AJ845A11	174	6.4	114	142	287

* 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 UXLC High-Strength Station-Class Surge Arresters

Arrester Rating (kV, rms)	Arrester MCOV (kV rms)	Catalog Number	Dimension A (in) Figure 8	Dimension B Diameter (in) Figure 8	Dimension C Minimum Phase-To-Ground Clearance (in) Figure 7	Dimension D Minimum Phase-to-Phase Clearance (in) Figure 7	Weight (lbs)
132	106	UXLC132106A8445A11	68.4	6.4	43.2	56.2	119
138	111	UXLC138111A8445A11	68.4	6.4	44.7	57.7	119
144	115	UXLC144115A8645A11	70	6.4	46	59	121
162	130	UXLC162130A9045A11	73.1	6.4	50.6	63.6	128
168	131	UXLC168131A9045A11	73.1	6.4	50.9	63.9	130
172	140	UXLC172140AB045A11	88.6	6.4	53.7	66.7	152
180	144	UXLC180144AB245A11	90.3	6.4	55	68	154
192	152	UXLC192152AB645A11	93.4	6.4	57.4	70.4	161
198	160	UXLC198160AC045A11	96.5	6.4	59.9	72.9	165
204	165	UXLC204165AC045A11	96.5	6.4	61.5	74.5	165
216	174	UXLC216174AC245A11	98	6.4	64.3	77.3	168
228	180	UXLC228180AC045A11	96.5	6.4	66.1	79.1	168
240	190	UXLC240190AC645A11	101	6.4	69.2	82.2	176
258	209	UXLC258209AE845A11	143	6.4	83.1	104	223
264	212	UXLC264212AF045A11	145	6.4	84	105	225
276	220	UXLC276220AF445A11	148	6.4	86.5	108	232
288	230	UXLC288230AF645A11	149	6.4	89.6	111	238
312	245	UXLC312245AH645A11	165	6.4	101	128	262
330	267	UXLC330267AJ445A11	171	6.4	108	135	273
336	269	UXLC336269AJ645A11	173	6.4	108	136	278
360	289	UXLC360289AK245A11	177	6.4	114	142	287

* 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.

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