

Ultrasil polymer-housed varistar type U4 surge arresters installation and maintenance instructions

Varistar® SURGE ARRESTER

Cat. No.			
Ser. No.			Yr
Rating/Ur		kV rms	
MCOV/Uc		kV rms	
Pres. Relief		kA rms sym.	
Class			
Cert.			
Frequency	Alt. 0-12000 Ft.		
50-60 Hz	0-3600 M		

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Safety for life



Eaton's Cooper Power series products meet or exceed all applicable industry standards relating to product safety. 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.

G122.3

Product information

Introduction

Eaton's Cooper Power series UltraSIL™ Housed VariSTAR™ Type U4 Surge Arresters incorporate the latest in metal oxide varistor (MOV) technology. These arresters are gapless and are constructed of a single series column of 76 mm diameter 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 IEC 60099-4.

CAUTION

Eaton's Cooper Power series VariSTAR Type U4 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.

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 sales representative.

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.

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.

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.

Identification

A nameplate attached to the base of each arrester indicates its catalog number, voltage rating (U_r), continuous operating voltage (U_c), 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.

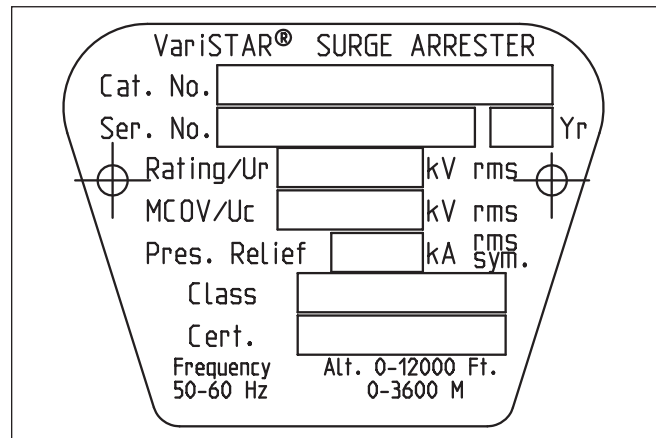


Figure 1. Arrester base nameplate (English version).

For multi-unit arresters with housing codes greater than 60 an additional nameplate is provided on the base that includes information regarding the catalog number, serial number, unit identification, and unit U_c . Refer to Figure 2. Information regarding unit identification is etched on the top plate for each arrester section.

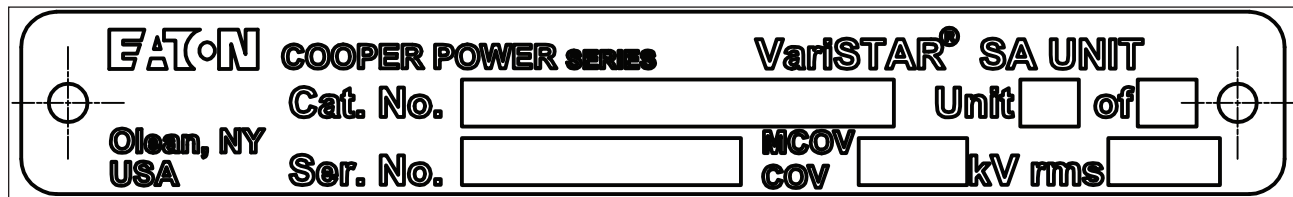


Figure 2. Detail of blank unit nameplate on arrester base.

CAUTION

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

Lifting instructions

All UltraSIL Housed Type U4 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.

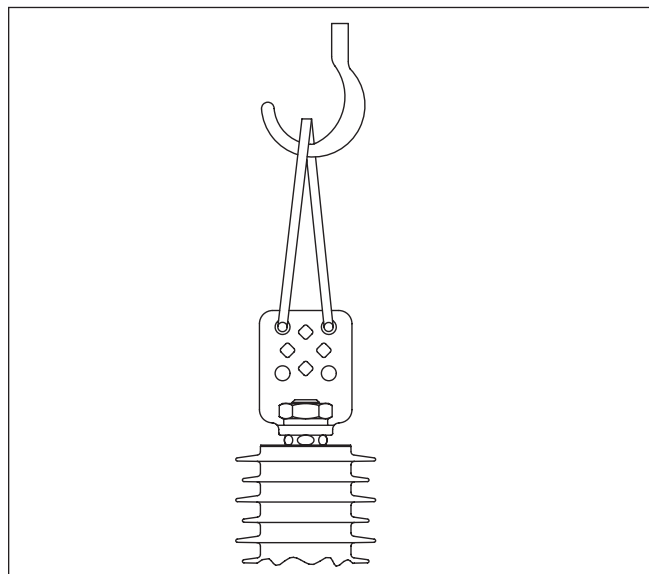


Figure 3. Detail of recommended lifting instructions.

Grading ring

Arresters with 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.

WARNING

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

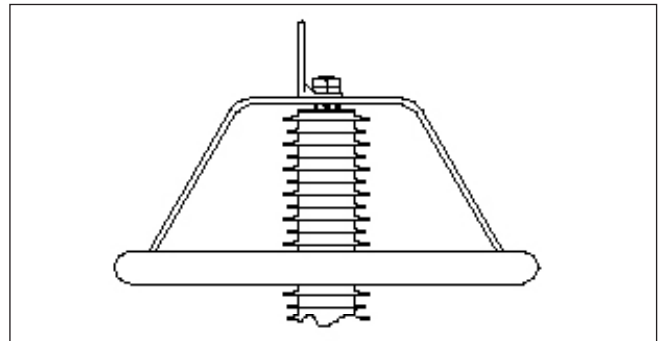


Figure 4. Detail of Grading Ring Placement.

Arrester installation

For arresters with housing codes 60 or less

UltraSIL Housed Type U4 Arresters are shipped assembled with housing codes 60 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 earth plane are listed in Table 1. Figure 6 shows the minimum phase-to-earth and minimum phase-to-phase clearances. Refer to Table 1 and Figure 7 for standard arrester dimension and weight information.

Packaged components

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

Detailed assembly instructions

Step 1

After the arrester is in place and ready to be secured, the earth 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.

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Step 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.

Step 3

Secure the arrester to the structure with the hex nuts (user supplied).

Step 4

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

For arresters with housing codes greater than 60

UltraSIL Housed Type U4 Arresters are shipped unassembled with housing codes greater than 60. These arresters are also supplied with a grading ring, that is packaged with the arrester. 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 earth plane are listed in Table 1. Figure 6 shows the minimum phase-to-earth 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

Unit A - Arrester identified with "Unit A" on top plate and with mounting base attached

Unit B - Arrester identified with "Unit B" on top plate

Unit C - Arrester identified with "Unit C" on top plate

Unit D - Arrester identified with "Unit D" on top plate, if supplied

Unit E - Arrester identified with "Unit E" on top plate, if supplied

Unit F - Arrester identified with "Unit F" on top plate, if supplied

CAUTION

Do not attempt to remove the large stud on either end of the arrester. They are an integral to the moisture seal of the arrester.

Line and earth 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.

Step 1

After Unit A is in place and ready to be secured, the earth 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.

Step 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.

Step 3

Secure the arrester to the structure with the hex nuts (user supplied).

CAUTION

Review the safety warning on the threadlocking sealant before use to prevent personal injury.

Step 4

Apply the threadlocking sealant (supplied) on to the top stud of each unit except the top unit. Attach and secure additional units (as supplied) onto previous units until tight as shown in Figure 5.

Note: Recommended torque of each arrester unit is 200 Nm if the arrester is going to be installed under severe loading conditions or in high seismic areas.

WARNING

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

Step 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.

CAUTION

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

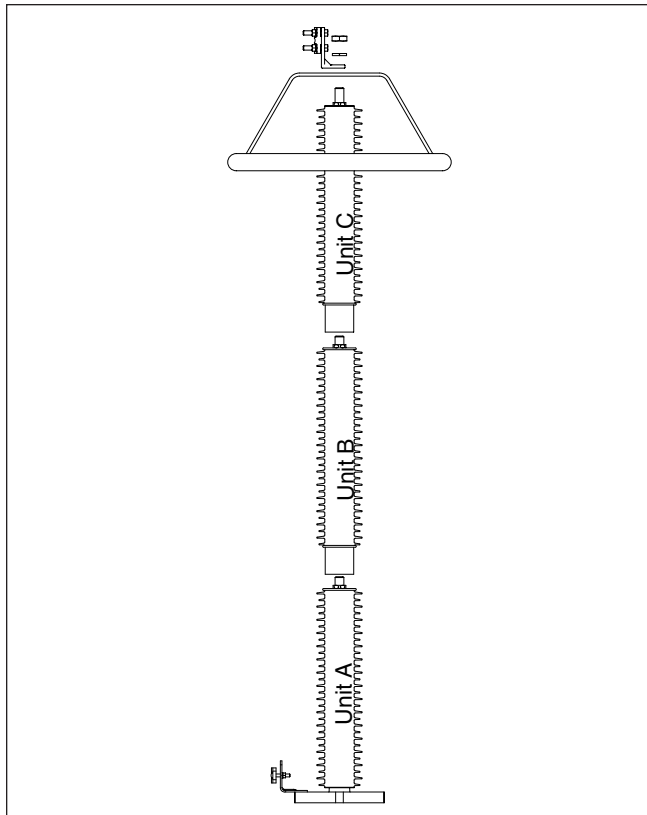


Figure 5. Example of Arrester Assembly.

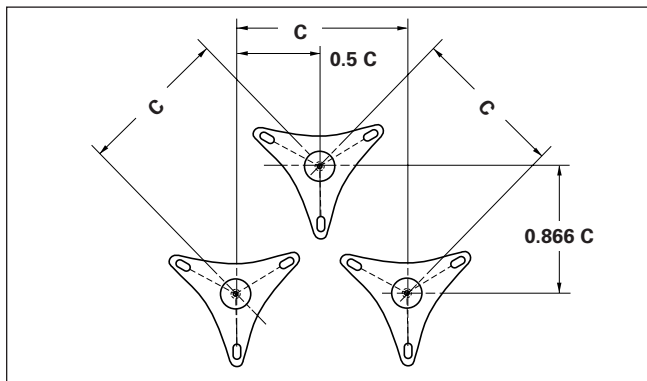


Figure 6a. Three-phase triangular mounting.

Note: Refer to Table 1, page 6, for Dimension C.

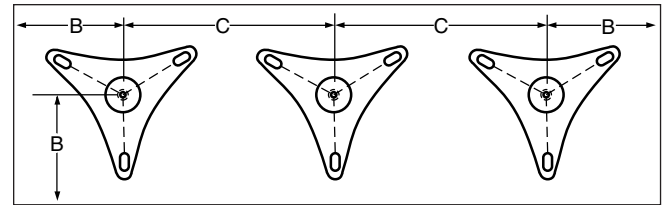


Figure 6b. Three-phase in-line mounting arrangement.

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

⚠ 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.

Mechanical strength

Type U4 Arresters have an ultimate cantilever strength rating of 4,000 Nm and a maximum recommended working load rating of 1,600 Nm.

In order to achieve rated cantilever strength use a 254 mm bolt circle mounting diameter and 12 mm hardened bolts with flat washers.

⚠ CAUTION

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

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Table 1. Catalog Numbers and Dimensional Information and Weights for VariSTAR U4 Surge Arresters

Arrester Rating Ur (kV, rms)	Arrester COV Uc (kV, rms)	Standard Arrester Catalog Number	Dim. A (mm) (Fig. 8)	Dimension B Minimum Phase-to-Earth Clearance* (mm) (Fig. 6b)	Dimension C Minimum Phase-to-Phase Clearance* (mm) (Fig. 6b)	Dim. D (mm) (Fig. 8)	Housing Leakage Distance** (mm)	Arrester Mass (kg)
3	2.55	U40030020845AAA	212	95	171	134	432	7.2
6	5.10	U40060051045AAA	251	97	173	134	540	8.3
9	7.65	U40090071045AAA	251	105	181	134	540	8.7
10	8.40	U40100081045AAA	251	108	184	134	540	8.7
12	10.2	U40120101245AAA	290	118	194	134	648	9.7
15	12.7	U40150121445AAA	329	135	211	134	756	10.8
18	15.3	U40180151445AAA	329	156	232	134	756	11.1
21	17.0	U40210171645AAA	368	153	230	134	864	11.8
24	19.5	U40240191845AAA	407	175	251	134	972	12.9
27	22.0	U40270221845AAA	407	196	272	134	972	13.2
30	24.4	U40300242045AAA	446	216	293	134	1080	14.3
33	27.5	U40330272245AAA	485	243	319	134	1188	15.4
36	29.0	U40360292245AAA	485	256	332	134	1188	15.4
39	31.5	U40390312245AAA	485	277	353	134	1188	15.7
42	34.0	U40420342445AAA	524	298	374	134	1296	16.7
45	36.5	U40450362645AAA	563	321	397	134	1404	17.8
48	39.0	U40480392645AAA	563	341	417	134	1404	18.2
54	42.0	U40540422845AAA	602	368	444	134	1512	19.2
60	48.0	U40600483045AAA	641	418	494	134	1620	20.6
66	53.0	U40660534045AAA	920	462	538	134	2160	28.9
72	57.0	U40720574445AAA	998	494	570	134	2376	30.7
78	62.0	U40780624845AA1	1076	538	615	134	2592	32.8
84	68.0	U40840684845AA1	1076	589	665	134	2592	33.5
90	70.0	U40900705045AA1	1115	606	682	134	2700	35.9
96	76.0	U40960765245AA1	1154	657	733	134	2808	36.0
108	84.0	U41080845845AA1	1271	724	800	134	3132	39.1
120	98.0	U41200986045AA1	1310	845	921	134	3240	41.7
132	106	U41321067645AA1	1706	1167	1497	134	4104	54.6
138	111	U41381117845AA1	1745	1208	1538	134	4212	55.7
144	115	U41441157845AA1	1745	1244	1574	134	4212	56.4
162	130	U41621308645AA1	1901	1370	1701	134	4644	61.0
168	131	U41681318645AA1	1901	1379	1709	134	4644	61.3
172	140	U41721408845AA1	1940	1456	1786	134	4752	63.1
180	144	U41801449045AA1	1979	1491	1821	134	4860	64.2
192	152	U4192152A445AA1	2336	1559	1889	134	5616	74.2
198	160	U4198160A845AA1	2414	1627	1957	134	5832	76.7
204	165	U4204165B045AA1	2453	1671	2001	134	5940	78.0
216	174	U4216174B445AA1	2531	1748	2078	134	6156	80.5
228	182	U4228182B645AA1	2570	1815	2146	134	6264	81.9
240	190	U4240190C045AA1	2648	1883	2213	134	6480	84.8

Note:

1. Refer to Figure 4 for illustrations of dimensions B and C and Figure 5 for dimensions A and D.

* Phase-to-Phase clearances are expressed as minimum arrester center-to-center distances. Phase-to-Earth clearances are expressed as minimum arrester centerline-to-ground distances.

** Leakage distances shown are for standard housing.

Base or foundation mounting

Pier footings should extend below the frost line. Elevate the foundation sufficiently for personnel safety and to prevent contamination. 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

Type U4 Arresters can be suspension-mounted. Either the top or bottom of suspension-mounted arresters can be connected to the line. It is important that the arrester is mounted so that the outer sheds of the housing are angled downward. For additional information regarding suspension mounting, contact your Eaton factory representatives.

Horizontal mounting

Type U4 Arresters can be horizontal mounted with housing codes 60 or less.

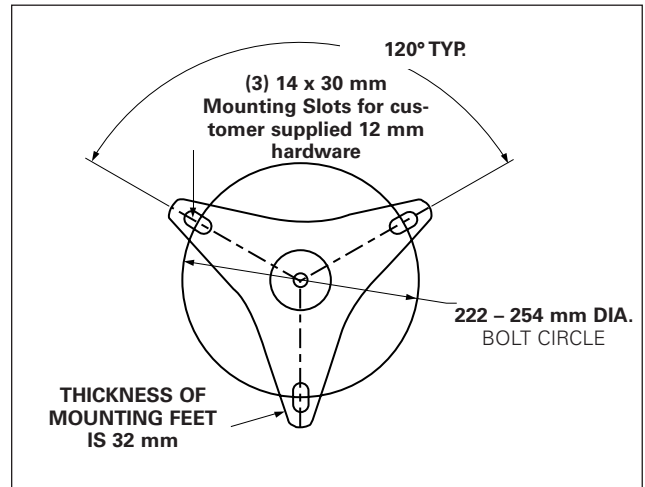


Figure 7. Mounting base details.

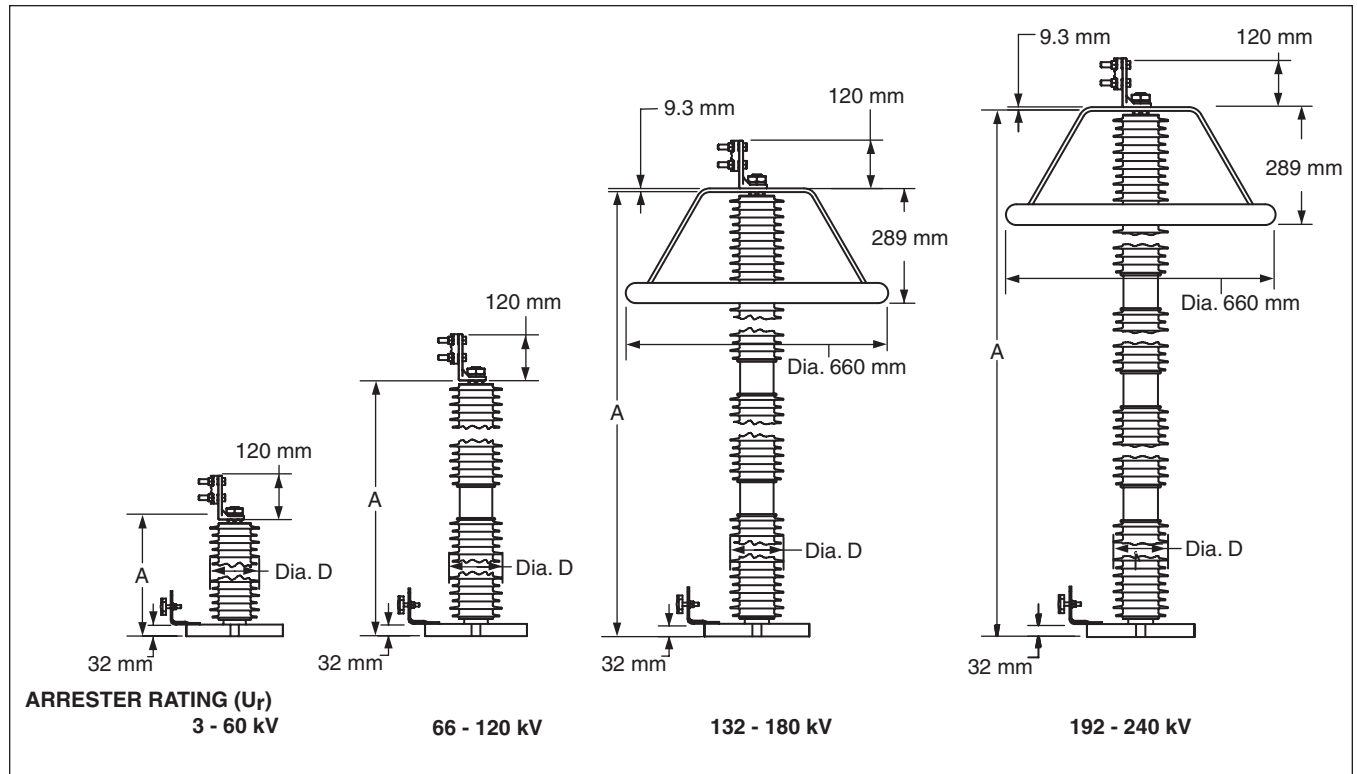


Figure 8. Standard UltraSIL Housed VariSTAR Type U4 Surge Arrester Dimensions.

Note:

Refer to Table 1 for dimensions A and D. Arresters shown with standard line terminal, Option 4 (in digit 11) and with standard earth terminal Option 5 (in digit 12).

Outlines in Figure 8 represent standard arrester catalog numbers from Table 1. Outline dimensions will vary when optional housing codes are selected. Consult factory for more information.

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Electrical connections

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

Note: Equipment protection will be improved by interconnecting the arrester earth 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 pages 3 and 4. After installation and adjustment of the line terminal to the desired position, secure until tight.

The standard line terminal (as shown in Figure 8) is suitable for copper or aluminum conductors through 29 mm Ø.

Earth terminal connector

Connect the earth terminal connector to the common earth system with as short a conductor as possible. The earth terminal can be attached to any of the bottom base mounting bolts (not supplied). The standard earth terminal (as shown in Figure 8) accommodates copper or aluminum conductor through 20 mm Ø.

WARNING

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 UltraSIL Housed Type U4 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. Keep all line and earth terminals secure.

WARNING

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



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