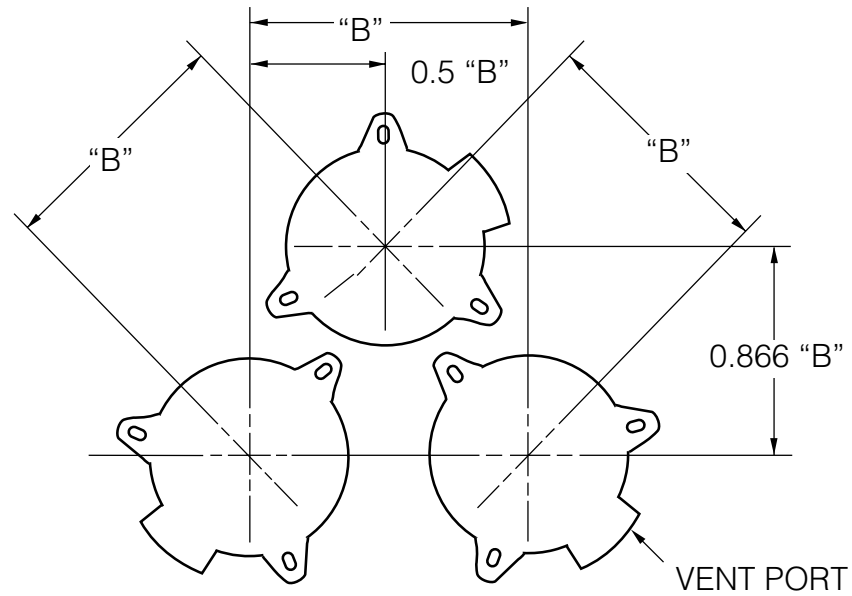


VariSTAR type AZE station class surge arresters installation and maintenance instructions



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Contents

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY I

SAFETY FOR LIFE III

SAFETY INFORMATION III
 Safety instructions iii

PRODUCT INFORMATION 1
 Introduction 1
 Additional information 1
 Acceptance and initial inspection 1
 Handling and storage 1
 Quality standards 1

GENERAL APPLICATION RECOMMENDATIONS 1

INSPECTION 1

IDENTIFICATION 1

ASSEMBLY 1
 Base or foundation mounting 2
 Bracket or structure mounting 2
 Suspension mounting 2

ELECTRICAL CONNECTIONS 4

MAINTENANCE 6



Safety for life



Cooper Power Systems 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 Cooper Power Systems 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 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 a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

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

CAUTION

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

CAUTION

Indicates a hazardous situation which, if not avoided, could 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 high voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

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.

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 may result in death, severe personal injury and equipment damage.

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.

CAUTION

Eaton's Cooper Power series VariSTAR Type AZE surge arrester is 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

VariSTAR™ AZE station class surge arresters incorporate the latest in metal oxide varistor (MOV) technology. These arresters are totally gapless and are constructed of a single series column of MOV disks. The arrester is designed and tested to the requirements of standard IEEE Std C62.11™ standard and is available in ratings suitable for the overvoltage protection of high-voltage systems through 345 kV.

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 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 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 arresters in well designed containers that reduce the possibility of damage which may occur during transit. Carefully inspect the porcelain for chips or cracks. In case of improper handling or shipping damage, immediately file a claim with the carrier, and promptly notify Eaton.

CAUTION

Do not install arresters that have evidence of damage.

Identification

A nameplate attached to the base casting of each VariSTAR 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.

For multiple unit arresters, a nameplate attached to the top casting of each unit indicates the catalog number and serial number of the complete arrester of which the unit forms a part. The unit nameplate also indicates the total number of units comprising the complete arrester and references the position of this unit in the complete assembly.

CAUTION

Always handle surge arresters carefully. Dropping or jarring an arrester may cause serious damage to the porcelain and/or internal parts and may cause catastrophic failure upon energization.

Assembly

VariSTAR Type AZE arresters rated 3 through 120 kV are shipped ready for installation. The 132 through 360 kV standard arresters require the assembly of multiple units stacked in a series. A grading ring is supplied for arresters rated 172 through 360 kV. Some lower voltage ratings having extra creepage housings may require multi-units stacked in series and grading rings. Grading ring assembly instructions are shown in Figure 6, 7 and 8.

Choose a permanent 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 2 and 3. Figures 1 and 2 show minimum phase-to-phase clearances. See Tables 2 and 3 and Figures 9 and 10 for standard arrester dimension and weight information.

⚠ CAUTION

The values shown in Tables 2 and 3 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.

⚠ CAUTION

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

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 foundation are shown in Figure 3.

⚠ CAUTION

The vent port in the base must be directed away from equipment to prevent ionized gases from damaging adjacent equipment in the unlikely event of arrester failure.

Bracket or structure mounting

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

Suspension mounting

AZE arresters rated through 168 kV can be suspension-mounted. Either the top or bottom of suspension-mounted arresters can be connected to the line as long as the sheds on the porcelain housings are not inverted.

To suspension mount arresters with duty cycle ratings from 172 to 198 kV, invert the grading ring, then attach it to the base of the arrester. See Figure 7 for diagram. For additional information regarding suspension mounting, contact your Eaton representatives.

⚠ CAUTION

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

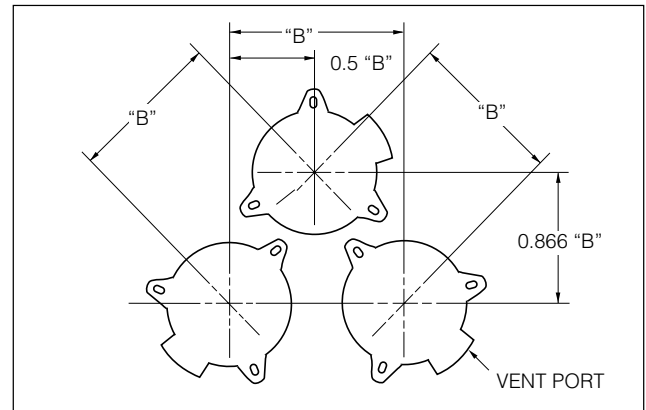


Figure 1. Three-phase triangular mounting

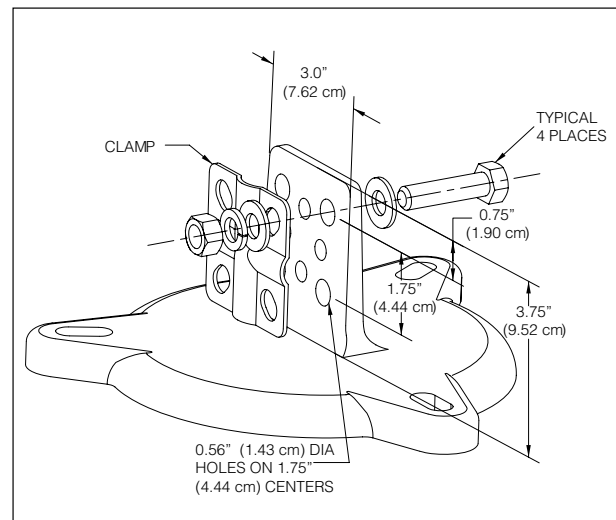


Figure 4. Line terminal cap (metal-top design)

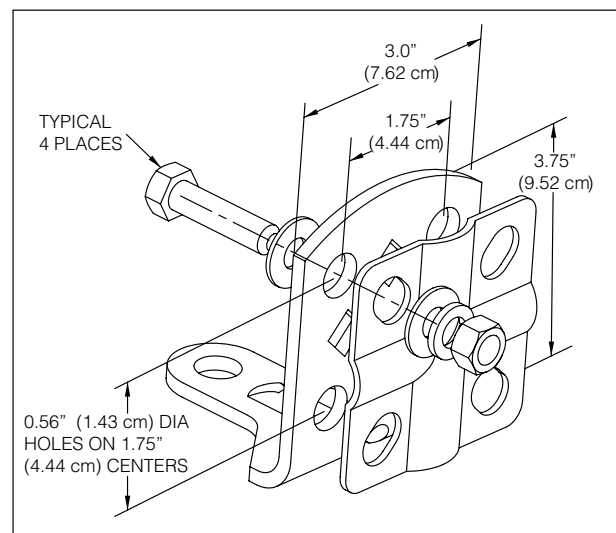


Figure 5. Ground terminal (also line terminal of cubicle-mount designs)

VariSTAR type aze station class surge arresters installation and maintenance instructions

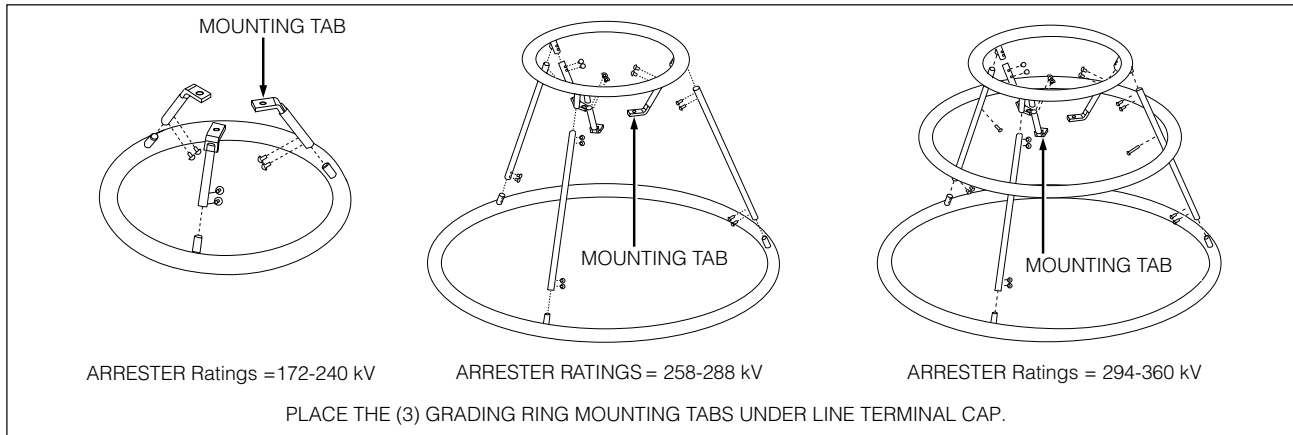


Figure 6. Grading ring assembly.

Note: Arresters with extra creepage housings may require grading rings in different voltage ratings.



Figure 7. Diagram of Suspension Mounted Arrester from 172 to 198 kV

To develop rated cantilever strength use 10 inch bolt circle mounting diameter and 0.5 inch hardened bolts and flat washers.

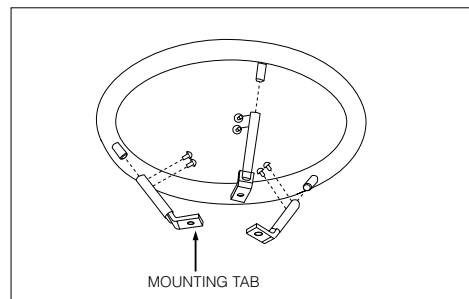


Figure 8. Grading ring assembly for arresters with duty cycles of 172 to 198 kV

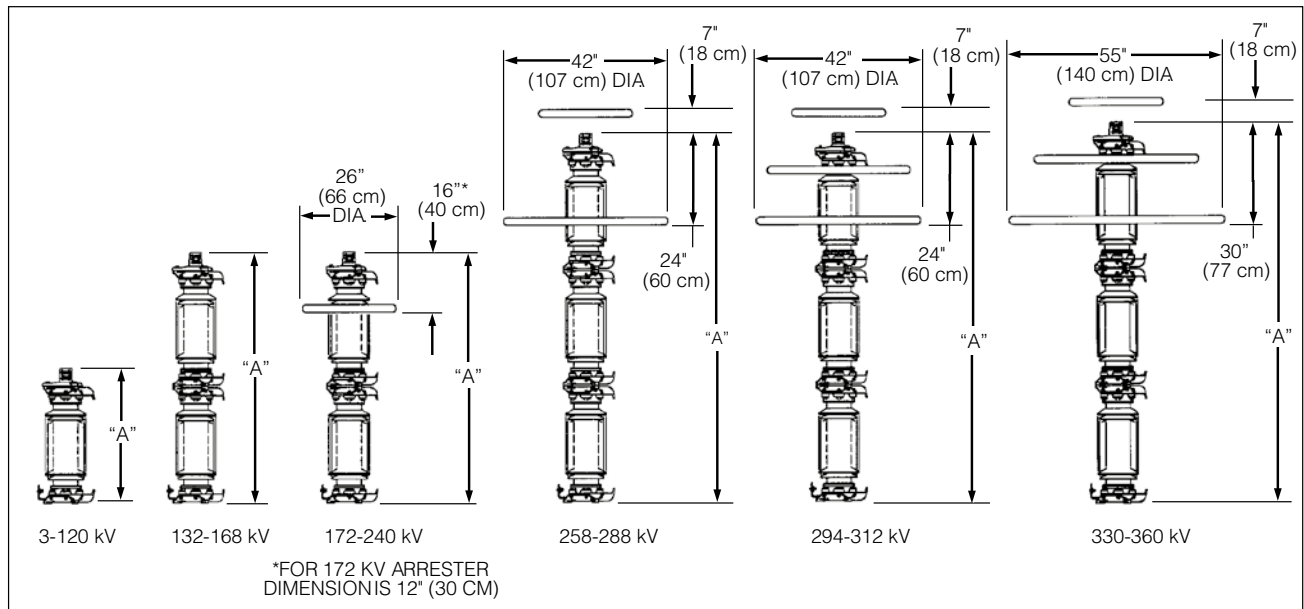


Figure 9. Dimensions of VariSTAR metal-top Type AZE surge arresters

Note: Refer to Table 2 for Dimension "A"

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.

The standard line and ground terminals (Figures 4 and 5) include connector clamps that accommodate up to .75 inch stranded copper or aluminum conductor.

The line and ground terminals allow the connector clamp to be positioned for vertical or horizontal conductor takeoff; in addition, it accommodates NEMA® standard two or four-hole connectors.

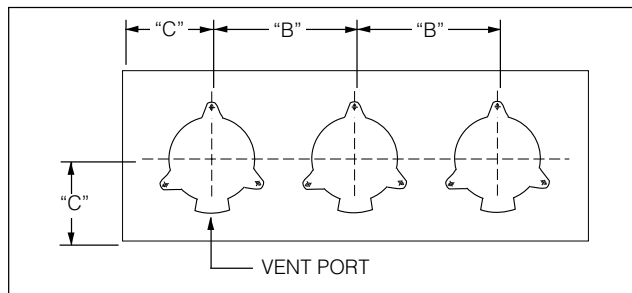


Figure 2. Three-phase in-line mounting

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

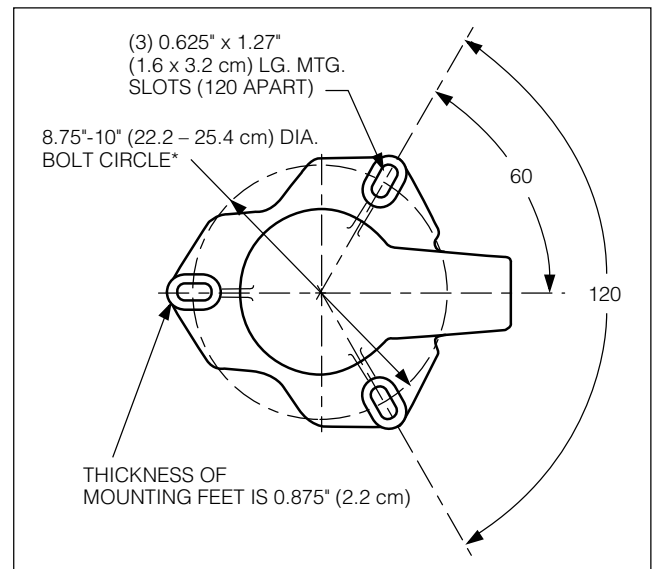


Figure 3. Base mounting details

*To develop rated cantilever strength use 10 inch bolt circle mounting diameter and 0.5 inch hardened bolts and flat washers.

VariSTAR type aze station class surge arresters installation and maintenance instructions

Table 1. Dimensional information and weights for type aze metal-top surge arresters in standard housings

Arrester rating kV, rms)	Arrester MCOV (kV, rms)	Figure 7 Dim. "A" (in.)	Figures 1 & 2 Dim. "B" Minimum Clearance Phase-to-Phase (in.)			Figure 2 Dim. "C" Minimum clearance phase-to-Ground (in.)			Weight (lbs.)		
			AZES	AZEH	AZEX	AZES	AZEH	AZEX	AZES	AZEH	AZEX
3	2.55	18.6	12	12	12	6	6	6	42	42	42
6	5.10	18.6	12	12	12	7	7	6	42	43	44
9	7.65	18.6	13	13	12	7	7	7	43	44	45
10	8.40	21.1	13	13	13	7	7	7	48	49	50
12	10.2	21.1	14	13	13	8	8	7	49	50	52
15	12.7	21.1	14	14	14	9	8	8	49	51	53
18	15.3	24.8	15	15	14	10	9	9	56	58	63
21	17.0	24.8	16	16	15	11	10	9	57	59	65
24	19.5	24.8	16	16	15	11	10	9	58	60	66
27	22.0	28.6	17	17	16	12	11	10	65	68	77
30	24.4	28.6	18	17	17	13	12	11	65	68	77
33	27.5	28.6	20	19	18	14	13	12	66	69	79
36	29.0	28.6	20	19	18	14	13	13	66	70	80
39	31.5	33.6	21	20	19	15	14	13	77	81	95
42	34.0	33.6	22	21	19	16	15	14	78	82	96
45	36.5	33.6	23	21	20	17	16	14	78	83	98
48	39.0	33.6	24	22	21	18	17	15	78	83	98
54	42.0	36.6	25	23	22	20	18	16	86	91	114
60	48.0	36.6	28	25	24	22	20	18	87	93	117
66	53.0	39.4	30	27	25	24	21	20	96	102	130
72	57.0	39.4	31	28	27	26	23	21	97	104	131
78	62.0	48.0	33	30	28	28	25	22	116	123	156
84	68.0	48.0	36	32	30	30	27	24	118	125	159
90	70.0	48.0	36	33	31	31	27	25	118	126	159
96	76.0	48.0	39	35	32	33	29	27	119	128	162
108	84.0	56.5	42	38	35	36	32	29	161	170	206
120	98.0	56.5	43	39	–	37	34	–	175	213	–
132	106	71.5	46	42	–	40	36	–	191	243	–
138	111	71.5	47	43	–	42	38	–	193	246	–
144	115	74.4	49	45	–	43	39	–	202	258	–
162	130	80.1	54	49	–	48	44	–	217	277	–
168	131	82.9	54	50	–	48	44	–	225	287	–
172	140	83.2	72	67	–	59	54	–	237	300	–
180	144	88.9	73	68	–	60	55	–	270	332	–
192	152	88.9	76	71	–	63	58	–	273	336	–
198	160	91.8	79	73	–	66	60	–	283	350	–
204	165	100.3	81	75	–	68	62	–	303	374	–
216	174	100.3	84	78	–	71	65	–	306	378	–
228	182	108.9	86	80	–	73	67	–	348	422	–
240	190	108.9	89	83	–	76	70	–	351	426	–
258	209	123.9	105	–	–	84	–	–	472	–	–
264	212	123.9	106	–	–	85	–	–	473	–	–
276	220	132.5	108	–	–	87	–	–	499	–	–
288	230	132.5	111	–	–	90	–	–	503	–	–
294	235	135.3	113	–	–	92	–	–	524	–	–
300	239	135.3	114	–	–	93	–	–	526	–	–
312	245	141.0	116	–	–	95	–	–	558	–	–
330	267	152.4	136	–	–	108	–	–	605	–	–
336	269	152.4	136	–	–	109	–	–	606	–	–
360	289	161.0	143	–	–	115	–	–	655	–	–

Note: Phase-to-phase clearances are expressed as minimum arrester centerline-to-centerline distances and are based upon arrester protective levels.

Table 2. Dimensional information and weights for type AZE cubicle-mount surge arresters in standard housings

Arrester rating (kV, rms)	Arrester MCOV (kV, rms)	Figure 8 Dim. "A" (in.)	Figures 1 & 2 Dim. "B" minimum clearance Phase-to-Phase (in.)		Minimum clearance phase-to-ground (in.)		Figure 2 Dim. "C" weight (lbs.)	
			AZES	AZEH	AZES	AZEH	AZES	AZEH
3	2.55	13.4	8	8	4	4	23	23
6	5.10	13.4	8	8	5	5	24	24
9	7.65	13.4	8	8	5	5	24	25
10	8.40	15.9	8	8	5	5	29	30
12	10.2	15.9	9	9	6	5	30	31
15	12.7	15.9	10	10	7	6	30	32
18	15.3	20.2	11	10	8	7	38	39
21	17.0	20.2	12	11	8	8	38	40
24	19.5	20.2	12	11	9	8	39	41
27	22.0	23.4	13	12	10	9	47	49
30	24.4	23.4	14	13	11	10	47	49
33	27.5	23.4	15	14	12	11	47	50
36	29.0	23.4	16	15	12	11	48	51
39	31.5	28.4	17	16	13	12	59	63
42	34.0	28.4	18	16	14	13	60	64
45	36.9	28.4	19	17	15	14	60	65
48	39.0	28.4	20	18	16	15	60	65

Note: Eaton recommends that a line terminal load limit of 100 pounds not be exceeded on cubicle mount designs. Excessive loading could lead to a shortened arrester life.

Maintenance

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.

VariSTAR Type AZE arresters require no special maintenance under normal conditions. If the arrester is installed in an area of severe contamination, keep the arrester housing clean by washing periodically. Keep line and ground connections tight.

WARNING:

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

Table 3. Cantilever strength of metal-top AZE surge arresters

AZE Type	Cantilever Strength (in-lbs)*
AZES	
Arrester Rating	
3-240 kV	90,000
258-360 kV	120,000
AZEH	
Arrester Rating	
3-108 kV	90,000
120-240 kV	120,000
AZEX	
Arrester Rating	
3-48 kV	90,000
54-108 kV	120,000

* Maximum working load should not exceed 40% of these values.

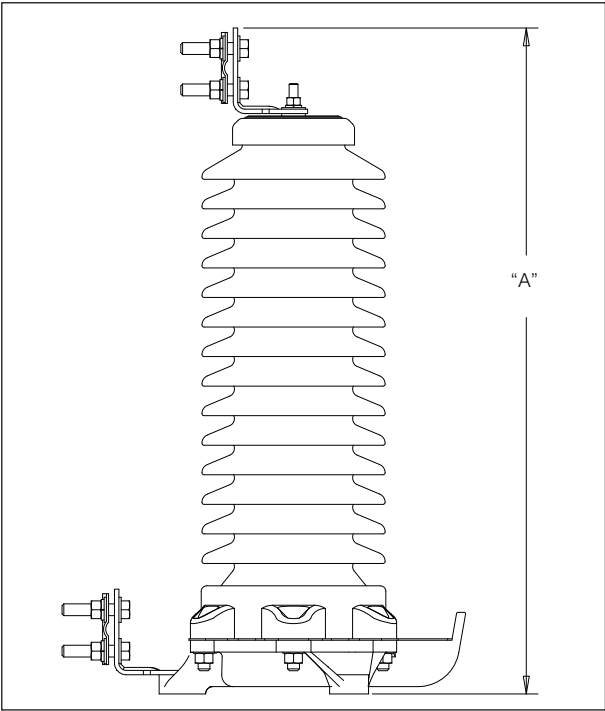


Figure 4. Dimensional drawing of VariSTAR cubicle-mount type AZE surge arrester

Note: Refer to Table 3 for dimension "A".



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