

## VariSTAR Type AZG2 Surge Arresters Installation and Maintenance Instructions

VariSTAR® SURGE ARRESTER		
Olean, N.Y. USA	Cat. No. AZG2	<input type="checkbox"/>
	Ser. No. <input type="text"/>	Year <input type="text"/>
Rating	<input type="text"/> kV rms	
MCOV/COV	<input type="text"/> kV rms	
Pres. Relief	40 <input type="text"/> kA <sub>sym</sub> <sup>rms</sup>	
Class	2/10KA	
Cert.	IEC 99-4	
Frequency 50-60 Hz	Alt. 0-12000 Ft. 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 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.

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#### **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.**

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#### **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.**

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#### **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.**

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#### **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.**

# VariSTAR Type AZG2 Surge Arresters Installation and Maintenance Instructions

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## **CAUTION:**

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Eaton's Cooper Power series VariSTAR Type AZG2 surge arrester is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace proper safety and operating procedures. Read all the 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

Eaton's Cooper Power series VariSTAR™ AZG2 Class 2, 10 kA 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 49 mm diameter MOV disks. The arrester is designed and tested exclusively to the requirements of the international standard IEC 99-4 and is available in ratings for the overvoltage protection of high-voltage systems through 260 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.

### 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.

---

## **CAUTION:**

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**Do not 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 casting of each VariSTAR arrester indicates its catalog number, voltage rating ( $U_r$ ), continuous operating voltage ( $U_c$ ), rated frequency, pressure-relief rated current, 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.

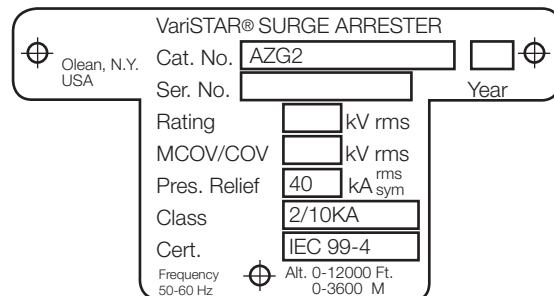


Figure 1. Unit nameplate.

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## **CAUTION:**

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

## Assembly

Assemble multi-unit VariSTAR Type AZG2 arresters in a series stack as indicated on the nameplate attached to the top casting of each unit. A grading ring is supplied for standard arresters rated 132 to 240 kV and some arresters of lower voltage rating having extra creepage housings. Grading ring assembly instructions are shown in Figure 7.

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 Table 1. Figures 1 and 2 show alternate mounting arrangements. See Table 1 and Figure 5 for arrester dimensions and creepage distance information.

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**⚠ CAUTION:**

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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.

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**⚠ CAUTION:**

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Make electrical connections so that no excessive 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 foundation is not level, use shims and level. Mounting dimensions for the arrester are shown in Figure 6.

The base section (unit #1) shall be bolted to the foundation. Units #2, #3, and #4 (as applicable) shall be bolted in place, one unit at a time, until all arrester units and grading ring (if supplied) are assembled.

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**⚠ CAUTION:**

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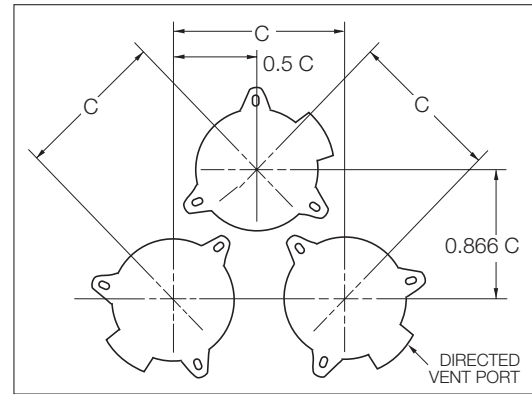
The vent port in the base must be directed away from adjacent equipment to prevent ionized gases from damaging other equipment in the unlikely event of arrester failure.

### Bracket or structure mounting

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

### Suspension mounting

Arresters rated through 120 kV can be suspension mounted. Either the top or bottom of suspension mounted arresters can be connected to line potential as long as the porcelain sheds are not inverted. For additional information regarding suspension mounting, contact your Eaton factory representative.



**Figure 2. Three-phase triangular mounting.**

**Note:** Refer to Table 1, page 4, for Dimension C.

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**⚠ CAUTION:**

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

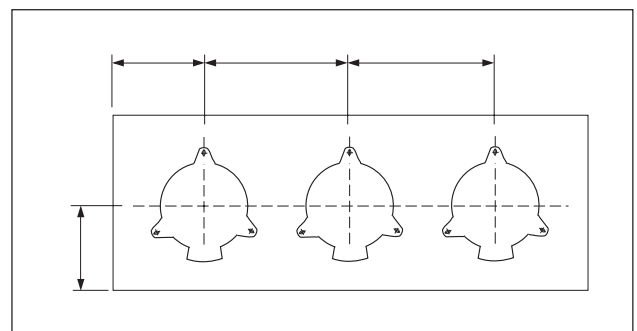
### Electrical connections

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 earth.

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

The standard line terminal (Figure 3) and earth terminal (Figure 4) include connector clamps that accommodate 14-335 mm<sup>2</sup> stranded copper or aluminum conductor.

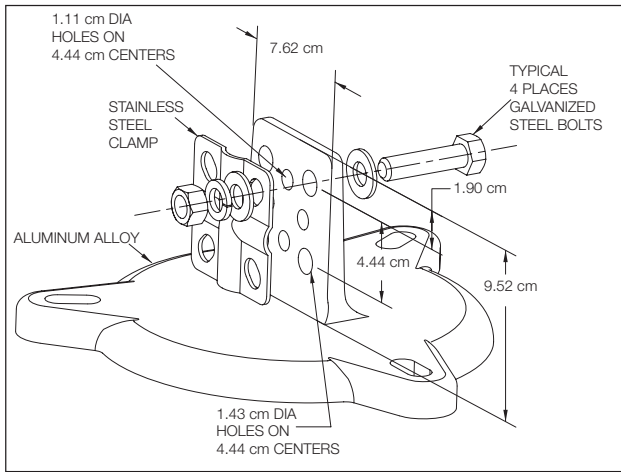
The line and ground terminals allow the connector clamp to be positioned for vertical or horizontal conductor takeoff; in addition, they accommodate industry standard two or four-hole connectors.



**Figure 3. Three-phase in-line mounting.**

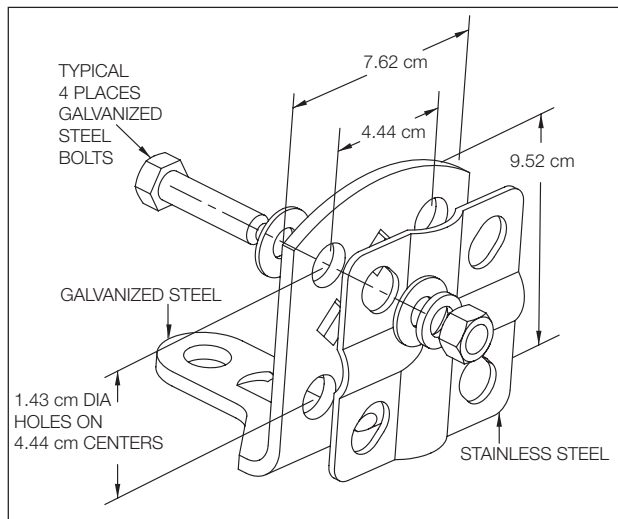
**Note:** Refer to Table 1, page 4, for Dimensions B and C.

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**Figure 4. Line terminal cap.**

**Note:** Line and earth terminals (suitable for copper or aluminum conductors up to 335 mm<sup>2</sup> (up to a maximum diameter of 20 mm)).



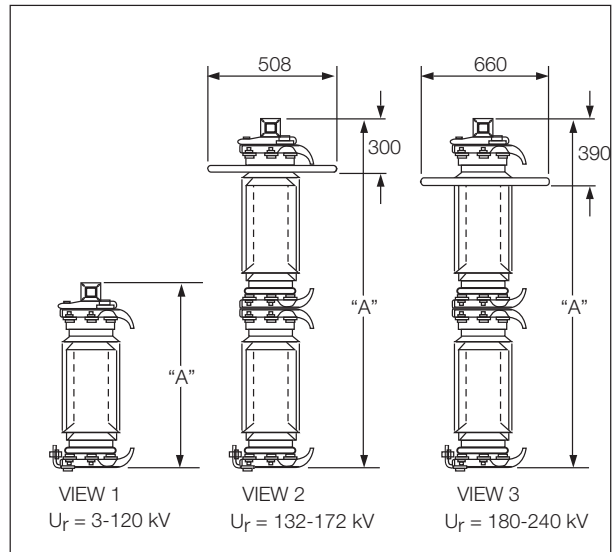
**Figure 5. Earth terminal.**

**Note:** Line and earth terminals (suitable for copper or aluminum conductors up to 335 mm<sup>2</sup> (up to a maximum diameter of 20 mm)).

## 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 earthed.**



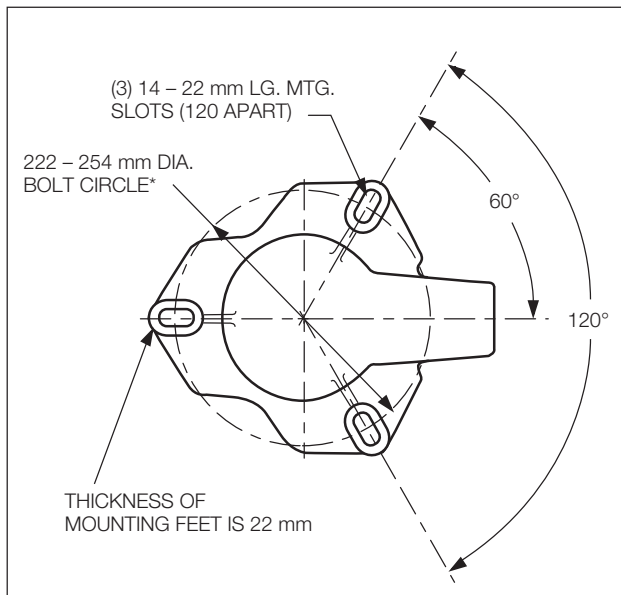
**Figure 6. Dimensions of VariSTAR Type AZG2 Surge Arrester.**

**Note:** Refer to Table 1, page 4, for Dimension A.

VariSTAR Type AZG2 arresters require no 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

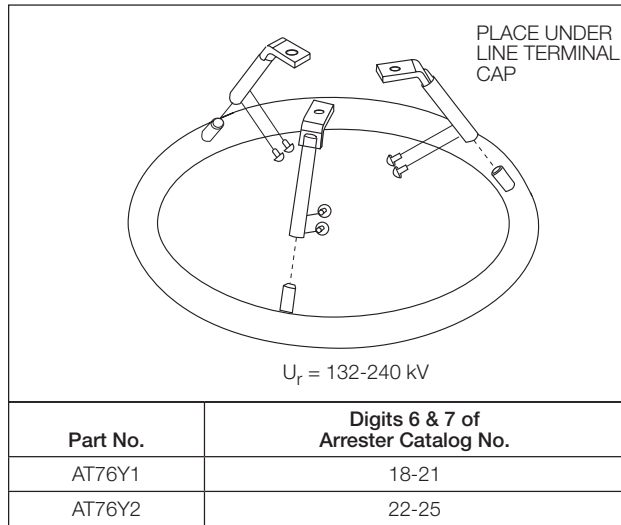
**Arresters can be washed while energized provided standard live washing procedures are followed.**



**Figure 7. Base mounting details.**

\* To develop rated cantilever strength use 254 mm bolt circle mounting diameter and 12 mm hardened bolts and flat washers.

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**Figure 8. Grading ring assembly.**

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



# VariSTAR Type AZG2 Surge Arresters Installation and Maintenance Instructions

**Table 1. Catalog Numbers and Dimensional Information for Standard Arresters (Contact Eaton Representative for Catalog Numbers of Non-standard Arresters)**

Ur Arrester Rating (kV, rms)	Uc COV (kV, rms)	Catalog Number	Dim. A (mm)	Figure 5 View Number	Dimension B Phase-to-Earth Clearance* (mm)	Dimension C Minimum Phase-to-Phase Clearance* (mm)	Housing Creepage Distance (mm)	Arrester Mass (kg)
3	2.55	AZG2001G002003	471	1	163	308	234	19
6	5.10	AZG2001G005006	471	1	167	312	234	19
9	7.65	AZG2001G007009	471	1	179	324	234	19
10	8.40	AZG2002G008010	534	1	184	329	406	22
12	10.2	AZG2002G010012	534	1	198	343	406	22
15	12.7	AZG2002G012015	534	1	222	366	406	22
18	15.3	AZG2003G015018	630	1	249	393	665	26
21	17.0	AZG2003G017021	630	1	267	412	665	26
24	19.5	AZG2003G019024	630	1	273	417	665	26
27	22.0	AZG2004G022027	725	1	298	442	922	30
30	24.4	AZG2004G024030	725	1	322	466	922	30
33	27.5	AZG2004G027033	725	1	353	498	922	30
36	29.0	AZG2004G029036	725	1	368	513	922	30
39	31.5	AZG2005G031039	852	1	393	538	1267	35
42	34.0	AZG2005G034042	852	1	418	562	1267	35
45	36.5	AZG2005G036045	852	1	442	587	1267	36
48	39.0	AZG2005G039048	852	1	470	614	1267	36
54	42.0	AZG2006G042054	929	1	500	645	1646	39
60	48.0	AZG2006G048060	929	1	558	703	1646	39
66	53.0	AZG2007G053066	1002	1	610	754	1875	44
72	57.0	AZG2007G057072	1002	1	649	794	1875	44
78	62.0	AZG2008G062078	1219	1	701	846	2540	53
84	68.0	AZG2008G068084	1219	1	759	904	2540	53
90	70.0	AZG2008G070090	1219	1	781	925	2540	53
96	76.0	AZG2008G076096	1219	1	842	986	2540	54
108	84.0	AZG2009G084108	1436	1	921	1065	3226	73
120	98.0	AZG2009G098120	1436	1	1061	1206	3226	74
132	106	AZG2018G106132	1826	2	1329	1659	3518	86
138	111	AZG2018G111138	1826	2	1378	1708	3518	86
144	115	AZG2019G115144	1898	2	1417	1748	3744	90
162	130	AZG2020G130162	2044	2	1570	1900	4186	96
168	131	AZG2021G131168	2116	2	1582	1912	4412	100
172	140	AZG2021G140172	2116	2	1670	2001	4412	100
180	144	AZG2022G144180	2260	3	1710	2040	4872	115
192	152	AZG2022G152192	2260	3	1792	2122	4872	116
198	160	AZG2023G160198	2333	3	1872	2202	5098	120
204	165	AZG2024G165204	2550	3	1923	2254	5766	129
216	174	AZG2024G174216	2550	3	2012	2342	5766	130
228	182	AZG2025G182228	2768	3	2094	2424	6452	149
240	190	AZG2025G190240	2768	3	2173	2503	6452	150

**Note:**

- Position #5 designates special nameplate options:  
 0-English  
 1-Spanish – American  
 2-Portuguese – Brazil  
 3-Portuguese – Portugal  
 4-Spanish – Spain (Castilian)
- All arresters are available in grey (standard) or brown porcelain glaze. For brown glaze, substitute “B” for “G” in the eighth position of the catalog number.
- Digit 6 & 7 housing designation may be modified for arresters requiring creepage distance other than the standard arresters shown.
- Cantilever strength for all ratings is 10,200 NM. Maximum working load should not exceed 40% of this value.
- Refer to Figure 2 for Illustration of Dimensions C and D and Figure 5 for Dimension A.

\* 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.

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