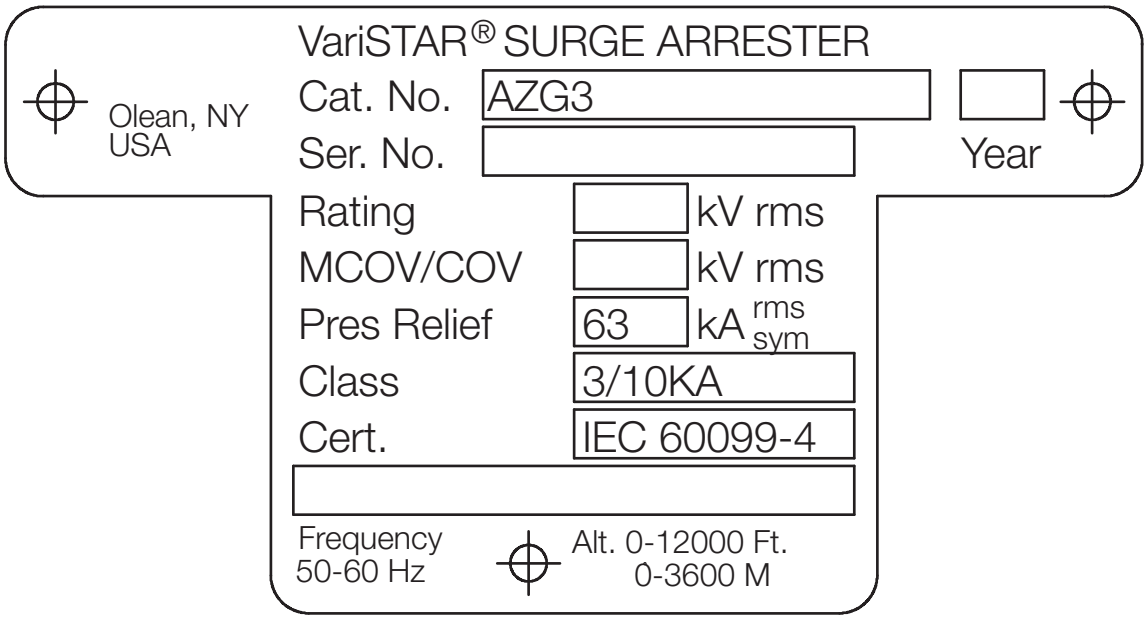
VariSTAR Type AZG3 Surge Arresters Installation and Maintenance Instructions



Powering Business Worldwide

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Contents

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.

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 AZG3 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™ AZG3 Class 3, 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 62 mm diameter MOV disks. The arrester is designed and tested exclusively to the requirements of the international standard IEC 60099-4 and is available in ratings for the overvoltage protection of high voltage systems through 312 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

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 (UR), continuous operating voltage (UC), 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.

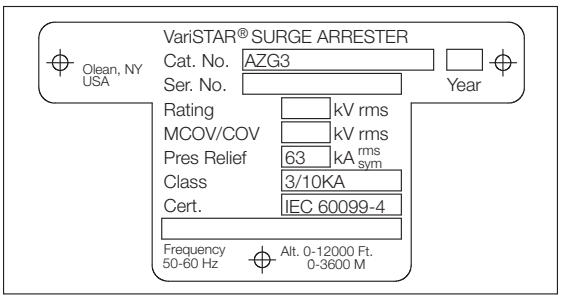

Figure 1. Unit Nameplate.

⚠ 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

Assemble multi-unit VariSTAR Type AZG3 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 172 to 312 kV and some arresters of lower voltage rating having extra leakage housings. Grading ring assembly instructions are shown in Figure 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 Table 1. Figures 2 and 3 show minimum phase-to-earth and minimum phase-to-phase clearances.

See Table 1 and Figure 7 for standard arrester height and leakage distance information.

⚠ CAUTION

The values shown in Table 1 are the minimum clearances recommended by Eaton. These minimum clear-ances 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 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.

⚠ CAUTION

The vent port in the base must be directed away from equipment to prevent ionized gases from damaging 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 the line as long as the sheds on the porcelain are not inverted. For additional information regarding suspension mounting, contact your Eaton factory representative.

⚠ CAUTION

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 interconnecting the arrester earth connections with the transformer tank and system neutral whenever possible.

The standard line terminal (Figure 4) and earth terminal (Figure 5) include connector clamps that accommodate 14-335 mm2 stranded copper or aluminum conductor. This is equivalent to a maximum conductor diameter of 21 mm or 500 mcm.

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

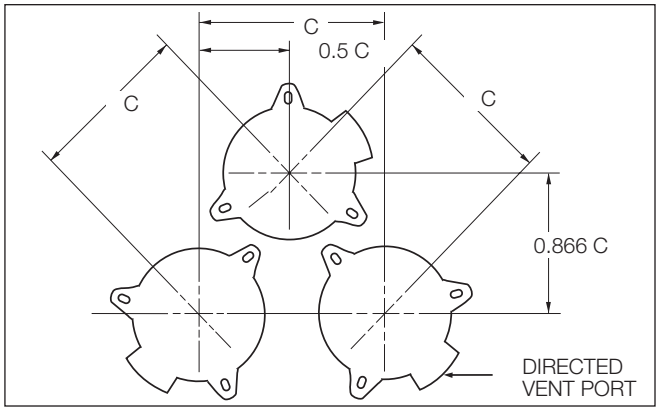

Figure 2. Three-phase triangular mounting.

Note: Refer to Table 1, page 5, for Dimension C.

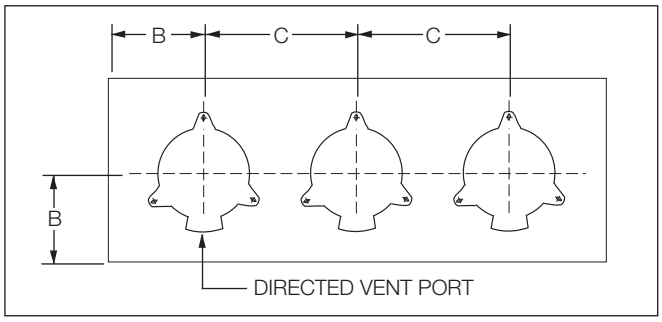

Figure 3. Three-phase in-line mounting.

Note: Refer to Table 1, page 5, for Dimensions B and C.

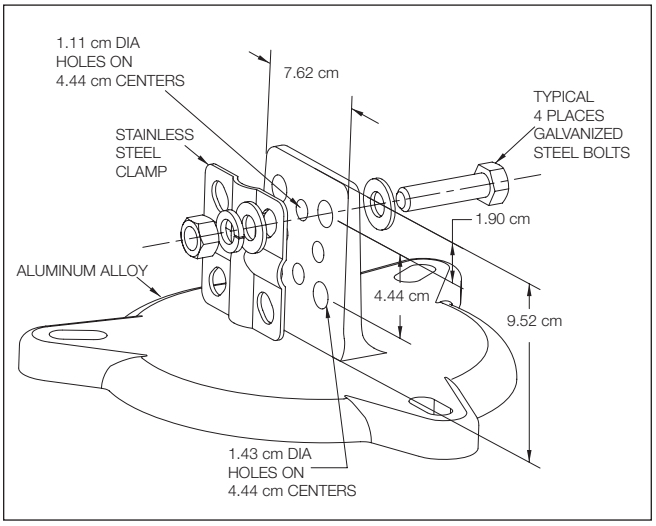

Figure 4. Line terminal cap.

Note: Line and earth terminals (suitable for copper or aluminum conductors up to 335 mm2 (up to a maximum diameter of 20 mm)).

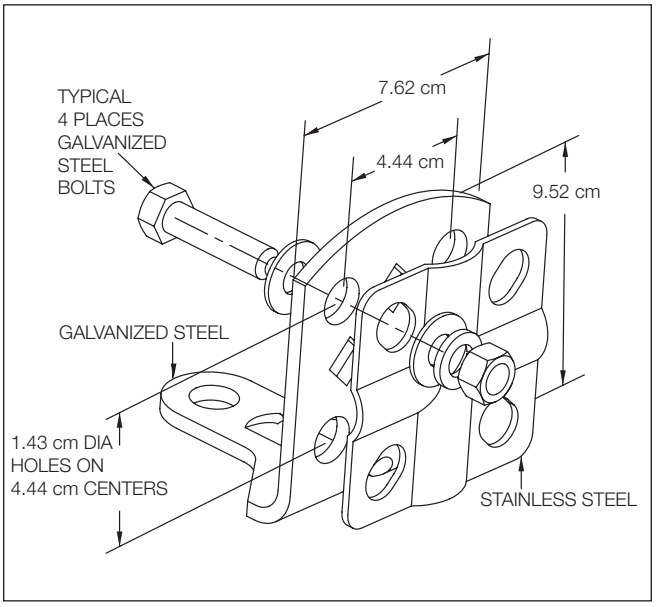

Figure 5. Earth terminal.

Note: Line and earth terminals (suitable for copper or aluminum conductors up to 335 mm2 (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.

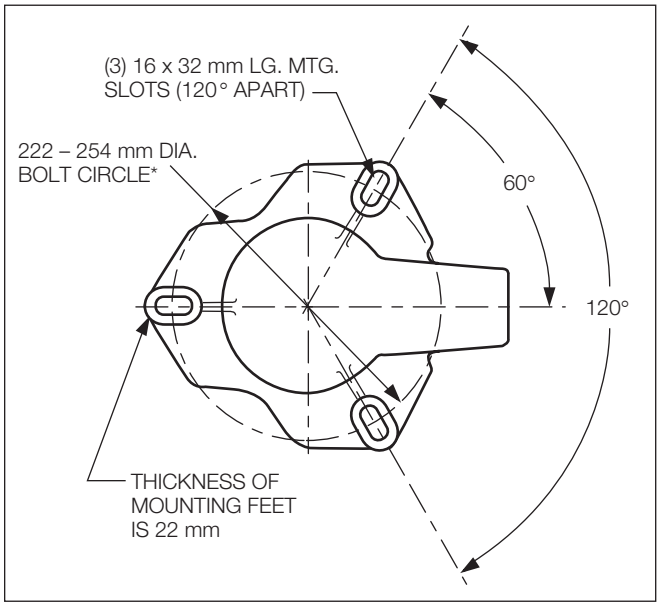

Figure 6. Base mounting details.

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

VariSTAR Type AZG3 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 earth connections tight.

⚠ WARNING

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

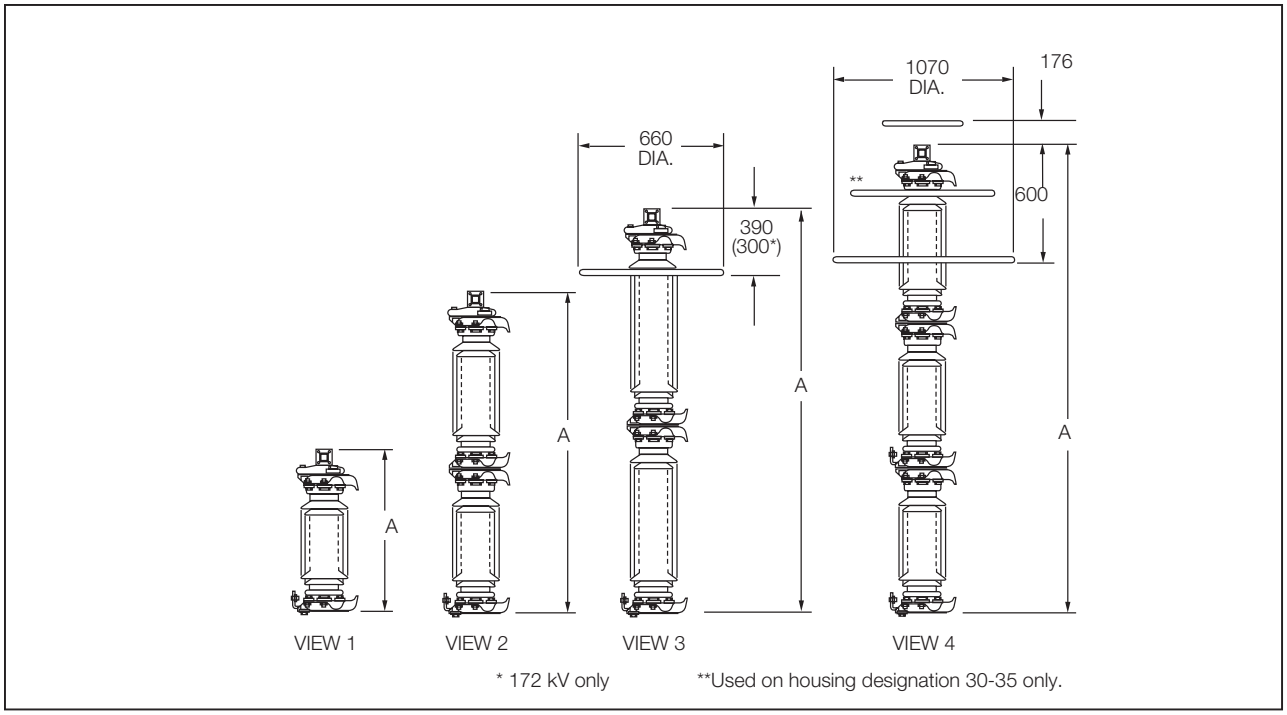

Figure 7. Dimensions of VariSTAR Type AZG3 Surge Arresters.

Note: Refer to Table 1, page 5, for Dimension A.

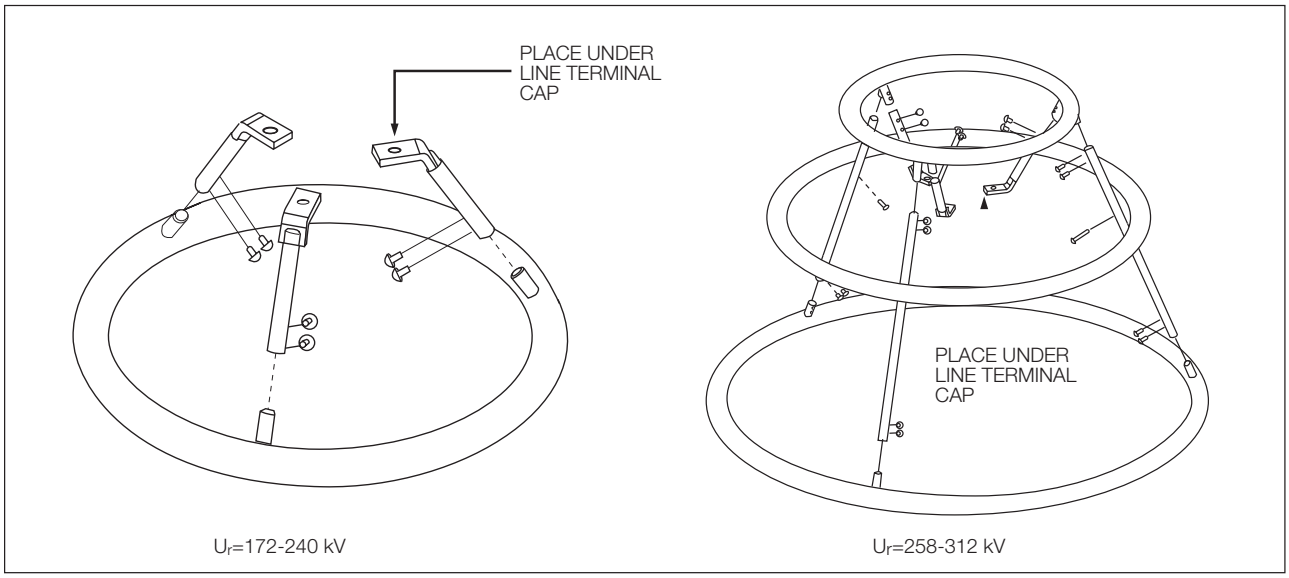

Figure 8. Grading ring assembly.

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

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

Ur Arrester Rating (kV rms)	Uc Arrester COV (kV rms)	Catalog Number	Dim. A (mm)	Figure 7 View Number	Dimension B Minimum Phase-to-Earth Clearance (mm)	Dimension C Minimum Phase-to-Phase Clearance (mm)	Housing Leakage Distance (mm)	Arrester Mass (kg)
3	2.55	AZG3001G002003	471	1	163	308	234	19
6	5.1	AZG3001G005006	471	1	166	310	234	19
9	7.65	AZG3001G007009	471	1	176	320	234	20
10	8.4	AZG3002G008010	535	1	180	324	406	22
12	10.2	AZG3002G010012	535	1	191	336	406	23
15	12.7	AZG3002G012015	535	1	211	355	406	23
18	15.3	AZG3003G015018	630	1	234	379	665	26
21	17	AZG3003G017021	630	1	251	395	665	27
24	19.5	AZG3003G019024	630	1	255	400	665	27
27	22	AZG3004G022027	725	1	278	422	922	31
30	24.4	AZG3004G024030	725	1	300	444	922	31
33	27.5	AZG3004G027033	725	1	328	473	922	31
36	29	AZG3004G029036	725	1	342	486	922	32
39	31.5	AZG3005G031039	852	1	365	509	1267	37
42	34	AZG3005G034042	852	1	377	521	1267	37
45	36.5	AZG3005G036045	852	1	399	543	1267	38
48	39	AZG3005G039048	852	1	421	565	1267	38
54	42	AZG3006G042054	929	1	447	592	1646	41
60	48	AZG3006G048060	929	1	500	644	1646	42
66	53	AZG3007G053066	1002	1	544	688	1872	46
72	57	AZG3007G057072	1002	1	579	724	1872	47
78	62	AZG3008G062078	1219	1	623	768	2540	56
84	68	AZG3008G068084	1219	1	676	820	2540	57
90	70	AZG3008G070090	1219	1	694	838	2540	57
96	76	AZG3008G076096	1219	1	746	891	2540	58
108	84	AZG3009G084108	1436	1	817	961	3226	77
120	98	AZG3009G098120	1436	1	940	1085	3226	79
132	106	AZG3012G106132	1817	2	1011	1156	3518	87
138	111	AZG3012G111138	1817	2	1055	1200	3518	87
144	115	AZG3013G115144	1890	2	1090	1235	3744	91
162	130	AZG3014G130162	2034	2	1223	1367	4186	98
168	131	AZG3015G131168	2107	2	1231	1376	4412	102
172	140	AZG3021G140172	2116	3	1496	1826	4412	107
180	144	AZG3022G144180	2261	3	1531	1862	4872	122
192	152	AZG3022G152192	2261	3	1602	1932	4872	124
198	160	AZG3023G160198	2333	3	1672	2003	5098	128
204	165	AZG3024G165204	2550	3	1716	2047	5766	137
216	174	AZG3024G174216	2550	3	1796	2126	5766	139
228	182	AZG3025G182228	2768	3	1866	2196	6452	158
240	190	AZG3025G190240	2768	3	1937	2267	6452	159
258	209	AZG3027G209258	3149	4	2308	2841	6744	173
264	212	AZG3027G212264	3149	4	2334	2868	6744	173
276	220	AZG3029G220276	3366	4	2405	2938	7412	182
288	230	AZG3029G230288	3366	4	2493	3026	7412	184
294	235	AZG3030G235294	3438	4	2537	3070	7638	192
300	239	AZG3030G239300	3438	4	2572	3105	7638	192
312	245	AZG3031G245312	3583	4	2625	3158	8098	208

Note:

1. Position #5 designates nameplate options: 0=English 1=Spanish 2=Portuguese
2. 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.
3. Digits 6 and 7 housing designation may be modified for arresters requiring leakage distance other than the standard arresters shown. Extended leakage may require additional clearances for phase-to-phase and phase-to-earth. Contact your sales representative for this information.
4. Cantilever strength for all ratings is 10,200 NM. Maximum working load should not exceed 40% of this value.
5. Refer to Figure 7 for Dimension A.

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