Ansaldo STS
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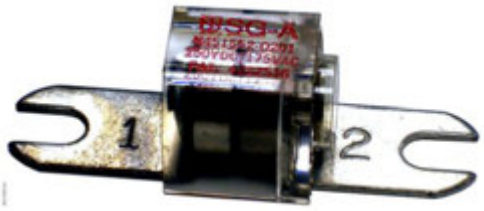
USG-A LIGHTNING ARRESTERS (E-Zvue)

Low Voltage Model: N451552-0101
High Voltage Model: N451552-0201
AC Line Model: N451552-0401



THIS MANUAL SUPERSEDES SM-6108 DATED OCTOBER 1982

Proprietary Notice

Important Notice

ASTS USA constantly strives to improve our products and keep our customers apprised of changes in technology. Following the recommendations contained in the attached service manual will provide our customers with optimum operational reliability. The data contained herein purports solely to describe the product, and does not create any warranties.

Within the scope of the attached manual, it is impossible to take into account every eventuality that may arise with technical equipment in service. Please consult an ASTS USA local sales representative in the event of any irregularities with our product.

ASTS USA expressly disclaims liability resulting from any improper handling or use of our equipment, even if these instructions contain no specific indication in this respect. We strongly recommend that only approved ASTS USA spare parts are used as replacements.

Revision History

Rev.	Date	Nature of Revision
Original	October 1982	Original Issue
*	January 1986	N. A.
1	May 1989	N. A.

* Revisions were not numbered, only dated

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1. GENERAL INFORMATION

1.1. Introduction

This manual describes the principle of operation, application and testing of the USG-A "E-Zvue" Lightning Arresters. These include the low voltage, high voltage, and AC line arresters.

These arresters are designed to limit transverse (line to line) and longitudinal (line to ground) voltage transients to levels below that of equipment destruction. They are provided as standalone units or mounted on an AAR terminal block

2. PRINCIPLES OF OPERATION

2.1. Low Voltage Arrester

The USG-A Low Voltage Lightning Arrester (N451552-0101) consists of a silicon carbide varistor ring sandwiched between two brass disks. Electrically, the varistor is in series with the brass disks but in parallel with the air gap spacing of the brass disks. This is referred to as a varistor-filled gap arrester. The varistor acts as a non-linear resistor whose resistance gets lower with more applied voltage. With this behavior, the arrester is quite effective at bleeding off electrostatic charge and limiting the peak level of surge voltages.

NOTE

The difference between surge and transient is time. Surges are classically defined as having a duration of greater than 8.3 mseconds and transients less than 8.3 mseconds.

In the transient case, the arrester behaves a little differently. The change of resistance, with respect to time, becomes slower than the rising level of voltage, with respect to time, which is seen across the arrester. At some point, this voltage becomes high enough - fast enough to jump the varistor-filled gap and thus you have an arc-over condition.

For this reason, the static and dynamic breakdown of this or any other varistor-based arrester are entirely different. The difference is determined by how rapidly the leading edge of the transient rises. The graph of Figure 2-1 shows the range of expected firing voltages for various transient rise rates.

2.2. High Voltage Arrester

The USG-A High Voltage Arrester (N451552-0201) is a true air gap arrester. Its construction is similar to the low voltage arrester with the exception of an added teflon washer which is used to mechanically hold the gap spacing. The assembly consists of: brass disk - silicon carbide ring - teflon washer - brass disk. The varistor-teflon washer provides for a current limited gap in parallel with the gap set by the physical separation of the brass disks. When exposed to a high voltage potential, the varistor-teflon gap breaks over. Current is limited by the non-linear, but resistive action of the varistor material. If the potential rise is rapid enough, the varistor resistance cannot decrease fast enough or far enough to allow all the energy to be transferred across its teflon gap. Therefore, the air gap between brass disks breaks down and arc-over

occurs. As with the low voltage type, the firing voltage will be dependent on the rate of rise of the leading edge of the transient. The graph of Figure 2-2 shows the range of expected firing voltages for various transient rise rates.

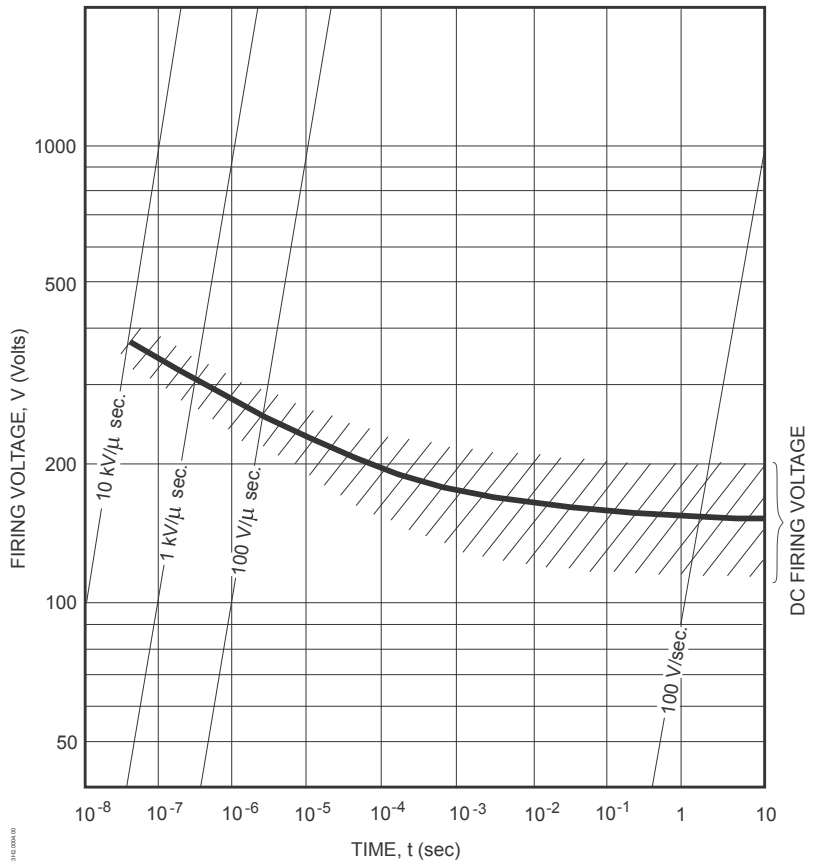


Figure 2-1. Firing Voltage vs. Voltage Rise Rate for USG-A Low Voltage Arrester (shaded area indicates dispersion)

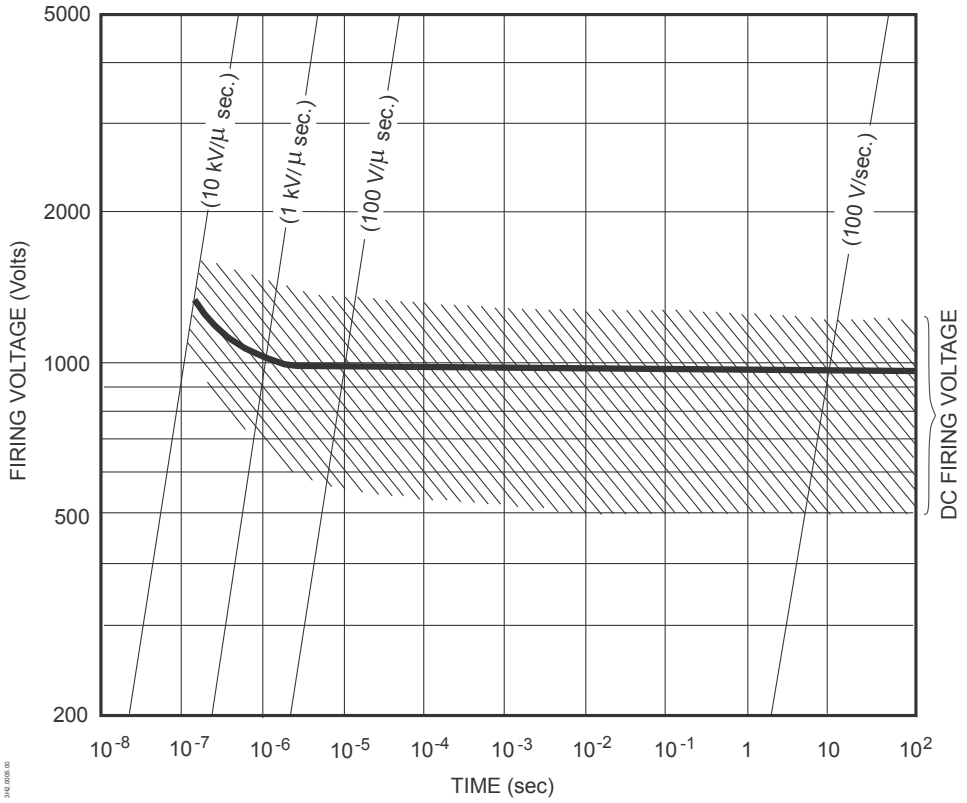


Figure 2-2. Firing Voltage vs. Voltage Rise Rate for USG-A High Voltage Arrester (shaded area indicates dispersion)

2.3. AC Line Arrester

The USG-A, AC Line Arrester (N451552-0401) is constructed by stacking five varistor filled gaps (identical to that of the USG-A Low Voltage Arrester) in series.

3. INSTALLATION AND APPLICATION

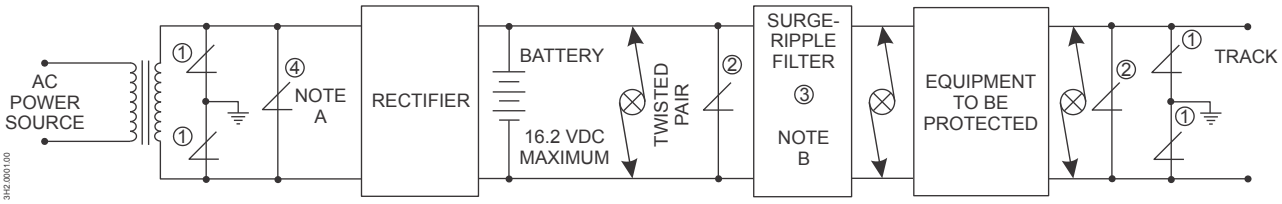
3.1. Mounting

All USG-A Lightning Arresters may be wall or shelf-mounted. Do not mount a unit upside down, or on the underside of a shelf. The unit may also be mounted horizontally or vertically. If mounting vertically, position the open end of the cover downwards to prevent accumulation of dust and moisture inside the cover. Allow one inch minimum clearance between the open end of the arrester and a flat mounting surface to permit escape of gases.

3.2. Wiring

To obtain maximum protection, wiring should be run first to the arresters, and then to the equipment. This places the arresters between the exposure and the equipment. The primary arresters should be kept as far from the equipment as possible and as near to the expected transient source as possible. The common ground bus should be as short and free of bends as practical, and should be connected to all housing, signal poles, and grounds at a particular location.

Figure 3-1 shows recommended applications for USG-A Arresters



PARTS	NOTES
1. USG-A Arrester: N451552-0201 (High Voltage) w/AAR terminal block: X451552-0302 Rated breakdown: 500-1300 VDC	NOTE A: For 240 VAC operation: two AC Line Arresters (item 4) in series.
2. USG-A Arrester: N451552-0101 (Low Voltage) w/AAR terminal block: X451552-0301 rated breakdown: 75-200 VDC	NOTE B: Surge ripple filter should be used if battery ripple exceeds 5%.
3. Surge ripple Filter: N451036-0702 Up to 2.5 amp load	
4. USG-A Arrester: N451552-0401 (AC Line) w/AAR terminal block: X451552-0306	

Figure 3-1. AFO System Basic Signal Diagram, End-Fed

4. STATIC SPECIFICATIONS

Table 4-1 shows the expected static operating and breakover voltages of the Low Voltage, High Voltage, and AC Line Arresters.

Table 4-1. Operating Specifications for the USG-A Lightning Arresters

Operating Voltages	N451552-0101	32 VDC, 25 VAC
	N451552-0201	250 VDC, 175 VAC
	N451552-0401	140 VAC
Breakdown Voltages	N451552-0101	75-200 VDC, 50-10 VAC (60Hz)
	N451552-0201	500-1300 VDC, 350-390 VAC (60 Hz)
	N451552-0401	(Not applicable)
Resistance	N451552-0101	≥ 10^3 ohms @ 32 VDC
	N451552-0201	≥ 10^9 ohms @ 100 VDC
	N451552-0401	≥ 5 x 10^3 ohms @ 120 VAC

5. MAINTENANCE

The USG-A Lightning Arresters are not serviceable, and must be replaced when faulty. Also, no attempt should be made to clean an arrester, otherwise carbon-tracking may develop around the air gap(s). However, an arrester may be given several visual and electrical tests to determine whether the unit is faulty.

When a USG-A Lighting Arrester has dissipated a surge, the transparent cover may be slightly burnt or singed around the air gap(s). This does not necessarily indicate a damaged arrester, nor will it affect the subsequent operation of the arrester.

The resistance of a USG-A Lightning Arrester may be checked with a power source and an ammeter. The procedure is as follows:

1. Connect power source, ammeter, and arrester in series.
2. Turn on power source and adjust as follows:
   32 VDC for unit N451552-0101.
   1V00 VDC for unit N451552-0201.
   120 AC for unit N451552-0401.
3. The ammeter should read as follows:
   Unit N451552-0l01 = less than 32.0 milliamps.
   Unit N451552-0201 = less than 0.1 microamps.
   Unit N451552-0401 = less than 25.0 milliamps.

6. PART NUMBER LIST

See front cover for photos.

Description	ASTS USA Part Number
Low Voltage USG-A Lightning Arrester, 32 VDC, 25 VAC, blue lettering	N451552-0101
High Voltage USG-A Lightning Arrester, 250 VDC, 175 VAC, red lettering	N451552-0201
AC Line USG-A Lightning Arrester, 140 VAC, yellow lettering	N451552-0401
Low Voltage USG-A Lightning Arrester, mounted on AAR terminal block	X451552-0301
High voltage USG-A Lightning Arrester, mounted on AAR terminal block	X451552-0302
AC Line USG-A Arrester, mounted on AAR terminal block	X451552-0306

7. RAIL TEAM AND TECHNICAL SUPPORT

The Rapid Action Information Link (RAIL) team created in 1996 serves the technical needs of current and potential ASTS USA customers. Convenient 24-hour access and a rapid resolution to customer problems are the trademarks of this organization. The RAIL team, which is staffed primarily by ASTS USA product and application engineers, is ready to assist and resolve technical issues concerning this or any ASTS USA product.

Direct any questions regarding the contents of this service manual to the RAIL team by telephone at 1-800-652-7276 or through Internet e-mail at railteam@ansaldo-sts.us..

End of Manual