

3M™ Elbow Surge Arresters; 235SA-Series 35 kV

Data Sheet

December 2020

General Information

The 3M™ Elbow Surge Arresters; 235SA-Series; 35 kV Small and Large Interface Elbow Arresters are gapless, metal oxide varistor (MOV) type surge arresters. These devices are designed to provide shielded, dead-front arrester protection for 35kV systems. These products limit lightning and switching transient over-voltages protecting equipment and extending service life.

The critical values for surge arresters are the discharge voltage (IR) and the IEEE Std. 386 interface class. In general, the lower the discharge voltage, the better the protection margin. The 3M Elbow Surge Arresters; 235SA-Series; 35 kV are also non-fragmenting.

The 3M Elbow Surge Arresters; 235SA-Series; 35 kV fully conform to the safe-failure mode per IEEE Std. C62.11. The standard requires that if the arrester should fail, the blocks will not be ejected through the body or side wall of the housing. The MOV blocks should exit out the bottom, down and away from the equipment.

Agency Approvals & Self Certifications

Tested in accordance with applicable sections of IEEE Standard 386 for Separable Insulated Connector Systems and IEEE Standard C62.11 for Metal Oxide Surge Arresters for AC Power Circuits.

For RoHS and REACH information, please visit www.3M.com/regs

Applications

The 3M Elbow Surge Arresters; 235SA-Series; 35 kV installed at the end of a radial system or at both ends of an open point in a loop circuit will provide excellent protection against high voltage surges resulting from lightning or switching.

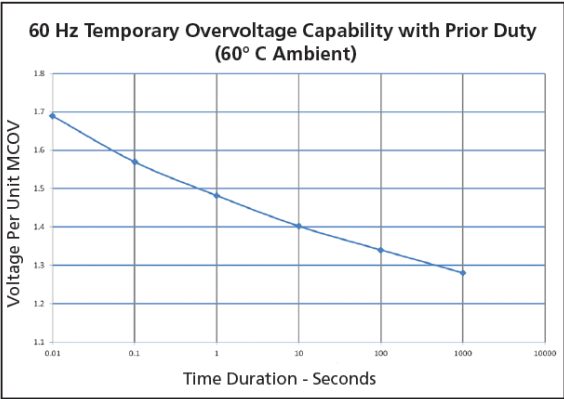
The 3M Elbow Surge Arresters are fully shielded and submersible, either continuously or intermittently, to a depth of 6 feet (2m).

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Performance Characteristics

Tests were performed in accordance with applicable sections of IEEE Std. 386 – Separable Insulated Connector Systems for Power Distribution Systems Above 600V and IEEE Std. C62.11 – Metal Oxide Surge Arresters for Alternating Current Power Circuits with test levels chosen that represent typical underground distribution systems.

Design Tests	
High Current, Short Duration	2 discharges of 65 kA Crest
Low Current, Long Duration	20 Surges of 75 A for 2,000 μ sec. duration
Operating Duty Cycle	22 Operations of 5 kA Crest 8 x 20 μ sec.
Safe Failure Mode	Verify blocks do not breach sidewall



Production Test

Production Tests
Polymer Housing Only per IEEE Std. 386
Partial Discharge Voltage Level (5 pC sensitivity)
AC 60 Hz, 1 minute withstand or BIL impulse lightning withstand
Periodic Fluoroscope Analysis

Production Tests
Complete Unit per IEEE Std. C62.11
Partial Discharge Voltage Level (10pC sensitivity)
Reference Voltage
Power Frequency

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Product Features

- **Pulling Eye** – Provides positive hotstick operation. The pulling eye strength exceeds 500 lbs of force.
- **Insulation** – Consists of peroxide-cured EPDM rubber that offers proven, uncompromised reliability and dimensional stability.
- **Molded Shield** – Conductive peroxide-cured EPDM rubber meets all requirements of IEEE Standard for Insulation Shields on Medium Voltage Cable Joints and Separable Connectors.
- **Drain Wire Tab** – Provides a contact point to attach #14 ground wire to ensure the shield is at ground potential and maintains deadfront construction.
- **Fiberglass Wrap** – Ensures that the MOV block stack remains in one piece and prevents the blocks from breaching the sidewall should the arrester fail.
- **ID Band** – Provides clear visual identification of arrester MCOV and duty cycle ratings.
- **Flexible Lead** – This is a #4 AWG copper rope lay conductor 595 strand (7 x 85). Ends are soldered to prevent fraying. Standard length is 36" long.



Common Terms

- **Discharge Voltage** – The voltage the arrester develops while discharging a surge to ground. The lower the voltage, the better the protection.
 - **MCOV** – Maximum Continuous Operating Voltage.
 - **MOV** – Metal Oxide Varistors.
 - **TOV** – Temporary Over-Voltage.
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Elbow Surge Arrester Selection Criteria

Selection of the arrester size is based upon the maximum continuous operating voltage (MCOV) line-to-ground that is applied across the arrester in service. For arresters on effectively grounded systems, this is normally the maximum line-to-ground voltage (e.g., 22.0kV on a 34.5kV multi-grounded system).

For ungrounded or impedance-grounded systems, the MCOV should be at least 90% of the maximum phase-to-phase voltage.

Protective Characteristics

Small Interface Elbow Surge Arresters (denoted below as 235SASxx) are designed and tested to meet all requirements of IEEE Std. 386. The operating interface will mate with any product that conforms to IEEE Std. 386, Interface 7B.

Large Interface Elbow Surge Arresters (denoted below as 235SALxx) are designed and tested to meet all requirements of IEEE Std. 386. The operating interface will mate with any product that conforms to IEEE Std. 386, Interface 8.

Product Number	MCOV kV	Rating kV	0.5 μ sec 5 kA Max IR-kV	Maximum Discharge Voltage (kV Crest) 8 x 20 microsecond current wave					
				1.5 kA	3.0 kA	5.0 kA	10 kA	20 kA	40 kA
235SAS24	19.5	24	92.0	71.5	76.5	82.0	90.5	106.5	N/A
235SAS27	22.0	27	100.5	78.0	84.0	90.0	99.0	117.0	N/A
235SAS30	24.4	30	108.0	81.0	88.5	94.5	108.0	124.5	N/A
235SAL27	22.0	27	88	70.8	75.4	80.4	90.5	104.6	130.7
235SAL30	24.4	30	97.8	78.7	83.8	89.3	100.6	116.2	145.2
235SAL33	26.9	33	107.6	86.6	92.2	98.3	110.7	127.9	159.8
235SAL36	29	36	117.4	94.4	100.5	107.2	120.7	139.4	174.3

Shelf Life

The 3M Elbow Surge Arrester; 235SA-Series; 35 kV are stable under normal storage conditions. Normal storage and stock rotation are recommended.

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78-9237-2999-6 Rev A