

Metal oxide varistor (MOV) parking stand surge arrester



General

Eaton's Cooper Power™ series parking stand arrester combines metal (zinc) oxide varistor technology with a premolded rubber insulated standoff bushing. The arrester provides overvoltage system protection in an insulated, fully shielded, submersible, deadfront device. The standoff bushing interface conforms to IEEE Std 386™-2006 standard – Separable Insulated Connector Systems. The arrester housing provides necessary deadfront safety.

Parking stand arresters are used on underground systems in pad-mounted transformers and entry cabinets, vaults, switching enclosures and other installations to provide shielded deadfront arrester protection.

Construction

The rubber body is constructed of high quality precision molded peroxide cured EPDM insulation and semiconductive materials.

This ensures that the column cannot be damaged during installation and that a reliable current path to the MOV blocks is maintained. The disk column is composed of MOV disks bonded together with high-conductivity, silver-loaded epoxy to yield the most reliable electrical connection and eliminate air voids. The #4 AWG flexible copper ground lead, which reliably carries current to ground during voltage surges, is attached to the housing by a brass magneformed end cap. The brass end cap provides a tight, weatherproof seal.

Operation

Parking stand arresters are designed for use with 200 A loadbreak interfaces that conform to IEEE Std 386™-2006 standard to limit overvoltages to acceptable levels, protect equipment and extend cable life. Parking stand arresters also provide an economical means of overvoltage protection for energized but parked open point cable runs.

Installation time and space are reduced as the parking stand arrester replaces a MOV elbow arrester and portable feedthru in this application. See *Document CA235025EN, Metal Oxide Varistor Elbow (M.O.V.E.) Surge Arrester* for information on the MOV elbow arrester for protection of the other side of loop, radial applications and mid-line protection.

The parking stand arrester is designed to be installed in the parking stand bracket found on the frontplate of a transformer or other apparatus. The molded EPDM rubber body is held in a stainless steel bracket assembly. A stainless steel eyebolt is used to secure the parking stand arrester in the parking stand bracket.

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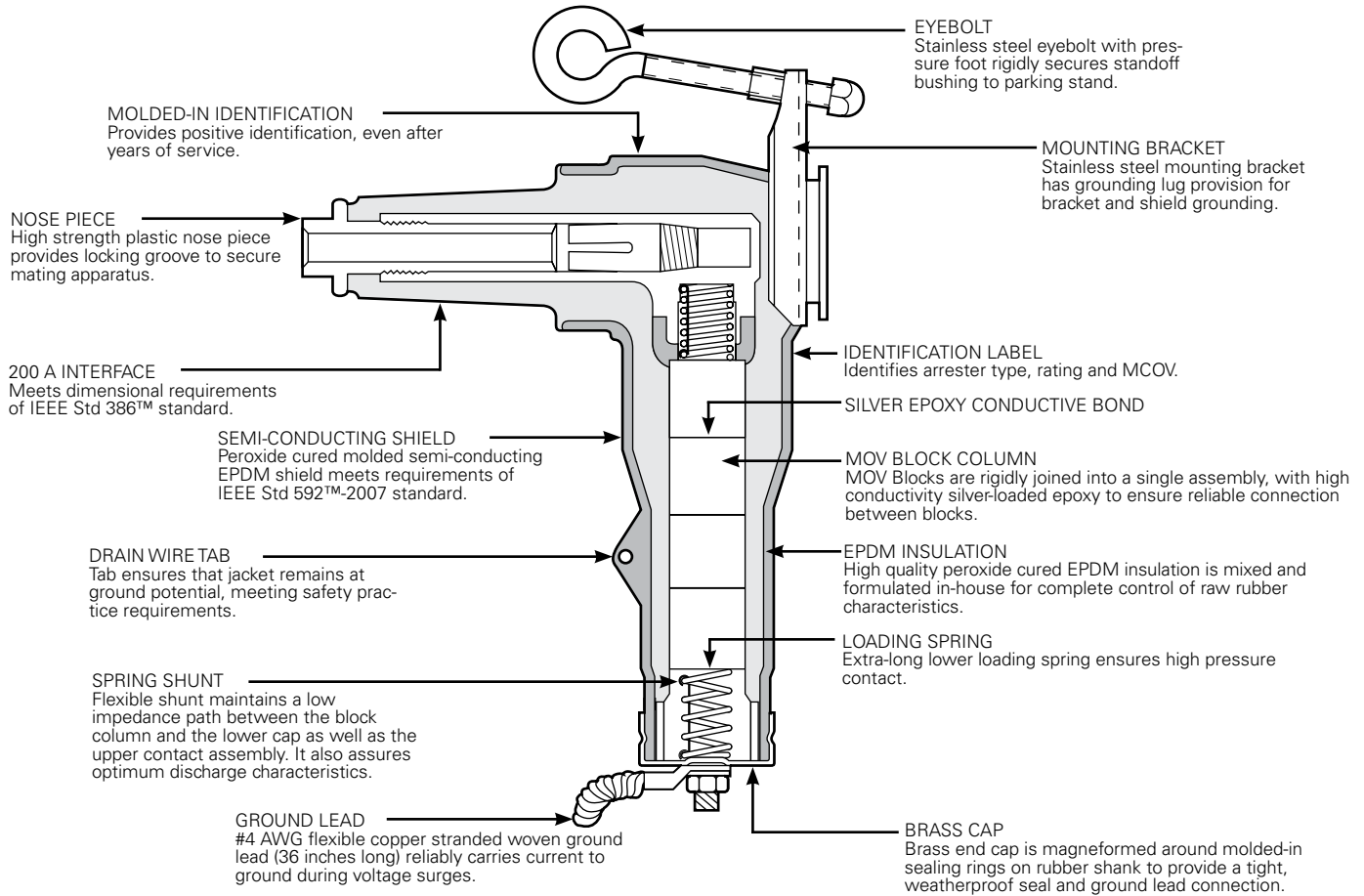


Figure 1. Cutaway illustration shows 25 kV Class metal oxide varistor parking stand surge arrester.

Standards

The parking stand arrester complies with the latest revision of IEEE Std C62.11™ standard "IEEE Standard for Metal Oxide Surge Arresters for AC Power Circuits" and IEEE Std 386™-2006 standard "Separable Insulated Connectors for Power Distribution Systems Above 600 Volts".

Installation

No special tools are required. The arrester is placed in a parking stand bracket with a clampstick. Refer to *Service Information S235-58-1, 15 and 25 kV Class Standard Parking Stand Arrester Installation Instructions* for more details.

Production tests

Tests conducted in accordance with IEEE Std 386™-2006 and Std C62.11™ standards:

- Partial Discharge Extinction Voltage Level
- AC 60 Hz 1 Minute Withstand
- AC 60 Hz Watts Loss

Tests conducted in accordance with Eaton requirements:

- Physical Inspection
- Periodic Dissection
- Arrester Assembly:
 - Voltage at 1 mA
- Periodic Fluoroscopic Analysis

Production tests of MOV blocks

A complete production test program ensures a quality product. Each metal oxide varistor receives a series of electrical tests. Quality is demonstrated by a series of destructive tests performed on every batch of varistors. Listed are the tests performed on the varistors:

- 100% Physical Inspection
- 100% Discharge Voltage test
- 100% V_{1mA/cm^2}
- 100% Leakage Current at 80% of V_{1mA/cm^2} Voltage (Watts Loss)
- Batch High-current, Short-duration test
- Batch Thermal Stability test
- Batch Aging test

General application recommendations

The rating of an arrester is the maximum power frequency line-to-ground voltage at which the arrester is designed to pass an operating duty-cycle test. Table 2 provides a general application guide for the selection of the proper arrester rating for a given system voltage and system grounding configuration as outlined in the IEEE Std C62.22™ standard application guide.

Under fault conditions and other system anomalies, higher voltages can be experienced by the arrester. To ensure that the arrester ratings will not be exceeded, Eaton application engineers are available to make recommendations. The following information is normally required:

1. System maximum operating voltage.
2. System grounding conditions.
 - A. For four-wire circuits, grounding conditions depend upon whether the system is multi-grounded, whether it has a neutral impedance and whether common primary and secondary neutrals are used.
 - B. For three-wire circuits, grounding conditions depend upon whether the system is solidly grounded at the source, grounded through neutral impedance at the source transformers or ungrounded.

Consult your Eaton representative to have your individual system application needs studied.

Protective characteristics

The protective characteristics of the M.O.V.E. Surge Arrester are shown in Table 1.

Table 1. Electrical Ratings and Characteristics

| Duty Cycle Voltage Rating (kV) | MCOV (kV) | Equivalent Front-of-Wave (kV crest)* | Maximum Discharge Voltage (kV crest) 8/20 μ s Current Wave | | | | |
|--------------------------------|-----------|--------------------------------------|--|------|------|-------|-------|
| | | | 1.5 kA | 3 kA | 5 kA | 10 kA | 20 kA |
| 3 | 2.55 | 11.0 | 9.0 | 9.7 | 10.4 | 11.4 | 13.0 |
| 6 | 5.1 | 22.0 | 18.0 | 19.4 | 20.8 | 22.7 | 26.0 |
| 9 | 7.65 | 31.7 | 26.0 | 28.0 | 30.0 | 32.8 | 37.4 |
| 10 | 8.4 | 33.0 | 27.0 | 29.1 | 31.2 | 34.1 | 38.9 |
| 12 | 10.2 | 41.5 | 33.9 | 36.6 | 39.2 | 42.9 | 48.9 |
| 15 | 12.7 | 51.8 | 42.4 | 45.7 | 49.0 | 53.6 | 61.1 |
| 18 | 15.3 | 62.2 | 50.9 | 54.9 | 58.8 | 64.3 | 73.4 |
| 21 | 17.0 | 66.0 | 54.0 | 58.2 | 62.4 | 68.2 | 77.9 |

* Equivalent front-of-wave voltage is the expected discharge voltage of the arrester when tested with a 5 kA current surge cresting in 0.5 μ s.

Table 2. Commonly Applied Voltage Ratings of MOV Parking Stand Arrester

| System Voltage (kV rms) | Commonly Applied Arrester Duty-cycle (MCOV) Voltage Rating (kV rms) on Distribution Systems | | | | |
|-------------------------|---|-------------------------|----------------------------------|-------------------------------|--|
| | Nominal Voltage | Maximum Voltage Range B | 4-Wire Multigrounded Neutral Wye | 3-Wire Low Impedance Grounded | Delta and 3-Wire High Impedance Grounded |
| 2.40 | 2.54 | – | – | – | 3 (2.55) |
| 4.16 Y/2.40 | 4.40 Y/2.54 | 3 (2.55) | – | 6 (5.1) | 6 (5.1) |
| 4.26 | 4.40 | – | – | – | 6 (5.1) |
| 4.80 | 5.08 | – | – | – | 6 (5.1) |
| 6.90 | 7.26 | – | – | – | 9 (7.65) |
| 8.32 Y/4.80 | 8.80 Y/5.08 | 6 (5.1) | – | 9 (7.65) | – |
| 12.00 Y/6.93 | 12.70 Y/7.33 | 9 (7.65) | – | 12 (10.2) | – |
| 12.47 Y/7.20 | 13.20 Y/7.62 | 9 (7.65) or 10 (8.4) | – | 15 (12.7) | – |
| 13.20 Y/7.62 | 13.97 Y/8.07 | 10 (8.4) | – | 15 (12.7) | – |
| 13.80 Y/7.97 | 14.52 Y/8.388 | 10 (8.4) and 12 (10.2) | – | 15 (12.7) | – |
| 13.80 | 14.52 | – | – | – | 18 (15.3) |
| 20.78 Y/12.00 | 22.00 Y/12.70 | 15 (12.7) | – | 21 (17.0) | – |
| 22.86 Y/12.00 | 22.00 Y/12.70 | 15 (12.7) | – | 21 (17.0) | – |
| 24.94 Y/14.40 | 26.40 Y/15.24 | 18 (15.3) | – | 27 (22.0) | – |
| 27.60 Y/15.935 | 29.255 Y/16.89 | 21 (17.0) | – | – | – |
| 34.50 Y/19.92 | 36.51 Y/21.08 | 27 (22.0) | – | – | – |

Temporary overvoltage (TOV) capability

The temporary overvoltage (TOV) capability of the parking stand arrester is shown in Figure 3.

Performance test characteristics

The parking stand arrester consistently withstands the following design tests as described by IEEE Std C62.11™ standard:

- **Duty Cycle:**
22 current surges of 5 kA crest 8/20 μs waveshape.
- **High-Current, Short-Duration Discharge:**
2 current surges of 40 kA crest 4/10 μs waveshape.
- **Low-Current, Long-Duration Discharge:**
20 current surges of 75 A crest 2000 μs rectangular wave duration.

Following each of these tests, the arresters remain thermally stable as verified by:

- Continually decreasing power values during a thirty minute power monitoring period.
- No evidence of physical or electrical deterioration.

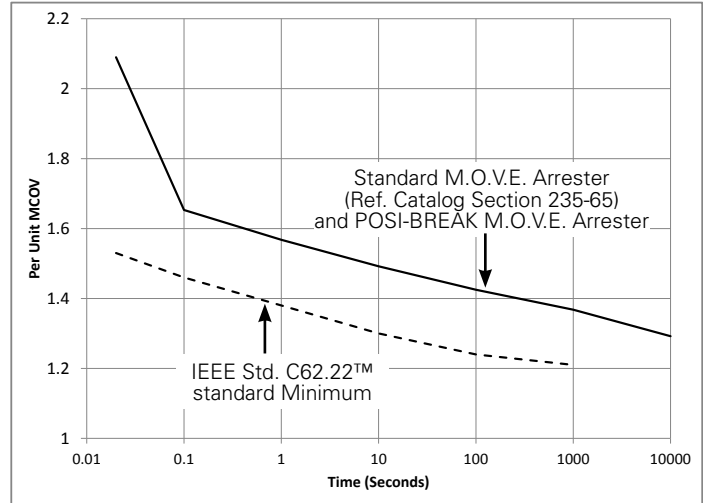
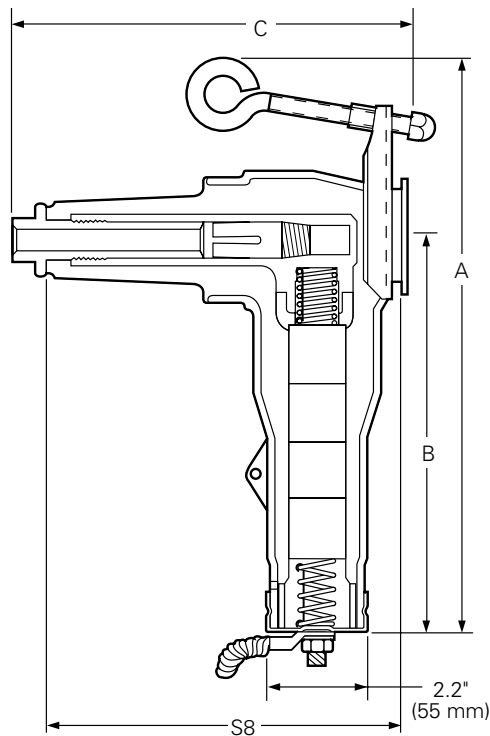


Figure 2. Temporary overvoltage curve. No prior duty at 85°C ambient.

Table 3. Parking Stand Surge Arrester Selection Chart

| IEEE Std 386™ standard Interface | Duty Cycle (kV) | MCOV Rating (kV) | Dimensions in./.(mm) | | | Catalog Number |
|----------------------------------|-----------------|------------------|----------------------|-----------|-----------|----------------|
| | | | A | B | C | |
| 15 kV Class | 3 | 2.55 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C03M |
| | 6 | 5.1 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C06M |
| | 9 | 7.65 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C09M |
| | 10 | 8.4 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C10M |
| | 12 | 10.2 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C12M |
| | 15 | 12.7 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C15M |
| | 18 | 15.3 | 11.9 (302) | 8.0 (203) | 7.7 (196) | 3237686C18M |
| 25 kV Class | 9 | 7.65 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C09M |
| | 10 | 8.4 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C10M |
| | 12 | 10.2 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C12M |
| | 15 | 12.7 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C15M |
| | 18 | 15.3 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C18M |
| | 21 | 17.0 | 11.9 (302) | 8.0 (203) | 8.2 (208) | 3237758C21M |



| Voltage Class | S8 |
|---------------|---------------|
| 15 kV | 7.4" (188 mm) |
| 25 kV | 7.4" (188 mm) |

Figure 3. Dimensional information of parking stand surge arrester (refer to Table 3).

Note: Dimensions given are for reference only.

Ordering information

To order a parking stand surge arrester kit, determine the arrester maximum continuous operating voltage (MCOV) rating for the intended application using Table 2 and specify the appropriate catalog number from Table 3. Contact your Eaton representative for applications not listed.

Additional information

Refer to the following reference literature for additional information:

- CA235025EN, Metal Oxide Varistor Elbow (M.O.V.E.) Surge Arrester
- S235-58-1, 15 and 25 kV Class Standard Parking Stand Arrester Installation Instructions

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Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Cooper Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

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