

# Surge Arresters

Electrical Apparatus  
**235-58**

## VariGAP MOV Gapped Parking Stand Arrester

### GENERAL

VariGAP Parking Stand Arrester from Cooper Power Systems incorporates the latest in metal oxide varistor (MOV) and resistance graded gap technology in a premolded rubber insulated standoff bushing. The arrester provides overvoltage system protection in an insulated, fully shielded, submersible, deadfront device. With this unique combination of technologies, Cooper Power Systems has advanced the performance characteristics of parking stand arresters beyond previously attainable limits.

### CONSTRUCTION

VariGAP Parking Stand Arrester is a combination of both metal oxide and gapped arrester technologies. Construction consists of metal oxide varistors in series with a non-linear resistance graded gap structure. The mating of these two service proven technologies results in a sharing of voltage during steady state conditions, minimizing voltage stress on both components. This results in a significant improvement in protective characteristics.

VariGAP Parking Stand Arrester is designed with a 60 Hz minimum sparkover of 1.5 times its duty cycle rating. This feature ensures a temporary overvoltage (TOV) capability greatly in excess of that available with gapless metal oxide arresters.

The standoff bushing interface conforms to IEEE Std 386™ standard — Separable Insulated Connector Systems. The arrester housing is molded of EPDM insulating rubber, which provides deadfront safety.

### OPERATION

The operation of the VariGAP Parking Stand Arrester differs from conventional gapless metal oxide arresters. During steady state conditions, line voltage is shared by both the resistance graded gap structure and metal oxide varistors. When overvoltages occur, the gaps sparkover, leaving only the metal oxide varistors in the circuit. This results in lower discharge voltages than are possible with gapless metal oxide arresters.



**Figure 1.**  
25 kV and 15 kV VariGAP Parking Stand MOV Gapped Arresters.

The superior protective characteristics of the VariGAP Parking Stand Arrester provide excellent protection to underground systems. They are used in pad-mounted transformer and entry cabinets, vaults, switching enclosures and other installations to provide shielded deadfront arrester protection. They are designed for use with 200 A loadbreak interfaces that conform to IEEE Std 386™ standard to limit overvoltages to acceptable levels, protect equipment and extend cable life. Parking stand arresters 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.

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 peroxide cured 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.

### INSTALLATION

No special tools are required. The arrester is placed in a parking stand bracket with a hotstick. Refer to Installation Instruction Sheet S235-58-1 for more details.

### PRODUCTION TESTS

Tests conducted in accordance with IEEE Std 386™ standard:

- Minimum Partial Discharge Extinction Voltage
- AC 60 Hz 1 Minute Withstand

Tests conducted in accordance with IEEE Std C62.11™ standard:

- Varistor Disks
  - Voltage at 1 mA
  - Batch Life Test
- Watts loss at MCOV
- 100% Sparkover Level Test

Tests conducted in accordance with Cooper Power Systems requirements:

- 100% Physical Inspection
- Periodic Dissection
- Periodic X-ray Analysis

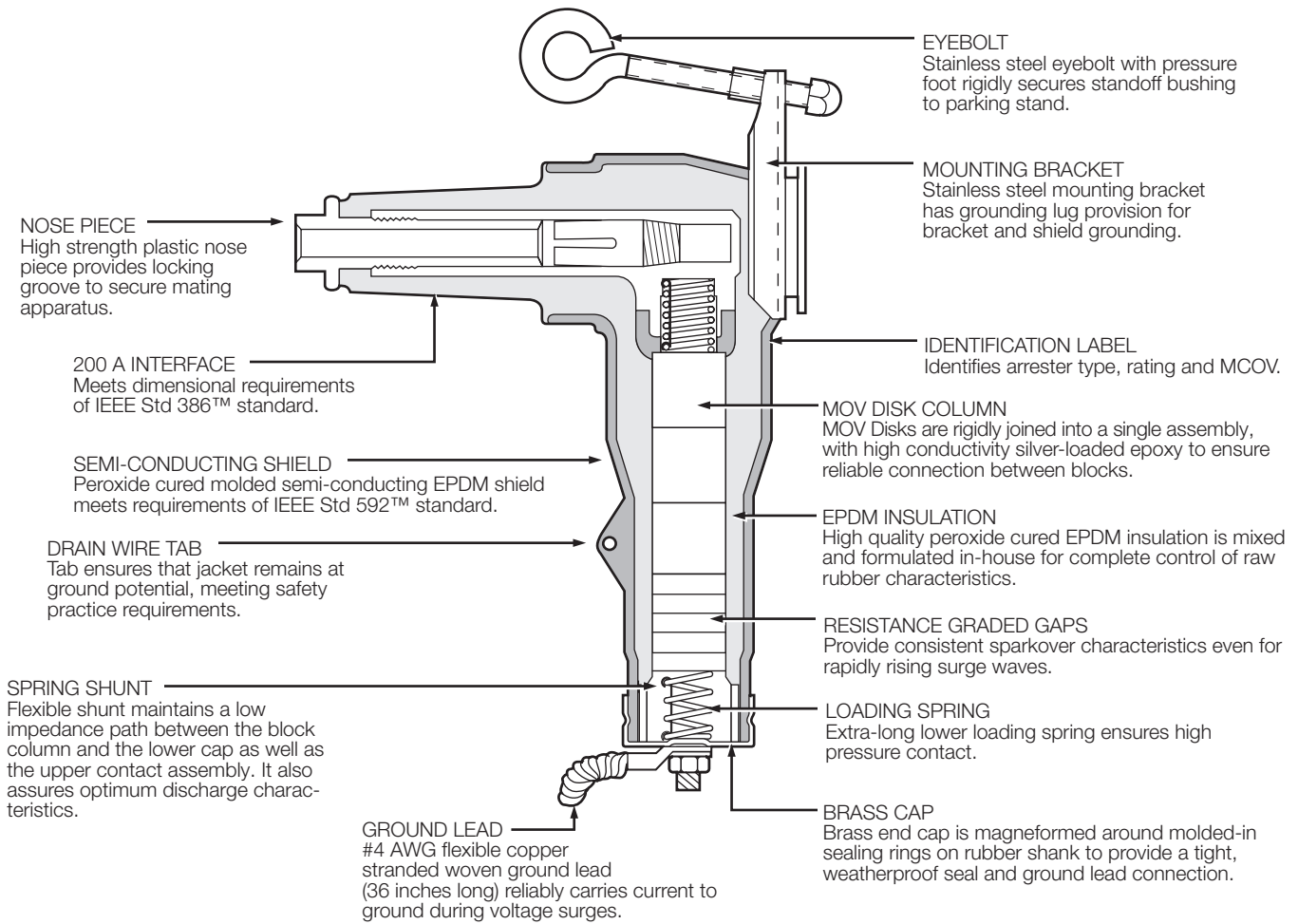


Figure 2. Cutaway illustration of 25 kV Class VariGAP Parking Stand Arrester.

## PROTECTIVE CHARACTERISTICS

The protective characteristics of the VariGAP Parking Stand Arresters are shown in Table 1.

TABLE 1  
Protective Characteristics

Arrester Rating (kV)	MCOV (kV)	Minimum 60 Hz Sparkover (kV crest/ $\sqrt{2}$ )	Front-of-Wave Protective Level* (kV crest)	Maximum Discharge Voltage 8/20 $\mu$ s Current Wave (kV crest)						Maximum 1.2/50 $\mu$ s Sparkover (kV crest)
				0.5 kA	1.5 kA	3 kA	5 kA	10 kA	20 kA	
9	7.65	13.5	25.8/28.5	19.5	21.2	23.8	24.7	28.5	33.3	24.2
10	8.4	15.0	27.1/30.0	20.5	22.3	25.0	26.0	30.0	35.0	25.5
12	10.2	18.0	35.5/39.5	25.0	27.0	29.6	31.4	36.8	43.2	31.3
15	12.7	22.5	37.8/41.0	30.0	31.3	33.7	36.2	40.4	44.5	36.0
18	15.3	27.0	48.8/59.3	35.8	40.2	44.4	46.8	49.4	60.5	42.8
21	17.0	31.5	60.1/65.3	39.4	44.3	48.9	51.5	54.4	66.6	51.3

\*First number is the value of the sparkover of the gap assembly based on a wave rising 100 kV per  $\mu$ s per 12 kV of arrester rating. Second number is based on 5 kA current impulse that results in a discharge voltage cresting in 0.5  $\mu$ s.

### TEMPORARY OVERVOLTAGE (TOV) CAPABILITY

The Temporary Overvoltage (TOV) capability of the VariGAP Parking Stand Arrester is shown in Figure 3.

### PERFORMANCE TEST CHARACTERISTICS

The VariGAP 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.
- The 60 Hz sparkover and 5 kA (8/20 μs) discharge voltages measured after each test changed by less than 10% from the initial values.

### STANDARDS

The VariGAP 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™ standard "Separable Insulated Connectors for Power Distribution Systems Above 600 Volts."

TABLE 2  
Commonly Applied Voltage Ratings of VariGAP Parking Stand Arrester

System Voltage (V 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
2400	2540	–	–	3 (2.55)
4160 Y/2400	4400 Y/2540	3 (2.55)	6 (5.1)	6 (5.1)
4260	4400	–	–	6 (5.1)
4800	5080	–	–	6 (5.1)
6900	7260	–	–	9 (7.65)
8320 Y/4800	8800 Y/5080	6 (5.1)	9 (7.65)	–
12000 Y/6930	12700 Y/7330	9 (7.65)	12 (10.2)	–
12470 Y/7200	13200 Y/7620	9 (7.65) or 10 (8.4)	15 (12.7)	–
13200 Y/7620	13970 Y/8070	10 (8.4)	15 (12.7)	–
13800 Y/7970	14520 Y/8388	10 (8.4) and 12 (10.2)	15 (12.7)	–
13800	14520	–	–	18 (15.3)
20780 Y/12000	22000 Y/12700	15 (12.7)	21 (17.0)	–
22860 Y/12000	22000 Y/12700	15 (12.7)	21 (17.0)	–
223000	243400	–	–	30 (24.4)
24940 Y/14400	26400 Y/15240	18 (15.3)	27 (22.0)	–
27600 Y/15935	29255 Y/16890	21 (17.0)	30 (24.4)	–
34500 Y/19920	36510 Y/21080	27 (22.0)	–	–

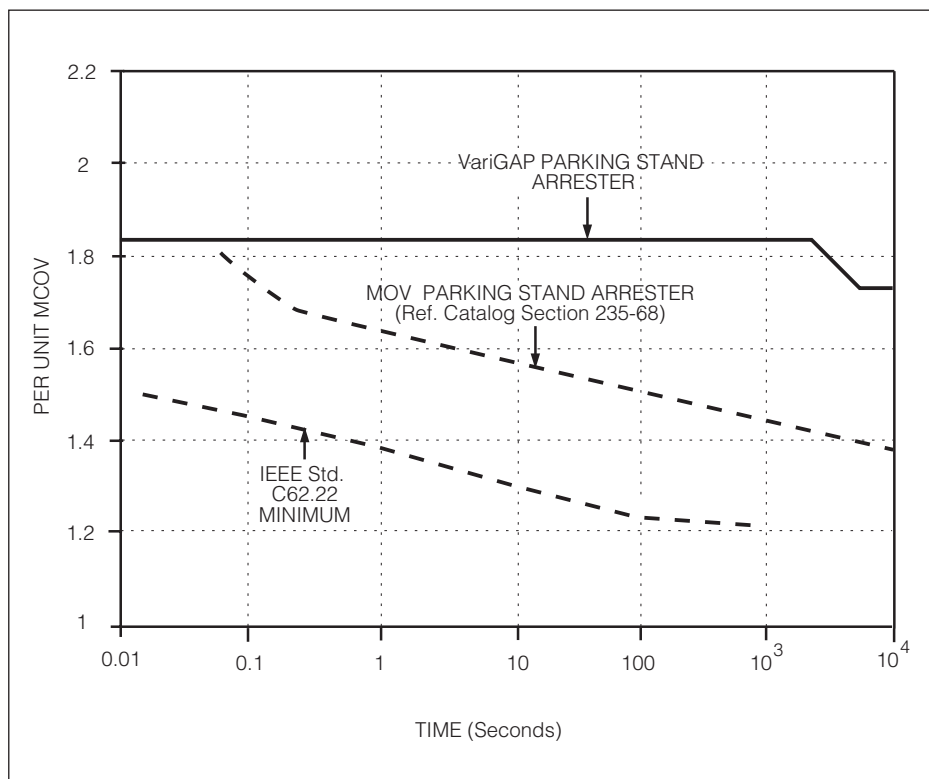
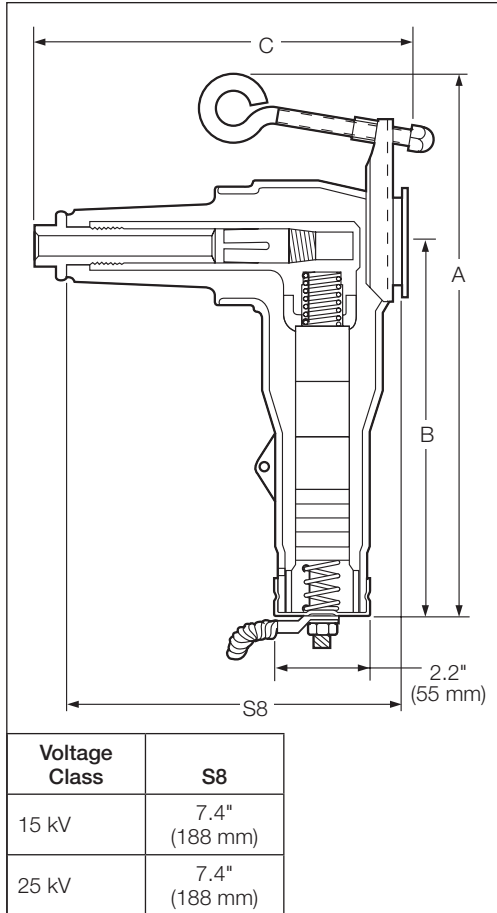


Figure 3.  
Temporary overvoltage curve. No prior duty at 85° C ambient.

### ORDERING INFORMATION

To order a Cooper Power Systems VariGAP Parking Stand Arrester, determine the voltage rating for the intended application using Table 2. Specify the appropriate catalog number from Table 3. Contact the Cooper Power Systems sales engineer in your location for applications not listed.



**Figure 4.** Dimensional information of VariGAP Parking Stand Surge Arrester (refer to Table 3).

Note: Dimensions given are for reference only.

**TABLE 3**  
Ordering Information

IEEE Std 386 standard Interface	Duty Cycle (kV)	MCOV Rating (kV)	Dimensions in./(mm)			Catalog Number
			A	B	C	
15 kV Class	9	7.65	11.9 (302)	8.0 (203)	7.7 (196)	3238104C09M
	10	8.4	11.9 (302)	8.0 (203)	7.7 (196)	3238104C10M
	12	10.2	11.9 (302)	8.0 (203)	7.7 (196)	3238104C12M
	15	12.7	11.9 (302)	8.0 (203)	7.7 (196)	3238104C15M
	18	15.3	14.5 (368)	10.6 (269)	7.7 (196)	3238104C18M
25 kV Class	9	7.65	11.9 (302)	8.0 (203)	8.2 (208)	3238105C09M
	10	8.4	11.9 (302)	8.0 (203)	8.2 (208)	3238105C10M
	12	10.2	11.9 (302)	8.0 (203)	8.2 (208)	3238105C12M
	15	12.7	11.9 (302)	8.0 (203)	8.2 (208)	3238105C15M
	18	15.3	14.5 (368)	10.6 (269)	8.2 (208)	3238105C18M
	21	17.0	14.5 (368)	10.6 (269)	8.2 (208)	3238105C21M