

# *Specification for Heavy Duty Class Polymer Housed Distribution Arresters*

## **1.0 Scope**

1.1 This specification covers heavy duty polymer housed gapless MOV distribution surge arresters. The arresters shall be heavy duty distribution class in accordance with the latest edition of ANSI/IEEE Standard C62.11.

If a conflict exists between the above referenced standard and this specification, this specification shall prevail.

## **2.0 General Requirements**

### 2.1 Guarantee

2.1.1 Bidder must provide certification that the supplier has at least 20 years experience in manufacturing gapless polymer housed surge arresters and must have an installed base of at least 18,000,000 of these arresters in service.

2.1.2 Bidders that cannot comply with section 2.1.1 will not be considered.

### 2.2 Information with bid

2.2.1 The bid documentation supplied will include as a minimum the following information:

- 2.2.1.1 Outline drawings of the arrester including the external mounting hardware.
- 2.2.1.2 Discharge voltage levels.
- 2.2.1.3 Design test reports in accordance with the latest revision of ANSI/IEEE C62.11.
- 2.2.1.4 Certification of an ISO 9002 registered quality program.
- 2.2.1.5 Certification of the amount of total internal air volume in the arrester.

2.2.2 All of the documentation will be supplied in English.

## **3.0 Standards**

- 1 ANSI/IEEE C62.11 (Latest Revision)
- 2 Performance Requirements

## **4.0 General**

4.1.1 The allowed housing materials will be either an alloy of EPDM rubber and low molecular weight silicone oil or silicone rubber.

4.1.2 The interface between the polymer housing must be filled with a silicone dielectric compound. Also, a housing that is bonded to the internal elements is permitted.

4.1.3 Each arrester will be supplied with line and ground terminal connectors suitable for clamping conductors from No. 6 AWG solid to No. 2 AWG stranded.

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4.1.4 The line and ground terminals of the arrester will be 3/8-16 threads. All external metal parts (excluding the mounting bracket and associated hardware) will be stainless steel. However, it is permitted that the nuts on the line and ground end may be brass.

4.1.5 A ground lead disconnecter will be installed on the arrester.

4.1.5.1 The ground lead disconnecter must operate for currents as low as 1 ampere rms.

4.1.5.2 The ground lead disconnecter must be in compliance with all Department of Transportation (DOT) shipping regulations without the need for an external restraining mechanism during shipment.

4.1.6 Nameplate data shall include the following information:

- a. Arrester Classification
- b. Manufacturer's Name or Trademark
- c. Manufacturer's Type and identification number
- d. Duty-cycle voltage rating of the arrester
- e. MCOV rating of the arrester
- f. Quarter and year of manufacture

4.1.7 To ensure a low failure rate from moisture ingress the arrester will have less than 5 % of the total internal volume as an air space.

4.1.8 The arrester will have a minimum fault current withstand capability of 20,000 amperes when tested per section 8.18 of IEEE Std C62.11-2005.

#### 4.2 Dimensions and Weight

4.2.1 Leakage distance - The arrester shall meet or exceed the leakage distances in the following table:

4.2.2 Height - The total height of the arrester will not exceed the values in the table below:

4.2.3 Weight - The weight of the arrester plus cross arm bracket must not exceed the values in the following table:

Duty Cycle Rating	Maximum Continuous Operating Voltage (MCOV)	Overall Height	Leakage Distance Terminal to Base	Mounting Clearance		Approximate Net Weights		
				Center Line to Center Line	Center Line to Ground	Unit Only	Unit with Insulating Base Bracket	Unit with Insulating Base Bracket and NEMA Bracket
kV	kV	Inches	Inches	Inches	Inches	Pounds	Pounds	Pounds
3	2.55	6.8	8.5	5	3	1.9	2.9	5.4
6	5.1	7.6	11.3	5.4	3.4	2.3	3.3	5.8
9	7.65	8.7	14.4	6	4	2.8	3.8	6.3
10	8.4	8.7	14.4	6.2	4.2	2.8	3.8	6.3
12	10.2	9.3	17.0	7.5	5.5	3.3	4.3	6.8
15	12.7	11.6	25.2	8.5	6.5	4.6	5.6	8.1
18	15.3	11.6	25.2	9.5	7.5	4.6	5.6	8.1
21	17.0	12.4	28.1	10.0	8.0	5.2	6.2	8.7
24	19.5	15.3	36.5	12.0	10.0	7.0	8.3	10.8
27	22.0	16.4	39.6	13.0	11.0	7.4	8.7	11.3
30	24.4	16.9	42.2	14.0	12.0	7.9	9.2	11.7
36	29.0	19.3	50.4	16.5	14.5	9.0	10.3	12.8

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### 4.3 Electrical

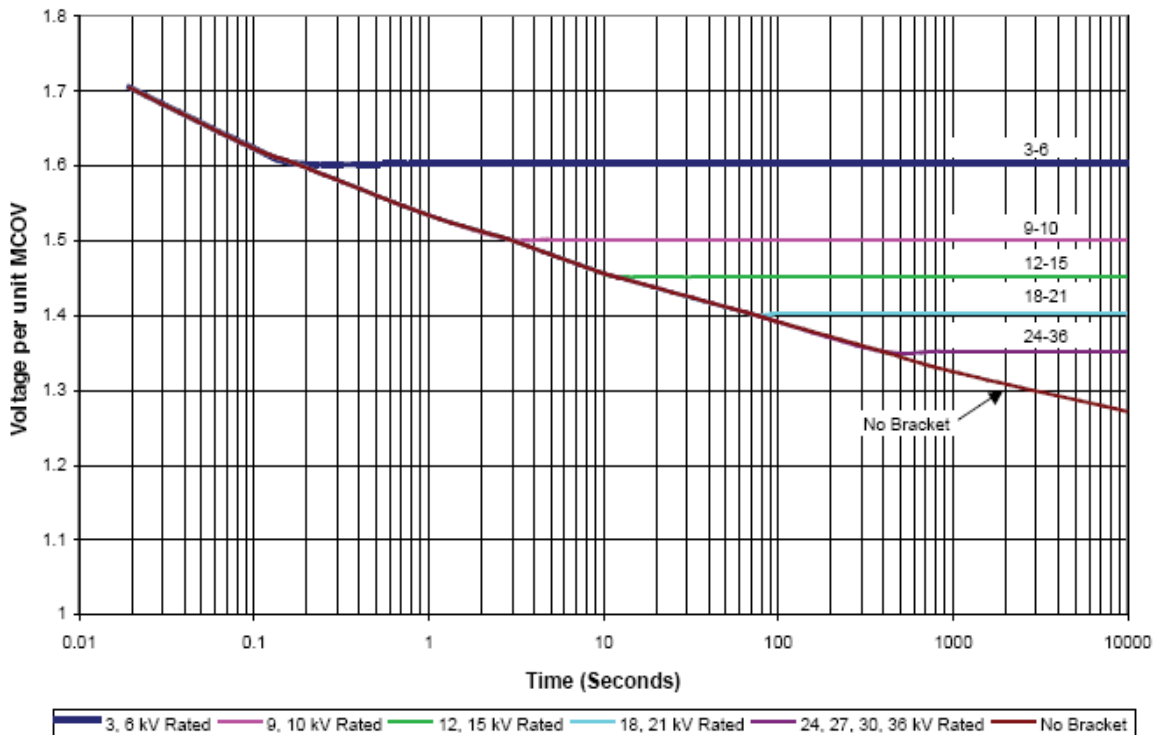
4.3.1 Discharge (Residual) voltages: Arresters shall be assembled with the correct number of MOV blocks to obtain proper characteristics for a given MCOV. The sum of the discharge voltages of discs assembled in an arrester and the voltage drop of springs and other internal parts will be less than or equal to the values in the table below in kV:

Rated Voltage (kV)	MCOV (kV)	.5 $\mu$ sec 10-kA Maximum IR -kV <sup>(1)</sup>	500 A Switching Surge Maximum IR -kV <sup>(2)</sup>	8/20 Maximum Discharge Voltage - kV					
				1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA
3	2.55	10.6	7.6	8.0	8.5	9.0	9.9	11.1	13.2
6	5.1	21.3	15.3	15.9	17.0	18.0	19.8	22.3	26.5
9	7.65	31.2	22.4	23.3	24.9	26.4	29.0	32.6	38.8
10	8.4	34.0	24.4	25.4	27.1	28.8	31.6	35.6	42.3
12	10.2	40.4	29.0	30.3	32.3	34.2	37.6	42.3	50.3
15	12.7	51.4	36.9	38.5	41.1	43.5	47.8	53.8	64.0
18	15.3	60.6	43.5	45.4	48.4	51.3	56.4	63.5	75.5
21	17	68.3	49.0	51.1	54.5	57.8	63.5	71.4	85.0
24	19.5	81.9	58.8	61.3	65.5	69.3	76.2	85.7	102.0
27	22	91.9	65.9	68.8	73.4	77.8	85.5	96.2	114.4
30	24.4	101.1	72.5	75.7	80.7	85.5	94.0	105.8	125.8
36	29	121.4	87.0	97.9	97.0	102.7	112.9	127.0	151.1

- (1) Maximum discharge voltage for a 10-kA impulse current wave which produces a voltage wave cresting in 0.5  $\mu$ s. This can be used for coordination where front-of-wave sparkover was formerly used.  
 (2) Based on a 500A surge of 45-  $\mu$ s time to crest.

4.3.2 Temporary Overvoltage (TOV) Capability - To provide long reliable service life the surge arrester must have TOV capability (with no prior duty) not less than the durations in the table below:

**ANSI No Prior Duty TOV Curves for Heavy Duty Arresters**



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## 5.0 Routine and Quality Assurance Testing

### 5.1 MOV block requirements

#### 5.1.1 Routine (100%) tests:

5.1.1.1 10 kA discharge voltage - Each MOV block is subjected to a 10 kA discharge with a wave shape of 8/20 and the resulting discharge voltage measured with an accuracy of 1.5 percent. This measured value must be stamped on the disc and used as the basic reference value in assembling multiple blocks into complete arresters.

5.1.1.2 Rated Energy Test - Each block will receive a single 8/20 high current impulse. The magnitude of the discharge current is maintained such that the resulting energy per discharge is greater than 249 +/- 10 percent joules per cubic centimeter of block material.

#### 5.1.2 Quality assurance tests:

5.1.2.1 Square-wave energy test - Sample blocks are subjected to a two shot series of high energy discharges which are increased in magnitude on successive series until the block fails. This indicates the ultimate energy capability by the magnitude of the energy absorbed on the last shot prior to failure. The minimum energy of the block will exceed 249 J/cc block material.

5.1.2.2 100 kA High Current Test - Sample blocks will be subjected to two 100-kA discharges with permissible wave shape 4-6/10-15. After a minimum one-hour cooling period, blocks may have a maximum increase in 10-kA discharge voltage of less than 2%.

5.1.2.3 AC Tests - After the disc is energized to  $\geq 20$  mApk, the current is reduced to 4 mApk ( $I_{ref}$ ) and the reference voltage measured ( $V_{refpk}$ ). Then the voltage is reduced to MCOV where the watts loss and capacitive current are measured. Maximum watts loss must be  $\leq 0.050$  Watts per kV of MCOVpk for the block under test. The capacitive current must be  $0.32 \pm 0.10$  mA.

5.1.2.4 Accelerated aging test - A sample of blocks from each batch will be subjected to accelerated aging test. The blocks are energized at  $\geq$  MCOV at 135° C for 160 hours. At the conclusion of the test, the curve of watts loss vs. time has a negative slope, and the final/minimum watts loss must be  $\leq 1.08$  and the final/initial watts loss must be  $< 1.00$ . This test is equivalent to over 100 years at an operating temperature of 40° C.

5.2 Arrester requirements: The following tests are to be done on 100% of the arresters. Certification that all arresters were tested must be supplied. It is not necessary that data be available for each individual arrester.

5.2.1 Starting (Reference) Voltage - The voltage necessary to produce 5 mA peak resistive current must be measured.

5.2.2 Partial Discharge – P-D must be measured and must be less than 10 pC with an applied voltage of 1.25 times MCOV or greater.

5.2.3 Power Frequency Test – Energize arrester for minimum of 1 second withstand at 1.25 times MCOV.

5.3 Documentation – Upon request the manufacturer will supply certification that all of the above tests are performed.

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