Specification for:

Distribution High (DH) Polymer Housed Distribution Arresters

1.0 Scope

1.1 This specification covers Distribution High polymer housed gapless MOV distribution surge arresters. The arresters shall be Distribution High in accordance with the latest edition of the IEC 60099-4 Standard.

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 30 years of experience in manufacturing gapless polymer housed MOV surge arresters and must have an installed base of at least 30,000,000 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 Residual voltage levels.

2.2.1.3 Type test reports in accordance with the latest revision of IEC 60099-4.

2.2.1.4 ISO 9001 quality certification.

2.2.1.5 ISO 14001 environmental certification.

2.2.1.6 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 Applicable Standards

3.1 IEC 60099-4 (Latest Revision)

4.0 Product Characteristics and Requirements

4.1 The arrester shall be gapless.

4.2 The allowed housing materials will be a blend of silicone and EPDM rubber, or silicone rubber.

4.3 The interface between the polymer housing must be filled with a silicone dielectric compound. A housing that is bonded to the internal elements is also permitted.

4.4 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.

4.5 The line and ground terminals of the arrester will be 3/8-16 or M12 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.

4.6 A ground lead disconnector will be installed on the arrester.

4.6.1 The ground lead disconnector must operate for currents as low as 1 Ampere RMS, in addition to the requirements in the latest version of IEC 60099-4.

4.6.2 The ground lead disconnector must comply with all US Department of Transportation (DOT) shipping regulations without the need for an external restraining mechanism during shipment.

4.7 Nameplate data shall include the following information:

a. Designation of arrester
b. Manufacturer's name or trademark, type and identification of arrester
c. Continuous operating voltage of the arrester
d. Rated voltage of the arrester
e. Nominal discharge current
f. Month and year of manufacture
g. Rated short-circuit current

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

4.9 The arrester will have a minimum short circuit withstand capability of 20 kA when tested per section 8.10 of the latest version of IEC 60099-4.

4.10 Dimensions and Clearances

4.10.1 Leakage distance - The arrester shall meet or exceed the leakage distances in Table 1.

4.10.2 Height - The height of the arrester shall be provided.

4.10.3 Strike Distance – The minimum strike distance shall be provided.

4.10.4 Clearances – The recommended phase-to-phase and phase-to-ground clearances shall be provided.

Table 1: Distribution High Surge Arrester Characteristics

Rated Voltage Ur	Continuous Operating Voltage Uc	Arrester Only Height	Minimum Leakage Distance	Minimum Strike Distance with Bracket	Recommended Clearances	
					Phase-Phase	Phase-Ground
kV	kV	mm	mm	mm	mm	mm
3	2.55	76	215	141	127	76
6	5.1	97	287	161	137	86
9	7.65	124	365	190	152	102
10	8.4	124	365	190	157	107
12	10.2	140	431	212	191	140
15	12.7	198	640	268	216	165
18	15.3	198	640	268	241	191
21	17	218	713	291	254	203
24	19.5	292	927	360	305	254
27	22	320	1005	385	330	279
30	24.4	333	1079	400	356	305
36	29	394	1280	456	419	368
42	34	437	1428	500	488	500

4.11 Electrical

4.11.1 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 residual 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 Table 2.

Table 2: Distribution High Surge Arrester Residual Voltages

Rated Voltage Ur	Continuous Operating Voltage Uc	Residual Voltage (kV)							
		Steep Current Impulse	8/20 Lightning Impulse						Switching Impulse
kV	kV	10 kA	1.5 kA	3 kA	5 kA	10 kA	20 kA	40 kA	0.5 kA
3	2.55	11.5	8	8.6	9.1	9.9	11.2	13.3	7.3
6	5.1	22.4	16	17.1	18.2	19.8	22.5	26.5	14.7
9	7.65	32.7	23.5	25.1	26.6	29	32.9	38.8	21.5
10	8.4	35.5	25.6	27.4	29	31.6	35.9	42.3	23.4
12	10.2	42.1	30.4	32.6	34.5	37.6	42.7	50.3	27.8
15	12.7	53.8	38.7	41.4	43.8	47.8	54.3	64	34.5
18	15.3	63.1	45.6	48.8	51.7	56.4	64.1	75.5	41.7
21	17	71	51.4	55	58.2	63.5	72.1	85	47
24	19.5	85.5	61.6	66	69.9	76.2	86.6	102	56.4
27	22	95.9	69.2	74	78.4	85.5	97.1	114.5	63.3
30	24.4	105.2	76	81.4	86.2	94	106.8	125.9	69.6
36	29	126.3	91.3	97.8	103.5	112.9	128.3	151.2	83.5
42	34	139.4	102.7	110	116.5	127	144.3	170.1	137.7

4.11.2 Power-frequency Voltage-versus-time Capability - To provide long reliable service life the surge arrester must have Temporary Overvoltage (TOV) capability (with and without prior duty) not less than the durations in the chart below.

4.12.1 Repetitive charge transfer rating (Qrs) shall be at least 0.4 C when tested per Clause 8.5 of IEC 60099-4.

4.12.2 Thermal charge transfer rating (Qth) shall be at least 1.1 C when tested per section 8.7 of IEC 60099-4

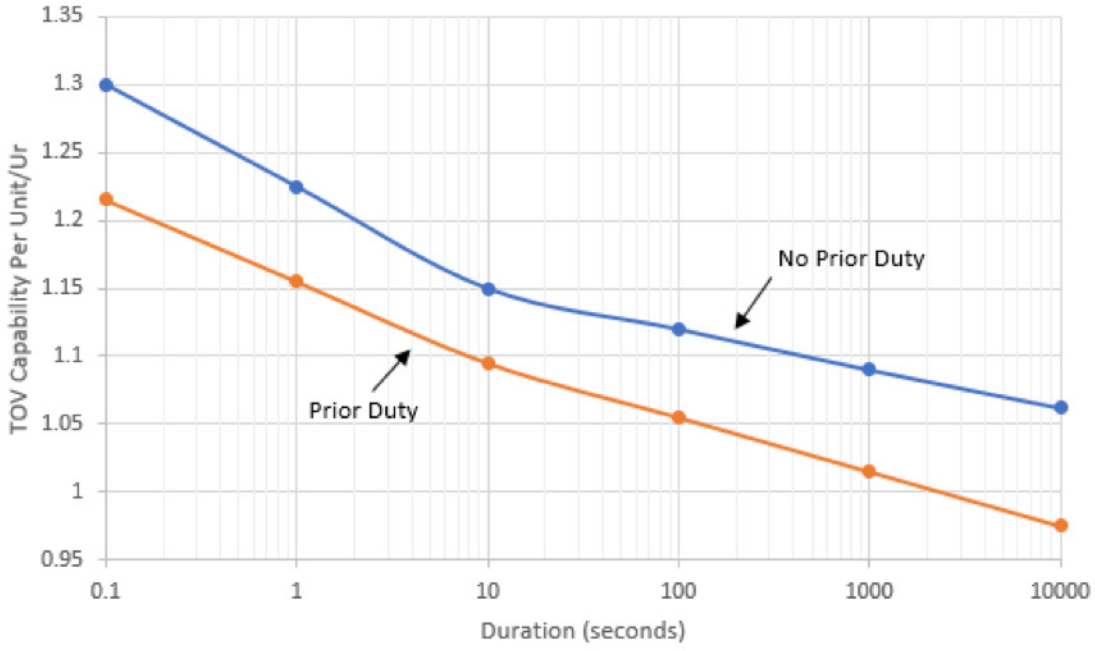

Figure 1: TOV Capability (without capacitive ground lead disconnector bracket)

5.0 Routine and Quality Assurance Testing

5.1 MOV block requirements

5.1.1 Routine (100%) tests:

5.1.1.1 Residual voltage (10 kA) - Each MOV block is subjected to a 10 kA discharge with a wave shape of 8/20 and the resulting residual 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 268 +/- 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 268 J/cc block material.

5.1.2.2 High Current Test (100 kA) - Sample blocks will be subjected to a single 100 kA discharge with permissible wave shape 4-6/10-15. If the block sustains damage during the discharge, it's watts loss and 10 kA discharge voltage are measured. The maximum watts loss must be ≤ 0.020 Watts per kV of MCOVpk for the block under test.

5.1.2.3 AC Tests - After the disc is energized to ≥ 20 mApk, the current is reduced to 4 mApk (Iref) and the reference voltage measured (Vrefpk). Then the voltage is reduced to MCOV where the watts loss and capacitive current are measured. Maximum watts loss must be ≤ 0.020 Watts per kV of MCOVpk for the block under test. The capacitive current must be 0.37 ± 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 ≥ 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 ≤ 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 shall be performed on 100% of the arresters. Certification that all arresters were tested must be supplied. It is not necessary that data will be available for each individual arrester.

5.2.1 Reference Voltage - The voltage necessary to produce 4 mA peak resistive current must be measured.

5.2.2 Partial Discharge – PD must be measured and must be less than 10 pC with an applied voltage of 1.05 times MCOV.

5.2.3 Power Frequency Test – Energize arrester for minimum of 2 second withstand at Rated Voltage of the arrester.

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

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