

# *Specification for Station Class Porcelain Housed Surge Arresters*

## **1.0 Scope**

1.1 This specification covers station class porcelain housed gapless MOV surge arresters. The arresters shall be station 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.

2.2.2 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 porcelain.

4.1.2 Each arrester will be supplied with line and ground terminal connectors suitable for clamping conductors from .25 to .81 inches in diameter.

4.1.3 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. Serial Number

NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

4.1.4 The arrester will have a minimum pressure relief capability when tested:

- a. 10kA for porcelain top (VLA)
- b. 65kA for metal top (VL)
- c. 93kA for metal top (VN)

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 must not exceed the values in the following table.

	Duty Cycle Rating	Maximum Continuous Operating Voltage (MCOV)	Overall Height	Minimum Leakage Distance	Mounting Clearance Spacing on Center		Net Weight
					Phase to Phase (In-line)	Phase to Ground	
					Inches	Inches	
VLA	3	2.55	12	11.1	11	5.5	35
	6	5.1	12	11.1	11	5.5	40
	9	7.65	12	11.1	11	5.5	40
	10	8.4	12	11.1	11	5.5	40
	12	10.2	12	11.1	11	6.5	42
	15	12.7	16.25	20	11	7.5	50
	18	15.3	16.25	20	11	9	50
	21	17.0	16.25	20	11	9	51
	24	19.5	16.25	20	11	9	52
VL	3	2.55	19.3	6.2	12	6	65
	6	5.1	19.3	6.2	12	7	65
	9	7.65	19.3	6.2	13	7	66
	10	8.4	19.3	6.2	13	8	66
	12	10.2	21.3	11.1	14	8.5	72
	15	12.7	21.3	11.1	14	8.5	73
	18	15.3	24.13	20	16	9	80
	21	17	24.13	20	16	9	51
	24	19.5	24.13	20	17	11	52
	27	22	28.13	31.7	18	12	90
	30	24.4	28.13	31.7	18	12	91
	36	29	28.13	31.7	20	14	93
	39	31.5	31.88	41	21	14	105
45	36.5	31.88	41	21	15	107	
48	39	31.88	41	22	15	109	
VN	54	42	38.13	60	24	18	180
	60	48	38.13	60	25	19	185
	72	57	44.13	80	26	20	220
	90	70	50.63	101	33	27	250
	90	74	50.63	101	35	29	260
	96	76	50.63	101	37	31	265
	108	84	57.13	122	38	32	280
	108	88	57.13	122	39	33	285
	120	98	57.13	122	42	36	290
	132	106	76.63	140	44	38	395
	144	115	82.63	160	51	46	425
	168	131	89.13	181	59	54	465
	172	140	89.13	181	78	59	475
	180	144	89.13	181	83	64	480
	192	152	96.13	202	83	67	515
	228	180	108.63	244	92	73	590
	258	209	128.13	262	111	92	700
264	212	133.63	282	116	96	725	
276	220	133.63	282	120	100	730	
312	245	147.13	324	130	110	800	

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### 4.3 Electrical

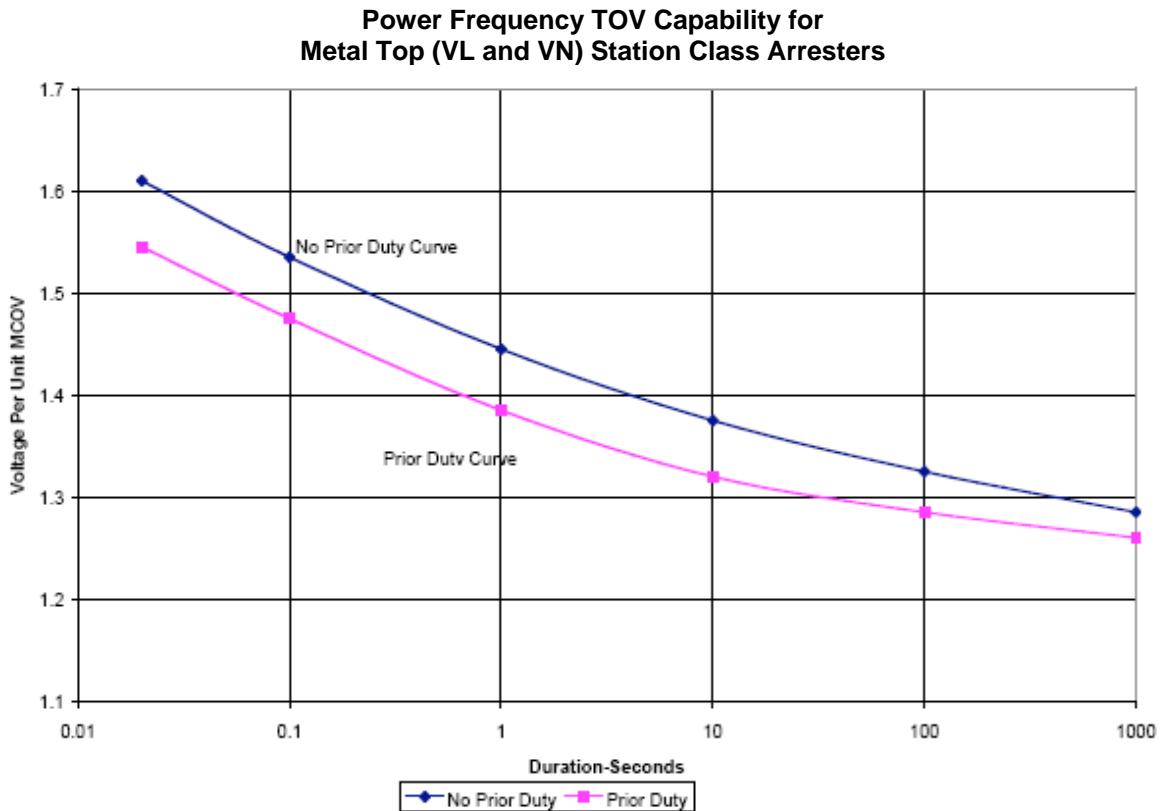
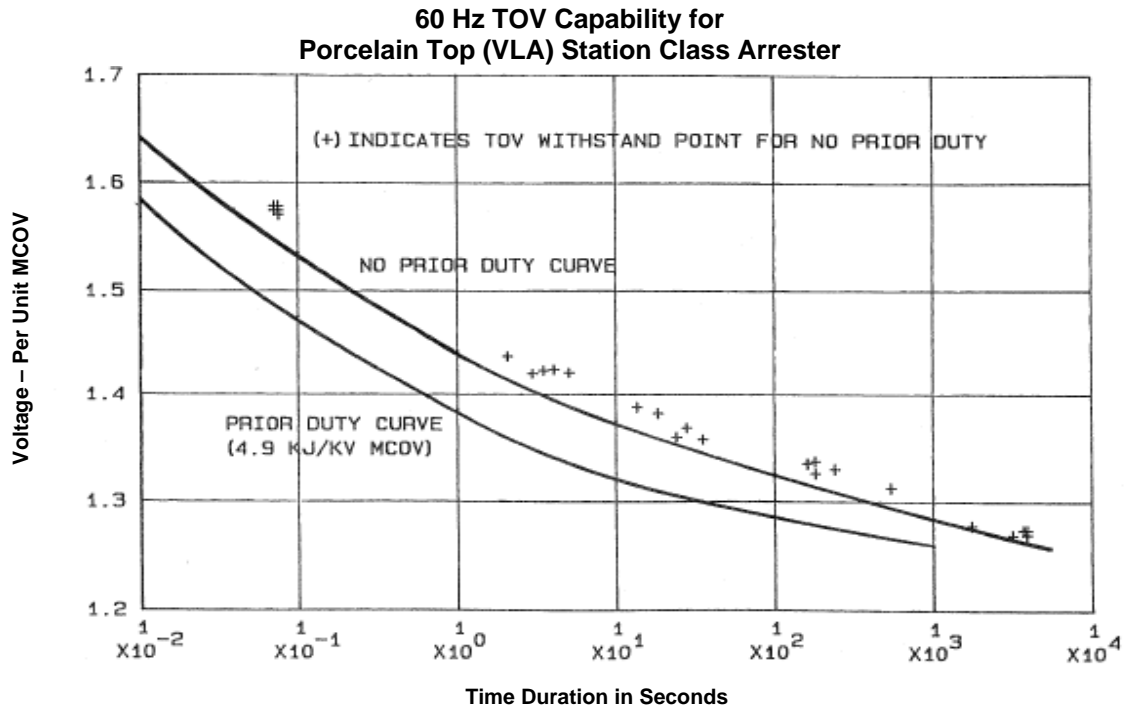
4.3.1 Discharge (Residual) voltages: Arresters shall be assembled with the correct number of MOV blocks to obtain proper characteristics for a given MCOV. The sum of the discharge voltages of discs assembled in an arrester and the voltage drop of springs and other internal parts will be less than or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

	Duty Cycle Rating kV	Maximum Continuous Operating Voltage kV	Maximum 0.5 $\mu$ sec Discharge Voltage kV <sup>(1)</sup>	Maximum Switching Surge Protective Level kV <sup>(2)</sup>	Maximum Discharge Voltage Using an 8/20 Current Wave - kV					
					1.5kA	3kA	5kA	10kA	20kA	40kA
VLA	3	2.55	9.1	6.3	6.9	7.2	7.5	8	9	10.3
	6	5.1	17.9	12.4	13.6	14.2	14.8	15.8	17.7	20.3
	9	7.65	26.6	18.4	20.2	21.1	22	23.5	26.4	30.2
	10	8.4	29.3	20.3	22.2	23.3	24.2	25.9	29.1	33.3
	12	10.2	35.5	24.6	26.9	28.2	29.4	31.4	35.2	40.4
	15	12.7	44.2	30.6	33.5	35.1	36.6	39.1	43.9	50.3
	18	15.3	53.3	36.8	40.4	42.3	44.1	47.1	52.8	60.6
	21	17.0	59.1	40.9	44.8	46.9	48.9	52.3	58.7	67.2
VL	24	19.5	67.8	46.9	51.4	53.8	56.1	60	67.3	77.1
	3	2.55	9.1	6.3	6.9	7.2	7.5	8	9	10.3
	6	5.1	17.9	12.4	13.6	14.2	14.8	15.8	17.7	20.3
	9	7.65	26.6	18.4	20.2	21.1	22	23.5	26.4	30.2
	10	8.4	29.3	20.3	22.2	23.3	24.2	25.9	29.1	33.3
	12	10.2	35.5	24.6	26.9	28.2	29.4	31.4	35.2	40.4
	15	12.7	44.2	30.6	33.5	35.1	36.6	39.1	43.9	50.3
	18	15.3	53.3	36.8	40.4	42.3	44.1	47.1	52.8	60.6
	21	17	59.1	40.9	44.8	46.9	48.9	52.3	58.7	67.2
	24	19.5	67.8	46.9	51.4	53.8	56.1	60	67.3	77.1
	27	22	76.5	52.9	58	60.8	63.3	67.7	75.9	87
	30	24.4	84.9	58.7	64.3	67.4	70.3	75.1	84.2	96.5
	36	29	101	69.7	76.4	80	83.4	89.2	100	115
	39	31.5	110	75.8	83	86.9	90.6	96.9	109	125
VN	45	36.5	128	88.3	96.8	102	106	113	127	146
	48	39	136	93.8	103	108	113	120	135	155
	54	42	135	100	107	112	117	125	136	151
	60	48	150	111	119	125	130	139	151	168
	72	57	178	132	141	148	154	165	179	199
	90	70	225	166	178	187	195	208	226	251
	90	74	238	176	188	198	206	220	239	265
	96	76	238	176	188	198	206	220	239	265
	108	84	269	199	213	224	233	249	270	300
	108	88	275	203	218	228	238	254	276	306
	120	98	306	235	242	254	265	283	307	341
	132	106	332	254	263	276	287	307	333	370
	144	115	360	276	285	299	312	333	361	402
	168	131	416	319	330	346	360	385	418	464
	172	140	438	336	347	363	379	405	439	488
	180	144	450	345	357	374	390	416	452	502
	192	152	476	365	377	395	412	440	477	531
	228	180	568	436	450	472	492	526	570	634
258	209	659	526	522	547	570	609	661	735	
264	212	662	528	524	550	573	612	664	738	
276	220	687	548	544	570	594	635	689	766	
312	245	773	617	612	641	668	714	775	862	

- (1) Maximum discharge voltage for an impulse current wave which produces a voltage wave cresting in 0.5 $\mu$ s. Discharge currents are 10kA for 2.55 – 245kV MCOV. This can be used for coordination where front-of-wave sparkover formerly was used.
- (2) Discharge voltages are based on a 500A surge for 45 $\mu$ s time to crest through 88kV MCOV and 1,000A surge of 45 $\mu$ s – time to crest through 180kV MCOV and 2,000A through 245kV MCOV.

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4.3.2 Temporary Overvoltage 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 tables below:



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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 Discharge voltage 10kA - 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 1.5percent. 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 multiple high energy square wave impulses. The magnitude of the discharge current is maintained such that the resulting energy per test is greater than 210 +/- 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 193 J/cc for VL and VLA block material and 210 for VN arresters block material.

5.1.2.2 High Current Test 100 kA - 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 3%.

5.1.2.3 AC Tests - After the disc is energized to  $\geq 30$  mApk, the current is reduced to 11 mApk ( $I_{ref}$ ) for VL and VLA and 17 mApk ( $I_{ref}$ ) for VN, 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 10kA discharge voltage for VL and VLA and  $\leq 0.065$  Watts per kV of 10kA discharge voltage for VN for the block under test. The capacitive current must be  $0.87 \pm 0.10$  mA for VL and VLA, and  $1.41 \pm 0.10$  mA for VN arresters.

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  $135^{\circ}$  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  $40^{\circ}$  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 11 mA peak resistive current must be measured for VL and VLA type arresters. The voltage necessary to produce 17.0 mA peak resistive current must be measured for VN type arresters.

5.2.2 Partial Discharge – P-D must be measured and must be less than 10 pC with an applied voltage of 1.05 times MCOV or greater.

5.2.3 Power Frequency Test – Energize arrester for minimum of 1 second withstand at 1.20 times MCOV.

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

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