

Surge Arresters

Functional Specification Guide

Polymer-housed station class arrester

PS235001EN

Functional Specification for Polymer-Housed Station-Class Surge Arresters

1. Scope:

- 1.1 This specification covers the electrical and mechanical characteristics of polymer-housed station-class arresters.

2. Applicable Standards:

- 2.1 The surge arresters shall meet the requirements of IEEE Std C62.11™-2005 standard “Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits”. The Pressure Relief Test was performed in accordance with IEEE Std C62.11a™-2008 standard.

3. Construction:

- 3.1 Arresters shall be polymer-housed station-class. The housing should contain a minimum of 75% silicone rubber. Housings, which are primarily EPDM, EPR or other carbon-based materials, are not acceptable.

4. Cantilever Strength:

- 4.1 Polymer-housed station-class arresters should meet ultimate cantilever strength, in in-lbs, for the following designs:

US (3-108kV)	15,000 in-lbs
US (120-240kV)	20,000 in-lbs
UH (3-108kV)	20,000 in-lbs
UH (120-240kV)	35,000 in-lbs
UX (3-108kV)	35,000 in-lbs

5. Creepage Distance:

- 5.1 The arrester housing shall have minimum creepage distance per the following table:

Arrester Rating (kV, rms)	Creepage Distance (inches)	Arrester Rating (kV, rms)	Creepage Distance (inches)	Arrester Rating (kV, rms)	Creepage Distance (inches)
3	30.7	42	84.4	138	245.7
6	38.4	45	92.1	144	245.7
9	38.4	48	99.8	162	307.1
10	38.4	54	99.8	168	314.8
12	46.1	60	107.5	172	322.4
15	46.1	66	138.2	180	330.1
18	53.7	72	138.2	192	337.8
21	53.7	78	153.5	198	353.2
24	61.4	84	168.9	204	360.8
27	61.4	90	176.6	216	406.9
30	69.1	96	184.3	228	422.2
33	69.1	108	199.6	240	429.9
36	69.1	120	215		
39	84.4	132	230.3		

6. Terminals

6.1. Terminals shall have solderless clamp-type connections suitable to accept up to 1.15" diameter conductors.

7. Mounting Provisions:

7.1. The arrester shall be supplied with a 3-hole mounting base using an 8.75"-10" diameter bolt circle pattern. The bolt-holes should be sized for .5" diameter bolts.

8. Nameplate:

8.1. The arrester should specify the manufacturer name, catalog number, serial number, arrester rating and MCOV. It should be permanently affixed to the mounting base.

9. Protective Characteristics:

9.1. The arrester shall have discharge voltages, which do not exceed the following single-impulse discharge energy ratings:

US - Standard Energy Handling (minimum 3.9 kJ/kV of MCOV)

Arrester Rating (kV, rms)	Arrester MCOV (kV, rms)	TOV*		Front-of-Wave Protective Level** (kV Crest)	Maximum Discharge Voltage (kV Crest)*** 8/20us Current Wave						Switching Surge Protective Level**** (kV Crest)			
		1 Sec	10 Sec		1.5kA	3kA	5kA	10kA	20kA	40kA	125A	250A	500A	1000A
3	2.55	3.5	3.3	8.8	6.8	7.2	7.6	8.3	9.1	10.4	5.9	6.1	6.3	6.6
6	5.1	6.9	6.6	17.5	13.6	14.4	15.2	16.6	18.2	20.7	11.8	12.1	12.5	13.1
9	7.65	10.4	9.9	26.2	20.4	21.6	22.7	24.9	27.3	31.1	17.7	18.1	18.8	19.6
10	8.4	11.4	10.8	28.8	22.4	23.7	24.9	27.3	29.9	34.1	19.4	19.9	20.6	21.5
12	10.2	13.9	13.1	34.9	27.2	28.8	30.3	33.1	36.3	41.4	23.5	24.1	25	26.1
15	12.7	17.2	16.4	43.5	33.8	35.8	37.7	41.3	45.2	51.5	29.3	30.1	31.1	32.5
18	15.3	20.8	19.7	52.4	40.8	43.1	45.4	49.7	54.5	62.1	35.3	36.2	37.5	39.1
21	17.0	23.1	21.9	58.2	45.3	47.9	50.4	55.2	60.5	69	39.2	40.2	41.6	43.5
24	19.5	26.5	25.1	66.7	51.9	55	57.8	63.3	69.4	79.1	44.9	46.1	47.8	49.8
27	22.0	29.9	28.4	75.3	58.6	62	65.2	71.4	78.3	89.2	50.7	52	53.9	56.2
30	24.4	33.1	31.5	83.5	65	68.8	72.3	79.2	86.8	98.9	56.2	57.7	59.8	62.4
33	27.5	37.3	35.4	94.1	73.2	77.5	81.5	89.3	97.9	112	63.3	65	67.3	70.3
36	29.0	39.4	37.4	99.2	77.2	81.7	86	94.2	104	118	66.8	68.6	71	74.1
39	31.5	42.8	40.6	108	83.9	88.8	93.4	103	113	128	72.5	74.5	77.1	80.5
42	34.0	46.2	43.8	117	90.5	95.8	101	111	121	138	78.3	80.4	83.2	86.9
45	36.5	49.6	47.0	125	97.2	103	109	119	130	148	84	86.3	89.4	93.3
48	39.0	53.0	50.3	134	104	110	116	127	139	159	89.8	92.2	95.5	99.6
54	42.0	57.0	54.1	144	112	119	125	137	150	171	96.7	99.3	103	108
60	48.0	65.2	61.9	165	128	136	143	156	171	195	111	114	118	123
66	53.0	72.0	68.3	182	142	150	158	172	189	215	122	126	130	136
72	57.0	77.4	73.5	195	152	161	169	185	203	232	132	135	140	146
78	62.0	84.2	79.9	213	165	175	184	202	221	252	143	147	152	159
84	68.0	92.3	87.7	233	181	192	202	221	242	276	157	161	167	174
90	72.0	97.8	92.8	247	192	203	214	234	257	292	166	171	177	184
96	76.0	103.2	98.0	260	203	215	226	247	271	309	175	180	186	195
108	84.0	114.1	108.3	288	224	237	249	273	299	341	194	199	206	215
120	98.0	133.1	126.3	314	250	263	275	298	323	361	219	225	232	241
132	106	143.9	136.6	339	270	285	298	323	349	390	237	243	251	261
138	111	150.7	143.1	355	283	298	312	338	366	408	248	255	263	273
144	115	156.2	148.2	368	293	309	323	350	379	423	257	264	272	283
162	130	176.5	167.6	416	331	349	365	396	429	478	291	298	308	319
168	131	177.9	168.9	419	334	352	368	399	432	482	293	300	310	322
172	140	190.1	180.5	448	357	376	393	426	461	515	313	321	331	344
180	144	195.6	185.6	461	367	387	404	438	475	530	322	330	341	354
192	152	206.4	195.9	486	387	408	427	463	501	559	340	348	360	373
198	160	217.3	206.2	512	408	430	449	487	527	589	358	367	378	393
204	165	224.1	212.7	528	420	443	463	502	544	607	369	378	390	405
216	174	236.3	224.3	556	443	467	488	529	573	640	389	399	412	427
228	180	244.4	232.0	582	464	488	511	554	600	669	407	417	430	447
240	190	258.0	244.9	608	484	510	533	578	626	699	424	435	449	467

UH – High Energy Handling (minimum 6.2 kJ/kV of MCOV)

Arrester Rating (kV, rms)	Arrester MCOV (kV, rms)	TOV*		Front-of-Wave Protective Level** (kV Crest)	Maximum Discharge Voltage (kV Crest)*** 8/20us Current Wave						Switching Surge Protective Level**** (kV Crest)			
		1 Sec	10 Sec		1.5kA	3kA	5kA	10kA	20kA	40kA	125A	250A	500A	1000A
		3	2.55		3.5	3.3	8.2	6.5	6.9	7.2	7.8	8.4	9.4	5.7
6	5.1	6.9	6.6	16.3	13	13.7	14.3	15.6	16.8	18.8	11.4	11.7	12.1	12.6
9	7.65	10.4	9.9	24.5	19.5	20.6	21.5	23.3	25.2	28.2	17.1	17.6	18.1	18.8
10	8.4	11.4	10.8	26.9	21.4	22.6	23.6	25.6	27.7	30.9	18.8	19.3	19.9	20.7
12	10.2	13.9	13.1	32.6	26	27.4	28.6	31.1	33.6	37.5	22.8	23.4	24.1	25.1
15	12.7	17.2	16.4	40.6	32.4	34.1	35.6	38.7	41.9	46.7	28.4	29.1	30	31.2
18	15.3	20.8	19.7	48.9	39	41.1	42.9	46.6	50.4	56.3	34.2	35.1	36.2	37.6
21	17.0	23.1	21.9	54.4	43.3	45.6	47.7	51.7	56	62.5	38	39	40.2	41.8
24	19.5	26.5	25.1	62.4	49.7	52.3	54.7	59.3	64.2	71.7	43.6	44.7	46.1	47.9
27	22.0	29.9	28.4	70.3	56	59	61.7	66.9	72.5	80.9	49.1	50.4	52	54
30	24.4	33.1	31.5	78	62.1	65.5	68.4	74.2	80.4	89.7	54.5	55.9	57.7	59.9
33	27.5	37.3	35.4	87.9	70	73.8	77.1	83.6	90.6	102	61.4	63	65	67.5
36	29.0	39.4	37.4	92.7	73.8	77.8	81.3	88.2	95.5	107	64.8	66.4	68.6	71.2
39	31.5	42.8	40.6	101	80.2	84.5	88.3	95.8	104	116	70.3	72.2	74.5	77.3
42	34.0	46.2	43.8	109	86.6	91.2	95.3	104	112	125	75.9	77.9	80.4	83.5
45	36.5	49.6	47.0	117	92.9	97.9	103	111	121	135	81.5	83.6	86.3	89.6
48	39.0	53.0	50.3	125	99.3	105	110	119	129	144	87.1	89.3	92.2	95.7
54	42.0	57.0	54.1	135	107	113	118	128	139	155	93.8	96.2	99.3	104
60	48.0	65.2	61.9	154	123	129	135	146	159	177	108	110	114	118
66	53.0	72.0	68.3	170	135	143	149	162	175	195	119	122	126	131
72	57.0	77.4	73.5	183	146	153	160	174	188	210	128	131	135	140
78	62.0	84.2	79.9	199	158	167	174	189	205	228	139	142	147	153
84	68.0	92.3	87.7	218	174	183	191	207	224	250	152	156	161	167
90	72.0	97.8	92.8	231	184	194	202	219	238	265	161	165	171	177
96	76.0	103.2	98.0	243	194	204	214	232	251	280	170	174	180	187
108	84.0	114.1	108.3	269	214	226	236	256	277	309	188	193	199	207
120	98.0	133.1	126.3	297	242	253	263	284	303	334	214	219	226	234
132	106	143.9	136.6	321	262	274	285	307	328	361	232	237	244	253
138	111	150.7	143.1	336	274	287	298	321	343	378	243	248	256	265
144	115	156.2	148.2	348	284	297	309	333	356	392	251	257	265	274
162	130	176.5	167.6	394	321	336	349	376	402	443	284	291	300	310
168	131	177.9	168.9	397	323	339	352	379	405	446	286	293	302	312
172	140	190.1	180.5	424	346	362	376	405	433	477	306	313	323	334
180	144	195.6	185.6	436	355	372	387	417	445	491	315	322	332	343
192	152	206.4	195.9	460	375	393	408	440	470	518	332	340	350	362
198	160	217.3	206.2	485	395	413	430	463	495	545	350	358	369	382
204	165	224.1	212.7	500	407	426	443	477	510	562	361	369	380	393
216	174	236.3	224.3	527	429	450	467	503	538	593	380	389	401	415
228	180	244.4	232.0	551	449	470	489	526	563	620	398	407	419	434
240	190	258.0	244.9	575	469	491	510	550	587	647	415	425	438	453

UX – Extra-High Energy Handling (minimum 10.0kJ/kV of MCOV)

Arrester Rating (kV, rms)	Arrester MCOV (kV, rms)	TOV*		Front-of-Wave Protective Level** (kV Crest)	Maximum Discharge Voltage (kV Crest) 8/20us Current Wave						Switching Surge Protective Level*** (kV Crest)			
		1 Sec	10 Sec		1.5kA	3kA	5kA	10kA	20kA	40kA	125A	250A	500A	1000A
3	2.55	3.5	3.3	7.8	6.3	6.6	6.9	7.4	7.9	8.7	5.6	5.7	5.9	6.1
6	5.1	6.9	6.6	15.5	12.6	13.2	13.7	14.8	15.8	17.4	11.2	11.4	11.8	12.2
9	7.65	10.4	9.9	23.2	18.9	19.8	20.6	22.2	23.7	26.1	16.7	17.1	17.6	18.3
10	8.4	11.4	10.8	25.5	20.8	21.7	22.6	24.3	26	28.6	18.4	18.8	19.4	20.1
12	10.2	13.9	13.1	30.9	25.2	26.4	27.4	29.5	31.6	34.8	22.3	22.8	23.5	24.3
15	12.7	17.2	16.4	38.5	31.4	32.8	34.1	36.8	39.3	43.3	27.8	28.4	29.3	30.3
18	15.3	20.8	19.7	46.3	37.8	39.5	41.1	44.3	47.3	52.1	33.4	34.2	35.2	36.5
21	17.0	23.1	21.9	51.5	42	43.9	45.6	49.2	52.6	57.9	37.1	38	39.2	40.5
24	19.5	26.5	25.1	59.1	48.1	50.4	52.3	56.4	60.3	66.4	42.6	43.6	44.9	46.5
27	22.0	29.9	28.4	66.6	54.3	56.8	59.1	63.6	68	74.9	48.1	49.2	50.7	52.4
30	24.4	33.1	31.5	73.9	60.2	63	65.5	70.6	75.4	83.1	53.3	54.6	56.2	58.2
33	27.5	37.3	35.4	83.3	67.8	71	73.8	79.5	85	93.7	60.1	61.5	63.3	65.5
36	29.0	39.4	37.4	87.8	71.5	74.9	77.8	83.9	89.6	98.8	63.3	64.8	66.8	69.1
39	31.5	42.8	40.6	95.4	77.7	81.3	84.5	91.1	97.4	108	68.8	70.4	72.5	75.1
42	34.0	46.2	43.8	103	83.9	87.8	91.2	98.3	106	116	74.2	76	78.3	81
45	36.5	49.6	47.0	111	90	94.2	97.9	106	113	125	79.7	81.6	84	87
48	39.0	53.0	50.3	119	96.2	101	105	113	121	133	85.1	87.2	89.8	92.9
54	42.0	57.0	54.1	128	104	109	113	122	130	143	91.7	93.9	96.7	101
60	48.0	65.2	61.9	146	119	124	129	139	149	164	105	108	111	115
66	53.0	72.0	68.3	161	131	137	143	154	164	181	116	119	122	127
72	57.0	77.4	73.5	173	141	148	153	165	177	195	125	128	132	136
78	62.0	84.2	79.9	188	153	161	167	180	192	212	136	139	143	148
84	68.0	92.3	87.7	206	168	176	183	197	211	232	149	152	157	162
90	72.0	97.8	92.8	218	178	186	194	209	223	246	158	161	166	172
96	76.0	103.2	98.0	230	188	197	204	220	235	259	166	170	175	181
108	84.0	114.1	108.3	255	208	217	226	243	260	286	184	188	194	201

10. Standard Production Tests:

10.1. Every metal oxide varistor and arrester shall be 100% production tested as follows to demonstrate compliance with the manufacturers' specifications. Test report should be supplied with each arrester. Each arrester shall be marked with a unique serial number to allow tracking for at least 20 years from date of production.

10.1.1. Metal Oxide Varistor Tests

- 10.1.1.1. Measure Reference Voltage at specified Reference Current. This voltage level must fall within the parameters established by the manufacturer.
- 10.1.1.2. The discharge voltage of each MOV must be measured per IEEE Std C62.11™-2005 standard, Section 13.2, "Discharge Voltage Test".
- 10.1.1.3. The leakage current must be measured by a method prescribed by the manufacturer.

10.1.2. Complete Arrester Tests

- 10.1.2.1. The partial discharge must be measured at no less than 1.05 times MCOV.
- 10.1.2.2. The Watts Loss must be measured at no less than 1.05 times MCOV.
- 10.1.2.3. The arrester reference voltage must be verified for each arrester.

11. Quality Assurance

11.1. Any varistor or complete arrester that does not comply with the requirements of these specifications shall be rejected.