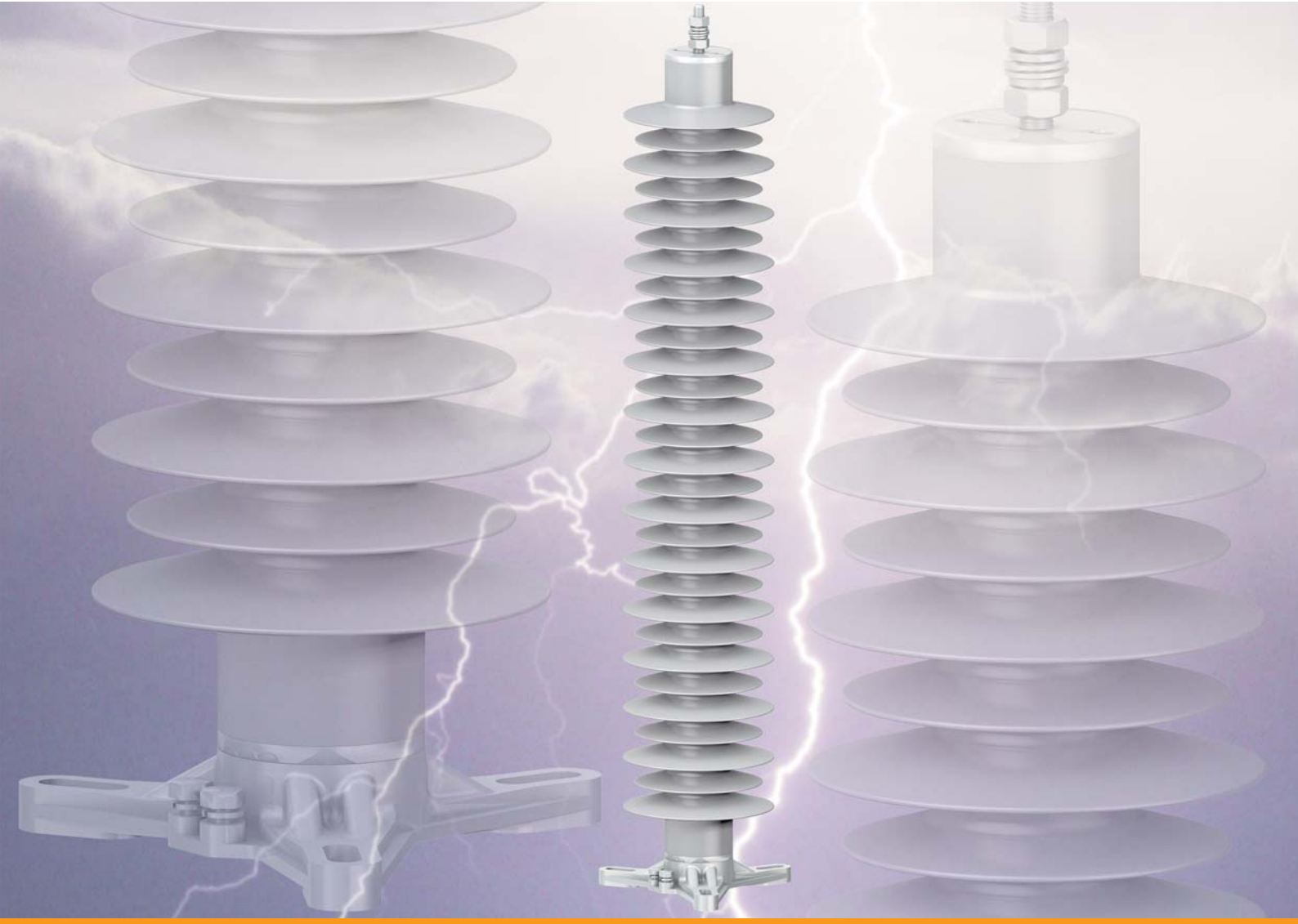


Bowthorpe EMP
High Voltage Single Column
Polymeric Surge Arresters

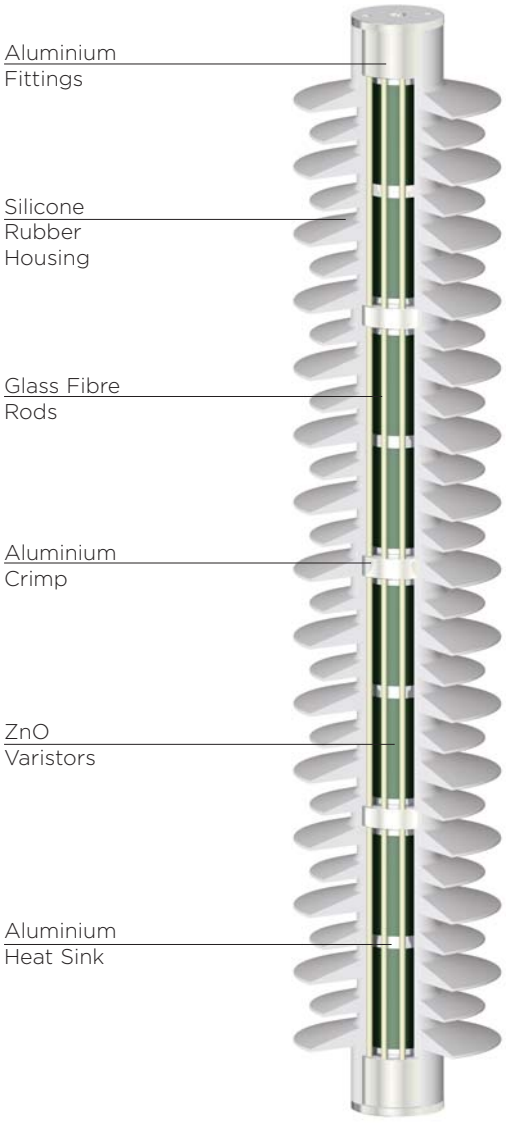
TE connectivity ENERGY

Single Column Polymeric Surge Arresters

Generic technical data

		PAA	PBA	PCA
System Voltage U_{max}	Kv	72.5	170	420
System Voltage U_{nom}	Kv	66	150	400
Rated discharge current	kA	10	10	10
High current impulse (4/10 µs)	kA	100	100	100
Classification		2	2	3
Energy Capability at Ur	kJ/kV	4.1	6.4	7.8
Short circuit rating	kA	40	65	65
Mechanical strength*				
Safe long-term load (SLL)	kNm	0.25	0.6	2.0
Safe short-term load (SSL)	kNm	0.35	1.0	2.5

* As defined in IEC60094-4, Edition2.2, 2009-05



Qualification testing:

Decades of arrester and materials, design and development experience has been combined to create the cage design surge arrester series. The basic construction comprises ZnO varistors assembled within a open cage design. The following IEC60099-4 design type tests have been carried out on the polymeric single column surge arresters.

- Insulation withstand tests on the arrester housing
- Residual voltage test
- Long duration current impulse withstand test
- Operating duty tests
- Short-circuit tests
- Internal partial discharge test
- Bending moment test (cantilever)
- Moisture ingress test
- Weather ageing test
- Power frequency voltage versus time characteristics on the arrester
- Tracking and erosion
- UV testing

Electrical performance

Maximum System Voltage U_m (kV)	Rated Voltage U_r (kV)	Line Discharge Class	Long Duration Current 2000 μs (A)	Nominal Discharge Current (8/20 μs) (kA)	Rated Short Circuit Current (kA)	Energy Capability at Ur acc. to IEC 60099-4 (kJ/kV)	Arrester Type
12	9 - 15	2	500	10	40	4.1	PAA
	9 - 15	2	680	10	65	6.4	PBA
	9 - 15	3	760	10	65	7.8	PCA
24	18 - 30	2	500	10	40	4.1	PAA
	18 - 30	2	680	10	65	6.4	PBA
	18 - 30	3	760	10	65	7.8	PCA
36	27 - 42	2	500	10	40	4.1	PAA
	27 - 42	2	680	10	65	6.4	PBA
	27 - 42	3	760	10	65	7.8	PCA
72.5	54 - 75	2	500	10	40	4.1	PAA
	54 - 75	2	680	10	65	6.4	PBA
	54 - 75	3	760	10	65	7.8	PCA
123	96 - 120	2	680	10	65	6.4	PBA
	96 - 120	3	760	10	65	7.8	PCA
145	108 - 132	2	680	10	65	6.4	PBA
	108 - 132	3	760	10	65	7.8	PCA
170	138 - 150	2	680	10	65	6.4	PBA
	138 - 150	3	760	10	65	7.8	PCA
245	180 - 216	3	760	10	65	7.8	PCA
300	240 - 288	3	760	10	65	7.8	PCA
400	336 - 360	3	760	10	65	7.8	PCA

Electrical Characteristics

System Voltage U_m kV	Rated Voltage U_r kV	Continuous operating voltage U_c kV	Line Discharge Class	Max. U_{res} tested with current wave									Steep Current (1/20 µs)
				Switching surge (30/60 µs)					Lightning Current (8/20 µs)				
				125 A kV	250 A kV	500 A kV	1000 A kV	2000 A kV	5 kA kV	10 kA kV	20 kA kV	40 kA kV	10 kA kV
12	9	7.2	2	19.5	20.1	20.8	21.6	22.6	24.6	26.5	29.2	33.2	28.4
	12	9.6	2	24.4	25.1	25.9	27.0	28.3	30.8	33.1	36.5	41.5	35.5
	15	12	2	29.3	30.1	31.1	32.4	33.9	37.0	39.7	43.8	49.8	42.6
	9	7.2	2	19.7	20.3	21.1	22.0	23.2	25.9	28.1	31.1	35.6	31.0
	12	10	2	29.6	30.5	31.6	33.0	34.8	38.8	42.1	46.7	53.4	46.6
	15	12	2	29.6	30.5	31.6	33.0	34.8	38.8	42.1	46.7	53.4	46.6
	9	7.2	3	22.1	22.6	23.4	24.0	25.1	27.9	29.2	32.0	35.7	31.8
	12	9.6	3	32.1	32.8	33.9	34.9	36.5	40.6	42.4	46.5	51.8	46.1
	15	12	3	33.1	33.9	35.1	36.0	37.7	41.9	43.8	48.0	53.5	47.6
24	18	14	2	36.6	37.6	38.9	40.5	42.4	46.2	49.7	54.7	62.3	53.3
	21	17	2	41.5	42.7	44.1	45.9	48.1	52.4	56.3	62.0	70.6	60.4
	24	19	2	48.8	50.2	51.9	54.0	56.6	61.6	66.2	73.0	83.0	71.1
	27	22	2	53.7	55.2	57.1	59.3	62.2	67.8	72.8	80.3	91.3	78.2
	30	24	2	58.6	60.2	62.3	64.7	67.9	73.9	79.4	87.6	99.6	85.3
	18	14	2	39.5	40.7	42.2	44.0	46.4	51.7	56.1	62.2	71.2	62.1
	21	17	2	46.5	47.9	49.7	51.9	54.8	61.0	66.2	73.4	83.9	73.2
	24	19	2	49.3	50.8	52.7	55.0	58.1	64.7	70.2	77.8	89.0	77.6
	27	22	2	57.9	59.7	61.9	64.6	68.2	75.9	82.4	91.4	104	91.1
	30	24	2	59.2	61.0	63.3	66.0	69.7	77.6	84.2	93.4	107	93.1
	18	14	3	42.8	43.8	45.3	46.5	48.7	54.1	56.6	62.0	69.1	61.5
	21	17	3	47.0	48.1	49.7	51.0	53.5	59.4	62.1	68.0	75.9	67.5
	24	19	3	53.5	54.7	56.6	58.1	60.9	67.7	70.7	77.5	86.4	76.9
	27	22	3	58.5	59.8	61.8	63.5	66.5	73.9	77.3	84.7	94.4	84.0
	30	24	3	64.2	65.7	67.9	69.7	73.1	81.2	84.9	93.0	104	92.3
36	30	24	2	58.6	60.2	62.3	64.7	67.9	73.9	79.4	87.6	99.6	85.3
	36	29	2	70.8	72.8	75.2	78.2	82.0	89.3	96.0	106	120	103
	42	34	2	83.0	85.3	88.2	91.7	96.2	105	113	124	141	121
	30	24	2	59.2	61.0	63.3	66.0	69.7	77.6	84.2	93.4	107	93.1
	36	29	2	72.2	74.4	77.2	80.6	85.0	94.7	103	114	130	114
	42	34	2	83.8	86.3	89.5	93.4	98.6	110	119	132	151	132
	30	24	3	64.2	65.7	67.9	69.7	73.1	81.2	84.9	93.0	104	92.3
	36	29	3	74.9	76.6	79.2	81.4	85.2	94.7	99.0	108	121	108
	42	34	3	85.6	87.6	90.5	93.0	97.4	108	113	124	138	123

* "TOV" curves are given on technical data sheets for selected surge arrester (on request)

Surge arresters with other characteristics are available on request

Mechanical Characteristics

Temporary Overvoltage capability for 1 sec* T_c kV	Creepage length mm	Overall height mm	Minimum distance between phase centers mm	Minimum distance between phase to earth mm	Cantilever load		Weight Kg	Drawing Reference	Product code
					Safe short-term load (SSL) kNm	Safe long-term load (SLL) kNm			
9.9	1125	375	126	60	0.35	0.25	5.5	BOW-34-001	PAA2-9
13	1125	375	156	90	0.35	0.25	5.5	BOW-34-001	PAA2-12
17	1125	375	156	90	0.35	0.25	5.5	BOW-34-001	PAA2-15
10	1340	449	138	60	1.0	0.6	7	BOW-33-001	PBA1-9
14	1340	449	168	90	1.0	0.6	7	BOW-33-001	PBA1-12
17	1340	449	168	90	1.0	0.6	7	BOW-33-001	PBA1-15
10	1100	400	150	60	2.5	2.0	10	BOW-28-061	PCA1-9
14	1100	400	180	90	2.5	2.0	10	BOW-28-061	PCA1-12
17	1100	400	180	90	2.5	2.0	10	BOW-28-061	PCA1-15
20	1125	375	186	120	0.35	0.25	5.5	BOW-34-001	PAA2-18
23	1125	375	186	120	0.35	0.25	5.5	BOW-34-001	PAA2-21
26	1125	375	226	160	0.35	0.25	5.5	BOW-34-001	PAA2-24
30	1125	375	226	160	0.35	0.25	5.5	BOW-34-001	PAA2-27
33	1125	375	286	220	0.35	0.25	5.5	BOW-34-001	PAA2-30
21	1340	449	198	120	1.0	0.6	7	BOW-33-001	PBA1-18
24	1340	449	238	160	1.0	0.6	7	BOW-33-001	PBA1-21
27	1340	449	238	160	1.0	0.6	7	BOW-33-001	PBA1-24
31	1340	449	298	220	1.0	0.6	7	BOW-33-001	PBA1-27
34	1340	449	298	220	1.0	0.6	7	BOW-33-001	PBA1-30
21	1100	400	210	120	2.5	2.0	10	BOW-28-061	PCA1-18
24	1100	400	250	160	2.5	2.0	10	BOW-28-061	PCA1-21
28	1100	400	250	160	2.5	2.0	10	BOW-28-061	PCA1-24
31	1100	400	310	220	2.5	2.0	10	BOW-28-061	PCA1-27
35	1100	400	310	220	2.5	2.0	10	BOW-28-061	PCA1-30
33	1125	375	286	220	0.35	0.25	5.5	BOW-34-001	PAA2-30
40	1125	375	286	220	0.35	0.25	5.5	BOW-34-001	PAA2-36
46	1125	375	398	320	0.35	0.25	5.5	BOW-34-001	PAA2-42
34	1340	449	298	220	1.0	0.6	7	BOW-33-001	PBA1-30
41	1340	449	348	270	1.0	0.6	7	BOW-33-001	PBA1-36
48	1340	449	398	320	1.0	0.6	7	BOW-33-001	PBA1-42
35	1100	400	310	220	2.5	2.0	10	BOW-28-061	PCA1-30
41	1100	400	360	270	2.5	2.0	10	BOW-28-061	PCA1-36
48	1100	400	410	320	2.5	2.0	10	BOW-28-061	PCA1-42

Electrical Characteristics

System Voltage U_m kV	Rated Voltage U_r kV	Continuous operating voltage U_c kV	Line Discharge Class	Max. U_{res} tested with current wave									Steep Current (1/20 µs)
				Switching surge (30/60 µs)					Lightning Current (8/20 µs)				
				125 A kV	250 A kV	500 A kV	1000 A kV	2000 A kV	5 kA kV	10 kA kV	20 kA kV	40 kA kV	10 kA kV
72.5	54	43	2	108	110	114	119	124	136	146	161	186	156
	60	48	2	117	120	125	129	136	148	159	175	199	171
	54	43	2	106	109	114	118	125	139	151	168	192	167
	60	48	2	116	119	124	129	136	152	165	183	209	182
	72	58	2	138	142	148	154	163	181	196	218	249	217
	75	60	2	145	149	155	162	170	190	206	228	261	228
	54	43	3	107	110	113	116	122	136	142	155	173	154
	60	48	3	118	120	124	128	134	149	156	170	190	169
	72	58	3	143	146	151	155	162	180	188	206	230	205
	75	60	3	146	150	155	159	166	185	193	212	236	210
123	96	77	2	181	186	193	201	213	237	257	285	326	284
	108	86	2	203	209	217	226	239	266	288	320	366	319
	120	96	2	223	230	239	249	263	293	318	352	403	351
	96	77	3	183	187	194	199	208	232	242	265	296	263
	108	86	3	205	209	216	222	233	259	270	296	330	294
	120	96	3	226	231	238	245	257	285	298	327	364	324
145	108	86	2	203	209	217	226	239	266	288	320	366	319
	120	96	2	223	230	239	249	263	293	318	352	403	351
	132	106	2	255	263	273	285	300	334	363	402	460	401
	108	86	3	205	209	216	222	233	259	270	296	330	294
	120	96	3	226	231	238	245	257	285	298	327	364	324
	132	106	3	246	252	260	267	280	311	325	356	397	354
170	138	110	2	267	275	285	298	314	356	380	421	481	420
	144	115	2	274	283	293	306	323	360	390	433	495	432
	150	120	2	290	298	310	323	341	380	412	457	522	456
	138	110	3	275	281	291	299	313	348	364	398	444	395
	144	115	3	285	292	302	310	325	361	377	413	461	410
	150	120	3	595	302	312	321	336	374	391	428	477	425
245	180	144	3	346	354	366	376	394	438	457	501	559	497
	192	154	3	366	375	388	398	417	463	484	531	592	527
	198	158	3	385	394	407	418	438	487	509	558	622	554
	216	173	3	409	419	433	445	466	517	541	593	661	588
300	240	192	3	472	483	499	513	537	597	624	684	763	679
	276	221	3	537	549	568	583	611	679	710	778	867	772
	288	230	3	559	571	591	607	636	706	738	809	902	803
400	336	269	3	642	657	679	697	731	812	849	930	1037	923
	360	288	3	677	692	715	735	770	855	894	980	1093	972

* "TOV" curves are given in technical data for selected surge arrester (on request)

Surge arresters with other characteristics are available on request

Mechanical Characteristics

Temporary Overvoltage capability for 1 sec* T_c kV	Creepage length mm	Overall height mm	Minimum distance between phase centers mm	Minimum distance between phase to earth mm	Cantilever load		Weight Kg	Drawing Reference	Product code
					Safe short-term load (SSL) kNm	Safe long-term load (SLL) kNm			
59	2250	750	546	480	0.35	0.25	9.6	BOW-34-002	PAA22-54
66	2250	750	546	480	0.35	0.25	9.6	BOW-34-002	PAA22-60
62	1948	604	558	480	1.0	0.6	10.0	BOW-33-002	PBA2-54
68	1948	604	558	480	1.0	0.6	10.0	BOW-33-002	PBA2-60
82	3872	1096	708	630	1.0	0.6	18.5	BOW-33-003	PBA3-72
86	3872	1096	708	630	1.0	0.6	18.5	BOW-33-003	PBA3-75
62	1815	590	570	480	2.5	2.0	14.0	BOW-28-062	PCA2-54
69	1815	590	570	480	2.5	2.0	14.0	BOW-28-062	PCA2-60
83	3625	1085	570	480	2.5	2.0	26.5	BOW-28-063	PCA3-72
86	3625	1085	720	630	2.5	2.0	26.5	BOW-28-063	PCA3-75
109	3872	1096	978	900	1.0	0.6	18.5	BOW-33-003	PBA3-96
123	3872	1096	978	900	1.0	0.6	18.5	BOW-33-003	PBA3-108
137	3872	1096	978	900	1.0	0.6	18.5	BOW-33-003	PBA3-120
110	3625	1085	720	630	2.5	2.0	26.5	BOW-28-063	PCA3-96
124	3625	1085	990	900	2.5	2.0	26.5	BOW-28-063	PCA3-108
138	3625	1085	990	900	2.5	2.0	26.5	BOW-28-063	PCA3-120
123	3872	1096	978	900	1.0	0.6	18.5	BOW-33-003	PBA3-108
137	3872	1096	978	900	1.0	0.6	18.5	BOW-33-003	PBA3-120
150	5820	1700	1810	1100	1.0	0.6	28.5	BOW-33-004	PBA31-132
124	3625	1085	990	900	2.5	2.0	26.5	BOW-28-063	PCA3-108
138	3625	1085	990	900	2.5	2.0	26.5	BOW-28-063	PCA3-120
152	3625	1085	990	900	2.5	2.0	26.5	BOW-28-063	PCA3-132
157	5820	1700	1810	1100	1.0	0.6	28.5	BOW-33-004	PBA32-138
164	5820	1700	1810	1100	1.0	0.6	28.5	BOW-33-004	PBA32-144
171	5820	1700	1810	1100	1.0	0.6	28.5	BOW-33-004	PBA32-150
159	4725	1501	1610	900	2.5	2.0	36.5	BOW-28-064	PCA31-138
166	4725	1501	1810	1100	2.5	2.0	36.5	BOW-28-064	PCA31-144
173	4725	1501	1810	1100	2.5	2.0	36.5	BOW-28-064	PCA31-150
207	7250	2186	2010	1300	2.5	2.0	53.0	BOW-28-064	PCA33-180
221	7250	2186	2010	1300	2.5	2.0	53.0	BOW-28-064	PCA33-192
228	7250	2186	2510	1500	2.5	2.0	53.0	BOW-28-064	PCA33-198
248	7250	2186	2415	1500	2.5	2.0	53.0	BOW-28-064	PCA33-216
276	8350	2656	2615	1700	2.5	2.0	63.0	BOW-28-068	PCA331-240
317	8350	2656	3100	1900	2.5	2.0	63.0	BOW-28-068	PCA331-276
331	8320	2656	4100	2100	2.5	2.0	63.0	BOW-28-068	PCA331-288
386	10875	3341	5200	2350	2.5	2.0	67.0	BOW-28-068	PCA333-336
414	10875	3341	5200	2350	2.5	2.0	67.0	BOW-28-068	PCA333-360

PAA termination options

L1
M16 stud assembly

L2
Line Clamp to suit cables up to Ø16 mm

L5
Line Clamp to suit cables up to Ø35 mm

L6
Aluminium Stem
Ø30 x 80mm high

L21
4 Hole NEMA Pad

E1
2 x M10 x 20mm Hexagonal headed set screws and spring washers

E2
Earth Clamp to suit cables up to Ø16 mm

E5
Earth Clamp to suit cables from Ø16 mm to 35mm

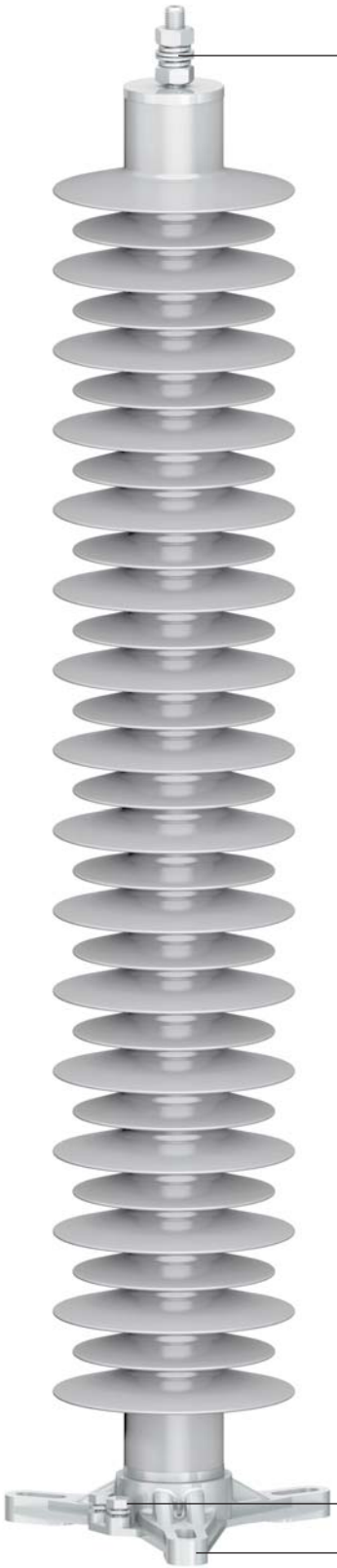
M7
Pedestal Base with 3 x 15mm slots on 200mm - 254mm PCD

M8
Set of 3 Ø89 x 76 Polyfibre Base Insulators supplied with M7 pedestal base with 3 x 15mm slots on 200mm - 254mm PCD

Example: PAA22 60 L1 E1 M7

- PAA22 — Arrester Housing
- 60 — Voltage
- L1 — Line Terminal
- E1 — Earth Terminal
- M7 — Mounting

PBA termination options



L1
M16 stud assembly

L2
Line Clamp to suit cables up to Ø16 mm

L5
Line Clamp to suit cables up to Ø35 mm

L6
Aluminium Stem
Ø30 x 80mm high

L21
4 Hole NEMA Pad

E1
2 x M10 x 20mm Hexagonal headed set screws and spring washers

E2
Earth Clamp to suit cables up to Ø16 mm

E5
Earth Clamp to suit cables from Ø16 mm to 35mm

M7
Pedestal Base with 3 x 15mm slots on 200mm - 254mm PCD

M8
Set of 3 Ø89 x 76 Polyfibre Base Insulators supplied with M7 pedestal base with 3 x 15mm slots on 200mm - 254mm PCD

Example: PBA3 120 L1 E1 M7

- PBA3 — Arrester Housing
- 120 — Voltage
- L1 — Line Terminal
- E1 — Earth Terminal
- M7 — Mounting

PCA standard termination options

L1
M16 stud assembly

L2
Line clamp to suit cables up to Ø16 mm

L5
Line clamp to suit cables up to Ø35 mm

L6
Aluminium stem Ø30 x 80mm high

L21
4 Hole NEMA Pad

E1
2 x M10 x 20mm Hexagonal headed set screws and spring washers

E2
Earth clamp to suit cables up to Ø16 mm

E5
Earth clamp to suit cables from Ø16 mm to 35mm

M5
Pedestal base with 4 holes on 280mm PCD or 3 x 15mm slots on 200mm - 254mm PCD

M4
Set of 4 Ø89 x 76 Polyfibre base insulators supplied with M5 pedestal base

M7
Pedestal base with 3 x 15mm slots on 200mm - 254mm PCD

M8
Set of 3 Ø89 x 76 Polyfibre base insulators supplied with M7 pedestal base

Example: PCA33 198 L1 E1 M7

- Arrester Housing
- Voltage
- Mounting
- Earth Terminal
- Line Terminal

SC12

SC13

SC14 / SC15

PAC-G

Temperature and Humidity sensor

The TE Connectivity range of surge counters and monitoring instruments are fully tested for use with any manufacturers' ZnO surge arrester.

- The surge counters, are designed for installation in the earth connections of a single phase surge arrester.
- Fully weatherproofed and sealed for life they are housed in a one piece gravity die cast aluminium case, epoxy power coated to enhance its already high degree of resistance to surface corrosion.
- The glass viewing window (SC12 and SC13) is sealed in place, using a silicon rubber adhesive, and a desiccator is enclosed to ensure any residual moisture trapped during sealing is absorbed for the service life of the counter.
- Mounting is effected by means of an integrally cast lug at the rear of the case providing a single clearance hole for the galvanized steel M12 bolt supplied.

Available options:

SC12

The SC12 gives a visual indication of the quantity of surges the arrester has received; this is via an integrated 6 digit cyclometer.

The SC12 can be supplied with an auxiliary volt free contact rated at 1A - 250V for connection to remote signalling equipment.

SC13

The SC 13 provides the additional measurement of total leakage current. The analogue instrument provides a means of monitoring the leakage current through the surge arrester and over the surface of the surge arrester housing. Significant changes after installation may indicate deterioration in the surge arrester or a build up of surface contamination.

The SC13 can be supplied with an auxiliary volt free contact rated at 1A- 250V for connection to remote signalling equipment.

SC14 with PAC-G

The SC14 is the next generation in surge arrester monitoring, which enables the surge data to be recorded and transmitted wirelessly to a PAC-G (Programmable Access Device –Gateway) via an integrated Zigbee data link. This is then uploaded via a GPRS data link to a web server.

SC15 with PAC-G & Temperature / Humidity sensor

The SC15 intelligent surge counter monitoring system takes the design of the SC14 one step further, by allowing total leakage current, temperature and humidity conditions in addition to surge activity to be transferred. When installed with earth guard the data allows utilities to record lightning & switching surge and leakage current trends of each arrester being monitored.

About TE Connectivity

TE Connectivity is a global, $14 billion company that designs and manufactures over 500,000 products that connect and protect the flow of power and data inside the products that touch every aspect of our lives. Our nearly 100,000 employees partner with customers in virtually every industry – from consumer electronics, energy and healthcare, to automotive, aerospace and communication networks – enabling smarter, faster, better technologies to connect products to possibilities.

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