



# BOWTHORPE EMP

MCA/MDA SURGE ARRESTERS (IEC)

## GENERIC TECHNICAL DATA

		MCA	MDA
Maximum system voltage $U_m$	kV	420	550
System voltage $U_s$	kV	400	500
Nominal discharge current	kA	10	20
High current impulse (4/10 $\mu$ s)	kA	100	100
Arrester class designation		SM	SH
Repetitive charge transfer rating $Q_{rs}$	C	2.2	3.0
Rated thermal energy $W_{th}$ at $U_r$	kJ/kV	7.0	10.0
Rated short circuit current	kA	65	65
<b>Cantilever load</b>			
Specified long-term load (SLL)	kNm	5	5
Specified short-term load (SSL)	kNm	12.5	12.5

**Qualification testing:**

Decades of design and development experience have been used to produce today's TE Connectivity HV surge arresters. The surge arrester comprises of a number of ZnO elements situated within a Porcelain housing and sealed against moisture ingress.

TE Connectivity HV surge arresters are designed and manufactured to the current IEC60099-4: 2014 standard and the following tests have been successfully performed:

**• Test performed on metal oxide blocks:**

- IEC Clause 8.3 - Residual voltage test
- IEC Clause 8.4 - Test to verify long term stability under continuous operating voltage
- IEC Clause 8.5 - Test to verify the repetitive charge transfer rating,  $Q_{rs}$ \*
- IEC Clause 8.7 - Operating duty test
- IEC Clause 8.8 - Power frequency voltage versus time test
- IEC Clause 8.15 - Test to verify the dielectric withstand of internal components

**• Test performed on complete surge arresters:**

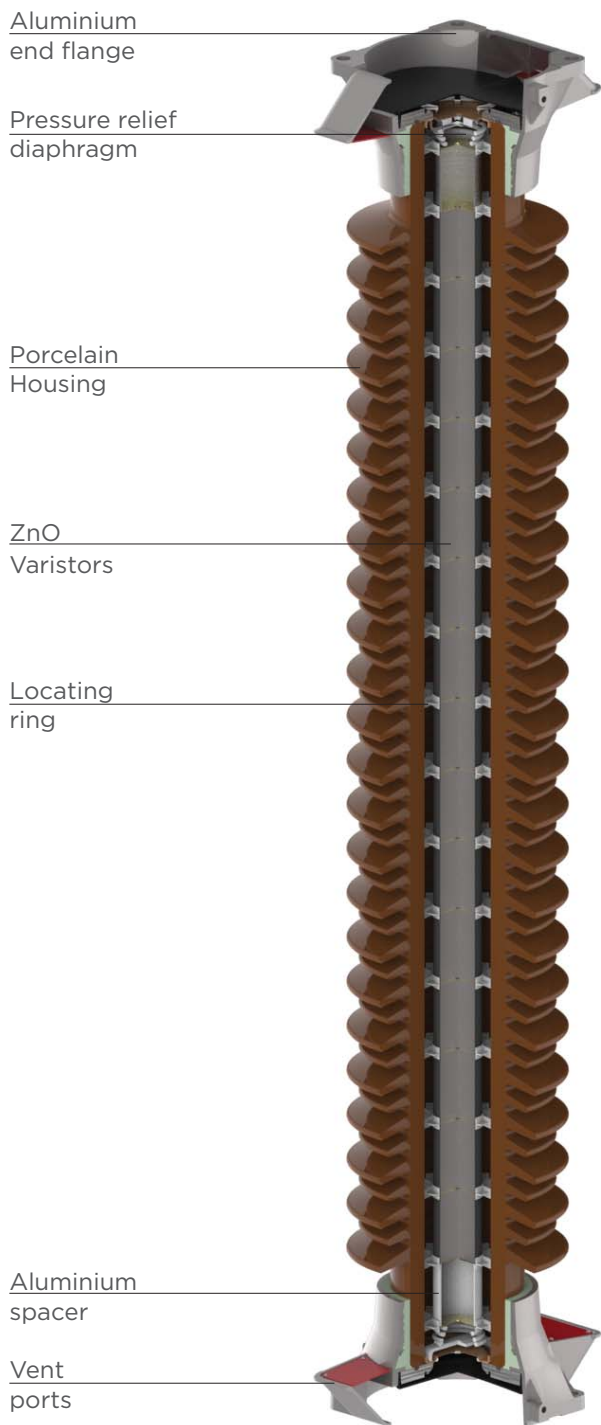
- IEC Clause 8.6 - Heat dissipation behavior of test sample
- IEC Clause 8.10 - Short-circuit test
- IEC Clause 8.11 - Bending moment test
- IEC Clause 8.13 - Seal leak rate test
- IEC Clause 8.14 - Radio interference voltage (RIV) test

**• Insulation withstand tests on surge arrester housing:**

- IEC Clause 8.2 - Insulation withstand tests include
  - Dry lightning impulse
  - Wet power frequency
  - Wet switching impulse

\*New test introduced in the IEC60099-4: 2014 standard.

## DESIGN CONCEPT



The seal design for porcelain surge arresters is a critical component of the surge arrester to ensure a long service life.

To prove the seal design the following development and verification tests were carried out.

- Ageing test on seal material
- Environmental and pollution test
- Mechanical and seal leak test



HV surge arrester helium leak test chamber for routine testing

ELECTRICAL CHARACTERISTICS

Maximum System Voltage $U_i$	Rated Voltage $U_r$	Continuous Operating Voltage $U_c$	Max. Ures tested with current wave								Steep Lightning Current Impulse (1/20 $\mu$ s)	
			Switching Current Impulse (30/60 $\mu$ s)				Lightning Current Impulse (8/20 $\mu$ s)					
			250 A	500 A	1000 A	2000 A	5 kA	10 kA	20 kA	40 kA	10 kA	20 kA
kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	
12	9	7.2	22.8	23.4	24.2	25.1	27.1	28.5	30.8	34.2	29.9	
	12	9.6	23.0	23.6	24.5	25.4	27.4	8.8	31.1	34.6	30.2	
	15	12.0	34.2	35.0	36.3	37.7	40.6	42.7	46.1	51.2	44.8	
24	18	14.4	34.6	35.4	36.7	38.1	41.0	43.2	46.7	51.8	45.4	
	21	16.8	45.6	46.7	48.5	50.3	54.2	57.0	61.6	68.4	59.9	
	24	19.2	46.1	47.2	50.8	52.4	54.7	57.6	62.2	69.1	60.5	
	27	21.6	57.4	58.9	61.0	63.3	68.2	71.8	77.5	86.2	75.4	
	30	24.0	57.6	59.0	61.2	63.5	68.4	72.0	77.8	86.4	75.6	
36	30	24.0	57.6	59.0	61.2	63.5	68.4	72.0	77.8	86.4	75.6	
	36	28.8	69.1	70.8	73.4	76.2	82.1	86.4	93.3	104	90.7	
	42	33.6	80.6	82.7	85.7	88.9	95.8	101	109	121	106	
	45	36.0	92.0	94.3	97.8	101	109	115	124	138	121	
	54	43.2	104	106	110	114	123	130	140	156	136	
52	42	33.6	80.6	82.7	85.7	88.9	95.8	101	109	121	106	
	45	36.0	92.0	94.3	97.8	101	109	115	124	138	121	
	48	38.4	92.2	94.5	97.9	102	109	115	124	138	121	
	54	43.2	104	106	110	114	123	130	140	156	136	
72.5	54	43.2	104	106	110	114	123	130	140	156	136	
	60	48.0	115	118	122	127	137	144	156	173	151	
	72	57.6	138	142	147	152	164	173	187	207	181	
	75	60.0	150	153	159	165	178	187	202	224	196	
123	84	67.2	161	165	171	178	192	202	2178	242	212	
	90	72.0	173	177	184	191	205	216	233	259	227	
	96	76.8	184	189	196	203	219	230	249	276	242	
	108	86.4	207	213	220	229	246	259	280	311	272	
	120	96.0	230	236	245	254	274	288	311	346	302	

Surge arresters with other characteristics are available on request

**MECHANICAL CHARACTERISTICS**

TOV Capability (with $W_{pr}$ prior energy)		Creepage length	Overall height	Minimum distance between phase centres	Minimum distance between phase to earth	Cantilever load		Weight	Drawing Reference	Product code
1 sec* $T_1$	10 sec* $T_1$					Specified short-term load (SSL)	Specified long-term load (SLL)			
kV	kV									
9.9	9.4	540	496	446	60	12.5	5.0	34.0	BOW-14-008	MCA0-9
13.2	12.5	540	496	446	60	12.5	5.0	34.0	BOW-14-008	MCA0-12
16.5	15.6	540	496	476	90	12.5	5.0	34.0	BOW-14-008	MCA0-15
19.8	18.7	1150	666	476	90	12.5	5.0	42.0	BOW-14-009	MCA1-18
23.1	21.8	1150	666	506	120	12.5	5.0	42.0	BOW-14-009	MCA1-21
26.4	25.0	1150	666	506	120	12.5	5.0	42.0	BOW-14-009	MCA1-24
29.7	28.1	1150	666	546	160	12.5	5.0	42.0	BOW-14-009	MCA1-27
33.0	31.2	1150	666	546	160	12.5	5.0	42.0	BOW-14-009	MCA1-30
33.0	31.2	1150	666	546	160	12.5	5.0	42.0	BOW-14-009	MCA1-30
39.6	37.4	1150	666	606	220	12.5	5.0	42.0	BOW-14-009	MCA1-36
46.2	43.7	2390	1036	656	270	12.5	5.0	55.0	BOW-14-010	MCA2-42
49.5	46.8	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-45
59.4	56.2	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-54
46.2	43.7	2390	1036	656	270	12.5	5.0	55.0	BOW-14-010	MCA2-42
49.5	46.8	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-45
52.8	49.9	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-48
59.4	56.2	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-54
59.4	56.2	2390	1036	706	320	12.5	5.0	55.0	BOW-14-010	MCA2-54
66.0	62.4	2390	1036	866	480	12.5	5.0	55.0	BOW-14-010	MCA2-60
79.2	74.9	2390	1036	866	480	12.5	5.0	55.0	BOW-14-010	MCA2-72
82.5	78.0	2390	1036	866	480	12.5	5.0	55.0	BOW-14-010	MCA2-75
92.4	87.4	3820	1384	1016	630	12.5	5.0	90.0	BOW-14-011	MCA3-84
99.0	93.6	3820	1384	1016	630	12.5	5.0	90.0	BOW-14-011	MCA3-90
106	99.8	3820	1384	1016	630	12.5	5.0	90.0	BOW-14-011	MCA3-96
119	112	3820	1384	1286	900	12.5	5.0	90.0	BOW-14-011	MCA3-108
132	125	3820	1384	1286	900	12.5	5.0	90.0	BOW-14-011	MCA3-120

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

ELECTRICAL CHARACTERISTICS

Maximum System Voltage $U_s$	Rated Voltage $U_r$	Continuous Operating Voltage $U_c$	Max. Ures tested with current wave								Steep Lightning Current Impulse (1/20 $\mu$ s)	
			Switching Current Impulse (30/60 $\mu$ s)				Lightning Current Impulse (8/20 $\mu$ s)					
			250 A	500 A	1000 A	2000 A	5 kA	10 kA	20 kA	40 kA	10 kA	20 kA
kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	
145	108	86.4	207	213	220	229	246	259	280	311	272	
	120	96.0	230	236	245	254	274	288	311	346	302	
	132	106	253	260	269	279	301	317	342	380	333	
	138	110	265	272	282	292	315	331	358	397	348	
	144	115	276	283	294	305	328	346	373	415	363	
	108	86.4	201	207	214	222	236	248	268	293		293
	120	96.0	224	230	237	246	262	276	298	326		326
	132	106	246	253	261	271	288	304	328	358		358
	138	110	257	264	273	283	302	317	343	375		375
	144	115	268	276	285	296	315	331	358	391		391
170	138	110	265	272	282	292	315	331	358	397	348	
	144	115	276	283	294	305	328	346	373	415	363	
	150	120	288	295	306	318	342	360	389	432	378	
	168	134	323	331	343	356	383	403	435	484	423	
	138	110	257	264	273	283	302	317	343	375		375
	144	115	268	276	285	296	315	331	358	391		391
	150	120	279	284	297	308	328	345	373	407		407
	168	134	313	322	332	345	367	386	417	456		456
245	180	144	346	354	367	381	410	432	467	518	454	
	192	154	369	378	392	406	438	461	498	553	484	
	198	158	380	390	404	419	451	475	513	570	499	
	216	173	415	425	441	457	492	518	560	622	544	
	180	144	335	345	356	370	393	414	447	489		489
	192	154	358	368	380	394	420	442	477	521		521
	198	158	369	379	392	407	433	455	492	537		537
	216	173	402	414	427	444	472	497	537	586		586

Surge arresters with other characteristics are available on request

**MECHANICAL CHARACTERISTICS**

TOV Capability (with $W_{pr}$ prior energy)		Creepage length mm	Overall height mm	Minimum distance between phase centres mm	Minimum distance between phase to earth mm	Cantilever load		Weight kg	Drawing Reference M7	Product code
1 sec* $T_1$	10 sec* $T_1$					Specified short-term load (SSL) kNm	Specified long-term load (SLL) kNm			
kV	kV									
119	112	3820	1384	1286	900	12.5	5.0	90.0	BOW-14-011	MCA3-108
132	125	3820	1384	1286	900	12.5	5.0	90.0	BOW-14-011	MCA3-120
145	137	5000	1736	1286	900	12.5	5.0	115	BOW-14-012	MCA4-132
152	144	5000	1736	1286	900	12.5	5.0	115	BOW-14-012	MCA4-138
158	150	5000	1736	1286	900	12.5	5.0	115	BOW-14-012	MCA4-144
118	111	3820	1384	1016	630	12.5	5.0	90.0	BOW-14-018	MDA3-108
131	124	3820	1384	1286	900	12.5	5.0	90.0	BOW-14-018	MDA3-120
144	136	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-132
150	142	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-138
157	148	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-144
152	144	5000	1736	1286	900	12.5	5.0	115	BOW-14-012	MCA4-138
158	150	5000	1736	1286	900	12.5	5.0	115	BOW-14-012	MCA4-144
165	156	5000	1736	1486	1100	12.5	5.0	115	BOW-14-012	MCA4-150
185	175	5000	1736	1486	1100	12.5	5.0	115	BOW-14-168	MCA4-168
150	142	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-138
157	148	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-144
165	155	5000	1736	1286	900	12.5	5.0	115	BOW-14-019	MDA4-150
183	173	5000	1736	1486	1100	12.5	5.0	115	BOW-14-019	MDA4-168
198	187	7640	2773	2215	1300	12.5	5.0	180	BOW-14-013	MCA33-180
211	200	7640	2773	2215	1300	12.5	5.0	180	BOW-14-013	MCA33-192
218	206	7640	2773	2215	1300	12.5	5.0	180	BOW-14-013	MCA33-198
238	225	7640	2773	2415	1500	12.5	5.0	180	BOW-14-013	MCA33-216
196	185	7640	2773	2015	1100	12.5	5.0	180	BOW-14-020	MDA33-180
209	198	7640	2773	2215	1300	12.5	5.0	180	BOW-14-020	MDA33-192
216	204	7640	2773	2215	1300	12.5	5.0	180	BOW-14-020	MDA33-198
235	222	7640	2773	2215	1300	12.5	5.0	180	BOW-14-020	MDA33-216

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

ELECTRICAL CHARACTERISTICS

Maximum System Voltage $U_s$	Rated Voltage $U_r$	Continuous Operating Voltage $U_c$	Max. Ures tested with current wave								Steep Lightning Current Impulse (1/20 $\mu$ s)	
			Switching Current Impulse (30/60 $\mu$ s)				Lightning Current Impulse (8/20 $\mu$ s)					
			250 A	500 A	1000 A	2000 A	5 kA	10 kA	20 kA	40 kA	10 kA	20 kA
kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	
300	252	202	484	496	514	533	575	605	653	726	635	
	258	206	495	508	526	546	588	619	669	743	650	
	264	211	507	520	539	559	602	634	684	760	665	
	276	221	530	543	563	584	629	662	715	795	696	
	288	230	553	567	588	610	657	691	746	829	726	
	300	240	576	590	612	635	684	720	778	864	756	
	312	250	599	614	636	660	711	749	809	899	786	
	252	202	469	483	498	518	551	580	626	684		684
	258	206	481	494	510	530	564	593	641	700		700
	264	211	492	506	522	542	577	607	656	716		716
	276	221	514	529	546	567	603	635	686	749		749
	288	230	537	552	570	592	629	662	715	782		782
	300	240	559	575	593	616	656	690	745	814		814
	312	250	581	598	617	641	682	718	775	847		847
420	312	250	599	614	636	660	711	749	809	899	786	
	330	264	634	649	673	699	752	792	855	950	832	
	336	269	645	661	685	711	766	806	871	968	847	
	342	274	657	673	698	724	780	821	886	985	862	
	360	288	691	708	734	762	821	864	933	1037	907	
	372	298	714	732	759	787	848	893	964	1071	937	
	396	317	760	779	808	838	903	950	1026	1140	998	
	312	250	581	598	617	641	682	718	775	847		847
	330	264	615	632	653	678	721	759	820	896		896
	336	269	626	644	665	690	734	773	835	912		912
	342	274	637	655	676	702	747	787	850	928		928
	360	288	671	690	712	739	787	828	894	977		977
	372	298	693	713	736	764	813	856	924	1010		1010
	396	317	738	759	783	813	865	911	984	1075		1075
500	396	317	738	759	783	813	865	911	984	1075		1075
	420	336	782	805	831	863	918	966	1043	1140		1140
	444	355	827	851	878	912	970	1021	1103	1205		1205
	468	374	872	897	926	961	1023	1076	1163	1270		1270

Surge arresters with other characteristics are available on request

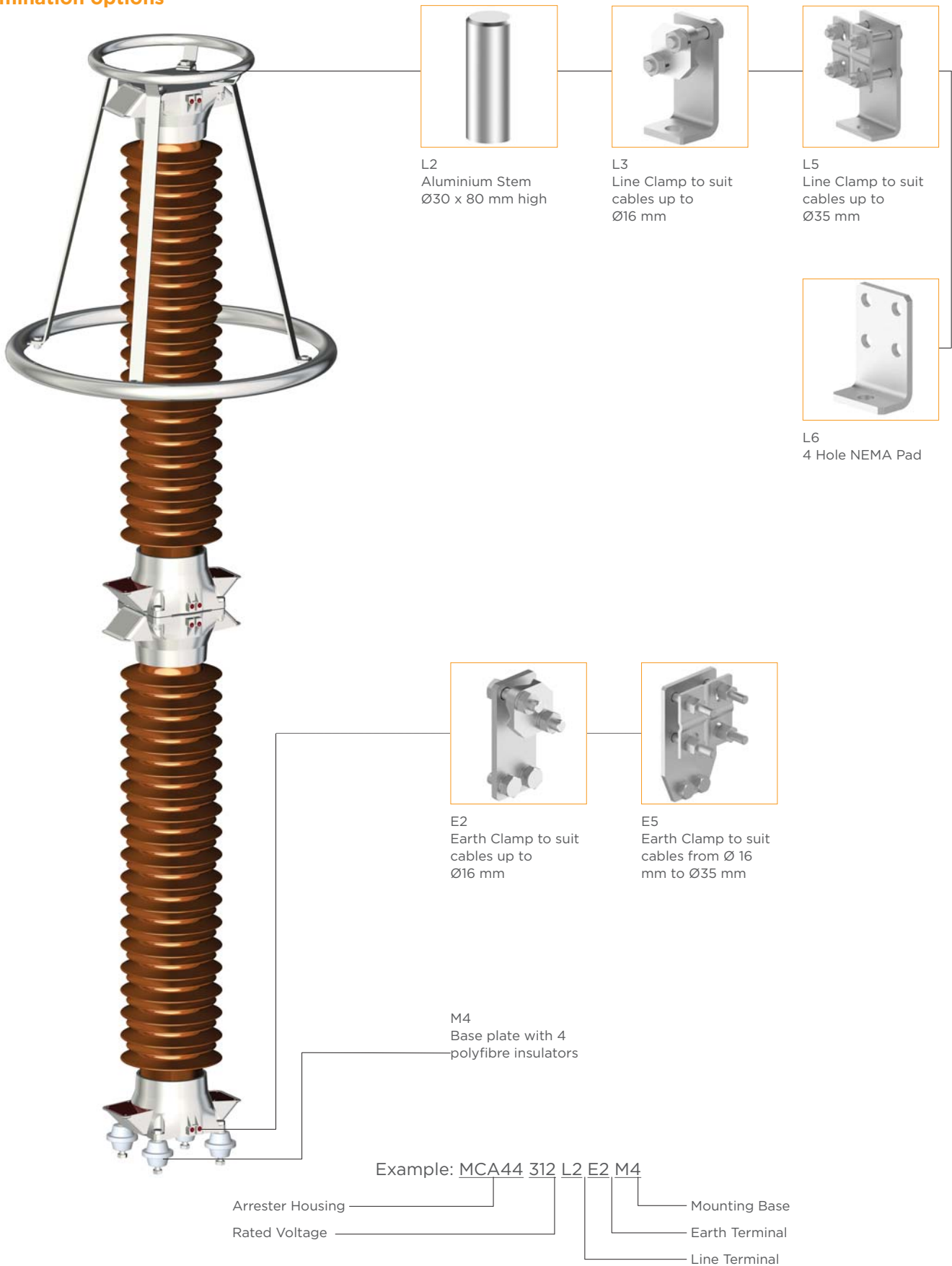


**MECHANICAL CHARACTERISTICS**

TOV Capability (with $W_{p}$ prior energy)		Creepage length	Overall height	Minimum distance between phase centres	Minimum distance between phase to earth	Cantilever load		Weight	Drawing Reference	Product code
1 sec* $T_1$	10 sec* $T_1$					Specified short-term load (SSL)	Specified long-term load (SLL)			
kV	kV	mm	mm	mm	mm	kNm	kNm	kg	M7	
277	262	8820	3125	2900	1700	12.5	5.0	205	BOW-14-013	MCA43-252
284	268	8820	3125	2900	1700	12.5	5.0	205	BOW-14-013	MCA43-258
290	275	8820	3125	2900	1700	12.5	5.0	205	BOW-14-013	MCA43-264
304	287	8820	3125	3100	1900	12.5	5.0	205	BOW-14-013	MCA43-276
317	300	10000	3477	3100	1900	12.5	5.0	230	BOW-14-013	MCA44-288
330	312	10000	3477	4100	1900	12.5	5.0	230	BOW-14-013	MCA44-300
343	324	10000	3477	4100	2100	12.5	5.0	230	BOW-14-013	MCA44-312
275	260	8820	3125	2900	1700	12.5	5.0	205	BOW-14-020	MDA43-252
281	266	8820	3125	2900	1700	12.5	5.0	205	BOW-14-020	MDA43-258
288	272	8820	3125	2900	1700	12.5	5.0	205	BOW-14-020	MDA43-264
301	284	8820	3125	2900	1700	12.5	5.0	205	BOW-14-020	MDA43-276
314	297	10000	3477	3100	1900	12.5	5.0	230	BOW-14-020	MDA44-288
327	309	10000	3477	3100	1900	12.5	5.0	230	BOW-14-020	MDA44-300
340	321	10000	3477	4100	1900	12.5	5.0	230	BOW-14-020	MDA44-312
343	324	11460	4162	4400	2100	12.5	5.0	270	BOW-14-014	MCA333-312
363	343	11460	4162	4400	2100	12.5	5.0	270	BOW-14-014	MCA333-330
370	349	11460	4162	5200	2100	12.5	5.0	270	BOW-14-014	MCA333-336
376	356	11460	4162	5200	2350	12.5	5.0	270	BOW-14-014	MCA333-342
396	374	11460	4162	5200	2350	12.5	5.0	270	BOW-14-014	MCA333-360
409	387	13820	4866	5200	2350	12.5	5.0	320	BOW-14-014	MCA443-372
436	412	13820	4866	5400	2600	12.5	5.0	320	BOW-14-014	MCA443-396
340	321	11460	4162	4400	1900	12.5	5.0	270	BOW-14-021	MDA333-312
360	340	11460	4162	4400	2100	12.5	5.0	270	BOW-14-021	MDA333-330
366	346	11460	4162	4400	2100	12.5	5.0	270	BOW-14-021	MDA333-336
373	352	11460	4162	5200	2350	12.5	5.0	270	BOW-14-021	MDA333-342
392	371	11460	4162	5200	2350	12.5	5.0	270	BOW-14-021	MDA333-360
405	383	13820	4866	5200	2350	12.5	5.0	320	BOW-14-021	MDA443-372
432	408	13820	4866	5400	2600	12.5	5.0	320	BOW-14-021	MDA443-396
432	408	15000	5218	5700	2600	12.5	5.0	345	BOW-14-021	MDA444-396
458	433	15000	5218	5700	2600	12.5	5.0	345	BOW-14-021	MDA444-420
484	457	15000	5218	6000	2850	12.5	5.0	345	BOW-14-021	MDA444-444
510	482	15000	5218	6000	2850	12.5	5.0	345	BOW-14-021	MDA444-468

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

Termination options



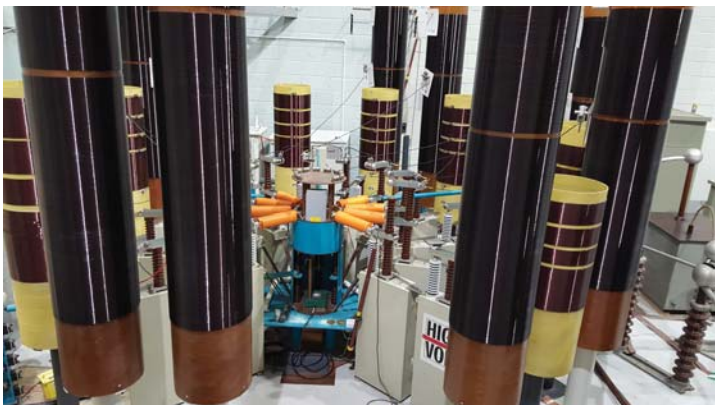
Brighton HV Laboratory



MARX impulse generator 1.6 MV



500 kV power transformer with PD and watt loss measurements



High Power Impulse Test System  
MV and HV surge arrester type testing to IEC and IEEE



MOV ageing test system with variable frequency AC and DC test voltage and computer control data logger

Surge Counter options



SC12

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.
- The SC12 can be installed to used on a 3-phase set of arresters
- Fully weatherproofed and sealed for life they are housed in a one piece gravity die cast aluminium case, epoxy powder 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 desiccant 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 1 A - 250 V 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 1 A - 250 V for connection to remote signalling equipment.



SC13

## Other product ranges Available



Polymeric surge arresters

### Polymeric surge arresters

- For system voltages up to 550 kV
- Standard: IEC60099-4, 2014
- Designation class: SL, SM & SH by matching parallel columns
- High Current short circuit up to 65 kA
- Application: Transmission and sub-station overvoltage protection



Transmission line arresters

### Transmission line surge arresters

- For system voltages up to 550 kV
- Standard: IEC60099-4, 2014 and IEEE C62.11:2012
- Designation class: SL, SM
- Short Circuit rating up to 65 kA
- Fast acting disconnect - DD5
- Application: Transmission line protection



Cable sheath arresters

### Cable sheath surge arresters

- For cable sheath protection up to 18 kV rating
- Standard: IEC60099-4
- Designation class: DH, SL & SH
- Application: Cable sheath protection



Cable spiker kit

### Cable spiker kit

- Safety device for cables
- Cable to BS6622 & BS EN/IEC60228
- Suitable for cable up to 102 mm diameter
- Hydraulic pump - no explosive cartridge required
- Application: To determine if 11 kV cable is dead or alive



Airfield lighting box

### Airfield lighting box type 2DCAFL4

- Suitable for 4 kV DC lighting systems
- Standard: IEC60099-4, 2014
- Designation class: DH
- Robust design to IP65
- Application: Protection of airfield lighting

TE Connectivity (NYSE: TEL) is a \$12 billion global technology leader. Our connectivity and sensor solutions are essential in today's increasingly connected world. We collaborate with engineers to transform their concepts into creations – redefining what's possible using intelligent, efficient and high-performing TE products and solutions proven in harsh environments. Our 72,000 people, including over 7,000 engineers, partner with customers in close to 150 countries across a wide range of industries. We believe EVERY CONNECTION COUNTS – [www.TE.com](http://www.TE.com).

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- OEMs
- Overhead distribution
- Petrochemical plants
- Railways
- Street lighting
- Substations
- Transmission lines
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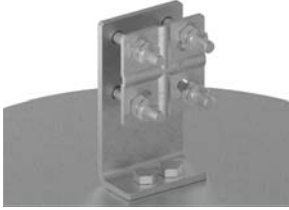
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# BOWTHORPE EMP

MEH SURGE ARRESTERS (IEC)

## GENERIC TECHNICAL DATA

Maximum system voltage $U_m$	kV	800
System voltage $U_s$	kV	750
Nominal discharge current	kA	20
High current impulse (4/10 $\mu$ s)	kA	100
Arrester class designation		SH
Repetitive charge transfer rating $Q_{rs}$	C	6.0
Rated thermal energy $W_{th}$ at $U_r$	kJ/kV	15.5
Rated short circuit current	kA	65
<b>Cantilever load</b>		
Specified long-term load (SLL)	kNm	8.4
Specified short-term load (SSL)	kNm	21.0

### Qualification testing:

Decades of design and development experience have been used to produce today's TE Connectivity HV surge arresters. The surge arrester comprises of a number of ZnO elements, assembled within an internal open cage construction, situated within a Porcelain housing and sealed against moisture ingress.

TE Connectivity HV surge arresters are designed and manufactured to the current IEC60099-4: 2014 standard and the following tests have been successfully performed:

#### • Test performed on metal oxide blocks:

- IEC Clause 8.3 - Residual voltage test
- IEC Clause 8.4 - Test to verify long term stability under continuous operating voltage
- IEC Clause 8.5 - Test to verify the repetitive charge transfer rating,  $Q_{rs}$ \*
- IEC Clause 8.7 - Operating duty test
- IEC Clause 8.8 - Power frequency voltage versus time test
- IEC Clause 8.15 - Test to verify the dielectric withstand of internal components

#### • Test performed on complete surge arresters:

- IEC Clause 8.6 - Heat dissipation behavior of test sample
- IEC Clause 8.10 - Short-circuit test
- IEC Clause 8.11 - Test of the bending moment
- IEC Clause 8.13 - Seal leak rate test
- IEC Clause 8.14 - Radio interference voltage (RIV) test

#### • Insulation withstand tests on surge arrester housing:

- IEC Clause 8.2 - Insulation withstand tests include
  - Dry lightning impulse
  - Wet power frequency
  - Wet switching impulse

\*New test introduced in the IEC60099-4: 2014 standard.



## DESIGN CONCEPT

Aluminium  
end flange

Pressure relief  
diaphragm

Glass Fibre  
Rods

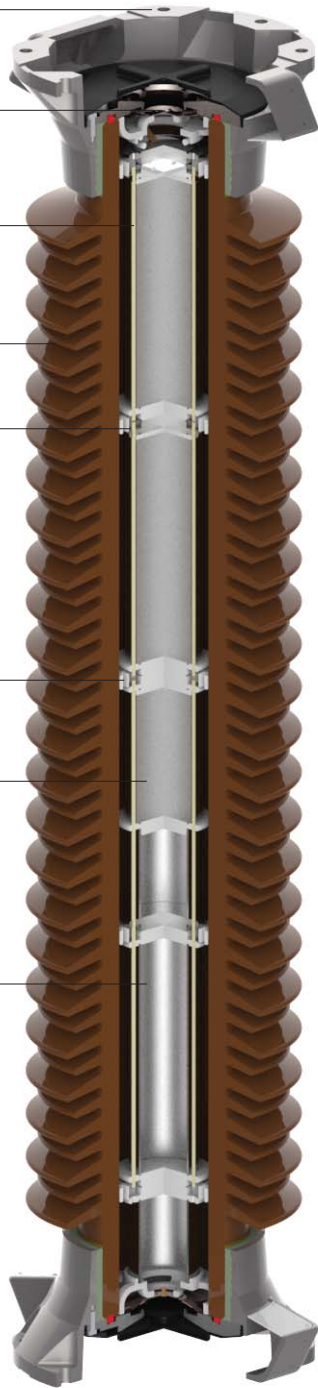
Porcelain  
Housing

Aluminium  
core end fitting

Locating  
ring

ZnO  
Varistors

Aluminium  
spacer



Prevention of moisture ingress in porcelain housed surge arresters is very important, we have designed a seal that ensures moisture is kept outside.

To prove the seal design the following development and verification tests were carried out.

- Ageing test on seal material
- Environmental and pollution test
- Mechanical and seal leak test



HV surge arrester helium leak test chamber for routine testing

**ELECTRICAL CHARACTERISTICS**

Maximum System Voltage $U_m$  kV	Rated voltage $U_r$  kV	Continuous operating voltage  kV	Max. Ures tested with current wave										Steep lightning current impulse (1/20 $\mu$ s)	
			Switching current impulse (30/60 $\mu$ s)					Lightning Current Impulse (8/20 $\mu$ s)					10 kA	20 kA
			125 A	250 A	500 A	1000 A	2000 A	5 kA	10 kA	15 kA	20 kA	10 kA	20 kA	
			kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	
123	96	76.8	170	173	178	184	190	201	211	222	228	220	237	
	108	86.4	191	195	200	207	214	226	238	249	257	247	266	
	120	96.0	213	216	223	230	238	251	264	277	285	275	296	
145	120	96.0	213	216	223	230	238	251	264	277	285	275	296	
	120	96.0	213	216	223	230	238	251	264	277	285	275	296	
245	198	158	351	357	367	379	392	414	436	457	470	453	488	
	198	158	351	357	367	379	392	414	436	457	470	453	488	
	198	158	351	357	367	379	392	414	436	457	470	453	488	
362	264	211	468	476	490	505	523	552	581	610	627	604	650	
	264	211	468	476	490	505	523	552	581	610	627	604	650	
	276	221	489	498	512	528	546	577	607	638	656	631	680	
	276	221	489	498	512	528	546	577	607	638	656	631	680	
	288	230	510	520	534	551	570	602	634	665	684	659	710	
	288	230	510	520	534	551	570	602	634	665	684	659	710	
	312	250	553	563	579	597	618	652	686	721	741	714	769	
420	336	269	595	606	623	643	665	702	739	776	798	769	828	
	336	269	595	606	623	643	665	702	739	776	798	769	828	
	336	269	595	606	623	643	665	702	739	776	798	769	828	
	342	274	606	617	634	655	677	715	752	790	813	782	843	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	360	288	638	649	668	689	713	752	792	832	855	824	887	
	372	300	659	671	690	712	737	777	818	859	884	851	917	
	372	300	659	671	690	712	737	777	818	859	884	851	917	
	372	300	659	671	690	712	737	777	818	859	884	851	917	
390	312	691	704	723	746	772	815	858	901	927	892	961		

\* 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**

TOV Capability (with prior energy)		Creepage length	Overall height	Minimum distance between phase centers	Minimum distance between phase to earth	Weight	Drawing Reference	Product code
1 sec* Tc	10 sec* Tc							
kV	kV	mm	mm	mm	mm	kg		
109	107	4500	1404	1070	630	200	BOW-40-013	MEH3-96
123	120	4500	1404	1340	900	200	BOW-40-013	MEH3-108
137	133	4500	1404	1340	900	200	BOW-40-013	MEH3-120
137	133	4500	1404	1340	900	200	BOW-40-013	MEH3-120
137	133	6000	1756	1340	900	250	BOW-40-012	MEH4-120
226	220	6000	1756	1740	1300	250	BOW-40-012	MEH4-198
226	220	9000	2802	2010	1300	400	BOW-40-015	MEH33-198
226	220	10500	3154	2010	1300	450	BOW-40-015	MEH43-198
301	293	9000	2802	2615	1700	400	BOW-40-015	MEH33-264
301	293	12000	3506	2615	1700	500	BOW-40-015	MEH44-264
315	306	10500	3154	2815	1900	450	BOW-40-015	MEH43-276
315	306	12000	3506	2815	1900	500	BOW-40-015	MEH44-276
328	320	10500	3154	2815	1900	450	BOW-40-015	MEH43-288
328	320	12000	3506	2815	1900	500	BOW-40-015	MEH44-288
356	346	12000	3506	3815	2100	500	BOW-40-015	MEH44-312
383	373	12000	3506	3815	2100	500	BOW-40-015	MEH44-336
383	373	15000	4552	3815	2100	650	BOW-40-016	MEH433-336
383	373	24000	7006	4400	2100	1000	BOW-40-017	MEH4444-336
390	380	18000	5256	4400	2350	750	BOW-40-016	MEH444-342
410	400	12000	3506	4400	2350	500	BOW-40-015	MEH44-360
410	400	13500	4200	4615	2350	600	BOW-40-016	MEH333-360
410	400	15000	4552	4615	2350	650	BOW-40-016	MEH433-360
410	400	16500	4904	4615	2350	700	BOW-40-016	MEH443-360
410	400	19500	5950	5200	2350	850	BOW-40-017	MEH4333-360
410	400	24000	7006	5200	2350	1000	BOW-40-017	MEH4444-360
424	413	12000	3506	4615	2350	500	BOW-40-015	MEH44-372
424	413	13500	4200	4615	2350	600	BOW-40-016	MEH333-372
424	413	15000	4552	4615	2350	650	BOW-40-016	MEH433-372
445	433	16500	4904	4815	2600	700	BOW-40-016	MEH443-390

**ELECTRICAL CHARACTERISTICS**

Maximum System Voltage $U_m$	Rated voltage $U_r$	Continuous operating voltage	Max. Ures tested with current wave										Steep lightning current impulse (1/20 $\mu$ s)	
			Switching current impulse (30/60 $\mu$ s)					Lightning Current Impulse (8/20 $\mu$ s)						
			125 A	250 A	500 A	1000 A	2000 A	5 kA	10 kA	15 kA	20 kA	10 kA	20 kA	
kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	kV	
550	390	312	691	704	723	746	772	815	858	901	927	892	961	
	396	317	701	714	734	758	784	828	871	915	941	906	976	
	396	317	701	714	734	758	784	828	871	915	941	906	976	
	396	317	701	714	734	758	784	828	871	915	941	906	976	
	396	317	701	714	734	758	784	828	871	915	941	906	976	
	420	336	744	758	779	804	832	878	924	970	998	961	1035	
	420	336	744	758	779	804	832	878	924	970	998	961	1035	
	420	336	744	758	779	804	832	878	924	970	998	961	1035	
	420	336	744	758	779	804	832	878	924	970	998	961	1035	
	444	355	786	801	823	850	879	928	977	1026	1055	1016	1094	
	444	355	786	801	823	850	879	928	977	1026	1055	1016	1094	
	468	374	829	844	868	896	927	978	1030	1081	1112	1071	1153	
	468	374	829	844	868	896	927	978	1030	1081	1112	1071	1153	
	468	374	829	844	868	896	927	978	1030	1081	1112	1071	1153	
800	588	470	1041	1061	1091	1125	1164	1229	1294	1358	1397	1345	1449	
	588	470	1041	1061	1091	1125	1164	1229	1294	1358	1397	1345	1449	
	612	490	1084	1104	1135	1171	1212	1279	1346	1414	1454	1400	1508	
	624	499	1105	1126	1157	1194	1236	1304	1373	1441	1483	1428	1538	

\* 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**

TOV Capability (with prior energy)		Creepage length	Overall height	Minimum distance between phase centers	Minimum distance between phase to earth	Weight	Drawing Reference	Product code
1 sec* Tc	10 sec* Tc							
kV	kV	mm	mm	mm	mm	kg		
445	433	16500	4904	5400	2600	700	BOW-40-016	MEH443-390
451	440	13500	4200	5400	2600	600	BOW-40-016	MEH333-396
451	440	15000	4552	5400	2600	650	BOW-40-016	MEH433-396
451	440	16500	4904	5400	2600	700	BOW-40-016	MEH443-396
451	440	18000	5256	5400	2600	750	BOW-40-016	MEH444-396
479	466	13500	4200	5400	2600	600	BOW-40-016	MEH333-420
479	466	15000	4552	5400	2600	650	BOW-40-016	MEH433-420
479	466	16500	4904	5400	2600	700	BOW-40-016	MEH443-420
479	466	18000	5256	5400	2600	750	BOW-40-016	MEH444-420
506	496	16500	4904	5700	2850	700	BOW-40-016	MEH443-444
506	493	18000	5256	5700	2850	750	BOW-40-016	MEH444-444
534	519	16500	4904	5700	3100	700	BOW-40-016	MEH443-468
534	519	18000	5256	5700	3100	750	BOW-40-016	MEH444-468
534	519	22500	6654	5700	3100	950	BOW-40-017	MEH4443-468
670	653	22500	6654	9800	3900	950	BOW-40-017	MEH4443-588
670	653	24000	7006	9800	3900	1000	BOW-40-017	MEH4444-588
698	679	24000	7006	9800	3900	1000	BOW-40-017	MEH4444-612
711	693	24000	7006	9800	3900	1000	BOW-40-017	MEH4444-624

MEH termination options



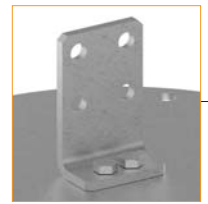
L2  
Aluminium Stem  
Ø30 x 80 mm high



L3  
Line Clamp to suit  
cables up to  
Ø16 mm



L5  
Line Clamp to suit  
cables up to  
Ø35 mm



L6  
4 Hole NEMA Pad



E2  
Earth Clamp to suit  
cables up to  
Ø16 mm



E5  
Earth Clamp to suit  
cables from Ø 16  
mm to Ø35 mm



E6  
4 Hole NEMA Pad



M4  
Set of 8 Ø89 x 76  
Polyfibre Base  
Insulators

Example: MEH4444 612 L2 E2 M4



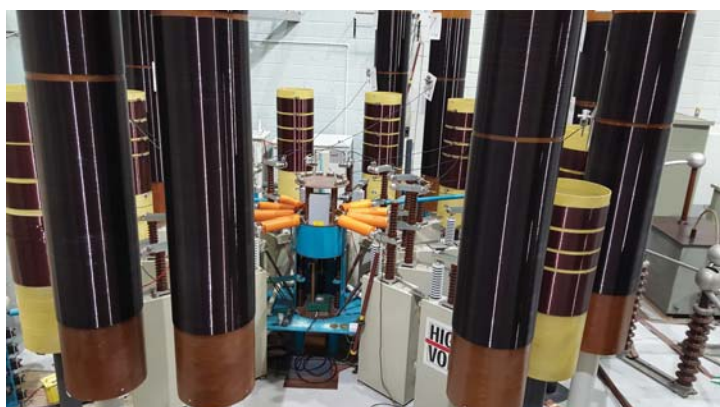
Brighton HV Laboratory



MARX impulse generator 1.6 MV



500 kV power transformer with PD and watt loss measurements



High Power Impulse Test System  
MV and HV surge arrester type testing to IEC and IEEE



MOV ageing test system with variable frequency AC and DC test voltage and computer control data logger

Surge Counter options



SC12

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.
- The SC12 can be installed to used on a 3-phase set of arresters
- Fully weatherproofed and sealed for life they are housed in a one piece gravity die cast aluminium case, epoxy powder 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 desiccant 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 1 A - 250 V 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 1 A - 250 V for connection to remote signalling equipment.



SC13



### Other product ranges Available



Polymeric surge arresters

#### Polymeric surge arresters

- For system voltages up to 550 kV
- Standard: IEC60099-4, 2014
- Designation class: SL, SM & SH by matching parallel columns
- High Current short circuit up to 65 kA
- Application: Transmission and sub-station overvoltage protection



Transmission line arresters

#### Transmission line surge arresters

- For system voltages up to 550 kV
- Standard: IEC60099-4, 2014 and IEEE C62.11:2012
- Designation class: SL, SM
- Short Circuit rating up to 65 kA
- Fast acting disconnect - DD5-130
- Application: Transmission line protection



Cable sheath arresters

#### Cable sheath surge arresters

- For cable sheath protection up to 10 kV rating
- Standard: IEC60099-4
- Designation class: DH, SL & SH
- Application: Cable sheath protection



Cable spiker kit

#### Cable spiker kit

- Safety device for cables
- Cable to BS6622 & BS EN/IEC60228
- Suitable for cable up to 102 mm diameter
- Hydraulic pump - no explosive cartridge required
- Application: To determine if 11 kV cable is dead or alive



Airfield lighting box

#### Airfield lighting box type 2DCAFL4

- Suitable for 4 kV DC lighting systems
- Standard: IEC60099-4, 2014
- Designation class: DH
- Robust design to IP65
- Application: Protection of airfield lighting

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- Petrochemical plants
- Railways
- Street lighting
- Substations
- Transmission lines
- Underground distribution
- Windfarms
- Solar
- Hydro-electric

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