

HIGHVOLT Prüftechnik Dresden GmbH
Marie-Curie-Straße 10
01139 Dresden, Germany
Phone +49 351 8425-700
Fax +49 351 8425-679
E-mail sales@highvolt.de
Website www.highvolt.de

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Data Sheet 3.61/6

Low-Damped Capacitive Impulse Voltage Dividers / Basic Load Capacitors, Type SMC 100 kV – 6000 kV

Application

Low-damped capacitive impulse voltage measuring dividers of the type SMC are used to convert the high lightning (LI), chopped lightning (LIC) or switching (SI) impulse voltages from peak voltages up to 6000 kV into a measurable and for a transient recorder or peak voltmeter processable voltage signal of 1000 V. Dividers of the type SMC are also used as basic load capacitors for impulse voltage generators.

What is the advantage of low-damped capacitive impulse voltage dividers?

The performance of a capacitance divider is mainly determined by the damping of the high-voltage circuit. Dividers of type SMC have been designed to fulfill all requirements of IEC standard 60060-2.

How to choose

SMC dividers version A are mainly used for impulse voltage generators of the HIGHVOLT series L and M and similar generators of other manufacturers. For generators of HIGHVOLT Series G the SMC divider versions B and C shall be applied. Depending on the rated voltage and the test object capacitance the version B or C has to be selected (Tables 1 and 2). If a multiple chopping gap is planned to be used in parallel to the divider, the SMC divider version B should be used to limit the overall maximum load capacitance.



Figure 1: Impulse voltage test system, series M (SMC divider in the front)

Table 1: Parameter ranges of dividers

Version of generators	Versions of divider			
	A series L, M	B series G	C series G	
Rated LI level 1.2/50	100...2400	1000...5000	1600...6000	kV
High-voltage capacitance	8000...330	8000...320	1500...400	pF
Rated charge:	0.8	1.6	2.4	mC
Rated secondary voltage	1000	1000	1000	V

General Design

The high-voltage capacitor is made of single units of oil impregnated capacitors. Single capacitor packages are connected in series with the inserted damping resistors. The mentioned components are housed in glass-fiber-reinforced plastic (GRP) cylinders with metal flanges. For higher voltages several high-voltage capacitors are connected in series. Especially for outdoor purpose the capacitors can be equipped with silicon sheds or porcelain insulators. Outdoor design is available only on request.

The low-voltage capacitor is located at the lower end of the capacitor column. Its compact design with the parallel configuration of low-voltage capacitors provides the necessary low inductance value. The termination resistor for the connection of a 50 Ω measuring cable is included. The divider has to be connected to a high-impedance measuring unit (transient recorder or peak voltmeter $\geq 1 \text{ M}\Omega$, $\leq 100 \text{ pF}$). The capacitor column is mechanically stabilized with fiber-reinforced plastic (FRP) struts. A copper foil high-voltage connection can be mounted on the connection terminal at the top electrode. A spring-tensioned metal rope realizes the earthing. The divider can be equipped with additional taps for partial operation. This item allows the optimum adaptation to the relevant test voltage level.

The top electrode is optimally designed for the respective rated voltages and wave shapes. Possible designs are single toroid, double toroid or polycon electrodes.

Type Tests and Routine Tests

HIGHVOLT certifies the divider performance by different test and calibration procedures according to IEC 60060-2. Response measurement is used as well as calibration measurement of the single components of the complete divider.

In addition to the test report, HIGHVOLT provides an official calibration certificate issued by the HIGHVOLT calibration laboratory. The HIGHVOLT calibration laboratory is accredited by the German Accreditation Body DAkkS with the registration no. D-K-19153-01-00.

Type designation SMC

Indoor design: SMC a/b

a = high-voltage capacitance in pF

b = rated LI voltage in kV

Example: SMC 1140/1400

Low-damped capacitive impulse voltage measuring divider of the type SMC with 1140 pF high voltage capacitance and 1400 kV rated LI voltage

Table 2: Electrical main parameters

Series			A		B		C	
Rated lightning impulse (LI) voltage ¹⁾ 1.2/50	Rated switching Impulse (SI) voltage ²⁾ 250/2500	Rated AC voltage 50/60 Hz (RMS)	HV capaci- tance	HV damp- ing resis- tance	HV capaci- tance	HV damp- ing resis- tance	HV capaci- tance	HV damp- ing resis- tance
kV	kV	kV	pF	Ohm	pF	Ohm	pF	Ohm
100	90	25	8000	12.5				
200	180	50	4000	25	8000	15		
300	270	75	2670	37.5				
400	360	100	2000	50	4000	30		
500	450	125	1600	62.5				
600	540	150	1330	75	2670	45		
700	630	175	1140	87.5				
800	720	200	1000	100	2000	60		
900	810	225	890	113				
1000	900	250	800	125	1600	75		
1100	990	275	730	138				
1200	1080	300	670	150	1330	90		
1300	1170	325	620	163				
1400	1260	350	570	175	1140	105		
1500	1350	375	530	188				
1600	1440	400	500	200	1000	120	1500	96
1700	1530	425	470	213				
1800	1620	450	440	225	890	135	1330	108
1900	1710	475	420	238				
2000	1800	500	400	250	800	150	1200	120
2100	1890	525	380	263				
2200	1980	550	360	275	730	165	1090	132
2300	2070	575	350	288				
2400	2160	600	330	300	670	180	1000	144
2600	2340	650			620	195	920	156
2800	2520	700			570	210	860	168
3000	2600	750			530	225	800	180
3200	2600	800			500	240	750	192
3400	2600	850			470	255	710	204
3600	2600	900			440	270	670	216
3800	2600	950			420	285	630	228
4000	2600	1000			400	300	600	240
4200	2600	1050			380	315	570	252
4400	2600	1100			360	330	550	264
4600	2600	1150			350	345	520	276
4800	2600	1200			330	360	500	288
5000	2600	1250			320	375	480	300
5200		1300					460	312
5400		1350					440	324
5600		1400					430	336
5800		1450					410	348
6000		1500					400	360

¹⁾ Higher rated lightning impulse voltages on request. ²⁾ Positive SI: The given values require a special top electrode.

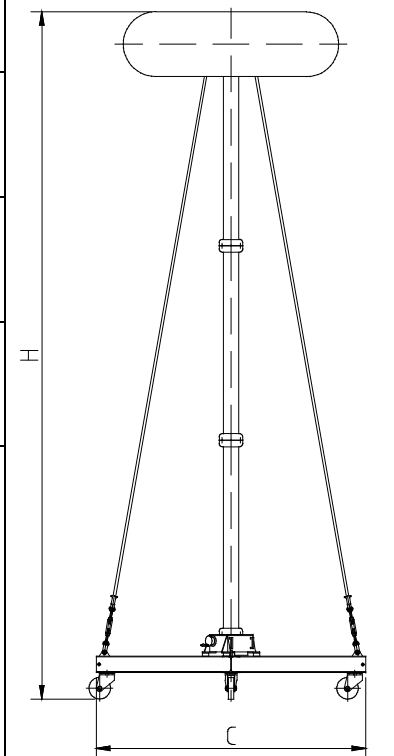
Scope of supply

Impulse voltage measuring / load capacitor consisting of:

- High-voltage capacitor
- Base frame with rollers
- Low-voltage capacitor mounted on base frame
- Measuring cable ($Z = 50 \Omega$, $l = 25 \text{ m}$)
- Connection point for high voltage and earthing connection
- Top electrode designed for rated LI voltage
- Fixing struts, if necessary
- Technical Documentation
- Calibration Certificate
- Preparation for Record of Performance

Table 3: Dimensions, weights

Series	A			B			C		
	Height ¹⁾	Width = Length C	Weight ¹⁾	Height ¹⁾	Width = Length C	Weight ¹⁾	Height ¹⁾	Width = Length C	Weight ¹⁾
	H	C		H	C		H	C	
kV	m	m	kg	m	m	kg	m	m	kg
100	0.90	0.65	41						
200	0.90	0.65	43	0.90	0.65	65			
300	1.20	0.65	48						
400	1.47	0.65	52	1.47	0.65	85			
500	1.79	0.65	65						
600	2.14	1.20	90	1.97	1.20	115			
700	2.42	1.20	105						
800	2.72	1.20	110	2.52	1.20	130			
900	3.02	1.20	130						
1000	3.44	1.58	210	3.19	1.58	230			
1100	3.74	1.58	235						
1200	4.04	1.58	260	3.74	1.75	280			
1300	4.34	1.58	285						
1400	4.64	1.58	310	4.29	1.75	350			
1500	4.94	2.10	385						
1600	5.24	2.10	410	4.84	2.10	450	4.84	2.10	470
1700	5.54	2.10	435						
1800	5.88	2.50	510	5.43	2.50	525	5.43	2.50	550
1900	6.18	2.50	535						
2000	6.48	2.50	560	5.98	2.50	600	5.98	2.50	625
2100	6.78	2.50	585						
2200	7.14	3.10	630	6.59	2.50	710	6.59	2.50	735
2300	7.44	3.10	655						
2400	7.74	3.10	680	7.14	3.50	750	7.14	3.50	790
2600				7.79	3.50	1000	7.79	3.50	1040
2800				8.34	3.50	1030	8.34	3.50	1070
3000				8.89	4.00	1070	8.89	4.00	1110
3200				9.51	4.00	1300	9.51	4.00	1350
3400				10.1	4.00	1350	10.1	4.00	1400
3600				10.6	4.50	1400	10.6	4.50	1450
3800				11.2	4.50	1550	11.2	4.50	1600
4000				11.7	4.50	1600	11.7	4.50	1650
4200				12.3	5.50	1650	12.3	5.50	1700
4400				12.8	5.50	1900	12.8	5.50	1950
4600				13.4	5.50	1950	13.4	5.50	2000
4800				13.9	5.50	2000	13.9	5.50	2050
5000				14.5	5.50	2150	14.5	5.50	2200
5200							15.0	6.00	2250
5400							15.6	6.00	2300
5600							16.2	7.00	3200
5800							16.7	7.00	3250
6000							17.3	7.00	3300



¹⁾ Indoor design, without top electrode for measurement of high positive switching impulse voltages 250/2500

Options

- Adaptation to other output low voltages
- Air cushion instead of rollers
- Other lengths of measuring cable
- Special top electrode for SI positive voltage 250/2500
- Cable winch spring-tensioned rope at the top for connection to test sample
- Cable winch spring-tensioned rope for short circuiting and earthing
- DaKKS calibration certificate