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Data Sheet 5.25/10

# Damped Capacitive Reference Measuring Divider, Type SMC...ref

## Application

The Damped Capacitive Reference Measuring Divider is designed especially for Reference Measuring Systems for Lightning (LI) and Switching Impulse (SI) Voltage as well as for Alternating Voltage (AC) Reference Measuring Systems. The divider can be applied for calibration purposes according to IEC 60060-2 and also as operational divider of a high-voltage test system.

## Design

The divider is based on a special measuring capacitor with a new mixed dielectric, which guarantees a high stability of the capacitance at both, alternating voltage and impulse voltage, too. There are arranged damping resistors between the internal single HV capacitor packages. Further carefully adjusted damping resistors are located inside the low-voltage part and at the beginning of the high-voltage lead. After the adjustment procedure the damping resistors guarantee an excellent dynamic behavior of the divider, which meets the recommendations of IEC 60060-2 for reference dividers.

The voltage divider is mounted on a base frame which is equipped with wheels. Type of socket is N-type.

## Instruments

Beside the Reference Measuring Divider the instruments for the Reference Measuring Systems may be delivered, too, e.g. the measurement transient recorder type HiRES for impulse voltage measurement (Brochure 5.50) and peak voltmeter MU for AC voltage measurement (Data Sheet 5.56).

## Option

Special transportation boxes for on-site calibrations.

Table 1: Operating conditions

Temperature range		
Reference working condition	°C	15 ... 30
Operating working condition	°C	5 ... 40
Relative humidity		
Reference working condition	%	≤ 80 (no condensation)
Operating working condition	%	≤ 80 (no condensation)
Height above sea level	m	≤ 1000
Installation		Indoor to keep the temperature range

Table 2: Measuring uncertainty

Measuring uncertainty of voltage: Measurement for a probability level of 95 %: (under reference working conditions)	%	≤ 0.7 lightning impulse voltage full waves and waves chopped after the peak ( $\hat{U}$ and scale factor)
	%	≤ 0.7 switching impulse voltage ( $\hat{U}$ and scale factor)
	%	≤ 0.7 alternating voltage ( $\hat{U} \sqrt{2}$ and scale factor)
Measuring uncertainty of time parameter: Measurement for a probability level of 95 %: (under reference working conditions and under condition of the measurement of the divider output voltage with a transient recorder, e. g. HiRES)	%	≤ 5 lightning and switching impulse voltage

Table 3: Reference atmospheric conditions

Temperature	°C	20
Absolute pressure	hPa	1013
Absolute humidity	g/m <sup>3</sup>	11

Table 4: Technical parameters

Type	Rated parameters					
	Capacitance C	LI voltage (peak)	SI voltage (peak)	AC voltage (45 ... 65 Hz) (rms)	AC duration	Divider ratio
	pF	kV	kV	kV	min	
SMC 1000/100-100 ref	1000	100	100	100	30	110
SMC 1500/200-40 ref	1500	200	200	80	30	220
SMC 1000/300-100 ref	1000	300	300	100	30	300
SMC 600/500-200 ref	600	500	500	200	30	500
SMC 375/800-400 ref	375	800	700	400	30	2000

The parameters of the step response are inside the following limits:

Table 5: Dynamic behaviour

Type	Experimental response time $T_N$	First partial response time $T_\alpha$	Settling time $t_s$
	ns	ns	ns
SMC 1000/100-100 ref	15	30	200
SMC 1500/200-40 ref	15	30	200
SMC 1000/300-100 ref	15	30	200
SMC 600/500-200 ref	15	30	200
SMC 375/800-400 ref	15	30	200

Table 6: Metrological characteristics

Type	Voltage- dependent non- linearity	Short-term instability at AC rated voltage and operating time 30 min	Long-term instability over 1 year	Temperature coefficient of scale factor
	%	%	%	%/K
SMC 1000/100-100 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0,03
SMC 1500/200-40 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0,03
SMC 1000/300-100 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0,03
SMC 600/500-200 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0,03
SMC 375/800-400 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0,03

Accessories (included in the scope of delivery):

- high-voltage lead
- damping resistor (arrangement at the beginning of the lead)
- measuring cable (wave resistance 50 Ohm, length 25 m, double screened)
- documentation (Record of Performance according to IEC 60060-2:2010)

Table 7: Dimensions and weight (approx.)

Type	Height (H)	Footprint (A x A)	length HV-lead L	Weight
	mm	mm	mm	kg
SMC 1000/100-100 ref	814	652 x 652	1215	35
SMC 1500/200-40 ref	1640	650 x 650	1954	46
SMC 600/500-200 ref	2100	1230 x 1230	3000	121
SMC 375/800-400 ref	3367	1590 x 1590	2605	106

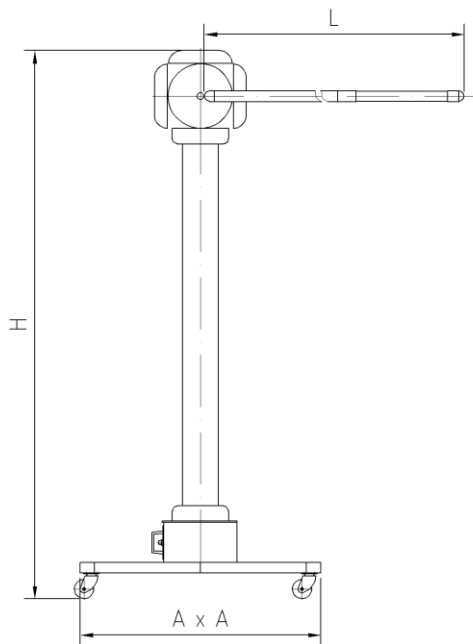


Figure 1: Dimensional drawing



Figure 2: SMC 600/500 ref

## Calibration

The Damped Capacitive Reference Measuring Dividers are calibrated by the HIGHVOLT calibration laboratory D-K-19153-01-00. The calibration is documented by a DAkkS-calibration certificate. This calibration certificate documents the traceability to national standards, which realize the units of measurements according to the International System of Units (SI).

Germany's Accreditation Body DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

If the application task demands a calibration at a National Institute for Metrology, on request, the Damped Capacitive Reference Voltage Dividers would be calibrated at the Physikalisch-Technische Bundesanstalt (PTB). It is recommended to calibrate the Damped Capacitive Reference Measuring Divider together with the instrument which will be used together with the divider.

## Type designation

SMC x/y-z ref

x = Capacitance in pF

y = LI voltage (peak) in kV

z = AC voltage (rms) in kV

ref = reference divider