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Data Sheet 5.24/7

Universal Resistive / Capacitive Reference Voltage Divider Type MCR ... ref

Application

The universal resistive/capacitive reference voltage divider is designed for the precise measurement of alternating (AC), direct (DC), lightning (LI) and switching impulse (SI) voltages. It is the basic component of the universal voltage reference measuring system for calibration purposes according to IEC 60060-2:2010.

Design

The divider is based on a special measuring capacitor with a newly mixed dielectric, which guarantees a high stability of the capacitance at both, alternating voltage and impulse voltage, too. There are damping resistors arranged 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 60060-2:2010 for reference dividers.
For the measurement of DC voltage, the divider has an additional resistive parallel path. The high-voltage high-ohmic resistors are arranged in one tube with the capacitor stack.
The divider is equipped with a PD free top electrode and a base frame with rollers.
The voltage is applied to the divider over a lead with damping resistor at the beginning. Type of socket is N-type.

Instruments

Beside the universal resistive/capacitive voltage divider the instruments for reference measuring systems can be delivered as well, e.g. the transient recorder type HiRES, for impulse voltage measurement (Product Brochure 5.50) and peak voltmeter MU for AC and DC voltage measurement (Data Sheet 5.56).

Option

For the application of the divider and the instrument for on-site calibrations special transportation boxes can be delivered on request.

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 for lightning impulse voltage full waves and waves chopped after the peak (Û and scale factor)
	%	≤ 0.7 switching impulse voltage ($\hat{U}$ and scale factor)
	%	≤ 0.7 alternating voltage ($\hat{U}/\sqrt{2}$ and scale factor)
	%	≤ 0.7 direct voltage (average 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^3	11

Table 4: Technical parameters

Type	Rated capacitance C	Rated resistance *R*	LI voltage (peak)	SI voltage (peak)	AC voltage (45…65 Hz)	DC voltage (peak)	AC/DC duration	Divider ratio
	pF	MΩ	kV	kV	(rms) kV	kV	min	
MCR 0.5/200-100/40 ref	500	100	200	200	40	40	30	220
MCR 1/300-300/100 ref	1000	300	300	300	100	100	30	300
MCR 0.6/500-500/200 ref	600	500	500	500	200	200	30	500
MCR 0.375/800-800/400 ref	375	800	800	700	400	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_α	Settling time t_S	Overshoot β
	ns	ns	ns	%
MCR 0.5/200-100/40 ref	15	30	200	10
MCR 1/300-300/100 ref	15	30	200	10
MCR 0.6/500-500/200 ref	15	30	200	10
MCR 0.375/800-800/400 ref	15	30	200	10

Table 6: Metrological characteristics

Type	Voltage-dependent non-linearity	Short term instability	Long-term instability over 1 year	Temperature coefficient of scale factor
	%	%	%	%/K
MCR 0.5/200-100/40 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0.03
MCR 1/300-300/100 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0.03
MCR 0.6/500-500/200 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0.03
MCR 0.375/800-800/400 ref	≤ 0.3	≤ 0.2	≤ 0.5	≤ 0.03

Accessories (included in the scope of delivery):

- high voltage lead
- damping resistor (arranged 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
MCR 0.5/200-100/40 ref	1160	650 x 650	1450	41
MCR 1/300-300/100 ref	1840	1230 x 1230	1837	90
MCR 0.6/500-500/200 ref	2530	1230 x 1230	2440	80
MCR 0.375/800-800/400 ref	3360	1590 x 1590	2605	105

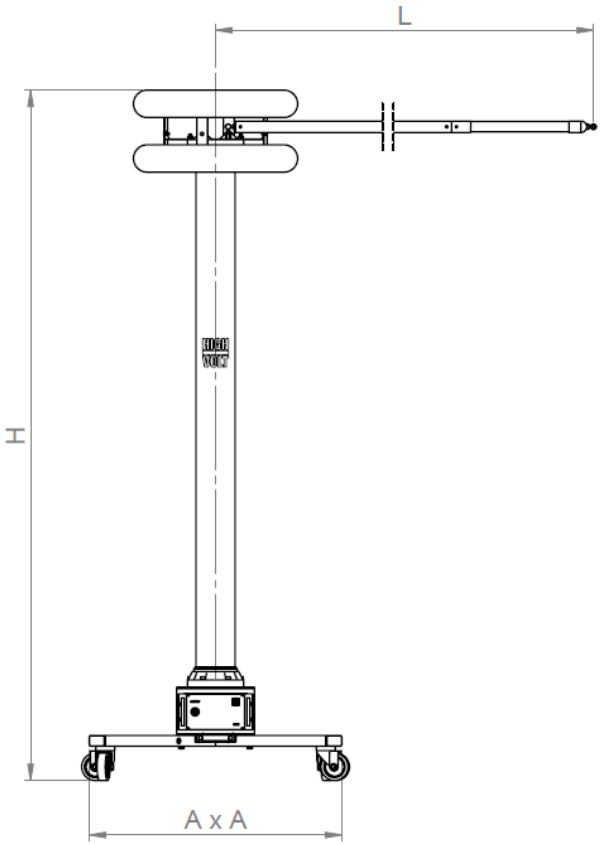

Figure 1: Dimensional drawing

Figure 2: MCR 0.6/500-500/200 ref

Calibration

The universal resistive/capacitive reference voltage divider is 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 controlled resistive lightning impulse reference voltage dividers would be calibrated at the Physikalisch-Technische Bundesanstalt (PTB).
It is recommended to calibrate the universal resistive/capacitive reference voltage dividers together with the instruments which will be used together with the divider.

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the

HIGHVOLT Prüftechnik Dresden GmbH
Marie-Curie-Straße 10, 01139 Dresden

with it´s calibration laboratory

Kalibrierlaboratorium der HIGHVOLT Prüftechnik Dresden GmbH
Marie-Curie-Straße 10, 01139 Dresden

is competent under the terms of DIN EN ISO/IEC 17025:2005
to carry out calibrations in the following fields:

Electrical quantities
DC and low frequency quantities
- **Voltage**
  - **DC voltage*)**
  - **AC voltage*)**
- **Current**
  - **DC current*)**
- **Capacitance*)**
- **High voltage quantities*)**
- **High voltage impulse quantities*)**
- **Power and energy**
  - **Electric power*)**

*) also on-site calibration

The accreditation certificate shall only apply in connection with the notice of accreditation of 19.06.2014 with the accreditation number D-K-19153-01 and is valid until 24.10.2018. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 07 pages.

Registration number of the certificate: **D-K-19153-01-00**

Braunschweig, 19.06.2014

signed Dr. Michael Wolf
Head of Division

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

Figure 3: Accreditation (first page)

Type designation

MCR a/b-c/d ref

a = rated capacitance C in nF
b = LI peak in kV
c = rated resistance R in MΩ
d = AC and DC voltage in kV
ref = reference divider