Deutsche Akkreditierungsstelle

Annex to the Partial Accreditation Certificate D-K-15086-01-01 according to DIN EN ISO/IEC 17025:2018

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This annex is a part of the accreditation certificate D-K-15086-01-00.

Holder of partial accreditation certificate:

MeßTechnikNord GmbH
Industriestraße 29, 22880 Wedel

The calibration laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The calibration laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and confirm generally with the principles of DIN EN ISO 9001.

Calibration in the fields:

Electrical quantities

DC and low frequency quantities

- **DC voltage**
- **AC voltage**
- **DC current**
- **AC current**
- **DC resistance**
- **AC/DC transfer**
- **Power factor**
- **Inductance**
- **Capacitance**
- **Phase angle**
- **High voltage quantities**

Time and frequency

- **Time interval**
- **Frequency**

Dimensional quantities

Length

- **Length measuring instruments**

Within the measurands/calibration items marked with *) the calibration laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use calibration standards or equivalent calibration procedures listed here with different issue dates.

The calibration laboratory maintains a current list of all calibration standards / equivalent calibration procedures within the flexible scope of accreditation.

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
DC voltage	0 V to 120 mV		$3 \cdot 10^{-6} \cdot U + 0{,}5\ \mu V$	U = Measured value
	> 120 mV to 1 V		$4 \cdot 10^{-6}$	
	10 V		$0{,}4 \cdot 10^{-6}$	
	> 1 V to 12 V		$2{,}5 \cdot 10^{-6}$	
	> 12 V to 1000 V		$3 \cdot 10^{-6}$	
	> 1000 V to 10 kV		$0{,}1 \cdot 10^{-3}$	
	> 10 kV to 50 kV		$0{,}5 \cdot 10^{-3}$	
DC current	1 µA to 10 µA		$10 \cdot 10^{-6}$	
	> 10 µA to 100 mA		$4 \cdot 10^{-6}$	
	> 100 mA to 1 A		$7 \cdot 10^{-6}$	
	> 1 A to 10 A		$15 \cdot 10^{-6}$	
	> 10 A to 30 A		$40 \cdot 10^{-6}$	
	> 30 A to 100 A		$60 \cdot 10^{-6}$	
Clamp-on current meter	0,01 A to 1000 A		$5 \cdot 10^{-3}$	with current coil
DC resistance	0,1 mΩ to 0,2 mΩ		$40 \cdot 10^{-6} \cdot R + 2 \cdot 10^{-9}\ \Omega$	R = Measured value
	> 0,2 mΩ to 2 mΩ		$30 \cdot 10^{-6} \cdot R + 2 \cdot 10^{-9}\ \Omega$	
	> 2 mΩ to 40 mΩ		$5 \cdot 10^{-6} \cdot R + 10 \cdot 10^{-9}\ \Omega$	
	> 40 mΩ to 0,4 Ω		$4 \cdot 10^{-6} \cdot R + 80 \cdot 10^{-9}\ \Omega$	
	> 0,4 Ω to 2 Ω		$3 \cdot 10^{-6} \cdot R + 0{,}8 \cdot 10^{-6}\ \Omega$	
	> 2 Ω to 20 Ω		$3 \cdot 10^{-6} \cdot R + 15 \cdot 10^{-6}\ \Omega$	
	> 20 Ω to 200 Ω		$1 \cdot 10^{-6} \cdot R + 25 \cdot 10^{-6}\ \Omega$	
	> 200 Ω to 2 kΩ		$1{,}3 \cdot 10^{-6} \cdot R + 0{,}22 \cdot 10^{-3}\ \Omega$	
	> 2 kΩ to 20 kΩ		$1{,}1 \cdot 10^{-6} \cdot R + 2{,}5 \cdot 10^{-3}\ \Omega$	
	> 20 kΩ to 200 kΩ		$1{,}2 \cdot 10^{-6} \cdot R + 22 \cdot 10^{-3}\ \Omega$	
	> 200 kΩ to 2 MΩ		$2 \cdot 10^{-6} \cdot R + 1\ \Omega$	
	> 2 MΩ to 20 MΩ		$2 \cdot 10^{-6} \cdot R + 12\ \Omega$	
	> 20 MΩ to 200 MΩ		$10 \cdot 10^{-6} \cdot R + 60\ \Omega$	
	> 200 MΩ to 2 GΩ		$0{,}1 \cdot 10^{-3} \cdot R + 100\ k\Omega$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage AC/DC transfer	0,1 V; 0,2 V	10 Hz	$0{,}10 \cdot 10^{-3}$	AC/DC transfer at fixed measured voltages and frequencies
		20 Hz	$80 \cdot 10^{-6}$	
		30 Hz; 40 Hz; 500 Hz	$50 \cdot 10^{-6}$	
		1 kHz; 20 kHz	$50 \cdot 10^{-6}$	
		50 kHz	$60 \cdot 10^{-6}$	
		100 kHz	$80 \cdot 10^{-6}$	
		500 kHz	$0{,}10 \cdot 10^{-3}$	
		700 kHz	$0{,}15 \cdot 10^{-3}$	
		1 MHz	$0{,}20 \cdot 10^{-3}$	
	0,3 V; 0,5 V	10 Hz	$0{,}10 \cdot 10^{-3}$	
		20 Hz	$60 \cdot 10^{-6}$	
		30 Hz; 40 Hz; 500 Hz	$30 \cdot 10^{-6}$	
		1 kHz; 20 kHz	$30 \cdot 10^{-6}$	
		50 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		500 kHz	$80 \cdot 10^{-6}$	
		700 kHz	$0{,}10 \cdot 10^{-3}$	
		1 MHz	$0{,}15 \cdot 10^{-3}$	
	1 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz; 500 Hz	$20 \cdot 10^{-6}$	
		1 kHz; 10 kHz	$20 \cdot 10^{-6}$	
		20 kHz	$30 \cdot 10^{-6}$	
		50 kHz	$40 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz; 500 kHz	$90 \cdot 10^{-6}$	
		700 kHz; 1 MHz	$0{,}15 \cdot 10^{-3}$	
	2 V; 3 V; 4 V; 6 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz	$20 \cdot 10^{-6}$	
		500 Hz; 1 kHz	$20 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$20 \cdot 10^{-6}$	
		50 kHz	$30 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz; 500 kHz	$90 \cdot 10^{-6}$	
		700 kHz; 1 MHz	$0{,}15 \cdot 10^{-3}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage AC/DC transfer	10 V; 12 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz	$20 \cdot 10^{-6}$	
		500 Hz; 1 kHz	$20 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$20 \cdot 10^{-6}$	
		50 kHz	$30 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz	$90 \cdot 10^{-6}$	
		500 kHz	$0{,}12 \cdot 10^{-3}$	
		700 kHz	$0{,}15 \cdot 10^{-3}$	
		1 MHz	$0{,}20 \cdot 10^{-3}$	
	20 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz	$20 \cdot 10^{-6}$	
		500 Hz; 1 kHz	$20 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$20 \cdot 10^{-6}$	
		50 kHz	$30 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz	$90 \cdot 10^{-6}$	
		500 kHz	$0{,}15 \cdot 10^{-3}$	
		700 kHz	$0{,}20 \cdot 10^{-3}$	
		1 MHz	$0{,}30 \cdot 10^{-3}$	
	30 V; 40 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz	$20 \cdot 10^{-6}$	
		500 Hz; 1 kHz	$20 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$20 \cdot 10^{-6}$	
		50 kHz	$30 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz	$90 \cdot 10^{-6}$	
		500 kHz	$0{,}15 \cdot 10^{-3}$	
	60 V	10 Hz	$30 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz	$20 \cdot 10^{-6}$	
		500 Hz; 1 kHz	$20 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$20 \cdot 10^{-6}$	
		50 kHz	$30 \cdot 10^{-6}$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}$	
		200 kHz	$90 \cdot 10^{-6}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage AC/DC transfer	100 V; 120 V	10 Hz 20 Hz; 30 Hz; 40 Hz 500 Hz; 1 kHz 10 kHz; 20 kHz 50 kHz 70 kHz; 100 kHz	$30 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $30 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	200 V	10 Hz 20 Hz; 30 Hz; 40 Hz 500 Hz; 1 kHz 10 kHz; 20 kHz; 50 kHz 70 kHz; 100 kHz	$55 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $70 \cdot 10^{-6}$	
	300 V; 400 V; 500 V	40 Hz 500 Hz; 1 kHz 10 kHz; 20 kHz; 50 kHz 70 kHz; 100 kHz	$50 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $70 \cdot 10^{-6}$	
	600 V; 700 V	40 Hz 500 Hz; 1 kHz 10 kHz; 20 kHz; 50 kHz 70 kHz 100 kHz	$70 \cdot 10^{-6}$ $70 \cdot 10^{-6}$ $70 \cdot 10^{-6}$ $90 \cdot 10^{-6}$ $0{,}15 \cdot 10^{-3}$	
	800 V	40 Hz 500 Hz; 1 kHz 10 kHz; 20 kHz	$70 \cdot 10^{-6}$ $70 \cdot 10^{-6}$ $70 \cdot 10^{-6}$	
	1000 V	40 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz	$0{,}10 \cdot 10^{-3}$ $0{,}10 \cdot 10^{-3}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage	1 mV to 2,2 mV	10 Hz to 20 Hz	$0{,}19 \cdot 10^{-3} \cdot U + 1{,}3\ \mu V$	with Fluke 5790A U = Measured value
		> 20 Hz to 40 Hz	$0{,}17 \cdot 10^{-3} \cdot U + 1{,}3\ \mu V$	
		> 40 Hz to 20 kHz	$0{,}12 \cdot 10^{-3} \cdot U + 1{,}3\ \mu V$	
		> 20 kHz to 50 kHz	$0{,}12 \cdot 10^{-3} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$0{,}18 \cdot 10^{-3} \cdot U + 2{,}5\ \mu V$	
	> 2,2 mV to 7 mV	10 Hz to 20 Hz	$0{,}12 \cdot 10^{-3} \cdot U + 1{,}3\ \mu V$	
		> 20 Hz to 40 Hz	$72 \cdot 10^{-6} \cdot U + 1{,}3\ \mu V$	
		> 40 Hz to 20 kHz	$70 \cdot 10^{-6} \cdot U + 1{,}3\ \mu V$	
		> 20 kHz to 50 kHz	$72 \cdot 10^{-6} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$83 \cdot 10^{-6} \cdot U + 2{,}5\ \mu V$	
	> 7 mV to 22 mV	10 Hz to 20 Hz	$91 \cdot 10^{-6} \cdot U + 1{,}3\ \mu V$	
		> 20 Hz to 40 Hz	$53 \cdot 10^{-6} \cdot U + 1{,}3\ \mu V$	
		> 40 Hz to 20 kHz	$47 \cdot 10^{-6} \cdot U + 1{,}3\ \mu V$	
		> 20 kHz to 50 kHz	$57 \cdot 10^{-6} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$70 \cdot 10^{-6} \cdot U + 2{,}5\ \mu V$	
	> 22 mV to 70 mV	10 Hz to 20 Hz	$70 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 20 Hz to 40 Hz	$39 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 40 Hz to 20 kHz	$35 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 20 kHz to 50 kHz	$44 \cdot 10^{-6} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$62 \cdot 10^{-6} \cdot U + 2{,}5\ \mu V$	
	> 70 mV to 220 mV	10 Hz to 20 Hz	$0{,}12 \cdot 10^{-3} \cdot U + 1{,}5\ \mu V$	
		> 20 Hz to 40 Hz	$84 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 40 Hz to 20 kHz	$55 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 20 kHz to 50 kHz	$55 \cdot 10^{-6} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$79 \cdot 10^{-6} \cdot U + 2{,}5\ \mu V$	
		> 100 kHz to 300 kHz	$0{,}13 \cdot 10^{-3} \cdot U + 4\ \mu V$	
		> 300 kHz to 500 kHz	$0{,}28 \cdot 10^{-3} \cdot U + 6\ \mu V$	
		> 500 kHz to 1 MHz	$0{,}92 \cdot 10^{-3} \cdot U + 6\ \mu V$	
	> 220 mV to 700 mV	10 Hz to 20 Hz	$0{,}12 \cdot 10^{-3} \cdot U + 1{,}5\ \mu V$	
		> 20 Hz to 40 Hz	$66 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 40 Hz to 20 kHz	$37 \cdot 10^{-6} \cdot U + 1{,}5\ \mu V$	
		> 20 kHz to 50 kHz	$55 \cdot 10^{-6} \cdot U + 2{,}0\ \mu V$	
		> 50 kHz to 100 kHz	$71 \cdot 10^{-6} \cdot U + 2{,}5\ \mu V$	
		> 100 kHz to 300 kHz	$0{,}13 \cdot 10^{-3} \cdot U + 4\ \mu V$	
		> 300 kHz to 500 kHz	$0{,}28 \cdot 10^{-3} \cdot U + 6\ \mu V$	
		> 500 kHz to 1 MHz	$0{,}91 \cdot 10^{-3} \cdot U + 6\ \mu V$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage	> 700 mV to 2,2 V	10 Hz to 20 Hz	$67 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$33 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$36 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$45 \cdot 10^{-6}$	
		> 50 kHz to 100 kHz	$70 \cdot 10^{-6}$	
		> 100 kHz to 300 kHz	$0{,}13 \cdot 10^{-3}$	
		> 300 kHz to 500 kHz	$0{,}24 \cdot 10^{-3}$	
		> 500 kHz to 1 MHz	$0{,}85 \cdot 10^{-3}$	
	> 2,2 V to 7 V	10 Hz to 20 Hz	$67 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$34 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$28 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$38 \cdot 10^{-6}$	
		> 50 kHz to 100 kHz	$80 \cdot 10^{-6}$	
		> 100 kHz to 300 kHz	$0{,}15 \cdot 10^{-3}$	
		> 300 kHz to 500 kHz	$0{,}38 \cdot 10^{-3}$	
		> 500 kHz to 1 MHz	$1{,}11 \cdot 10^{-3}$	
	> 7 V to 22 V	10 Hz to 20 Hz	$67 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$34 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$28 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$38 \cdot 10^{-6}$	
		> 50 kHz to 100 kHz	$80 \cdot 10^{-6}$	
		> 100 kHz to 300 kHz	$0{,}17 \cdot 10^{-3}$	
		> 300 kHz to 500 kHz	$0{,}39 \cdot 10^{-3}$	
		> 500 kHz to 1 MHz	$1{,}14 \cdot 10^{-3}$	
	> 22 V to 70 V	10 Hz to 20 Hz	$67 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$35 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$30 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$39 \cdot 10^{-6}$	
		> 50 kHz to 100 kHz	$81 \cdot 10^{-6}$	
	> 70 V to 220 V	10 Hz to 20 Hz	$82 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$58 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$55 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$58 \cdot 10^{-6}$	
		> 50 kHz to 100 kHz	$96 \cdot 10^{-6}$	
	> 220 V to 700 V	10 Hz to 20 Hz	$94 \cdot 10^{-6}$	
		> 20 Hz to 40 Hz	$77 \cdot 10^{-6}$	
		> 40 Hz to 20 kHz	$74 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$0{,}13 \cdot 10^{-3}$	
		> 50 kHz to 100 kHz	$0{,}42 \cdot 10^{-3}$	
	> 700 V to 1000 V	10 Hz to 20 Hz	$0{,}12 \cdot 10^{-3}$	
		> 20 Hz to 40 Hz	$0{,}11 \cdot 10^{-3}$	
		> 40 Hz to 20 kHz	$0{,}11 \cdot 10^{-3}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
High voltage	> 1 kV to 10 kV	40 Hz to 60 Hz	$5 \cdot 10^{-3} \cdot U + 2$ V	U = Measured value
AC current	190 µA to 800 µA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}26 \cdot 10^{-3} \cdot I + 20$ nA $0{,}15 \cdot 10^{-3} \cdot I + 20$ nA $0{,}10 \cdot 10^{-3} \cdot I + 20$ nA	I = Measured value
	> 800 µA to 8 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3} \cdot I + 20$ nA $90 \cdot 10^{-6} \cdot I + 20$ nA $60 \cdot 10^{-6} \cdot I + 20$ nA	
	> 8 mA to 10 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 10 mA to 20 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 20 mA to 30 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 30 mA to 50 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 50 mA to 100 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 100 mA to 200 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 200 mA to 300 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 300 mA to 500 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	
	> 500 mA to 1 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}25 \cdot 10^{-3}$ $95 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC current	> 1 A to 2 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}3 \cdot 10^{-3}$ $0{,}15 \cdot 10^{-3}$ $85 \cdot 10^{-6}$	
	> 2 A to 3 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}3 \cdot 10^{-3}$ $0{,}15 \cdot 10^{-3}$ $70 \cdot 10^{-6}$	
	> 3 A to 5 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}3 \cdot 10^{-3}$ $0{,}2 \cdot 10^{-3}$ $0{,}18 \cdot 10^{-3}$	
	> 5 A to 10 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}3 \cdot 10^{-3}$ $0{,}15 \cdot 10^{-3}$ $0{,}13 \cdot 10^{-3}$	
	> 10 A to 20 A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 10 kHz	$0{,}3 \cdot 10^{-3}$ $0{,}15 \cdot 10^{-3}$ $0{,}1 \cdot 10^{-3}$	
Clamp-on current meter	0,01 A to 1000 A	45 Hz to 65 Hz	$8 \cdot 10^{-3}$	with current coil
	0,01 A to 150 A	> 65 Hz to 400 Hz	$6 \cdot 10^{-3}$	
Capacitance Standards	10 pF to 100 pF	500 Hz to 4 kHz	$3{,}5 \cdot 10^{-3} \cdot C + 0{,}05$ pF	C = Measured value
	> 100 pF to 1 nF	500 Hz to 4 kHz	$2 \cdot 10^{-3}$	
	> 1 nF to 10 nF	50 Hz to 800 Hz > 800 Hz to 4 kHz	$2 \cdot 10^{-3}$ $1 \cdot 10^{-3}$	
	> 10 nF to 10 µF	50 Hz to 10 kHz	$1 \cdot 10^{-3}$	
	> 10 µF to 100 µF	50 Hz to 4 kHz	$1 \cdot 10^{-3}$	
	> 100 µF to 1 mF	20 Hz to 600 Hz	$2 \cdot 10^{-3}$	
Capacitance Measuring instruments	10 pF	1 kHz	$30 \cdot 10^{-6}$	
	100 pF	1 kHz	$30 \cdot 10^{-6}$	
	1 nF	100 Hz; 400 Hz	$0{,}2 \cdot 10^{-3}$	
		1 kHz	$20 \cdot 10^{-6}$	
		10 kHz	$0{,}2 \cdot 10^{-3}$	
	10 nF	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	
	100 nF	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	
	1 µF	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Inductance Standards	100 µH to 1 mH	50 Hz to 500 Hz > 500 Hz to 5 kHz > 5 kHz to 10 kHz	$4 \cdot 10^{-3} \cdot L + 0{,}25$ µH $2 \cdot 10^{-3}$ $1 \cdot 10^{-3}$	L = Measured value
	> 1 mH to 10 mH	50 Hz to 500 Hz > 500 Hz to 10 kHz	$1{,}5 \cdot 10^{-3}$ $0{,}8 \cdot 10^{-3}$	
	> 10 mH to 100 mH	50 Hz to 10 kHz	$0{,}8 \cdot 10^{-3}$	
	> 100 mH to 10 H	50 Hz to 1 kHz	$0{,}8 \cdot 10^{-3}$	
Inductance Measuring instruments	100 µH	100 Hz; 400 Hz 1 kHz; 10 kHz	$0{,}3 \cdot 10^{-3}$	
	1 mH	100 Hz; 400 Hz	$0{,}3 \cdot 10^{-3}$	
		1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	
	10 mH	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	
	100 mH	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
		10 kHz	$0{,}3 \cdot 10^{-3}$	
	1 H	100 Hz; 400 Hz; 1 kHz	$0{,}2 \cdot 10^{-3}$	
Phase angle between voltages	0° to 360°	10 Hz to 2 kHz U_{ref} / U_{var}		
		5 V / 5 V	0,003°	
		50 mV to 100 V / 50 mV to 100 V	(0,003 + 0,0005 · R)°	R = ratio of larger to lower voltage (U_{ref} / U_{var})
		> 100 V to 120 V / > 100 V to 120 V	(0,005 + 0,0001 · R)°	
Phase angle between voltage and current Measuring instruments	0° to 360°	10 Hz to 2 kHz U_{ref} / I_{var}		
		5 V / 0,5 A; 5 A	0,005°	
		50 mV to 100 V / 10 mA to 0,5 A	(0,005 + 0,0005 · R)°	R = ratio of larger to lower voltage (U_{ref} / U_{var}) $I_{var} = U_{var} \cdot 0{,}1$ A/V
		> 100 V to 120 V / 10 mA to 0,5 A	(0,005 + 0,0001 · R)°	
		50 mV to 100 V / > 0,5 A to 5 A	(0,005 + 0,0005 · R)°	R = ratio of larger to lower voltage (U_{ref} / U_{var}) $I_{var} = U_{var} \cdot 1$ A/V
		> 100 V to 120 V / > 0,5 A to 5 A	(0,005 + 0,0001 · R)°	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure		Expanded uncertainty of measurement	Remarks
Phase angle between voltages Sources	0° to 360°	10 Hz to 2 kHz 50 mV to 120 V		0,05°	
Power factor	-1 to 1	10 Hz to 2 kHz			
		U_{ref}	I_{var}		
		5 V	0,5 A; 5 A	0,005°	
		50 mV to 100 V	10 mA to 0,5 A	(0,005 + 0,0005 · R)°	R = ratio of larger to lower voltage (U_{ref} / U_{var}) I_{var} = U_{var} · 0,1 A/V
		> 100 V to 120 V	10 mA to 0,5 A	(0,005 + 0,0001 · R)°	
		50 mV to 100 V	> 0,5 A to 5 A	(0,005 + 0,0005 · R)°	R = ratio of larger to lower voltage (U_{ref} / U_{var}) I_{var} = U_{var} · 1 A/V
		> 100 V to 120 V	> 0,5 A to 5 A	(0,005 + 0,0001 · R)°	

Permanent laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Frequency	1 MHz; 5 MHz; 10 MHz		$2 \cdot 10^{-12}$	Phase-time difference measurement
	1 µHz to 3 GHz		$7 \cdot 10^{-12} + U_{Tf}$	Trigger uncertainty U_{Tf} has to be determined from signal to noise ratio and signal rising time.
	> 3 GHz to 18 GHz		$2 \cdot 10^{-10} + U_{Tf}$	
Time interval t	5 ns to 100000 s		$[(1\ \text{ns})^2 + (5 \cdot 10^{-11} \cdot t)^2]^{1/2}$	
Length				
Calipers for external, internal and depth dimensions *	0 mm to 300 mm	VDI/VDE/DGQ 2618, Blatt 9.1:2006	30 µm + 30 · 10^{-6} · l	l = measured length
	> 300 mm to 1000 mm		50 µm + 30 · 10^{-6} · l	
Micrometers *	0 mm to 100 mm	VDI/VDE/DGQ 2618, Blatt 10.1:2001	3 µm + 30 · 10^{-6} · l	
Reference gauges for micrometers with plane-parallel or spherical measuring faces, spherical-end gauges and internal calipers *	to 100 mm	VDI/VDE/DGQ 2618, Blatt 4.4:2009	2 µm + 30 · 10^{-6} · l	
Mechanical dial gauges *	0 mm to 10 mm	VDI/VDE/DGQ/DKD 2618, Blatt 11.1:2021	4 µm + 10 · 10^{-6} · l	l = measured length
	> 10 mm to 50 mm		5 µm + 10 · 10^{-6} · l	at l > 10 mm in horizontal position

Abbreviations used:

CMC	Calibration and measurement capabilities
DGQ	Deutsche Gesellschaft für Qualität e.V.
DIN	Deutsches Institut für Normung e.V.
DKD	Deutscher Kalibrierdienst (German Calibration Service)
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik e.V.
VDI	Verein Deutscher Ingenieure e.V.