Overview of Measuring Ranges for electrial measurements

Overview of Measuring Ranges to the accreditation certificate D-K-15055-01-02 according to DIN ISO/IEC 17025:2018

The accreditation certificate is valid from: 07.09.2023

Date of issue of accreditation certificate: 07.09.2023

Holder of the accreditation certificate:

europascal GmbH
An der Wiesenhecke 10, 63456 Hanau

The calibration laboratory meets the requirements according to DIN EN ISO/IEC 17025:2018 to perform the conformity assessment activities listed in this annex.
The calibration laboratory fulfills, where applicable, additional legal and normative requirements, including those in relevant sectoral programs, provided that these are explicitly confirmed in the annexes to the partial accreditation certificates listed below.

The requirements for the management system in DIN EN ISO/IEC 17025 are written in a language relevant to calibration laboratories and are overall in accordance with the principles of DIN EN ISO 9001.

The current status of valid and monitored accreditation can be found in the database of accredited bodies of the German Accreditation Body (www.dakks.de).

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Overview of Measuring Ranges for electrial measurements

Calibrations in the following scopes:

Electrical measurments

Direct current (DC) and low frequency measurements
- **DC voltage** [a)]
- **DC current** [a)]
- **DC resistance** [a)]
- **AC Voltage** [a)]
- **AC current** [a)]
- **Capacitance** [a)]
- **Inductance** [a)]

-Electrical power [a)]

- **Power factor** [a)]
- **High voltage measurands** [a)]

Time and frequency
- **Frequency and RPM** [a)]

a) also on-site calibration

For example, we can calibrate the following measuring devices:

- - Multimeter 1100 V
- - Current clamps up to 1000A
- - Resistance decades
- - LCR meter
- - Safety measuring devices
- - Laboratory power supplies
- - Oscilloscopes
- - Frequency counter
- - Power measuring devices up to 20KW
- - Special measuring devices on request

Overview of Measuring Ranges for electrial measurements

Accreditation for Electrical Measuring Quantities
Accreditation Certificate D-K-15055-01-01

Permanent laboratory and on-site calibration Calibration and measurement capabilities (CMC)

Measurement quantity / Calibration item	Measuring range / Measuring span	Measuring conditions / methods	Advanced measurement uncertainty 1)	Remarks
DC voltage Measuring Devices	0 V		0,5 µV	*U* = measurement value
	> 0 V to 0,22 V		$9 \cdot 10^{-6} \cdot U + 0{,}5$ µV	
	> 0,22 V to 2,2 V		$7 \cdot 10^{-6} \cdot U + 0{,}7$ µV	
	> 2,2 V to 22 V		$6{,}0 \cdot 10^{-6} \cdot U$	
	> 22 V to 220 V		$9{,}0 \cdot 10^{-6} \cdot U$	
	> 220 V to 1100 V		$10 \cdot 10^{-6} \cdot U$	
DC Voltage Sources	0 V		0,2 µV	*U* = measurement value
	> 0 V to < 0,2 V		$5 \cdot 10^{-6} \cdot U + 0{,}2$ µV	
	0,2 V to < 2 V		$3{,}5 \cdot 10^{-6} \cdot U + 0{,}4$ µV	
	2 V to < 20 V		$3{,}5 \cdot 10^{-6} \cdot U + 4$ µV	
	20 V to < 200		$6 \cdot 10^{-6} \cdot U + 40$ µV	
	200 V to 1000 V		$6 \cdot 10^{-6} \cdot U + 0{,}4$ mV	
High Voltage	> 1 kV to 10 kV		$2 \cdot 10^{-3} \cdot U + 2$ V	
	> 1 kV to 7 kV	45 Hz to 65 Hz	$4 \cdot 10^{-3} \cdot U + 2$ V	
DC Current Measuring Devices	0 A		8 nA	*I* = measurement value
	1 µA to 220 µA		$45 \cdot 10^{-6} \cdot I + 8$ nA	
	> 220 µA to 2,2 mA		$45 \cdot 10^{-6} \cdot I + 10$ nA	
	> 2,2 mA to 22 mA		$45 \cdot 10^{-6} \cdot I + 50$ nA	
	> 22 mA to 220 mA		$60 \cdot 10^{-6} \cdot I + 1$ µA	
	0,22 A to 2,2 A		$0{,}10 \cdot 10^{-3} \cdot I + 15$ µA	
	> 2,2 A to < 3 A		$0{,}30 \cdot 10^{-3} \cdot I + 50$ µA	*I* = measurement value
	3 A to 11 A		$0{,}45 \cdot 10^{-3} \cdot I + 0{,}5$ mA	
	11 A to 20,5 A		$0{,}80 \cdot 10^{-3} \cdot I + 1{,}5$ mA	
DC Current Sources	1 µA to < 200 µA		$45 \cdot 10^{-6} \cdot I + 8$ nA	*I* = measurement value
	200 µA to < 2 mA		$45 \cdot 10^{-6} \cdot I + 10$ nA	
	2 mA to < 20 mA		$45 \cdot 10^{-6} \cdot I + 50$ nA	
	20 mA to < 200 mA		$60 \cdot 10^{-6} \cdot I + 1$ µA	
	0,2 A to < 2 A		$0{,}20 \cdot 10^{-3} \cdot I + 30$ µA	
	2 A to < 20 A		$0{,}70 \cdot 10^{-3} \cdot I$	
	0 A to 100 A	Voltage drop at standard resistance	$15 \cdot 10^{-6} \cdot I + 3$ nA	*I* = measurement value
	100 A to 2000 A		$50 \cdot 10^{-6} \cdot I$	

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DC Currnt Current clamps	1 mA to 20 A		1,0 · 10^{-3} · / + 0,2 µA	*I* = measurement value
	> 20A to100A		1,2 · 10^{-3} · *I*	
	>100 A to 1000 A		2 · 10^{-3} · *I*	
DC Power	100 µW to 330 W	33 mV ≤ U ≤ 1000 V 1 mA ≤ / ≤ 330 mA	0,35 · 10^{-3} · + 1 µW	*P* = set value
	33 mW to 3 kW	33 mV ≤ U ≤ 1000 V 0,33 mA ≤ / ≤ 3 mA	0,6 · 10^{-3} · *P*	
	300 mW to 20 kW	33 mV ≤ U ≤ 1000 V 3 A ≤ / ≤ 20 A	1,1 · 10^{-3} · *P*	
DC Resistance Measuring Devices	0 Ω to < 11 Ω		35 · 10^{-6} · *R* + 1,2 mΩ	*R* = measurement value
	11 Ω to < 110 Ω		28 · 10^{-6} · *R* + 1,7 mΩ	
	110 Ω to < 1,1 kΩ		30 · 10^{-6} · *R* + 2,0 mΩ	
	1,1 kΩ to < 11 kΩ		30 · 10^{-6} · *R* + 20 mΩ	
	11 kΩ to < 110 kΩ		30 · 10^{-6} · *R* + 0,2 mΩ	
	110 kΩ to < 1,10 MΩ		33 · 10^{-6} · *R* + 2 mΩ	
	1,1 MΩ to < 3,3 MΩ		52 · 10^{-6} · *R* + 30 Ω	
	3,3 MΩ to < 11 MΩ		0,11 · 10^{-3} · *R* + 50 Ω	
	11 MΩ to < 33 MΩ		0,28 · 10^{-3} · *R* + 3 kΩ	
	33 MΩ to < 110 MΩ		0,45 · 10^{-3} · *R* + 3 kΩ	
	110 MΩ to < 330 MΩ		3,1 · 10^{-3} · *R* + 0,1 MΩ	
	330 MΩ to < 1,1 GΩ		12 · 10^{-3} · *R* + 0,5 MΩ	
DC Resistance Measuring Devices	0 Ω		0,1 µΩ	*R* = measurement value
	15 µΩ		0,1 · 10^{-3} · R	
	40 µΩ		0,1 · .10^{-3} · R	
	62,5 µΩ		0,1. · 10^{-3} · R	
	100 µΩ		0,1 · . 10^{-3} · R	
	1 mΩ		15 · . 10^{-6} · R	
	10 mΩ		15. · 10^{-6} · R	
	100 mΩ		15. · 10^{-6} · R	

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DC Resistance Measuring Devices	1 Ω		12 · . 10^{-6} · R	R = resistance value
	1,9 Ω		12 · . 10^{-6} · R	
	10 Ω		10 · 10^{-6} · R	
	19 Ω		10 · . 10^{-6} · R	
	100 Ω		5 · 10^{-6} · R	
	190 Ω		7 · . 10^{-6} · R	
	1 kΩ		3 · . 10^{-6} · R	
	1,9 kΩ		3 · 10^{-6} · R	
	10 kΩ		3 · 10^{-6} · R	
	19 kΩ		3 · 10^{-6} · R	
	100 kΩ		3 · 10^{-6} · R	
	190 kΩ		7 · 10^{-6} · R	
	1 MΩ		10 · 10^{-6} · R	
	1,9 MΩ		18 · 10^{-6} · R	
	10 MΩ		10 · 10^{-6} · R	
	19 MΩ		20 · 10^{-6} · R	
	100 MΩ		36 · 10^{-6} · R	
	1 GΩ		0,2 · 10^{-3} · R	
	10 GΩ		0,5 · 10^{-3} · R	
	100 GΩ		2 · 10^{-3} · R	
	1 TΩ		8 · 10^{-3} · R	
DC Resistance Resistances	10 µΩ to < 1 mΩ		0,3 · 10^{-3} · *R* + 0,05 µΩ	*R* = resistance value
	1 um to < 0,2 Ω		0,15 · 10^{-3} · *R*	
	0,2 Ω to < 2 Ω		20 · 10^{-6} · *R* + 6 µΩ	
	2 Ω to < 20 Ω		12 · 10^{-6} · *R* + 15 µΩ	
	20 Ω to < 200 Ω		12 · 10^{-6} · *R* + 50 µΩ	
	200 MΩ to < 2 kΩ		12 · 10^{-6} · *R* + 0,5 mΩ	
	2 kΩ to < 20 kΩ		12 · 10^{-6} · *R* + 5 mΩ	
	20 kΩ to < 200 kΩ		12 · 10^{-6} · *R* + 50 µmΩ	
	200 kΩ to < 2 MΩ		12 · 10^{-6} · *R* + 1 Ω	
	2 MΩ to < 20 MΩ		18 · 10^{-6} · *R* + 0.12 kΩ	
	20 MΩ to < 200 MΩ		95 · 10^{-6} · *R* + 12 kΩ	
	200 MΩ to < 2 GΩ		1,2 · 10^{-3} · R + 1,2 MΩ	
	2 GΩ to < 20 GΩ		1,2 · 10^{-3} · R + 12 MΩ	

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Measurement quantity / Calibration item	Measuring range / Measuring span	Measuring conditions / method		Advanced measurement uncertainty [1)]	Remarks
AC Voltage Measuring Devices	1 mV to 2,2 mV	10 Hz	to 40 Hz	$0{,}14 \cdot 10^{-3} \cdot U + 8\ \mu V$	U = measurement value
		> 40 Hz	to 20 kHz	$50 \cdot 10^{-6} \cdot U + 8\ \mu V$	
Measuring devices		>20 kHz	to 50 kHz	$0{,}12 \cdot 10^{-3} \cdot U + 8\ \mu V$	
		>50 kHz	to 100 kHz	$0{,}31 \cdot 10^{-3} \cdot U + 8\ \mu V$	
		>100 kHz	to 300 kHz	$0{,}75 \cdot 10^{-3} \cdot U + 15\ \mu V$	
		>300 kHz	to 500 kHz	$1{,}1 \cdot 10^{-3} \cdot U + 25\ \mu V$	
		>500 kHz	to 1 MHz	$2{,}1 \cdot 10^{-3} \cdot U + 25\ \mu V$	
	> 2,2 mV to 22 mV	10 Hz	to 40 Hz	$0{,}16 \cdot 10^{-3} \cdot U + 8\ \mu V$	
		> 40 Hz	to 20 kHz	$50 \cdot 10^{-6} \cdot U + 8\ \mu V$	
		>20 kHz	to 50 kHz	$0{,}13 \cdot 10^{-3} \cdot U + 8\ \mu V$	
		>50 kHz	to 100 kHz	$0{,}35 \cdot 10^{-3} \cdot U + 8\ \mu V$	
		>100 kHz	to 300 kHz	$0{,}83 \cdot 10^{-3} \cdot U + 15\ \mu V$	
		>300 kHz	to 500 kHz	$1{,}1 \cdot 10^{-3} \cdot U + 25\ \mu V$	
		>500 kHz	to 1 MHz	$2{,}2 \cdot 10^{-3} \cdot U + 25\ \mu V$	
	>22 mV to 220 mV	10 Hz	to 40 Hz	$0{,}20 \cdot 10^{-3} \cdot U + 15\ \mu V$	
		> 40 Hz	to 20 kHz	$65 \cdot 10^{-6} \cdot U + 10\ \mu V$	
		>20 kHz	to 50 kHz	$0{,}16 \cdot 10^{-3} \cdot U + 10\ \mu V$	
		>50 kHz	to 100 kHz	$0{,}38 \cdot 10^{-3} \cdot U + 20\ \mu V$	
		>100 kHz	to 300 kHz	$0{,}73 \cdot 10^{-3} \cdot U + 25\ \mu V$	
		>300 kHz	to 500 kHz	$1{,}1 \cdot 10^{-3} \cdot U + 30\ \mu V$	
		>500 kHz	to 1 MHz	$2{,}2 \cdot 10^{-3} \cdot U + 50\ \mu V$	
	>0,22 V to 2,2 V	10 Hz	to 40 Hz	$0{,}20 \cdot 10^{-3} \cdot U + 45\ \mu V$	
		> 40 Hz	to 20 kHz	$40 \cdot 10^{-6} \cdot U + 10\ \mu V$	
		>20 kHz	to 50 kHz	$70 \cdot 10^{-6} \cdot U + 10\ \mu V$	
		>50 kHz	to 100 kHz	$0{,}10 \cdot 10^{-3} \cdot U + 0{,}35\ \mu V$	
		>100 kHz	to 300 kHz	$0{,}35 \cdot 10^{-3} \cdot U + 0{,}10\ mV$	
		>300 kHz	to 500 kHz	$0{,}80 \cdot 10^{-3} \cdot U + 0{,}25\ mV$	
		>500 kHz	to 1 MHz	$1{,}4 \cdot 10^{-3} \cdot U + 0{,}35\ mV$	
	>2,2 V to 22 V	10 Hz	to 40 Hz	$0{,}20 \cdot 10^{-3} \cdot U + 0{,}5\ mV$	
		> 40 Hz	to 20 kHz	$45 \cdot 10^{-6} \cdot U + 50\ \mu V$	
		>20 kHz	to 50 kHz	$70 \cdot 10^{-6} \cdot U + 0{,}10\ mV$	
		>50 kHz	to 100 kHz	$90 \cdot 10^{-6} \cdot U + 0{,}25\ mV$	
		>100 kHz	to 300 kHz	$0{,}24 \cdot 10^{-3} \cdot U + 0{,}70\ mV$	
		>300 kHz	to 500 kHz	$0{,}83 \cdot 10^{-3} \cdot U + 2{,}3\ mV$	
		>500 kHz	to 1 MHz	$1{,}3 \cdot 10^{-3} \cdot U + 3{,}6\ mV$	
	>22 V to 220 V	10 Hz	to 40 Hz	$0{,}20 \cdot 10^{-3} \cdot U + 4{,}5\ mV$	
		> 40 Hz	to 20 kHz	$55 \cdot 10^{-6} \cdot U + 0{,}60\ mV$	
		>20 kHz	to 50 kHz	$75 \cdot 10^{-6} \cdot U + 1{,}1\ mV$	
		>50 kHz	to 100 kHz	$0{,}13 \cdot 10^{-3} \cdot U + 2{,}8\ mV$	
	>220 V to 1100 V	50 Hz	to 1 kHz	$70 \cdot 10^{-6} \cdot U + 3{,}5\ mV$	

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Accreditation for Electrical Measuring Quantities
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Permanent laboratory and on-site calibration Calibration and measurement capabilities (CMC)

Measurement quantity / Calibration item	Measuring range / Measuring span	Measuring conditions / method		Smallest specifiable measurement uncertainty [1)]	Remarks
AC Voltage Sources	0,001 V to 0,01 V	10 Hz	to 20 Hz	10 µV	*U* = measurement value
		> 20 Hz	to < 50 kHz	15 µV	
		>50 kHz	to < 100 kHz	$3 \cdot 10^{-3} \cdot U + 15$ µV	
		>100 kHz	to 300 kHz	$30 \cdot 10^{-3} \cdot U + 15$ µV	
	>0,01 V to 0,1 V	10 Hz	to 40 Hz	$45 \cdot 10^{-6} \cdot U + 8$ µV	
		> 40 Hz	to 1 kHz	$45 \cdot 10^{-6} \cdot U + 6$ µV	
		> 1 kHz	to 20 kHz	$90 \cdot 10^{-6} \cdot U + 6$ µV	
		> 20 kHz	to 50 kHz	$0{,}21 \cdot 10^{-3} \cdot U + 6$ µV	
		> 50 kHz	to 100 kHz	$0{,}6 \cdot 10^{-3} \cdot U + 6$ µV	
		> 100 kHz	to 300 kHz	$2{,}5 \cdot 10^{-3} \cdot U + 10$ µV	
		> 300 kHz	to 1 MHz	$8 \cdot 10^{-3} \cdot U + 10$ µV	
	>0,1 V to 1 V	10 Hz	to 40 Hz	$65 \cdot 10^{-6} \cdot U + 45$ µV	
		> 40 Hz	to 1 kHz	$65 \cdot 10^{-6} \cdot U + 25$ µV	
		> 1 kHz	to 20 kHz	$0{,}12 \cdot 10^{-3} \cdot U + 25$ µV	
		> 20 kHz	to 50 kHz	$0{,}24 \cdot 10^{-3} \cdot U + 25$ µV	
		> 50 kHz	to 100 kHz	$0{,}65 \cdot 10^{-3} \cdot U + 25$ µV	
		> 100 kHz	to 300 kHz	$2{,}5 \cdot 10^{-3} \cdot U + 0{,}1$ mV	
		> 300 kHz	to 1 MHz	$8 \cdot 10^{-3} \cdot U + 0{,}1$ mV	
	>1 V to 10 V	10 Hz	to 40 Hz	$65 \cdot 10^{-6} \cdot U + 0{,}45$ mV	
		> 40 Hz	to 1 kHz	$65 \cdot 10^{-6} \cdot U + 0{,}25$ mV	
		> 1 kHz	to 20 kHz	$0{,}11 \cdot 10^{-3} \cdot U + 0{,}25$ mV	
		> 20 kHz	to 50 kHz	$0{,}24 \cdot 10^{-3} \cdot U + 0{,}25$ mV	
		> 50 kHz	to 100 kHz	$0{,}65 \cdot 10^{-3} \cdot U + 0{,}25$ mV	
		> 100 kHz	to 300 kHz	$2{,}5 \cdot 10^{-3} \cdot U + 1$ mV	
		> 300 kHz	to 1 MHz	$8 \cdot 10^{-3} \cdot U + 1$ mV	
	>10 V to 100 V	10 Hz	to 40 Hz	$0{,}16 \cdot 10^{-3} \cdot U + 4{,}5$ mV	
		> 40 Hz	to 20 kHz	$0{,}16 \cdot 10^{-3} \cdot U + 2{,}5$ mV	
		>20 kHz	to 50 kHz	$0{,}28 \cdot 10^{-3} \cdot U + 2{,}5$ mV	
		>50 Hz	to 100 kHz	$0{,}95 \cdot 10^{-3} \cdot U + 2{,}5$ mV	
	>100 V to 700 V	10 Hz	to 40 Hz	$0{,}34 \cdot 10^{-3} \cdot U + 30$ mV	
		> 40 Hz	to 1 kHz	$0{,}33 \cdot 10^{-3} \cdot U + 20$ mV	
		> 1 kHz	to 20 kHz	$0{,}46 \cdot 10^{-3} \cdot U + 20$ mV	
		> 20 kHz	to 50 kHz	$0{,}95 \cdot 10^{-3} \cdot U + 20$ mV	
		> 50 kHz	to 100 kHz	$2{,}5 \cdot 10^{-3} \cdot U + 20$ mV	
	>700 V to 1000 V	10 Hz	to 10 k Hz	$0{,}11 \cdot 10^{-3} \cdot U + 25$ mV	
		> 10 kHz	to 30 kHz	$0{,}21 \cdot 10^{-3} \cdot U + 45$ mV	

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AC Voltage Measuring Devices	0,1 mA to 0,22 mA	10 Hz to 40 Hz	$0{,}30 \cdot 10^{-3} \cdot I + 20$ nA	I = measurement value
		> 40 Hz to < 1 kHz	$0{,}15 \cdot 10^{-3} \cdot I + 20$ nA	
		1 kHz to < 5 kHz	$0{,}33 \cdot 10^{-3} \cdot I + 20$ nA	
		5 kHz to 10 kHz	$1{,}2 \cdot 10^{-3} \cdot I + 80$ nA	
	> 0,22 mA to 2,2 mA	10 Hz to 40 Hz	$0{,}21 \cdot 10^{-3} \cdot I + 50$ nA	
		> 40 Hz to < 1 kHz	$0{,}11 \cdot 10^{-3} \cdot I + 50$ nA	
		1 kHz to < 5 kHz	$0{,}17 \cdot 10^{-3} \cdot I + 0{,}2$ µA	
		5 kHz to 10 kHz	$0{,}91 \cdot 10^{-3} \cdot I + 0{,}8$ µA	
	> 2,2 mA to < 22 mA	10 Hz to 40 Hz	$0{,}21 \cdot 10^{-3} \cdot I + 0{,}5$ µA	
		> 40 Hz to < 1 kHz	$0{,}11 \cdot 10^{-3} \cdot I + 0{,}5$ µA	
		1 kHz to < 5 kHz	$0{,}17 \cdot 10^{-3} \cdot I + 0{,}6$ µA	
		5 kHz to 10 kHz	$0{,}91 \cdot 10^{-3} \cdot I + 6$ µA	
	22 mA to < 220 mA	10 Hz to 40 Hz	$0{,}21 \cdot 10^{-3} \cdot I + 5$ µA	
		> 40 Hz to < 1 kHz	$0{,}10 \cdot 10^{-3} \cdot I + 5$ µA	
		1 kHz to < 5 kHz	$0{,}17 \cdot 10^{-3} \cdot I + 5$ µA	
		5 kHz to 10 kHz	$0{,}91 \cdot 10^{-3} \cdot I + 10$ µA	
	220 mA to 2,2 A	20 Hz to < 1 kHz	$0{,}21 \cdot 10^{-3} \cdot I + 40$ µA	
		1 kHz to < 5 kHz	$0{,}35 \cdot 10^{-3} \cdot I + 0{,}1$ mA	
		5 kHz to 10 kHz	$6 \cdot 10^{-3} \cdot I + 0{,}2$ mA	
	> 2,2 A to < 3 A	10 Hz to < 1 kHz	$1{,}6 \cdot 10^{-3} \cdot I + 0{,}1$ mA	I = measurement value
		>1 kHz to 5 kHz	$5 \cdot 10^{-3} \cdot I + 1$ mA	
		>5 kHz to 10 kHz	$20 \cdot 10^{-3} \cdot I + 5$ mA	
	>3 A to 11 A	45 Hz to 100 Hz	$0{,}6 \cdot 10^{-3} \cdot I + 2$ mA	
		>100 Hz to 1 kHz	$1 \cdot 10^{-3} \cdot I + 2$ mA	
		>1 kHz to 5 kHz	$25 \cdot 10^{-3} \cdot I + 2$ mA	
	>11 A to 20,5 A	45 Hz to 100 Hz	$1{,}1 \cdot 10^{-3} \cdot I + 5$ mA	
		>100 kHz to <1 kHz	$1{,}3 \cdot 10^{-3} \cdot I + 5$ mA	
		>1 kHz to 5 kHz	$25 \cdot 10^{-3} \cdot I + 5$ mA	
AC Current Sources	20 µA to <0,2 mA	10 Hz to 10 kHz	$0{,}25 \cdot 10^{-3} \cdot I + 0{,}03$ µA	I = set value
	0,2 mA to <2 mA	10 Hz to 10 kHz	$0{,}25 \cdot 10^{-3} \cdot I + 0{,}30$ µA	
	2 mA to <20 mA	10 Hz to 10 kHz	$0{,}25 \cdot 10^{-3} \cdot I + 3$ µA	
	20 mA to <200 mA	10 Hz to 10 kHz	$0{,}25 \cdot 10^{-3} \cdot I + 23$ µA	
	200 mA to <2 A	10 Hz to 2 kHz	$0{,}55 \cdot 10^{-3} \cdot I + 0{,}23$ mA	
		>2 kHz to 10 kHz	$0{,}65 \cdot 10^{-3} \cdot I + 0{,}23$ mA	

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AC Current Sources	2 A to 20 A	10 Hz to 2 kHz	$0{,}7 \cdot 10^{-3} \cdot I + 2{,}3$ mA	I = set value
		>2 kHz to 10 kHz	$2 \cdot 10^{-3} \cdot I + 2{,}3$ mA	
	50 µA to 20 A	10 Hz to 1 kHz	$75 \cdot 10^{-6} \cdot I$	
		>1 kHz to 20 kHz	$0{,}13 \cdot 10^{-3} \cdot I$	
		>20 kHz to 50 kHz	$0{,}25 \cdot 10^{-3} \cdot I$	
		>50 kHz to 100 kHz	$0{,}70 \cdot 10^{-3} \cdot I$	
AC Current Current Clamps	1 mA to 20 A	45 Hz to 1 kHz	$2{,}0 \cdot 10^{-3} \cdot I + 15$ µA	I = measurement value
	>20 A to 100 A		$2{,}5 \cdot 10^{-3} \cdot I$	
	>100 A to 1000 A		$3{,}0 \cdot 10^{-3} \cdot I$	
Capacitance Measuring Devices				C = set value
	220 pF to < 400 pF	10 Hz to 10 kHz	20 pF	
	0,4 nF to < 1,1 nF	10 Hz to 10 kHz	30 pF	
	1,1 nF to < 3,3 nF	10 Hz to 3 kHz	40 pF	
	3,3 nF to < 11 nF	10 Hz to 1 kHz	50 pF	
	11 nF to < 33 nF	10 Hz to 1 kHz	0,25 nF	
	33 nF to < 110 nF	10 Hz to 1 kHz	0,5 nF	
	110 nF to < 330 nF	10 Hz to 1 kHz	$9 \cdot 10^{-3} \cdot C$	
	330 nF to < 1,1 µF	10 Hz to 600 Hz	$9 \cdot 10^{-3} \cdot C$	
	1,1 µF to < 3,3 µF	10 Hz to 300 Hz	$9 \cdot 10^{-3} \cdot C$	
	3,3 µF to < 11 µF	10 Hz to 150 Hz	$9 \cdot 10^{-3} \cdot C$	
	11 µF to < 33 µF	10 Hz to 120 Hz	$9 \cdot 10^{-3} \cdot C$	
	33 µF to < 110 µF	10 Hz to 80 Hz	$13 \cdot 10^{-3} \cdot C$	
	110 µF to < 330 µF	0 Hz to 50 Hz	$9{,}5 \cdot 10^{-3} \cdot C$	
	0,33 mF to < 1,1 mF	0 Hz to 20 Hz	$9{,}5 \cdot 10^{-3} \cdot C$	
	1,1 mF to < 3,3 mF	0 Hz to 6 Hz	$9{,}5 \cdot 10^{-3} \cdot C$	
	3,3 mF to < 11 mF	0 Hz to 2 Hz	$9{,}5 \cdot 10^{-3} \cdot C$	
	11 mF to < 33 mF	0 Hz to 0,6 Hz	$12{,}5 \cdot 10^{-3} \cdot C$	
	33 mF to < 110 mF	0 Hz to 0,2 Hz	$18 \cdot 10^{-3} \cdot C$	
Capacitance Sources	0,1 pF to 1 nF	10 Hz .to 1 kHz	$1 \cdot 10^{-3} \cdot C + 0{,}05$ pF	
		>1kHz .to 10 kHz	$2{,}4 \cdot 10^{-3} \cdot C + 0{,}05$ pF	
		>10 kHz. to 100 kHz	$16 \cdot 10^{-3} \cdot C + 0{,}05$ pF	
	>1 nF to 10 µ	10 Hz to 1 kHz	$1 \cdot 10^{-3} \cdot C$	
		>1kHz .to 10 kHz	$2{,}4 \cdot 10^{-3} \cdot C$	
	>10 µF to 1 mF	10 Hz .to 1 kHz	$1 \cdot 10^{-3} \cdot C$	
	1 µF to 70 µF	DC-Methode	$3 \cdot 10^{-3} \cdot C$	
	>70 µF to 110 mF		$0{,}6 \cdot 10^{-3} \cdot C$	

Overview of Measuring Ranges for electrial measurements

Accreditation for Electrical Measuring Quantities
Accreditation Certificate D-K-15055-01-01

Permanent laboratory and on-site calibration Calibration and measurement capabilities (CMC)

Measurement quantity / Calibration item	Measuring range / Measuring span	Measuring conditions / method	Advanced measurement uncertainty [1)]	Remarks
Inductance Sources	0,1 µH to 100 mH	10 H to 1 kHz	$1 \cdot 10^{-3} \cdot L + 0{,}03$ µH	*L* = measurement value (with LCR-6100)
		>1kHz to 10 kHz	$2{,}4 \cdot 10^{-3} \cdot L + 0{,}03$ µH	
	100 mH to 100 H	10 Hz to 1 kHz	$1 \cdot 10^{-3} \cdot L$	
AC Power	1 mW to 20 kW	33 mV ≤ U ≤ 1000 V 10 mA ≤ *I* ≤ 20 A *PF* = 1,0 45 Hz to 65 Hz	$1{,}7 \cdot 10^{-3} \cdot P + 10$ µW	*P* = set value with Fluke 5522A *PF* = Power Factor = *cos φ* *Φ*= included angle *I* = measurement value *U* = measurement value
Power factor	0 to 1	33 mV ≤ U ≤ 1000 V 10 mA ≤ *I* ≤ 20 A 45 Hz to 65 Hz	$2{,}0 \cdot 10^{-3} \cdot PF$	*P* = set value witht Fluke 5522A *PF* = Power Factor = *cos φ* *φ*= included angle
Frequency Measuring Devices	10 mHz to 3 GHz		$90 \cdot 10^{-9} \cdot f + U_{tf}$	*f* = measurement value U_{tf} = Trigger uncertainty, with 33521A, DSG800
Scources	1 Hz to 1 MHz		$90 \cdot 10^{-9} \cdot f + U_{tf}$	*f* = measurement value U_{tf} = Trigger uncertainty, with 53220A
RPM Tachometer (optical)	60 min^{-1} to $3 \cdot 10^{-5}$ min^{-1}		$8 \cdot 10^{-6} \cdot U_d + 0{,}005$ min^{-1}	U_d = measurement value withFluke 33521A

Abbreviations used:
CMC – Calibration and measurement capabilities
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