

# Deutsche Akkreditierungsstelle GmbH

## Annex to the Accreditation Certificate D-K-15123-01-00 according to DIN EN ISO/IEC 17025:2018

**Valid from:** 04.06.2021

Date of issue 04.06.2021

Holder of certificate:

**Fluke Deutschland GmbH**  
**Heinrich-Pesch-Straße 11, 50739 Köln**

Calibration in the fields:

### Electrical quantities

#### DC and low frequency quantities

- DC voltage \*)
- AC voltage \*)
- DC current \*)
- AC current \*)
- DC resistance \*)
- AC/DC Transfer
- Capacitance

#### Time and frequency

- Frequency \*)

### High frequency quantities

- Oscilloscope quantities
- Risetime

\*) also on site calibrations

*The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories. Laboratories that conform to the requirements of this standard, operate generally in accordance with the principles of DIN EN ISO 9001.*

*The certificate together with the annex reflects the status as indicated by the date of issue.*

*The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH <https://www.dakks.de/en/content/accredited-bodies-dakks>.*

Abbreviations used: see last page

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

Annex to the accreditation certificate D-K-15123-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
DC voltage reference standard	1 V		$0.4 \cdot 10^{-6}$	
	1.018 V		$0.4 \cdot 10^{-6}$	
measurement instruments and sources	10 V		$0.2 \cdot 10^{-6}$	
	10 μV to 10 V		$0.2 \cdot 10^{-6}$	
	> 10 V to 100 V > 100 V to 1000 V		$\cdot [0.7 + (1.1 V/U)^2]^{1/2}$ $0.3 \cdot 10^{-6}$ $0.6 \cdot 10^{-6}$	
DC current measurement instruments	0.1 μA		$35 \cdot 10^{-6}$	
	> 0.1 μA to < 1 μA		$8.0 \cdot 10^{-6}$	
	> 1 μA to < 10 μA		$8.0 \cdot 10^{-6}$	
	10 μA to 2 A		$6.0 \cdot 10^{-6}$	
	> 2 A to 10 A		$12 \cdot 10^{-6}$	
	> 10 A to 20 A > 20 A to 100 A		$14 \cdot 10^{-6}$ $20 \cdot 10^{-6}$	
sources	0.1 μA		$35 \cdot 10^{-6}$	
	> 0.1 μA to < 1 μA		$6.0 \cdot 10^{-6}$	
	> 1 μA to < 10 μA		$6.0 \cdot 10^{-6}$	
	10 μA to 2 A		$4.0 \cdot 10^{-6}$	
	> 2 A to 10 A		$15 \cdot 10^{-6}$	
	> 10 A to 20 A > 20 A to 100 A		$20 \cdot 10^{-6}$ $30 \cdot 10^{-6}$	
current clamps	0 A to 1000 A		$5.0 \cdot 10^{-3}$	
DC resistance measurement instruments and reference standard	10 μΩ to < 100 μΩ		$22 \cdot 10^{-6}$	
	100 μΩ to < 1 mΩ		$4.6 \cdot 10^{-6}$	
	1 mΩ to < 10 mΩ		$2.3 \cdot 10^{-6}$	
	10 mΩ to < 1 Ω		$1.2 \cdot 10^{-6}$	
	1 Ω to < 10 kΩ		$3.0 \cdot 10^{-7}$	
	10 kΩ to 1 MΩ		$5.0 \cdot 10^{-7}$	
	> 1 MΩ to 100 MΩ		$2.0 \cdot 10^{-6}$	
	> 100 MΩ to 1000 MΩ		$8.0 \cdot 10^{-6}$	
	> 1 GΩ to 10 GΩ		$1.1 \cdot 10^{-3}$	
measurement instruments	> 1 GΩ to 10 GΩ		$4.0 \cdot 10^{-4}$	
DC Electric power power measurement and calibration generators	10 mW to 20 kW	simulated power	$27 \cdot 10^{-6}$	
AC voltage AC Voltage- measurement instruments	1 mV	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	$0.45 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.42 \cdot 10^{-3}$ $0.45 \cdot 10^{-3}$ $0.45 \cdot 10^{-3}$ $0.50 \cdot 10^{-3}$ $0.60 \cdot 10^{-3}$	Voltage range: 2.2 mV AC Measurement Standard Fluke 5790A/5790B

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15123-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks			
AC voltage AC voltage- measurement instruments	2 mV	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	$0.22 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.22 \cdot 10^{-3}$ $0.22 \cdot 10^{-3}$ $0.25 \cdot 10^{-3}$ $0.30 \cdot 10^{-3}$	Voltage range: 2.2 mV AC Measurement Standard Fluke 5790A/5790B			
	2 mV	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz; 500 kHz 700 kHz; 800 kHz 1 MHz	$0.20 \cdot 10^{-3}$ $0.18 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$ $0.18 \cdot 10^{-3}$ $0.19 \cdot 10^{-3}$ $0.22 \cdot 10^{-3}$ $0.25 \cdot 10^{-3}$		Voltage range: 7 mV AC Measurement Standard Fluke 5790A/5790B		
	6 mV	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz; 100 kHz 200 kHz; 300 kHz; 500 kHz 700 kHz; 800 kHz 1 MHz	$0.12 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.12 \cdot 10^{-3}$ $0.14 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$			Voltage range: 22 mV AC Measurement Standard Fluke 5790A/5790B	
	2 mV	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz 50 kHz; 70 kHz; 100 kHz 200 kHz; 300 kHz; 500 kHz 700 kHz 800 kHz 1 MHz	$0.19 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$ $0.17 \cdot 10^{-3}$ $0.18 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.21 \cdot 10^{-3}$ $0.25 \cdot 10^{-3}$				Voltage range: 22 mV AC Measurement Standard Fluke 5790A/5790B

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

**Annex to the accreditation certificate D-K-15123-01-00**

**Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage AC voltage- measurement instrument	6 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	1.0 · 10 <sup>-3</sup> 80 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 90 · 10 <sup>-6</sup> 0.10 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup>	Voltage range: 22 mV AC Measurement Standard Fluke 5790A/5790B
	10 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	80 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 0.10 · 10 <sup>-3</sup> 0.12 · 10 <sup>-3</sup>	
	20 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz; 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	60 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup>	
	20 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	90 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 90 · 10 <sup>-6</sup> 0.12 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage AC voltage- measurement instrument	40 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	75 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 0.10 · 10 <sup>-3</sup> 0.12 · 10 <sup>-3</sup>	Voltage range: 70 mV AC Measurement Standard Fluke 5790A/5790B
	60 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz 50 kHz; 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	60 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup>	
	60 mV	10 Hz 20 Hz; 30 Hz 55 Hz; 40 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	40 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 0.10 · 10 <sup>-3</sup> 0.12 · 10 <sup>-3</sup>	Voltage range: 220 mV AC Measurement Standard Fluke 5790A/5790B
	100 mV; 200 mV	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	15 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage AC voltage- measurement instrument	200 mV	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	15 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	Voltage range: 700 mV AC Measurement Standard Fluke 5790A/5790B
	300 mV; 400 mV	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	
	500 mV; 600 mV; 700 mV	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	
	600 mV	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 5.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks			
AC voltage AC voltage- measurement instrument	1 V; 2 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz; 200 kHz 300 kHz; 500 kHz 700 kHz; 800 kHz 1 MHz	5.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 10 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup>	Voltage range: 2.2 V AC Measurement Standard Fluke 5790A/5790B			
	2 V; 3 V; 4 V; 5 V; 6 V; 7 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz; 200 kHz 300 kHz; 500 kHz 700 kHz; 800 kHz 1 MHz	5.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 10 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup>		Voltage range: 7 V AC Measurement Standard Fluke 5790A/5790B		
	6 V; 8 V; 10 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz; 200 kHz 300 kHz; 500 kHz 700 kHz; 800 kHz 1 MHz	5.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 4.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 10 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup>			Voltage range: 22 V AC Measurement Standard Fluke 5790A/5790B	
	20 V	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	6.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 6.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 10 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup>				

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks	
AC voltage AC voltage- measurement instrument	20 V	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 10 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>	Voltage range: 70 V AC Measurement Standard Fluke 5790A/5790B	
	30 V	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	8.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 15 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>		
	40 V; 50 V; 60 V; 70 V	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	9.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup>		
	60 V	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	9.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 8.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 7.0 · 10 <sup>-6</sup> 9.0 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup>		Voltage range: 220 V AC Measurement Standard Fluke 5790A/5790B
	100 V; 200 V	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	14 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>		

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.



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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage AC voltage- measurement instrument	200 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	14 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>	Voltage range: 700 V AC Measurement Standard Fluke 5790A/5790B
	300 V; 400 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	16 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>	
	500 V; 600 V; 700 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	16 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>	
	200 V	10 Hz; 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz 70 kHz 100 kHz	14 · 10 <sup>-6</sup> 14 · 10 <sup>-6</sup> 14 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>	
300 V; 500 V	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	16 · 10 <sup>-6</sup> 14 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>		
600 V; 800 V; 1000 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz 70 kHz 100 kHz	18 · 10 <sup>-6</sup> 14 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>		

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15123-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage measurement instruments and sources	0.6 mV to 2.2 mV	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$1.1 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.49 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.28 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.54 \cdot 10^{-3} \cdot U + 1.3 \mu\text{V}$ $0.80 \cdot 10^{-3} \cdot U + 1.7 \mu\text{V}$ $1.5 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $1.6 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $2.1 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 2.2 mV
	1.9 mV to 7 mV	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.57 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.25 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.14 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.27 \cdot 10^{-3} \cdot U + 1.3 \mu\text{V}$ $0.40 \cdot 10^{-3} \cdot U + 1.7 \mu\text{V}$ $0.80 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $0.87 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $1.3 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 7 mV
	6 mV to 22 mV	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.19 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $0.12 \cdot 10^{-3} \cdot U + 0.9 \mu\text{V}$ $73 \cdot 10^{-6} \cdot U + 0.9 \mu\text{V}$ $0.14 \cdot 10^{-3} \cdot U + 1.3 \mu\text{V}$ $0.21 \cdot 10^{-3} \cdot U + 1.7 \mu\text{V}$ $0.54 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $0.57 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $0.93 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 22 mV
	19 mV to 70 mV	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $0.16 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $80 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $43 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $80 \cdot 10^{-6} \cdot U + 1.3 \mu\text{V}$ $0.17 \cdot 10^{-3} \cdot U + 1.7 \mu\text{V}$ $0.34 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $0.44 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $0.73 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 70 mV
	60 mV to 220 mV	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $0.14 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $56 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $25 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $46 \cdot 10^{-6} \cdot U + 1.3 \mu\text{V}$ $0.11 \cdot 10^{-3} \cdot U + 1.7 \mu\text{V}$ $0.16 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $0.24 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $0.63 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 220 mV
	190 mV to 700 mV	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $0.14 \cdot 10^{-3} \cdot U + 1.0 \mu\text{V}$ $50 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $21 \cdot 10^{-6} \cdot U + 1.0 \mu\text{V}$ $33 \cdot 10^{-6} \cdot U + 1.3 \mu\text{V}$ $53 \cdot 10^{-6} \cdot U + 1.7 \mu\text{V}$ $0.11 \cdot 10^{-3} \cdot U + 2.7 \mu\text{V}$ $0.20 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$ $0.60 \cdot 10^{-3} \cdot U + 4.0 \mu\text{V}$	U: measured value 5790A/B Range: 700 mV

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage measurement instruments and sources	600 mV to 2.2 V	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U$ $0.13 \cdot 10^{-3} \cdot U$ $43 \cdot 10^{-6} \cdot U$ $15 \cdot 10^{-6} \cdot U$ $30 \cdot 10^{-6} \cdot U$ $47 \cdot 10^{-6} \cdot U$ $0.10 \cdot 10^{-3} \cdot U$ $0.17 \cdot 10^{-3} \cdot U$ $0.56 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 2.2 V
	1.9 V to 7 V	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U$ $0.13 \cdot 10^{-3} \cdot U$ $44 \cdot 10^{-6} \cdot U$ $15 \cdot 10^{-6} \cdot U$ $31 \cdot 10^{-6} \cdot U$ $53 \cdot 10^{-6} \cdot U$ $0.12 \cdot 10^{-3} \cdot U$ $0.25 \cdot 10^{-3} \cdot U$ $0.73 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 7 V
	6 V to 22 V	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U$ $0.13 \cdot 10^{-3} \cdot U$ $44 \cdot 10^{-6} \cdot U$ $17 \cdot 10^{-6} \cdot U$ $31 \cdot 10^{-6} \cdot U$ $53 \cdot 10^{-6} \cdot U$ $0.12 \cdot 10^{-3} \cdot U$ $0.25 \cdot 10^{-3} \cdot U$ $0.73 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 22 V
	19 V to 70 V	9.5 Hz to < 10 Hz 10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$0.67 \cdot 10^{-3} \cdot U$ $0.13 \cdot 10^{-3} \cdot U$ $45 \cdot 10^{-6} \cdot U$ $20 \cdot 10^{-6} \cdot U$ $37 \cdot 10^{-6} \cdot U$ $61 \cdot 10^{-6} \cdot U$ $0.13 \cdot 10^{-3} \cdot U$ $0.27 \cdot 10^{-3} \cdot U$ $0.73 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 70 V
	60 V to 220 V	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz	$0.13 \cdot 10^{-3} \cdot U$ $45 \cdot 10^{-6} \cdot U$ $19 \cdot 10^{-6} \cdot U$ $45 \cdot 10^{-6} \cdot U$ $64 \cdot 10^{-6} \cdot U$ $0.14 \cdot 10^{-3} \cdot U$ $0.29 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 220 V
	190 V to 700 V	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.13 \cdot 10^{-3} \cdot U$ $64 \cdot 10^{-6} \cdot U$ $26 \cdot 10^{-6} \cdot U$ $80 \cdot 10^{-6} \cdot U$ $0.27 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 700 V
	600 V to 1050 V	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.13 \cdot 10^{-3} \cdot U$ $64 \cdot 10^{-6} \cdot U$ $25 \cdot 10^{-6} \cdot U$ $80 \cdot 10^{-6} \cdot U$ $0.27 \cdot 10^{-3} \cdot U$	<i>U</i> : measured value 5790A/B Range: 1100 V

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC /DC voltage-transfer	2 mV	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	0.11 · 10 <sup>-3</sup> 90 · 10 <sup>-6</sup> 85 · 10 <sup>-6</sup> 85 · 10 <sup>-6</sup> 85 · 10 <sup>-6</sup> 85 · 10 <sup>-6</sup> 85 · 10 <sup>-6</sup> 90 · 10 <sup>-6</sup> 0.11 · 10 <sup>-3</sup> 0.12 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.19 · 10 <sup>-3</sup>	Voltage range: 22 mV Thermal Transfer Standards Fluke 792A
	6 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz ; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	90 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 60 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 90 · 10 <sup>-6</sup> 0.12 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup>	
	10 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz ; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	75 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup> 55 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 95 · 10 <sup>-6</sup> 0.12 · 10 <sup>-3</sup>	
	20 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	60 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC /DC voltage-transfer	60 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz; 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	35 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 50 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup>	Voltage range: 220 mV Thermal Transfer Standards Fluke 792A
	100 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz; 70 kHz; 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	15 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	
	200 mV	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	15 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 20 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	
	200 mV	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	12 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks		
AC /DC voltage-transfer	300 mV; 400 mV; 500 mV; 600 mV; 700 mV	10 Hz; 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz 400 Hz; 500 Hz; 1 kHz 10 kHz; 20 kHz; 30 kHz 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>	Voltage range: 700 mV Thermal Transfer Standards Fluke 792A		
	600 mV	10 Hz; 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz; 300 Hz 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 5 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup> 40 · 10 <sup>-6</sup> 45 · 10 <sup>-6</sup>		Voltage range: 2.2 V Thermal Transfer Standards Fluke 792A	
	1 V; 2 V	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz 300 Hz ; 400 Hz; 500 Hz 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	4 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 5 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 15 · 10 <sup>-6</sup>			Voltage range: 7 V Thermal Transfer Standards Fluke 792A
	2 V; 3 V; 4 V; 5 V; 6 V; 7 V	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz 300 Hz ; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz 800 kHz 1 MHz	4 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 5 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 8 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 15 · 10 <sup>-6</sup>			

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC / DC voltage-transfer	6 V; 8 V	10 Hz 20 Hz 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz 300 Hz ; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	4 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 2 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 5 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 15 · 10 <sup>-6</sup>	Voltage range: 22 V Thermal Transfer Standards Fluke 792A
	10 V	10 Hz 20 Hz; 30 Hz; 40 Hz; 55 Hz 60 Hz; 120 Hz 300 Hz; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	4 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 4 · 10 <sup>-6</sup> 5 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 15 · 10 <sup>-6</sup>	
	20 V	10 Hz; 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup>	
	20 V	10 Hz; 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz; 120 Hz 300 Hz ; 400 Hz; 500 Hz 1 kHz; 10 kHz; 20 kHz 30 kHz; 50 kHz; 70 kHz 100 kHz 200 kHz; 300 kHz 500 kHz 700 kHz; 800 kHz 1 MHz	6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 6 · 10 <sup>-6</sup> 3 · 10 <sup>-6</sup> 7 · 10 <sup>-6</sup> 9 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 25 · 10 <sup>-6</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC / DC voltage-transfer	30 V	10 Hz	$7 \cdot 10^{-6}$	Voltage range: 70 V Thermal Transfer Standards Fluke 792A
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$6 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$6 \cdot 10^{-6}$	
		400 Hz; 500 Hz; 1 kHz	$6 \cdot 10^{-6}$	
		10 kHz; 20 kHz; 30 kHz	$6 \cdot 10^{-6}$	
		50 kHz; 70 kHz	$6 \cdot 10^{-6}$	
		100 kHz	$8 \cdot 10^{-6}$	
40 V; 50 V; 60 V; 70 V	40 V; 50 V; 60 V; 70 V	10 Hz	$8 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$7 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$7 \cdot 10^{-6}$	
		400 Hz; 500 Hz; 1 kHz	$6 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$6 \cdot 10^{-6}$	
		30 kHz; 50 kHz	$6 \cdot 10^{-6}$	
		70 kHz	$8 \cdot 10^{-6}$	
100 kHz	$12 \cdot 10^{-6}$			
60 V	60 V	10 Hz	$8 \cdot 10^{-6}$	Voltage range: 220 V Thermal Transfer Standards Fluke 792A
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$7 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$7 \cdot 10^{-6}$	
		400 Hz; 500 Hz; 1 kHz	$6 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$6 \cdot 10^{-6}$	
		30 kHz; 50 kHz	$6 \cdot 10^{-6}$	
		70 kHz	$8 \cdot 10^{-6}$	
100 kHz	$12 \cdot 10^{-6}$			
100 V	100 V	10 Hz	$12 \cdot 10^{-6}$	
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$11 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$11 \cdot 10^{-6}$	
		400 Hz; 500 Hz; 1 kHz	$11 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$11 \cdot 10^{-6}$	
		30 kHz; 50 kHz	$11 \cdot 10^{-6}$	
		70 kHz	$18 \cdot 10^{-6}$	
100 kHz	$30 \cdot 10^{-6}$			
200 V	200 V	10 Hz; 20 Hz	$12 \cdot 10^{-6}$	
		30 Hz; 40 Hz; 55 Hz	$12 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$12 \cdot 10^{-6}$	
		400 Hz; 500 Hz; 1 kHz	$11 \cdot 10^{-6}$	
		10 kHz; 20 kHz	$11 \cdot 10^{-6}$	
		30 kHz; 50 kHz	$11 \cdot 10^{-6}$	
		70 kHz	$18 \cdot 10^{-6}$	
100 kHz	$30 \cdot 10^{-6}$			
200 V	200 V	10 Hz	$15 \cdot 10^{-6}$	Voltage range: 1000 V Thermal Transfer Standards Fluke 792A
		20 Hz	$13 \cdot 10^{-6}$	
		30 Hz; 40 Hz; 55 Hz	$12 \cdot 10^{-6}$	
		60 Hz; 120 Hz; 300 Hz	$12 \cdot 10^{-6}$	
		400 Hz; 500 Hz	$11 \cdot 10^{-6}$	
		1 kHz; 10 kHz	$11 \cdot 10^{-6}$	
		20 kHz; 30 kHz; 50 kHz	$11 \cdot 10^{-6}$	
		70 kHz	$18 \cdot 10^{-6}$	
		100 kHz	$30 \cdot 10^{-6}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.



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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC /DC voltage-transfer	300 V	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	15 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 30 · 10 <sup>-6</sup>	Voltage range: 1000 V Thermal Transfer Standards Fluke 792A
	500 V	10 Hz 20 Hz; 30 Hz 40 Hz; 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	17 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>	
	600 V; 800 V; 1000 V	10 Hz 20 Hz; 30 Hz; 40 Hz 55 Hz; 60 Hz 120 Hz; 300 Hz; 400 Hz 500 Hz; 1 kHz; 10 kHz 20 kHz; 30 kHz; 50 kHz 70 kHz 100 kHz	17 · 10 <sup>-6</sup> 12 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 11 · 10 <sup>-6</sup> 18 · 10 <sup>-6</sup> 35 · 10 <sup>-6</sup>	
AC voltage	1 mV	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	0.50 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.70 · 10 <sup>-3</sup> 0.90 · 10 <sup>-3</sup>	Square wave voltage, Triangular voltage at 50 Ω and 1 MΩ
	2 mV	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	0.30 · 10 <sup>-3</sup> 0.30 · 10 <sup>-3</sup> 0.30 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.80 · 10 <sup>-3</sup>	
	6 mV; 10 mV; 20 mV	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	0.20 · 10 <sup>-3</sup> 0.20 · 10 <sup>-3</sup> 0.20 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.80 · 10 <sup>-3</sup>	
	40 mV	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	0.20 · 10 <sup>-3</sup> 0.20 · 10 <sup>-3</sup> 0.20 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.80 · 10 <sup>-3</sup>	
	60 mV	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	0.15 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.50 · 10 <sup>-3</sup> 0.80 · 10 <sup>-3</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC voltage	100 mV to 30 V	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz 200 kHz to 700 kHz 700 kHz to 1 MHz	$0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.45 \cdot 10^{-3}$ $0.80 \cdot 10^{-3}$	Square wave voltage, Triangular voltage at 50 $\Omega$ and 1 M $\Omega$
AC voltage: Square wave voltage. Triangular voltage	40 V to 100 V	10 Hz to 40 Hz 55 Hz to 10 kHz 10 kHz to 100 kHz	$0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$ $0.10 \cdot 10^{-3}$	Square wave voltage, Triangular voltage at 50 $\Omega$ and 1 M $\Omega$
AC/DC current transfer	300 $\mu$ A; 1 mA; 3 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$15 \cdot 10^{-6}$ $11 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $25 \cdot 10^{-6}$ $30 \cdot 10^{-6}$ $35 \cdot 10^{-6}$	
	5 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$13 \cdot 10^{-6}$ $13 \cdot 10^{-6}$ $22 \cdot 10^{-6}$ $32 \cdot 10^{-6}$ $39 \cdot 10^{-6}$ $49 \cdot 10^{-6}$ $67 \cdot 10^{-6}$	
	10 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$15 \cdot 10^{-6}$ $11 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $25 \cdot 10^{-6}$ $25 \cdot 10^{-6}$ $25 \cdot 10^{-6}$	
	20 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$13 \cdot 10^{-6}$ $13 \cdot 10^{-6}$ $14 \cdot 10^{-6}$ $14 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $22 \cdot 10^{-6}$	
	30 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$13 \cdot 10^{-6}$ $13 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $18 \cdot 10^{-6}$ $22 \cdot 10^{-6}$ $29 \cdot 10^{-6}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC/DC current transfer	50 mA	10 Hz to 40 Hz	$13 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$13 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$15 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$15 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$15 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$15 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$18 \cdot 10^{-6}$	
		100 mA	10 Hz to 40 Hz	
> 40 Hz to 1 kHz	$14 \cdot 10^{-6}$			
> 1 kHz to 10 kHz	$14 \cdot 10^{-6}$			
> 10 kHz to 20 kHz	$15 \cdot 10^{-6}$			
> 20 kHz to 50 kHz	$16 \cdot 10^{-6}$			
> 50 kHz to 70 kHz	$16 \cdot 10^{-6}$			
> 70 kHz to 100 kHz	$16 \cdot 10^{-6}$			
200 mA	10 Hz to 40 Hz			$15 \cdot 10^{-6}$
		> 40 Hz to 1 kHz	$15 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$15 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$16 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$17 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$17 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$17 \cdot 10^{-6}$	
		300 mA	10 Hz to 40 Hz	$13 \cdot 10^{-6}$
> 40 Hz to 1 kHz	$13 \cdot 10^{-6}$			
> 1 kHz to 10 kHz	$13 \cdot 10^{-6}$			
> 10 kHz to 20 kHz	$13 \cdot 10^{-6}$			
> 20 kHz to 50 kHz	$17 \cdot 10^{-6}$			
> 50 kHz to 70 kHz	$24 \cdot 10^{-6}$			
> 70 kHz to 100 kHz	$28 \cdot 10^{-6}$			
500 mA	10 Hz to 40 Hz			$13 \cdot 10^{-6}$
		> 40 Hz to 1 kHz	$13 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$13 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$13 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$14 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$17 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$17 \cdot 10^{-6}$	
		1 A	10 Hz to 40 Hz	$13 \cdot 10^{-6}$
> 40 Hz to 1 kHz	$13 \cdot 10^{-6}$			
> 1 kHz to 10 kHz	$13 \cdot 10^{-6}$			
> 10 kHz to 20 kHz	$17 \cdot 10^{-6}$			
> 20 kHz to 50 kHz	$17 \cdot 10^{-6}$			
> 50 kHz to 70 kHz	$17 \cdot 10^{-6}$			
> 70 kHz to 100 kHz	$21 \cdot 10^{-6}$			
2 A	10 Hz to 40 Hz			$15 \cdot 10^{-6}$
		> 40 Hz to 1 kHz	$15 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$15 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$17 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$21 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$29 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$43 \cdot 10^{-6}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC/DC current transfer	3 A	10 Hz to 40 Hz	$21 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$21 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$21 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$27 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$46 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$64 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$90 \cdot 10^{-6}$	
5 A	5 A	10 Hz to 40 Hz	$20 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$20 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$20 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$21 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$30 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$45 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$65 \cdot 10^{-6}$	
10 A	10 A	10 Hz to 40 Hz	$24 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$25 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$25 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$25 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$53 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$64 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$84 \cdot 10^{-6}$	
20 A	20 A	10 Hz to 40 Hz	$34 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$34 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$43 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$43 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$64 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$86 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$0.11 \cdot 10^{-3}$	
50 A	50 A	10 Hz to 40 Hz	$45 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$45 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$56 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$56 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$76 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$0.11 \cdot 10^{-3}$	
		> 70 kHz to 100 kHz	$0.15 \cdot 10^{-3}$	
100 A	100 A	10 Hz to 40 Hz	$64 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$64 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$81 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$83 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$93 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$0.14 \cdot 10^{-3}$	
		> 70 kHz to 100 kHz	$0.17 \cdot 10^{-3}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC current calibration generators and sources	100 $\mu$ A	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$65 \cdot 10^{-6}$ $60 \cdot 10^{-6}$ $65 \cdot 10^{-6}$ $70 \cdot 10^{-6}$ $75 \cdot 10^{-6}$ $80 \cdot 10^{-6}$ $0.10 \cdot 10^{-3}$	
	300 $\mu$ A; 1 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$25 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $25 \cdot 10^{-6}$ $35 \cdot 10^{-6}$ $45 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $80 \cdot 10^{-6}$	
	3 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$20 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $25 \cdot 10^{-6}$ $35 \cdot 10^{-6}$ $45 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $80 \cdot 10^{-6}$	
	5 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$26 \cdot 10^{-6}$ $24 \cdot 10^{-6}$ $29 \cdot 10^{-6}$ $36 \cdot 10^{-6}$ $42 \cdot 10^{-6}$ $49 \cdot 10^{-6}$ $68 \cdot 10^{-6}$	
	10 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$19 \cdot 10^{-6}$ $17 \cdot 10^{-6}$ $23 \cdot 10^{-6}$ $31 \cdot 10^{-6}$ $39 \cdot 10^{-6}$ $44 \cdot 10^{-6}$ $64 \cdot 10^{-6}$	
	20 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$19 \cdot 10^{-6}$ $17 \cdot 10^{-6}$ $23 \cdot 10^{-6}$ $31 \cdot 10^{-6}$ $38 \cdot 10^{-6}$ $44 \cdot 10^{-6}$ $65 \cdot 10^{-6}$	
	30 mA;	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	$19 \cdot 10^{-6}$ $17 \cdot 10^{-6}$ $24 \cdot 10^{-6}$ $31 \cdot 10^{-6}$ $39 \cdot 10^{-6}$ $45 \cdot 10^{-6}$ $67 \cdot 10^{-6}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC current calibration generators and sources	50 mA	10 Hz to 40 Hz	$19 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$17 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$24 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$31 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$38 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$42 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$63 \cdot 10^{-6}$	
		100 mA	10 Hz to 40 Hz	
> 40 Hz to 1 kHz	$17 \cdot 10^{-6}$			
> 1 kHz to 10 kHz	$23 \cdot 10^{-6}$			
> 10 kHz to 20 kHz	$31 \cdot 10^{-6}$			
> 20 kHz to 50 kHz	$38 \cdot 10^{-6}$			
> 50 kHz to 70 kHz	$43 \cdot 10^{-6}$			
> 70 kHz to 100 kHz	$63 \cdot 10^{-6}$			
200 mA	10 Hz to 40 Hz		$21 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$18 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$24 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$32 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$39 \cdot 10^{-6}$		
	> 50 kHz to 70 kHz	$43 \cdot 10^{-6}$		
	> 70 kHz to 100 kHz	$63 \cdot 10^{-6}$		
	300 mA	10 Hz to 40 Hz	$19 \cdot 10^{-6}$	
> 40 Hz to 1 kHz		$17 \cdot 10^{-6}$		
> 1 kHz to 10 kHz		$23 \cdot 10^{-6}$		
> 10 kHz to 20 kHz		$30 \cdot 10^{-6}$		
> 20 kHz to 50 kHz		$42 \cdot 10^{-6}$		
> 50 kHz to 70 kHz		$49 \cdot 10^{-6}$		
> 70 kHz to 100 kHz		$69 \cdot 10^{-6}$		
500 mA		10 Hz to 40 Hz	$19 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$17 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$23 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$30 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$40 \cdot 10^{-6}$		
	> 50 kHz to 70 kHz	$46 \cdot 10^{-6}$		
	> 70 kHz to 100 kHz	$65 \cdot 10^{-6}$		
	1 A	10 Hz to 40 Hz	$20 \cdot 10^{-6}$	
> 40 Hz to 1 kHz		$18 \cdot 10^{-6}$		
> 1 kHz to 10 kHz		$23 \cdot 10^{-6}$		
> 10 kHz to 20 kHz		$33 \cdot 10^{-6}$		
> 20 kHz to 50 kHz		$42 \cdot 10^{-6}$		
> 50 kHz to 70 kHz		$46 \cdot 10^{-6}$		
> 70 kHz to 100 kHz		$66 \cdot 10^{-6}$		
2 A		10 Hz to 40 Hz	$22 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$18 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$25 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$32 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$44 \cdot 10^{-6}$		
	> 50 kHz to 70 kHz	$52 \cdot 10^{-6}$		
	> 70 kHz to 100 kHz	$76 \cdot 10^{-6}$		

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC current calibration generators and sources	3 A	10 Hz to 40 Hz	$27 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$25 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$29 \cdot 10^{-6}$	
		> 10 kHz to 20 kHz	$36 \cdot 10^{-6}$	
		> 20 kHz to 50 kHz	$53 \cdot 10^{-6}$	
		> 50 kHz to 70 kHz	$67 \cdot 10^{-6}$	
		> 70 kHz to 100 kHz	$94 \cdot 10^{-6}$	
		5 A	10 Hz to 40 Hz	
> 40 Hz to 1 kHz	$25 \cdot 10^{-6}$			
> 1 kHz to 10 kHz	$29 \cdot 10^{-6}$			
> 10 kHz to 20 kHz	$36 \cdot 10^{-6}$			
> 20 kHz to 50 kHz	$52 \cdot 10^{-6}$			
> 50 kHz to 70 kHz	$65 \cdot 10^{-6}$			
> 70 kHz to 100 kHz	$92 \cdot 10^{-6}$			
10A	10 Hz to 40 Hz		$30 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$29 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$33 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$38 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$71 \cdot 10^{-6}$		
	> 50 kHz to 70 kHz	$81 \cdot 10^{-6}$		
	> 70 kHz to 100 kHz	$0.11 \cdot 10^{-3}$		
	20 A	10 Hz to 40 Hz	$38 \cdot 10^{-6}$	
> 40 Hz to 1 kHz		$37 \cdot 10^{-6}$		
> 1 kHz to 10 kHz		$48 \cdot 10^{-6}$		
> 10 kHz to 20 kHz		$52 \cdot 10^{-6}$		
> 20 kHz to 50 kHz		$79 \cdot 10^{-6}$		
> 50 kHz to 70 kHz		$0.10 \cdot 10^{-3}$		
> 70 kHz to 100 kHz		$0.13 \cdot 10^{-3}$		
30 A		10 Hz to 40 Hz	$61 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$61 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$70 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$78 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$98 \cdot 10^{-6}$		
	> 50 kHz to 70 kHz	$0.13 \cdot 10^{-3}$		
	> 70 kHz to 100 kHz	$0.17 \cdot 10^{-3}$		
	50 A	10 Hz to 40 Hz	$61 \cdot 10^{-6}$	
> 40 Hz to 1 kHz		$61 \cdot 10^{-6}$		
> 1 kHz to 10 kHz		$70 \cdot 10^{-6}$		
> 10 kHz to 20 kHz		$78 \cdot 10^{-6}$		
> 20 kHz to 50 kHz		$98 \cdot 10^{-6}$		
> 50 kHz to 70 kHz		$0.13 \cdot 10^{-3}$		
> 70 kHz to 100 kHz		$0.17 \cdot 10^{-3}$		
80 A;100 A		10 Hz to 40 Hz	$68 \cdot 10^{-6}$	
	> 40 Hz to 1 kHz	$68 \cdot 10^{-6}$		
	> 1 kHz to 10 kHz	$85 \cdot 10^{-6}$		
	> 10 kHz to 20 kHz	$92 \cdot 10^{-6}$		
	> 20 kHz to 50 kHz	$0.10 \cdot 10^{-3}$		
	> 50 kHz to 70 kHz	$0.15 \cdot 10^{-3}$		
	> 70 kHz to 100 kHz	$0.19 \cdot 10^{-3}$		

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC current measurement instruments	100 µA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	0.10 · 10 <sup>-3</sup> 95 · 10 <sup>-6</sup> 0.15 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup> 0.17 · 10 <sup>-3</sup>	
	300 µA; 1 mA; 3 mA; 5 mA; 10 mA; 20 mA; 30 mA; 50 mA; 100 mA; 200 mA; 300 mA; 500 mA	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	75 · 10 <sup>-6</sup> 65 · 10 <sup>-6</sup> 0.14 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup>	
	1 A; 2 A	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	75 · 10 <sup>-6</sup> 70 · 10 <sup>-6</sup> 0.14 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup>	
	3 A; 5 A	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	80 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 0.14 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup> 0.17 · 10 <sup>-3</sup>	
	10A	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	80 · 10 <sup>-6</sup> 75 · 10 <sup>-6</sup> 0.14 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.16 · 10 <sup>-3</sup> 0.17 · 10 <sup>-3</sup> 0.19 · 10 <sup>-3</sup>	
	20 A	10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 70 kHz > 70 kHz to 100 kHz	90 · 10 <sup>-6</sup> 80 · 10 <sup>-6</sup> 0.14 · 10 <sup>-3</sup> 0.15 · 10 <sup>-3</sup> 0.17 · 10 <sup>-3</sup> 0.18 · 10 <sup>-3</sup> 0.20 · 10 <sup>-3</sup>	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.



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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC current measurement instruments	30 A	10 Hz to 40 Hz	$90 \cdot 10^{-6}$	
		> 40 Hz to 1 kHz	$85 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$0.15 \cdot 10^{-3}$	
		> 20 kHz to 30 kHz	$0.16 \cdot 10^{-3}$	
	50 A	50 kHz	$0.17 \cdot 10^{-3}$	
		70 kHz	$0.19 \cdot 10^{-3}$	
		100 kHz	$0.23 \cdot 10^{-3}$	
		10 Hz to 40 Hz	$90 \cdot 10^{-6}$	
	80 A	> 40 Hz to 1 kHz	$85 \cdot 10^{-6}$	
		> 1 kHz to 10 kHz	$0.15 \cdot 10^{-3}$	
		> 20 kHz to 30 kHz	$0.16 \cdot 10^{-3}$	
		50 kHz	$0.17 \cdot 10^{-3}$	
	100 A	70 kHz	$0.18 \cdot 10^{-3}$	
		100 kHz	$0.20 \cdot 10^{-3}$	
		10 Hz to 40 Hz	$0.10 \cdot 10^{-3}$	
		> 40 Hz to 1 kHz	$90 \cdot 10^{-6}$	
Inductance measurement instruments	100 μH	100 Hz; 400 Hz; 1000 Hz; 10 kHz	$0.5 \cdot 10^{-3}$	
		1 mH; 10 mH	$0.4 \cdot 10^{-3}$	
	100 mH	100 Hz; 400 Hz; 1000 Hz	$0.4 \cdot 10^{-3}$	
		10 kHz	$0.5 \cdot 10^{-3}$	
	1 H; 2 H; 5 H	100 Hz; 400 Hz; 1000 Hz	$0.4 \cdot 10^{-3}$	
	10 H	100 Hz; 400 Hz	$0.4 \cdot 10^{-3}$	
		1000 Hz	$0.6 \cdot 10^{-3}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
Capacitance measurement instruments	1 pF	100 Hz 1 kHz 10 kHz	$0.12 \cdot 10^{-3}$	
	10 pF; 100 pF	100 Hz 1 kHz 10 kHz 100 kHz 1000 kHz	$70 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $80 \cdot 10^{-6}$ $0.1 \cdot 10^{-3}$ $0.4 \cdot 10^{-3}$	
	1000 pF	100 Hz 1 kHz 10 kHz 100 kHz 1MHz	$80 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $80 \cdot 10^{-6}$ $0.15 \cdot 10^{-3}$ $1.5 \cdot 10^{-3}$	
	10 nF	100 Hz; 1 kHz; 10 kHz	$0.1 \cdot 10^{-3}$	
	100 nF. 1 $\mu$ F	100 Hz 1 kHz 10 kHz	$0.11 \cdot 10^{-3}$	
			$0.11 \cdot 10^{-3}$ $0.16 \cdot 10^{-3}$	
Capacitance reference standard	$\geq 100$ pF	1 kHz; 10 kHz	$0.55 \cdot 10^{-3}$	
	$\geq 1$ nF to 3 nF	100 Hz; 1 kHz; 10 kHz	$0.13 \cdot 10^{-3}$	
	$\geq 3$ nF to 10 nF		$0.33 \cdot 10^{-3}$	
	$\geq 10$ nF to 100 nF		$0.26 \cdot 10^{-3}$	
	$\geq 100$ nF to 110 $\mu$ F		$0.35 \cdot 10^{-3}$	
Capacitance calibration generators	> 110 $\mu$ F to 110 mF		DC	$0.3 \cdot 10^{-3}$

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
Oscilloscopes deflection vertical	5 mV to 30 mV	Square wave voltage 10 Hz to 10 kHz	0.03 %	
	> 30 mV to 300 mV	10 Hz to 10 kHz	0.02 %	
	> 300 mV to 200 V	10 Hz to 10 kHz	0.016 %	
horizontal	> 500 ps to 5 s	Time mark amplitude < 1 V	$0.015 \% \cdot t_0 + 2 \text{ ps}$	$t_0 =$ period of time markers
rise time	> 50 ps to 100 ps	Step amplitude < 1 V	7 ps	$t_r =$ Rise time
	> 100 ps to 10 ms		$2 \cdot 10^{-2} \cdot t_r + 4 \text{ ps}$	
Oscilloscope calibrator Deflection vertical	5 mV to 30 mV	Square wave voltage 10 Hz to 10 kHz	$0.23 \cdot 10^{-3}$	
	> 30 mV to 300 mV	10 Hz to 10 kHz	$0.12 \cdot 10^{-3}$	
	> 300 mV to 200 V	10 Hz to 10 kHz	$40 \cdot 10^{-6}$	
horizontal	> 1 s to 5 s	Time mark amplitude > 0.5 V	$3 \cdot 10^{-11} + W_{\text{tr}}$	Measurement period > 1000 s
	> 10 ns to 1 s		$2 \cdot 10^{-11} + W_{\text{tr}}$	$W_{\text{tr}} =$ relative
	> 500 ps to 10 ns		$3 \cdot 10^{-11}$	trigger uncertainty
rise-time	14 ps to 100 ps	Step amplitude < 1 V	3 ps	$t_r =$ rise-time
	> 100 ps to 10 ms		$2 \cdot 10^{-2} \cdot t_r + 4 \text{ ps}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
Frequency	1 MHz 5 MHz 10 MHz	Sinus. $U_{\text{eff}} \geq 0.5 \text{ V}$ measurement period > 24 h	$6 \cdot 10^{-12}$	Analoge phase time difference measurement
	0.01 Hz to 1 Hz	Sinus. $U_{\text{eff}} \geq 0.5 \text{ V}$ measurement period > 1000 s	$3 \cdot 10^{-11} + W_{\text{tr}}$	$W_{\text{tr}}$ = rel. trigger uncertainty digital Frequency measurement on count basis
	1 Hz to 150 MHz  150 MHz to 4.7 GHz	Sinus. $U_{\text{eff}} \geq 0.5 \text{ V}$ measurement period > 1000 s  Sinus. $U_{\text{eff}} \geq 0.5 \text{ V}$ measurement period > 1000 s	$2 \cdot 10^{-11} + W_{\text{tr}}$  $3 \cdot 10^{-11}$	Digital Frequency measurement on count basis

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
DC voltage measurement instruments and sources	0.01 V to 0.22 V		$8 \cdot 10^{-6} \cdot U + 2 \mu\text{V}$	$U =$ measured value
	> 0.22 V to 2.2 V		$5 \cdot 10^{-6} \cdot U + 2 \mu\text{V}$	
DC current	> 2.2 V to 11 V		$4 \cdot 10^{-6} \cdot U + 8 \mu\text{V}$	$I =$ measured value
	> 11 V to 22 V		$4 \cdot 10^{-6} \cdot U + 5 \mu\text{V}$	
	> 22 V to 220 V		$7 \cdot 10^{-6} \cdot U + 60 \mu\text{V}$	
	> 220 V to 1000 V		$8 \cdot 10^{-6} \cdot U + 0.7 \text{ mV}$	
	10 $\mu\text{A}$ to 220 $\mu\text{A}$		$80 \cdot 10^{-6}$	
	> 220 $\mu\text{A}$ to 2.2 mA		$50 \cdot 10^{-6}$	
> 2.2 mA to 22 mA	$50 \cdot 10^{-6}$			
> 22 mA to 220 mA	$60 \cdot 10^{-6} \cdot I + 1 \mu\text{A}$			
> 0.22 A to 2.2 A	$80 \cdot 10^{-6} \cdot I + 25 \mu\text{A}$			
> 2.2 A to 10 A	$4 \cdot 10^{-4} \cdot I + 0.48 \text{ mA}$			
Current clamps	0 A to 1000 A		$5 \cdot 10^{-3}$	
DC resistance measurement instruments and reference standards	0.1 $\Omega$ to 1.9 $\Omega$		$85 \cdot 10^{-6}$	
	> 1.9 $\Omega$ to 10 $\Omega$		$30 \cdot 10^{-6}$	
	> 10 $\Omega$ to 19 $\Omega$		$25 \cdot 10^{-6}$	
	> 19 $\Omega$ to 190 $\Omega$		$20 \cdot 10^{-6}$	
	> 190 $\Omega$ to 1.9 k $\Omega$		$15 \cdot 10^{-6}$	
	> 1.9 k $\Omega$ to 19 k $\Omega$		$12 \cdot 10^{-6}$	
	> 19 k $\Omega$ to 190 k $\Omega$		$15 \cdot 10^{-6}$	
	> 190 k $\Omega$ to 1.9 M $\Omega$		$20 \cdot 10^{-6}$	
	> 1.9 M $\Omega$ to 10 M $\Omega$		$35 \cdot 10^{-6}$	
	> 10 M $\Omega$ to 19 M $\Omega$		$70 \cdot 10^{-6}$	
	> 19 M $\Omega$ to 100 M $\Omega$		$0.12 \cdot 10^{-3}$	
AC Voltage measurement instruments and sources	60 mV to 220 mV	10 Hz to 20 Hz	$0.84 \cdot 10^{-3}$	
		> 20 Hz to 40 Hz	$0.38 \cdot 10^{-3}$	
		> 40 Hz to 20 kHz	$0.27 \cdot 10^{-3}$	
		> 20 kHz to 50 kHz	$0.48 \cdot 10^{-3}$	
		> 50 kHz to 100 kHz	$1.4 \cdot 10^{-3}$	
		> 100 kHz to 300 kHz	$1.7 \cdot 10^{-3}$	
		> 300 kHz to 500 kHz	$2.5 \cdot 10^{-3}$	
	> 500 kHz to 1 MHz	$5.2 \cdot 10^{-3}$		
	> 220 mV to 2.2 V	10 Hz to 20 Hz	$0.95 \cdot 10^{-3}$	
		> 20 Hz to 40 Hz	$0.3 \cdot 10^{-3}$	
		> 40 Hz to 20 kHz	$0.11 \cdot 10^{-3}$	
		> 20 kHz to 50 kHz	$0.22 \cdot 10^{-3}$	
		> 50 kHz to 100 kHz	$0.62 \cdot 10^{-3}$	
		> 100 kHz to 300 kHz	$1.2 \cdot 10^{-3}$	
> 300 kHz to 500 kHz		$3.0 \cdot 10^{-3}$		
> 500 kHz to 1 MHz	$6.7 \cdot 10^{-3}$			

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**On-site Calibration**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC Voltage measurement instruments and sources	> 2.2 V to 22 V	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz >100 kHz to 300 kHz >300 kHz to 500 kHz >500 kHz to 1 MHz	$0.95 \cdot 10^{-3}$ $0.3 \cdot 10^{-3}$ $0.11 \cdot 10^{-3}$ $0.22 \cdot 10^{-3}$ $0.43 \cdot 10^{-3}$ $1.4 \cdot 10^{-3}$ $3.6 \cdot 10^{-3}$ $7.4 \cdot 10^{-3}$	
	> 22 V to 220 V	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.95 \cdot 10^{-3}$ $0.3 \cdot 10^{-3}$ $0.13 \cdot 10^{-3}$ $0.41 \cdot 10^{-3}$ $0.95 \cdot 10^{-3}$	
	> 220 V to 1100 V	10 Hz to 50 Hz > 50 Hz to 1 kHz > 1 kHz to 20 kHz > 20 kHz to 30 kHz	$0.50 \cdot 10^{-3}$ $0.15 \cdot 10^{-3}$ $0.20 \cdot 10^{-3}$ $0.50 \cdot 10^{-3}$	
	> 220 V to 750 V	30 kHz to 50 kHz > 50 kHz to 100 kHz	$0.5 \cdot 10^{-3}$ $1.8 \cdot 10^{-3}$	

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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**On-site Calibration**

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement <sup>1)</sup>	Remarks
AC Current measurement instruments and sources	10 $\mu$ A to 220 $\mu$ A	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.7 · 10 <sup>-3</sup> 0.36 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.59 · 10 <sup>-3</sup> 1.7 · 10 <sup>-3</sup>	/ = measured value
	> 220 $\mu$ A to 2.2 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.7 · 10 <sup>-3</sup> 0.36 · 10 <sup>-3</sup> 0.14 · 10 <sup>-3</sup> 0.59 · 10 <sup>-3</sup> · / + 1 $\mu$ A 1.7 · 10 <sup>-3</sup> · / + 1 $\mu$ A	
	> 2.2 mA to 22 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.7 · 10 <sup>-3</sup> · / + 1 $\mu$ A 0.36 · 10 <sup>-3</sup> · / + 1 $\mu$ A 0.14 · 10 <sup>-3</sup> · / + 1 $\mu$ A 0.59 · 10 <sup>-3</sup> · / + 5 $\mu$ A 1.7 · 10 <sup>-3</sup> · / + 10 $\mu$ A	
	> 22 mA to 220 mA	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.7 · 10 <sup>-3</sup> · / + 5 $\mu$ A 0.36 · 10 <sup>-3</sup> · / + 5 $\mu$ A 0.14 · 10 <sup>-3</sup> · / + 5 $\mu$ A 0.59 · 10 <sup>-3</sup> · / + 50 $\mu$ A 1.7 · 10 <sup>-3</sup> · / + 0.1 mA	
	> 220 mA to 2.2 A	20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.64 · 10 <sup>-3</sup> · / + 50 $\mu$ A 0.76 · 10 <sup>-3</sup> · / + 0.1 mA 8.7 · 10 <sup>-3</sup> · / + 0.2 mA	
	> 2.2 A to 11 A	40 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	0.47 · 10 <sup>-3</sup> · / + 0.2 mA 1 · 10 <sup>-3</sup> · / + 0.5 mA 3.8 · 10 <sup>-3</sup> · / + 0.9 mA	

**Abbreviations used:**

CMC Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)

<sup>1)</sup> The expanded uncertainties according to EA-4/02 M:2013 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of  $k = 2$  unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.