Deutsche Akkreditierungsstelle GmbH

Annex up to the accreditation certificate D-K-15070-01-01 according up to DIN EN ISO/IEC 17025:2018

Valid from: 21.07.2021

Date of issue: 21.07.2021

Certificate holder:

Testo Industrial Services GmbH
Gewerbestraße 3, 79199 Kirchzarten,
Germany

The German original version
„Anlage zur Akkreditierungsurkunde D-K-15070-01-01 nach DIN EN ISO/IEC 17025:2018“
is valid.

Within the measurands/calibration items marked with ***)** , the calibration laboratory is permitted up to apply the standards/calibration guidelines listed here with different editions without requiring prior information and approval up up to the DAkkS. The calibration laboratory has an up-to-date list of all standards/calibration guidelines in the flexible accreditation area.

abbreviations used: see last page

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

The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of the Deutsche Akkreditierungsstelle GmbH (DAkkS). https://www.dakks.de/content/datenbank-akkreditierter-stellen

Calibration in the areas:

Electrical measurands

DC current and low frequency measurands

- **DC voltage** [a), b)]
- **AC voltage** [a), b)]
- **DC current** [a), b)]
- **AC current** [a), b)]
- **AC/DC transfer**
- **Electrical power** [a), b)]
- **Phase angle**
- **DC resistance** [a), b)]
- **AC resistance**
- **Capacitance** [a), b)]
- **Inductance**
- **Voltage ratio** [a), b)]
- **High voltage measurement** [a)]

Thermodynamic measurands

Temperature measurands

- **Resistance thermometers** [a)]
- **Thermocouples, thermoelements** [a)]
- **Radiation Thermometer**
- **Temperature fixed point cells**
- **Temperature block calibrators** [a)]
- **Temperature indicators and simulators** [a), b)]
- **Climatic chambers (temperature)** [a)]
- **Temperature transmitter, data logger** [a)]

Humidity measurands

- **Measurement equipment for relative humidity** [a)]
- **Measurement equipment for absolute humidity** [a)]
- **Climate chambers (humidity)** [a)]
- **Humidity generators and -calibrators**

Mechanical measurands

- **Force**
- **Scales** [a)]
- **Pressure** [a)]
- **Torque** [a)]
- **Acceleration**

Time and frequency

- **Time interval** [a),b)]
- **Frequency and rotational frequency** [a), b)]

High-frequency measurands

- **HF-impedance (reflection coefficient)** [a), b)]
- **HF-performance** [a), b)]
- **HF-attenuation** [a), b)]
- **HF-Random noise**
- **Modulation measurands**
- **Oscilloscope measurands** [a), b)]
- **Rise time** [a), b)]
- **Bandwidth** [a), b)]
- **Pulsed-shaped measurands** [a), b)]

Chemical and medical measurands

Chemical analyses and reference materials

- **Euqipment for electrolytic conductance**
- **pH value**

Dimensional measurands

Length

- **diameter** [a), b)]
- **Thread** [a), b)]
- **Length gauges**
- **Length measuring instruments** [a), b)]
- **Point Measure**

Angle

- **Inclinometers**

Coordinate measuring technology

- **Coordinate measuring machines** [a)]

Flow measurement variables

- **Velocity of gases**
- **flow of fluids** [c)]
- **Volume of flowing liquids** [c)]
- **mass of flowing liquids** [c)]
- **Volume of flowing gases** [c)]
- **Mass of flowing gases** [c)]

Acoustic measurands

a) **on-site calibration as well**
b) **Mobile laboratory**
c) **Only on-site calibration**

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC voltage	0 V		0.1 µV	
	10 mV		$12 \cdot 10^{-6}$ *U*	*U* = measured value
	100 mV		$1.3 \cdot 10^{-6}$ *U*	
	1 V		$0.35 \cdot 10^{-6}$ *U*	
	10 V		$0.25 \cdot 10^{-6}$ *U*	
	100 V		$0.4 \cdot 10^{-6}$ *U*	
	1000 V		$0.9 \cdot 10^{-6}$ *U*	
	1 µV up to 100 mV		$1.4 \cdot 10^{-6}$ *U* 0.15 µV	
	> 100 mV up to 100 V		$0.5 \cdot 10^{-6}$ *U*	
	> 100 V up to 1000 V		$1.4 \cdot 10^{-6}$ *U*	
High Voltage	> 1 kV up to 50 kV		$0.4 \cdot 10^{-3}$ *U*	
Direct current	0 A up to 10 pA		$1.6 \cdot 10^{-3}$ *I* 2 fA	*I* = measured value
	> 10 pA up to 100 pA		$0.3 \cdot 10^{-3}$ *I*	
	> 100 pA up to 1 nA		$0.2 \cdot 10^{-3}$ *I*	
	> 1 nA up to 10 nA		$28 \cdot 10^{-6}$ *I*	
	> 10 nA up to 100 nA		$10 \cdot 10^{-6}$ *I*	
	> 100 nA up to 1 µA		$1.0 \cdot 10^{-6}$ *I*	
	> 1 µA up to 100 mA		$0.8 \cdot 10^{-6}$ *I*	
	> 100 mA up to 20 A		$1.5 \cdot 10^{-6}$ *I*	
	> 20 A up to 1000 A		$9 \cdot 10^{-6}$ *I*	
Direct current	1 mA up to 2,2 A		$1 \cdot 10^{-3}$ *I*	
Current clamps	> 2,2 A up to 20 A		$2 \cdot 10^{-3}$ *I*	
	> 20 A up to 1000 A		$3 \cdot 10^{-3}$ *I*	
Direct current	1 A up to 120 A		$0.22 \cdot 10^{-3}$ *I*	
Current transformer	> 120 A up to 1000 A		$0.25 \cdot 10^{-3}$ *I*	
DC resistance	100 µΩ, 1 mΩ, 10 mΩ		$1.2 \cdot 10^{-6}$ *R*	*R* = measured value
(discrete values)	100 mΩ		$0.5 \cdot 10^{-6}$ *R*	
	1 Ω		$80 \cdot 10^{-9}$ *R*	
	10 Ω		$0.12 \cdot 10^{-6}$ *R*	
	100 Ω, 1 kΩ		$0.1 \cdot 10^{-6}$ *R*	
	10 kΩ		$50 \cdot 10^{-9}$ *R*	
	100 kΩ		$0.1 \cdot 10^{-6}$ *R*	
	1 MΩ		$0.25 \cdot 10^{-6}$ *R*	
	10 MΩ		$0.75 \cdot 10^{-6}$ *R*	
	100 MΩ		$2.5 \cdot 10^{-6}$ *R*	
	1 GΩ		$8 \cdot 10^{-6}$ *R*	
	10 GΩ		$28 \cdot 10^{-6}$ *R*	
	100 GΩ		$64 \cdot 10^{-6}$ *R*	
	1 TΩ		$0.12 \cdot 10^{-3}$ *R*	
	10 TΩ		$0.32 \cdot 10^{-3}$ *R*	
	100 TΩ		$0.87 \cdot 10^{-3}$ *R*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC resistance	0 µΩ up to < 1 mΩ		$4 \cdot 10^{-6}$ R 1 nΩ	R = measured value
Ranges	1 mΩ up to < 10 mΩ		$3 \cdot 10^{-6}$ R 1 nΩ	
	10 mΩ up to < 100 mΩ		$2 \cdot 10^{-6}$ R 1 nΩ	
	0,1 Ω up to < 1 Ω		$0.5 \cdot 10^{-6}$ R	
	1 Ω up to 100 kΩ		$0.2 \cdot 10^{-6}$ R	
	> 100 kΩ up to 1 MΩ		$0.6 \cdot 10^{-6}$ R	
	> 1 MΩ up to 10 MΩ		$1.1 \cdot 10^{-6}$ R	
	> 10 MΩ up to 100 MΩ		$2.5 \cdot 10^{-6}$ R	
	> 100 MΩ up to 1 GΩ		$8 \cdot 10^{-6}$ R	
	> 1 GΩ up to 10 GΩ		$30 \cdot 10^{-6}$ R	
	> 10 GΩ up to 100 GΩ		$82 \cdot 10^{-6}$ R	
	> 100 GΩ up to 1 TΩ		$0.14 \cdot 10^{-3}$ R	
	> 1 TΩ up to 10 TΩ		$0.35 \cdot 10^{-3}$ R	
	> 10 TΩ up to 100 TΩ		$1.2 \cdot 10^{-3}$ R	
DC power	1 mW up to 2 kW	Product of U and I;	$8 \cdot 10^{-6}$	
	> 2 kW up to 1000 kW	1 mV ≤ U ≤ 1000 V, 100 µA ≤ I ≤ 1000 A	$15 \cdot 10^{-6}$	
AC resistance	0,1 Ω	10 Hz; 20 Hz; 30 Hz;	$25 \cdot 10^{-6}$ R	R = measured value
Resistance		40 Hz; 55 Hz;	$15 \cdot 10^{-6}$ R	
(discrete values)		400 Hz; 500 Hz;	$11 \cdot 10^{-6}$ R	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$15 \cdot 10^{-6}$ R	
	1 Ω	10 Hz; 20 Hz; 30 Hz;	$25 \cdot 10^{-6}$ R	
		40 Hz; 55 Hz; 400 Hz; 500 Hz;	$11 \cdot 10^{-9}$ R	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$11 \cdot 10^{-6}$ R	
	10 Ω	10 Hz; 20 Hz; 30 Hz;	$25 \cdot 10^{-6}$ R	
		40 Hz; 55 Hz; 400 Hz; 500 Hz;	$10 \cdot 10^{-6}$ R	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$10 \cdot 10^{-6}$ R	
	100 Ω	10 Hz; 20 Hz; 30 Hz;	$12 \cdot 10^{-6}$ R	
		40 Hz; 55 Hz;	$8 \cdot 10^{-6}$ R	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$6 \cdot 10^{-6}$ R	
		5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ R	
	1 kΩ	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$35 \cdot 10^{-6}$ R	
		55 Hz; 400 Hz; 500 Hz; 1 kHz;	$35 \cdot 10^{-6}$ R	
		2 kHz; 5 kHz; 10 kHz;	$35 \cdot 10^{-6}$ R	
	10 kΩ	10 Hz;	$85 \cdot 10^{-6}$ R	
		20 Hz; 30 Hz; 40 Hz;	$45 \cdot 10^{-6}$ R	
		55 Hz;	$110 \cdot 10^{-6}$ R	
		400 Hz; 500 Hz; 1 kHz;	$65 \cdot 10^{-6}$ R	
		2 kHz; 5 kHz; 10 kHz;	$65 \cdot 10^{-6}$ R	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC resistance (Ranges)	0,1 Ω up to 1 Ω	10 Hz up to 20 Hz	$35 \cdot 10^{-6} \cdot R$	R = measured value
		> 20 Hz up to 40 Hz	$30 \cdot 10^{-6} \cdot R$	
		> 40 Hz up to 10 kHz	$20 \cdot 10^{-6} \cdot R$	
	1 Ω up to < 10 Ω	10 Hz up to 20 Hz	$35 \cdot 10^{-6} \cdot R$	
		> 20 Hz up to 40 Hz	$30 \cdot 10^{-6} \cdot R$	
		> 40 Hz up to 10 kHz	$15 \cdot 10^{-6} \cdot R$	
	10 Ω up to < 100 Ω	10 Hz up to 20 Hz	$35 \cdot 10^{-6} \cdot R$	
		> 20 Hz up to 40 Hz	$30 \cdot 10^{-6} \cdot R$	
		> 40 Hz up to 10 kHz	$15 \cdot 10^{-6} \cdot R$	
	100 Ω up to < 1 kΩ	10 Hz up to 20 Hz	$40 \cdot 10^{-6} \cdot R$	
		> 20 Hz up to 40 Hz	$40 \cdot 10^{-6} \cdot R$	
		> 40 Hz up to 10 kHz	$35 \cdot 10^{-6} \cdot R$	
	1 kΩ up to 10 kΩ	10 Hz up to 20 Hz	$90 \cdot 10^{-6} \cdot R$	
		> 20 Hz up to 40 Hz	$45 \cdot 10^{-6} \cdot R$	
		> 40 Hz up to <400 Hz	$110 \cdot 10^{-6} \cdot R$	
		400 Hz up to 10 kHz	$65 \cdot 10^{-6} \cdot R$	
Loading	1 pC up to 10.000 pC	0.2 Hz up to < 1 Hz	0,5 %	Calibration result:
Charge amplifier,		1 Hz up to 10 kHz	0,4 %	Amount of the Transmittal-coefficients
Charge measurement instruments		> 10 kHz up to 20 kHz	0,6 %	
		> 20 kHz up to 50 kHz	1,0 %	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	1 mV	10 Hz; 20 Hz; 30 Hz	$0.23 \cdot 10^{-3}\ U$	U = measured value
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$0.11 \cdot 10^{-3}\ U$	
Transfer		300 Hz; 400 Hz; 500 Hz;	$0.11 \cdot 10^{-3}\ U$	
AC voltage		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$0.11 \cdot 10^{-3}\ U$	
Source		20 kHz; 30 kHz; 50 kHz	$0.11 \cdot 10^{-3}\ U$	
		70 kHz; 100 kHz	$0.16 \cdot 10^{-3}\ U$	
		200 kHz; 300 kHz	$0.17 \cdot 10^{-3}\ U$	
		500 kHz; 700 kHz; 800 kHz	$0.25 \cdot 10^{-3}\ U$	
		1 MHz	$0.27 \cdot 10^{-3}\ U$	
	2 mV	10 Hz, 20 Hz, 30 Hz	$0.13 \cdot 10^{-3}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$0.08 \cdot 10^{-3}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$0.08 \cdot 10^{-3}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$0.08 \cdot 10^{-3}\ U$	
		20 kHz; 30 kHz; 50 kHz	$0.08 \cdot 10^{-3}\ U$	
		70 kHz; 100 kHz; 200 kHz;	$0.11 \cdot 10^{-3}\ U$	
		300 kHz	$0.11 \cdot 10^{-3}\ U$	
		500 kHz; 700 kHz; 800 kHz	$0.16 \cdot 10^{-3}\ U$	
		1 MHz	$0.18 \cdot 10^{-3}\ U$	
	6 mV	10 Hz; 20 Hz; 30 Hz	$60 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$45 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$45 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$45 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$45 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$55 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$73 \cdot 10^{-6}\ U$	
		500 kHz	$0.13 \cdot 10^{-3}\ U$	
		700 kHz; 800 kHz; 1 MHz	$0.16 \cdot 10^{-3}\ U$	
	10 mV	10 Hz; 20 Hz; 30 Hz	$44 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$37 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$37 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$37 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$37 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$50 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$60 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz; 800 kHz;	$0.14 \cdot 10^{-3}\ U$	
		1 MHz	$0.14 \cdot 10^{-3}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	20 mV	10 Hz; 20 Hz; 30 Hz	$30 \cdot 10^{-6}$ *U*	*U* = measured value
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$26 \cdot 10^{-6}$ *U*	
Transfer		300 Hz; 400 Hz; 500 Hz;	$26 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$26 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$26 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$38 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$47 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$98 \cdot 10^{-6}$ *U*	
		1 MHz	$98 \cdot 10^{-6}$ *U*	
	40 mV	10 Hz; 20 Hz; 30 Hz	$24 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$21 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$21 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$21 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$21 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$31 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$47 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$90 \cdot 10^{-6}$ *U*	
		1 MHz	$90 \cdot 10^{-6}$ *U*	
	60 mV	10 Hz; 20 Hz; 30 Hz	$29 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$21 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz	$21 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz	$20 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz; 50 kHz	$23 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$27 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$42 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$86 \cdot 10^{-6}$ *U*	
		1 MHz	$86 \cdot 10^{-6}$ *U*	
	100 mV	10 Hz; 20 Hz	$24 \cdot 10^{-6}$ *U*	
		30 Hz	$18 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$8 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$8 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$8 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz;	$8 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$8 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$10 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz;	$30 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$30 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	200 mV	10 Hz; 20 Hz	$18 \cdot 10^{-6}$ *U*	*U* = measured value
		30 Hz	$11 \cdot 10^{-6}$ *U*	
Transfer		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz;	$8 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$8 \cdot 10^{-6}$ *U*	
		500 kHz	$17 \cdot 10^{-6}$ *U*	
		700 kHz	$22 \cdot 10^{-6}$ *U*	
		800 kHz	$27 \cdot 10^{-6}$ *U*	
		1 MHz	$28 \cdot 10^{-6}$ *U*	
AC / DC voltage	300 mV	10 Hz	$14 \cdot 10^{-6}$ *U*	
		20 Hz	$11 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$10 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$5 \cdot 10^{-6}$ *U*	
Source		300 Hz; 400 Hz; 500 Hz;	$5 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz	$5 \cdot 10^{-6}$ *U*	
		5 kHz; 10 kHz; 20 kHz;	$7 \cdot 10^{-6}$ *U*	
		30 kHz; 50 kHz; 70 kHz	$7 \cdot 10^{-6}$ *U*	
		100 kHz; 200 kHz; 300 kHz	$8 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz;	$18 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$18 \cdot 10^{-6}$ *U*	
	400 mV	10 Hz; 20 Hz	$10 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$5 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$5 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$5 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz;	$5 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$15 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1MHz	$17 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	500 mV	10 Hz	$15 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$9 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$6 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz;	$4 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$6 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz,	$6 \cdot 10^{-6}$ *U*	
		50 kHz; 70 kHz; 100 kHz;	$6 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz;	$15 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$15 \cdot 10^{-6}$ *U*	
AC / DC voltage	600 mV	10 Hz	$14 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$7 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
Source		300 Hz; 400 Hz; 500 Hz;	$4 \cdot 10^{-6}$ *U*	
		1kHz; 2 kHz	$4 \cdot 10^{-6}$ *U*	
		5 kHz	$6 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz;	$4 \cdot 10^{-6}$ *U*	
		30 kHz; 50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz;	$15 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$15 \cdot 10^{-6}$ *U*	
	700 mV	10 Hz	$15 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$6 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz;	$4 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz	$4 \cdot 10^{-6}$ *U*	
		2 kHz; 5 kHz; 10 kHz;	$5 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz;	$5 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz;	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz;	$15 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$15 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	1 V	10 Hz	$9 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$8 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$7 \cdot 10^{-6}$ *U*	
AC / DC voltage		40 Hz; 55 Hz; 60 Hz;	$4 \cdot 10^{-6}$ *U*	
		120 Hz; 300 Hz	$4 \cdot 10^{-6}$ *U*	
		400 Hz; 500 Hz; 1 kHz	$2 \cdot 10^{-6}$ *U*	
		2 kHz; 5 kHz	$3 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz;	$4 \cdot 10^{-6}$ *U*	
		30 kHz; 50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$7 \cdot 10^{-6}$ *U*	
		500 kHz	$11 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$14 \cdot 10^{-6}$ *U*	
AC / DC voltage	2 V	10 Hz; 20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
Transfer		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$2 \cdot 10^{-6}$ *U*	
AC voltage		300 Hz; 400 Hz; 500 Hz;	$2 \cdot 10^{-6}$ *U*	
Source		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$2 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$2 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$11 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$14 \cdot 10^{-6}$ *U*	
		1 MHz	$16 \cdot 10^{-6}$ *U*	
	3 V; 4 V; 5 V;	10 Hz	$10 \cdot 10^{-6}$ *U*	
	6 V; 7 V; 8 V	20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$3 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$3 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$3 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$3 \cdot 10^{-6}$ *U*	
		70 kHz	$4 \cdot 10^{-6}$ *U*	
		100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$8 \cdot 10^{-6}$ *U*	
		500 kHz	$9 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$12 \cdot 10^{-6}$ *U*	
		1 MHz	$15 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	10 V	10 Hz	$10 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$8 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$5 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
Source		300 Hz; 400 Hz; 500 Hz;	$4 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$4 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$10 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$13 \cdot 10^{-6}$ *U*	
	20 V	10 Hz; 20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$3 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$3 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$3 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$3 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$10 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$12 \cdot 10^{-6}$ *U*	
	30 V; 40 V; 50 V; 60 V; 70 V	10 Hz; 20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$9 \cdot 10^{-6}$ *U*	
	100 V	10 Hz	$10 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$9 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	200 V	10 Hz; 20 Hz	$10 \cdot 10^{-6}$ *U*	*U* = measured value
		30 Hz; 40 Hz; 55 Hz;	$7 \cdot 10^{-6}$ *U*	
Transfer		60 Hz; 120 Hz; 300 Hz;	$7 \cdot 10^{-6}$ *U*	
AC voltage		400 Hz; 500 Hz; 1 kHz;	$7 \cdot 10^{-6}$ *U*	
Source		2 kHz; 5 kHz; 10 kHz;	$7 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$7 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$12 \cdot 10^{-6}$ *U*	
	300 V; 400 V; 500 V; 600 V;	10 Hz; 20 Hz; 30 Hz	$9 \cdot 10^{-6}$ *U*	
	700 V; 800 V; 1000 V	40 Hz; 55 Hz; 60 Hz;	$7 \cdot 10^{-6}$ *U*	
		120 Hz; 300 Hz; 400 Hz;	$7 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz 2 kHz;	$7 \cdot 10^{-6}$ *U*	
		5 kHz; 10 kHz; 20 kHz	$7 \cdot 10^{-6}$ *U*	
		30 kHz; 50 kHz	$9 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$15 \cdot 10^{-6}$ *U*	
AC / DC voltage	1 mV	10 Hz; 20 Hz; 30 Hz	$0.30 \cdot 10^{-3}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$0.22 \cdot 10^{-3}$ *U*	
Transfer		300 Hz; 400 Hz; 500 Hz;	$0.22 \cdot 10^{-3}$ *U*	
AC voltage		1 kHz; 2 kHz; 5 kHz; 10 kHz	$0.22 \cdot 10^{-3}$ *U*	
measuring instrument		20 kHz; 30 kHz; 50 kHz;	$0.26 \cdot 10^{-3}$ *U*	
		70 kHz; 100 kHz; 200 kHz;	$0.26 \cdot 10^{-3}$ *U*	
		300 kHz	$0.26 \cdot 10^{-3}$ *U*	
		500 kHz; 700 kHz; 800 kHz	$0.32 \cdot 10^{-3}$ *U*	
		1 MHz	$0.33 \cdot 10^{-3}$ *U*	
	2 mV	10 Hz; 20 Hz; 30 Hz	$0.16 \cdot 10^{-3}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$0.13 \cdot 10^{-3}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$0.13 \cdot 10^{-3}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$0.13 \cdot 10^{-3}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$0.13 \cdot 10^{-3}$ *U*	
		70 kHz; 100 kHz; 200 kHz;	$0.14 \cdot 10^{-3}$ *U*	
		300 kHz	$0.14 \cdot 10^{-3}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$0.20 \cdot 10^{-3}$ *U*	
		1 MHz	$0.20 \cdot 10^{-3}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	6 mV	10 Hz; 20 Hz; 30 Hz	$67 \cdot 10^{-6}\ U$	U = measured value
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$57 \cdot 10^{-6}\ U$	
Transfer		300 Hz; 400 Hz; 500 Hz	$57 \cdot 10^{-6}\ U$	
AC voltage		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$57 \cdot 10^{-6}\ U$	
measuring instruments		20 kHz; 30 kHz; 50 kHz	$57 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$65 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$80 \cdot 10^{-6}\ U$	
		500 kHz	$0.14 \cdot 10^{-3}\ U$	
		700 kHz; 800 kHz; 1 MHz	$0.16 \cdot 10^{-3}\ U$	
	10 mV	10 Hz; 20 Hz; 30 Hz	$50 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$45 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$45 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$45 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$45 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$55 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$65 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz; 800 kHz;	$0.15 \cdot 10^{-3}\ U$	
		1 MHz	$0.15 \cdot 10^{-3}\ U$	
	20 mV	10 Hz	$32 \cdot 10^{-6}\ U$	
		20 Hz; 30 Hz; 40 Hz; 55 Hz;	$30 \cdot 10^{-6}\ U$	
		60 Hz; 120 Hz; 300 Hz;	$30 \cdot 10^{-6}\ U$	
		400 Hz; 500 Hz; 1 kHz; 2 kHz;	$30 \cdot 10^{-6}\ U$	
		5 kHz; 10 kHz; 20 kHz	$30 \cdot 10^{-6}\ U$	
		30 kHz; 50 kHz	$30 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$40 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$50 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz; 800 kHz;	$0.1 \cdot 10^{-3}\ U$	
		1 MHz	$0.1 \cdot 10^{-3}\ U$	
	40 mV	10 Hz; 20 Hz; 30 Hz	$30 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$25 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$25 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$25 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$25 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$30 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz;	$43 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz; 800 kHz;	$86 \cdot 10^{-6}\ U$	
		1 MHz	$86 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	60 mV	10 Hz; 20 Hz; 30 Hz	$30 \cdot 10^{-6}$ *U*	*U* = measured value
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$25 \cdot 10^{-6}$ *U*	
Transfer		300 Hz; 400 Hz; 500 'Hz;	$25 \cdot 10^{-6}$ *U*	
AC voltage		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$25 \cdot 10^{-6}$ *U*	
measuring instruments		20 kHz; 30 kHz; 50 kHz	$25 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$28 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$43 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$86 \cdot 10^{-6}$ *U*	
		1 MHz	$86 \cdot 10^{-6}$ *U*	
	100 mV	10 Hz; 20 Hz	$24 \cdot 10^{-6}$ *U*	
		30 Hz	$18 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$8 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$8 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$8 \cdot 10^{-6}$ *U*	
		20 kHz; 300 kHz; 50 kHz	$8 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$9 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$10 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$30 \cdot 10^{-6}$ *U*	
		1 MHz	$30 \cdot 10^{-6}$ *U*	
	200 mV	10 Hz; 20 Hz	$18 \cdot 10^{-6}$ *U*	
		30 Hz	$11 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz,	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz; 200 kHz;	$8 \cdot 10^{-6}$ *U*	
		300 kHz	$8 \cdot 10^{-6}$ *U*	
		500 kHz;	$17 \cdot 10^{-6}$ *U*	
		700 kHz	$22 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$28 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	300 mV	10 Hz; 20 Hz	$14 \cdot 10^{-6}\ U$	U = measured value
		30 Hz	$10 \cdot 10^{-6}\ U$	
Transfer		40 Hz, 55 Hz; 60 Hz; 120 Hz;	$5 \cdot 10^{-6}\ U$	
AC voltage		300 Hz; 400 Hz; 500 Hz;	$5 \cdot 10^{-6}\ U$	
measuring instruments		1 kHz, 2 kHz; 5 kHz; 10 kHz;	$5 \cdot 10^{-6}\ U$	
		20 kHz	$5 \cdot 10^{-6}\ U$	
		30 kHz; 50 kHz	$7 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz; 200 kHz;	$8 \cdot 10^{-6}\ U$	
		300 kHz	$8 \cdot 10^{-6}\ U$	
		500 kHz	$15 \cdot 10^{-6}\ U$	
		700 kHz; 800 kHz; 1 MHz	$18 \cdot 10^{-6}\ U$	
	400 mV	10 Hz; 20 Hz	$10 \cdot 10^{-6}\ U$	
		30 Hz	$7 \cdot 10^{-6}\ U$	
		40 Hz, 55 Hz; 60 Hz; 120 Hz;	$5 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz	$5 \cdot 10^{-6}\ U$	
		1 kHz, 2 kHz; 5 kHz; 10 kHz;	$3 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz	$3 \cdot 10^{-6}\ U$	
		50 kHz; 70 kHz; 100 kHz;	$5 \cdot 10^{-6}\ U$	
		200 kHz	$5 \cdot 10^{-6}\ U$	
		300 kHz	$6 \cdot 10^{-6}\ U$	
		500 kHz	$12 \cdot 10^{-6}\ U$	
		700 kHz; 800 kHz; 1 MHz	$17 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	500 mV	10 Hz	$15 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$9 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$6 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
measuring instruments		300 Hz; 400 Hz	$4 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$6 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$6 \cdot 10^{-6}$ *U*	
		50 kHz; 70 kHz; 100 kHz;	$6 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$15 \cdot 10^{-6}$ *U*	
		1 MHz	$15 \cdot 10^{-6}$ *U*	
	600 mV	10 Hz	$14 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$4 \cdot 10^{-6}$ *U*	
		1 kHz; 2kHz	$4 \cdot 10^{-6}$ *U*	
		5 kHz	$6 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$4 \cdot 10^{-6}$ *U*	
		50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$15 \cdot 10^{-6}$ *U*	
		1 MHz	$15 \cdot 10^{-6}$ *U*	
	700 mV	10 Hz	$15 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$6 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$4 \cdot 10^{-6}$ *U*	
		1 kHz	$4 \cdot 10^{-6}$ *U*	
		2 kHz; 5 kHz; 10 kHz; 20 kHz;	$5 \cdot 10^{-6}$ *U*	
		30 kHz; 50 kHz; 70 kHz;	$5 \cdot 10^{-6}$ *U*	
		100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz;	$15 \cdot 10^{-6}$ *U*	
		1 MHz	$15 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	1 V	10 Hz	$9 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$8 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$7 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
measuring instruments		300 Hz	$4 \cdot 10^{-6}$ *U*	
		400 Hz; 500 Hz; 1 kHz	$2 \cdot 10^{-6}$ *U*	
		2 kHz; 5 kHz	$3 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$4 \cdot 10^{-6}$ *U*	
		50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz, 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$7 \cdot 10^{-6}$ *U*	
		500 kHz	$11 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$14 \cdot 10^{-6}$ *U*	
	2 V	10 Hz; 20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz, 120 Hz;	$2 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$2 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$2 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$2 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz, 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$11 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$14 \cdot 10^{-6}$ *U*	
		1 MHz	$16 \cdot 10^{-6}$ *U*	
	3 V; 4 V; 5 V; 6 V; 7 V; 8 V	10 Hz	$10 \cdot 10^{-6}$ *U*	
		20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$3 \cdot 10^{-6}$ *U*	
		300 Hz, 400 Hz; 500 Hz;	$3 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$3 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$3 \cdot 10^{-6}$ *U*	
		70 kHz	$4 \cdot 10^{-6}$ *U*	
		100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$8 \cdot 10^{-6}$ *U*	
		500 kHz	$9 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$12 \cdot 10^{-6}$ *U*	
		1 MHz	$15 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	10 V	10 Hz	$10 \cdot 10^{-6}$ *U*	*U* = measured value
		20 Hz	$8 \cdot 10^{-6}$ *U*	
Transfer		30 Hz	$5 \cdot 10^{-6}$ *U*	
AC voltage		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$4 \cdot 10^{-6}$ *U*	
measuring instruments		300 Hz; 400 Hz, 500 Hz;	$4 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$4 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$4 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$10 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz, 1 MHz	$13 \cdot 10^{-6}$ *U*	
	20 V	10 Hz, 20 Hz	$8 \cdot 10^{-6}$ *U*	
		30 Hz	$5 \cdot 10^{-6}$ *U*	
		40 Hz, 55 Hz; 60 Hz, 120 Hz;	$3 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$3 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$3 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$3 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$5 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$6 \cdot 10^{-6}$ *U*	
		500 kHz	$10 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$12 \cdot 10^{-6}$ *U*	
	30 V; 40 V; 50 V; 60 V; 70 V	10 Hz, 20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz,	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$9 \cdot 10^{-6}$ *U*	
	100 V	10 Hz	$10 \cdot 10^{-6}$ *U*	
		20 Hz	$9 \cdot 10^{-6}$ *U*	
		30 Hz	$7 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$6 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$6 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$6 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$6 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$9 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC / DC voltage	200 V	10 Hz; 20 Hz	$10 \cdot 10^{-6}\ U$	U = measured value
		30 Hz; 40 Hz; 55 Hz; 60 Hz;	$7 \cdot 10^{-6}\ U$	
Transfer		120 Hz; 300 Hz; 400 Hz;	$7 \cdot 10^{-6}\ U$	
AC voltage		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$7 \cdot 10^{-6}\ U$	
measuring instruments		10 kHz; 20 kHz; 30 kHz;	$7 \cdot 10^{-6}\ U$	
		50 kHz	$7 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$12 \cdot 10^{-6}\ U$	
	300 V; 400 V; 500 V; 600 V;	10 Hz; 20 Hz; 30 Hz	$9 \cdot 10^{-6}\ U$	
	700 V; 800 V; 1000 V	40 Hz; 55 Hz; 60 Hz, 120 Hz;	$7 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$7 \cdot 10^{-6}\ U$	
		1 kHz, 2 kHz; 5 kHz; 10 kHz;	$7 \cdot 10^{-6}\ U$	
		20 kHz	$7 \cdot 10^{-6}\ U$	
		30 kHz; 50 kHz	$9 \cdot 10^{-6}\ U$	
		70 kHz, 100 kHz	$15 \cdot 10^{-6}\ U$	
AC voltage	1 mV	10 Hz; 20 Hz; 30 Hz	$0.42 \cdot 10^{-3}\ U$	
Measuring instruments and		40 Hz; 55 Hz; 60 Hz;	$0.36 \cdot 10^{-3}\ U$	
Sources		120 Hz; 300 Hz; 400 Hz;	$0.36 \cdot 10^{-3}\ U$	
		500 Hz; 1kHz; 2 kHz; 5 kHz;	$0.36 \cdot 10^{-3}\ U$	
		10 kHz; 20 kHz; 30 kHz;	$0.36 \cdot 10^{-3}\ U$	
		50 kHz; 70 kHz; 100 kHz	$0.36 \cdot 10^{-3}\ U$	
		200 kHz; 300 kHz	$0.43 \cdot 10^{-3}\ U$	
		500 kHz; 700 kHz; 800 kHz	$0.48 \cdot 10^{-3}\ U$	
		1 MHz	$0.53 \cdot 10^{-3}\ U$	
	2 mV	10 Hz; 20 Hz; 30 Hz	$0.18 \cdot 10^{-3}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$0.14 \cdot 10^{-3}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$0.14 \cdot 10^{-3}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$0.14 \cdot 10^{-3}\ U$	
		20 kHz; 30 kHz; 50 kHz	$0.14 \cdot 10^{-3}\ U$	
		70 kHz; 100 kHz;	$0.18 \cdot 10^{-3}\ U$	
		200 kHz; 300 kHz	$0.18 \cdot 10^{-3}\ U$	
		500 kHz; 700 kHz; 800 kHz	$0.21 \cdot 10^{-3}\ U$	
		1 MHz	$0.24 \cdot 10^{-3}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage Measuring instruments and Sources	6 mV	10 Hz; 20 Hz; 30 Hz	$70 \cdot 10^{-6}\ U$	U = measured value
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$60 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$60 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$60 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$60 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$70 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$85 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz;	$0.17 \cdot 10^{-3}\ U$	
		800 kHz; 1 MHz	$0.17 \cdot 10^{-3}\ U$	
	10 mV	10 Hz; 20 Hz; 30 Hz	$53 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$47 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$47 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$47 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$47 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$57 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$70 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz;	$0.14 \cdot 10^{-3}\ U$	
		800 kHz; 1 MHz	$0.14 \cdot 10^{-3}\ U$	
	20 mV	10 Hz; 20 Hz; 30 Hz	$37 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$35 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$35 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$35 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$35 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$45 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$56 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz;	$0.11 \cdot 10^{-3}\ U$	
		800 kHz; 1 MHz	$0.11 \cdot 10^{-3}\ U$	
	40 mV	10 Hz; 20 Hz; 30 Hz	$33 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$31 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$31 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$31 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$31 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$40 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$56 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz;	$95 \cdot 10^{-6}\ U$	
		800 kHz; 1 MHz	$95 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage	60 mV	10 Hz; 20 Hz; 30 Hz	$31 \cdot 10^{-6}$ *U*	*U* = measured value
Measuring instruments and Sources		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$25 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$25 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$25 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$25 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$29 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$43 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz	$87 \cdot 10^{-6}$ *U*	
		1 MHz	$98 \cdot 10^{-6}$ *U*	
	100 mV	10 Hz; 20 Hz	$26 \cdot 10^{-6}$ *U*	
		30 Hz	$20 \cdot 10^{-6}$ *U*	
		40 Hz, 55 Hz; 60 Hz;120Hz;	$12 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$12 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5kHz; 10 kHz;	$12 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$12 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$13 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$14 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz; 800 kHz	$33 \cdot 10^{-6}$ *U*	
		1 MHz	$53 \cdot 10^{-6}$ *U*	
	200 mV	10 Hz; 20 Hz	$21 \cdot 10^{-6}$ *U*	
		30 Hz	$15 \cdot 10^{-6}$ *U*	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$12 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$12 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$12 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$12 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz;	$13 \cdot 10^{-6}$ *U*	
		200 kHz; 300 kHz	$13 \cdot 10^{-6}$ *U*	
		500 kHz; 700 kHz	$25 \cdot 10^{-6}$ *U*	
		800 kHz; 1 MHz	$35 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage	300 mV	10 Hz; 20 Hz; 30 Hz	$17 \cdot 10^{-6}\ U$	U = measured value
Measuring instruments and Sources		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$12 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$12 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz;	$12 \cdot 10^{-6}\ U$	
		10 kHz; 20 kHz; 30 kHz;	$12 \cdot 10^{-6}\ U$	
		50 kHz; 70 kHz	$12 \cdot 10^{-6}\ U$	
		100 kHz; 200 kHz; 300 kHz	$13 \cdot 10^{-6}\ U$	
		500 kHz	$17 \cdot 10^{-6}\ U$	
		700 kHz; 800 kHz	$21 \cdot 10^{-6}\ U$	
		1 MHz	$28 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage Measuring instruments and Sources	500 mV; 600 mV; 700 mV	10 Hz	$18 \cdot 10^{-6}\ U$	U = measured value
		20 Hz; 30 Hz	$13 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$10 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$10 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$10 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$10 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz;	$11 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$11 \cdot 10^{-6}\ U$	
		500 kHz; 700 kHz; 800 kHz	$21 \cdot 10^{-6}\ U$	
		1 MHz	$40 \cdot 10^{-6}\ U$	
	1 V	10 Hz; 20 Hz	$13 \cdot 10^{-6}\ U$	
		30 Hz	$11 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$10 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$10 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$10 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$10 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz	$10 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$11 \cdot 10^{-6}\ U$	
		500 kHz	$15 \cdot 10^{-6}\ U$	
		700 kHz; 800 kHz	$25 \cdot 10^{-6}\ U$	
		1 MHz	$60 \cdot 10^{-6}\ U$	
	2 V	10 Hz; 20 Hz	$12 \cdot 10^{-6}\ U$	
		30 Hz	$10 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz; 120 Hz;	$9 \cdot 10^{-6}\ U$	
		300 Hz; 400 Hz; 500 Hz;	$9 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$9 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$9 \cdot 10^{-6}\ U$	
		70 kHz; 100 kHz;	$10 \cdot 10^{-6}\ U$	
		200 kHz; 300 kHz	$10 \cdot 10^{-6}\ U$	
		500 kHz	$15 \cdot 10^{-6}\ U$	
		700 kHz; 800 kHz	$25 \cdot 10^{-6}\ U$	
		1 MHz	$67 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage Measuring instruments and Sources	3 V; 4 V; 5 V	10 Hz; 20 Hz	$15 \cdot 10^{-6}$ *U*	*U* = measured value
		30 Hz; 40 Hz; 55 Hz; 60 Hz;	$11 \cdot 10^{-6}$ *U*	
		120 Hz; 300 Hz; 400 Hz;	$11 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz	$11 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$11 \cdot 10^{-6}$ *U*	
		50 kHz; 70 kHz	$11 \cdot 10^{-6}$ *U*	
		100 kHz; 200 kHz; 300 kHz	$11 \cdot 10^{-6}$ *U*	
		500 kHz	$15 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$25 \cdot 10^{-6}$ *U*	
		1 MHz	$67 \cdot 10^{-6}$ *U*	
	6 V; 7 V; 8 V	10 Hz; 20 Hz	$15 \cdot 10^{-6}$ *U*	
		30 Hz; 40 Hz; 55 Hz; 60 Hz;	$11 \cdot 10^{-6}$ *U*	
		120 Hz; 300 Hz; 400 Hz;	$11 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$11 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$11 \cdot 10^{-6}$ *U*	
		50 kHz; 70 kHz	$11 \cdot 10^{-6}$ *U*	
		100 kHz; 200 kHz; 300 kHz	$13 \cdot 10^{-6}$ *U*	
		500 kHz	$30 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz	$60 \cdot 10^{-6}$ *U*	
		1 MHz	$95 \cdot 10^{-6}$ *U*	
	10 V; 20 V	10 Hz; 20 Hz	$13 \cdot 10^{-6}$ *U*	
		30 Hz; 40 Hz; 55 Hz; 60 Hz;	$11 \cdot 10^{-6}$ *U*	
		120 Hz; 300 Hz; 400 Hz;	$11 \cdot 10^{-6}$ *U*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$11 \cdot 10^{-6}$ *U*	
		10 kHz; 20 kHz; 30 kHz;	$11 \cdot 10^{-6}$ *U*	
		50 kHz; 70 kHz	$11 \cdot 10^{-6}$ *U*	
		100 kHz; 200 kHz;	$25 \cdot 10^{-6}$ *U*	
		300 kHz; 500 kHz	$25 \cdot 10^{-6}$ *U*	
		700 kHz; 800 kHz; 1 MHz	$0.11 \cdot 10^{-3}$ *U*	
	30 V; 40 V; 50 V; 60 V; 70 V	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$15 \cdot 10^{-6}$ *U*	
		55 Hz; 60 Hz; 120 Hz;	$15 \cdot 10^{-6}$ *U*	
		300 Hz; 400 Hz; 500 Hz;	$15 \cdot 10^{-6}$ *U*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$15 \cdot 10^{-6}$ *U*	
		20 kHz; 30 kHz; 50 kHz	$15 \cdot 10^{-6}$ *U*	
		70 kHz; 100 kHz	$20 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage Measuring instruments and Sources	100 V; 200 V	10 Hz; 20 Hz; 30 Hz	$17 \cdot 10^{-6}\ U$	U = measured value
		40 Hz; 55 Hz; 60 Hz;	$14 \cdot 10^{-6}\ U$	
		120 Hz; 300 Hz; 400 Hz;	$14 \cdot 10^{-6}\ U$	
		500 Hz; 1 kHz	$14 \cdot 10^{-6}\ U$	
		2 kHz; 5 kHz; 10 kHz;	$17 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz;	$17 \cdot 10^{-6}\ U$	
		50 kHz; 70 kHz	$17 \cdot 10^{-6}\ U$	
		100 kHz	$32 \cdot 10^{-6}\ U$	
	300 V	10 Hz; 20 Hz; 30Hz	$17 \cdot 10^{-6}\ U$	
		40 Hz; 55 Hz; 60 Hz;	$14 \cdot 10^{-6}\ U$	
		120 Hz; 300 Hz; 400 Hz;	$14 \cdot 10^{-6}\ U$	
		500 Hz; 1 kHz	$14 \cdot 10^{-6}\ U$	
		2 kHz; 5 kHz; 10 kHz; 20 kHz	$20 \cdot 10^{-6}\ U$	
		30 kHz; 50 kHz	$32 \cdot 10^{-6}\ U$	
		70 kHz	$44 \cdot 10^{-6}\ U$	
		100 kHz	$66 \cdot 10^{-6}\ U$	
	500 V; 1000 V	10 Hz; 20 Hz	$24 \cdot 10^{-6}\ U$	
		30 Hz; 40 Hz; 55 Hz;	$25 \cdot 10^{-6}\ U$	
		60 Hz; 120 Hz; 300 Hz;	$25 \cdot 10^{-6}\ U$	
		400 Hz; 500 Hz	$25 \cdot 10^{-6}\ U$	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$30 \cdot 10^{-6}\ U$	
		20 kHz; 30 kHz; 50 kHz	$47 \cdot 10^{-6}\ U$	
		70 kHz	$55 \cdot 10^{-6}\ U$	
		100 kHz	$66 \cdot 10^{-6}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage measuring instrument and sources	1 mV up to 2.2 mV	10 Hz up to 20 Hz	$0.52 \cdot 10^{-3}\ U$	U = measured value
		> 20 Hz up to 40 Hz	$0.52 \cdot 10^{-3}\ U$	
		> 40 Hz up to 20 kHz	$0.40 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.40 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$0.41 \cdot 10^{-3}\ U$	
		> 100 kHz up t o300 kHz	$0.46 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$0.55 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$0.60 \cdot 10^{-3}\ U$	
	> 2.2 mV up to 7 mV	10 Hz up to 20 Hz	$0.22 \cdot 10^{-3}\ U$	
		> 20 Hz up to 40 Hz	$0.22 \cdot 10^{-3}\ U$	
		> 40 Hz up to 20 kHz	$0.16 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.16 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$0.20 \cdot 10^{-3}\ U$	
		> 100 kHz up to 300 kHz	$0.22 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$0.33 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$0.45 \cdot 10^{-3}\ U$	
	> 7 mV up to 22 mV	10 Hz up to 20 Hz	$80 \cdot 10^{-6}\ U$	
		> 20 Hz up to 40 Hz	$80 \cdot 10^{-6}\ U$	
		> 40 Hz up to 20 kHz	$65 \cdot 10^{-6}\ U$	
		> 20 kHz up to 50 kHz	$75 \cdot 10^{-6}\ U$	
		> 50 kHz up to 100 kHz	$75 \cdot 10^{-6}\ U$	
		> 100 kHz up to 300 kHz	$95 \cdot 10^{-6}\ U$	
		> 300 kHz up to 500 kHz	$0.19 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$0.21 \cdot 10^{-3}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibrianand Messomility (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage measuring instrument and sources	> 22 mV up to 70 mV	10 Hz up to 20 Hz	$70 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$58 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$35 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$35 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$45 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$55 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$0.11 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	
	> 70 mV up to 220 mV	10 Hz up to 20 Hz	$39 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$35 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$25 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$25 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$28 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$42 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$85 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.1 \cdot 10^{-3}$ *U*	
	> 220 mV up to 700 mV	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$22 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$12 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$12 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$14 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$27 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$40 \cdot 10^{-6}$ *U*	
	> 700 mV up to 2.2 V	10 Hz up to 20 Hz	$20 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$14 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$10 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$10 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$11 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$22 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$68 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage measuring instrument and sources	> 2.2 V up to 7 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$12 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$13 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$95 \cdot 10^{-6}$ *U*	
	> 7 V up to 22 V	10 Hz up to 20 Hz	$17 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1MHz	$0.11 \cdot 10^{-3}$ *U*	
	> 22 V up to 70 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$15 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$15 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$25 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$40 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	
	> 70 V up to 220 V	10 Hz up to 20 Hz	$19 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$18 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$17 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$17 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$32 \cdot 10^{-6}$ *U*	
	> 220 V up to 1000 V	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$27 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$45 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$45 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$65 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage Measuring instruments	0,01 V up to 0,1 V	10 Hz up to 40 Hz	$0.69 \cdot 10^{-3}\ U$	U = measured value
		> 40 Hz up to 20 kHz	$0.53 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.64 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$1.1 \cdot 10^{-3}\ U$	
		> 100 kHz up to 300 kHz	$2.1 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$3.6 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$5.0 \cdot 10^{-3}\ U$	
	> 0,1 V up to 0,22 V	10 Hz up to 40 Hz	$0.38 \cdot 10^{-3}\ U$	
		> 40 Hz up to 20 kHz	$0.16 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.28 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$0.65 \cdot 10^{-3}\ U$	
		> 100 kHz up to 300 kHz	$1.1 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$1.6 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$3.3 \cdot 10^{-3}\ U$	
	> 0,22 V up to 2,2 V	10 Hz up to 40 Hz	$0.49 \cdot 10^{-3}\ U$	
		> 40 Hz up to 20 kHz	$0.09 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.14 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$0.29 \cdot 10^{-3}\ U$	
		> 100 kHz up to 300 kHz	$0.85 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$2.1 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$3.3 \cdot 10^{-3}\ U$	
	> 2,2 V up to 22 V	10 Hz up to 40 Hz	$0.45 \cdot 10^{-3}\ U$	
		> 40 Hz up to 20 kHz	$0.07 \cdot 10^{-3}\ U$	
		> 20 kHz up to 50 kHz	$0.13 \cdot 10^{-3}\ U$	
		> 50 kHz up to 100 kHz	$0.21 \cdot 10^{-3}\ U$	
		> 100 kHz up to 300 kHz	$0.6 \cdot 10^{-3}\ U$	
		> 300 kHz up to 500 kHz	$2.0 \cdot 10^{-3}\ U$	
		> 500 kHz up to 1 MHz	$3.1 \cdot 10^{-3}\ U$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage measuring instruments	> 22 V up to 220 V	10 Hz up to 40 Hz	$0.47 \cdot 10^{-3}$ *U*	*U* = measured value with Fluke 5720A (ranges)
		> 40 Hz up to 20 kHz	$0.09 \cdot 10^{-3}$ *U*	
		> 20 kHz up to 50 kHz	$0.14 \cdot 10^{-3}$ *U*	
		> 50 kHz up to 100 kHz	$0.29 \cdot 10^{-3}$ *U*	
	> 220 V up to 1000 V	50 Hz up to 1 kHz	$85 \cdot 10^{-6}$ *U*	
AC voltage with 50 Ω input impedance	3,2 V	10 Hz; 40 Hz; 100 Hz; 500 Hz 1 kHz; 10 kHz; 50 kHz 100 kHz; 200 kHz; 500 kHz 1 MHz; 2 MHz; 4 MHz	$0.5 \cdot 10^{-3}$	at discrete points
		5 MHz; 8 MHz	$1.1 \cdot 10^{-3}$	
		10 MHz; 15 MHz; 20 MHz	$2.0 \cdot 10^{-3}$	
		26 MHz; 30 MHz; 50 MHz	$3.2 \cdot 10^{-3}$	
	1 V; 320 mV	10 Hz; 40 Hz; 100 Hz; 500 Hz 1 kHz; 10 kHz; 50 kHz 100 kHz; 200 kHz; 500 kHz 1 MHz 2 MHz; 4 MHz	$0.7 \cdot 10^{-3}$	
		5 MHz; 8 MHz	$1.8 \cdot 10^{-3}$	
		10 MHz; 15 MHz; 20 MHz	$3.5 \cdot 10^{-3}$	
		26 MHz; 30 MHz; 50 MHz	$5.4 \cdot 10^{-3}$	
	100 mV; 32 mV 10 mV; 3.2 mV 1 mV	10 Hz; 40 Hz; 100 Hz; 500 Hz 1 kHz; 10 kHz; 50 kHz 100 kHz; 200 kHz; 500 kHz 1 MHz 2 MHz; 4 MHz	$1.3 \cdot 10^{-3}$	
		5 MHz; 8 MHz	$2.7 \cdot 10^{-3}$	
		10 MHz; 15 MHz; 20 MHz	$5.2 \cdot 10^{-3}$	
		26 MHz; 30 MHz; 50 MHz	$7.9 \cdot 10^{-3}$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
High Voltage	> 1 kV to 30 kV	50 Hz	$0.5 \cdot 10^{-3}$ *U*	*U* = measured value
	> 30 kV to 50 kV	50 Hz	$0.6 \cdot 10^{-3}$ *U*	
AC current / DC current Transfer	100 µA	10 Hz	$82 \cdot 10^{-6}$ *I*	*I* = measured value
		20 Hz	$39 \cdot 10^{-6}$ *I*	
		30 Hz	$31 \cdot 10^{-6}$ *I*	
		40 Hz	$34 \cdot 10^{-6}$ *I*	
		55 Hz	$0.11 \cdot 10^{-3}$ *I*	
		400 Hz	$63 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz	$41 \cdot 10^{-6}$ *I*	
		2 kHz	$39 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$31 \cdot 10^{-6}$ *I*	
	300 µA	10 Hz	$37 \cdot 10^{-6}$ *I*	
		20 Hz	$34 \cdot 10^{-6}$ *I*	
		30 Hz; 40 Hz	$31 \cdot 10^{-6}$ *I*	
		55 Hz	$41 \cdot 10^{-6}$ *I*	
		400 Hz	$35 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz	$31 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz; 10 kHz	$32 \cdot 10^{-6}$ *I*	
	1 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$31 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$31 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$31 \cdot 10^{-6}$ *I*	
	3 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$7 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$7 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz	$7 \cdot 10^{-6}$ *I*	
		10 kHz	$8 \cdot 10^{-6}$ *I*	
	5 mA	10 Hz; 20 Hz	$7 \cdot 10^{-6}$ *I*	
		30 Hz	$6 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz	$5 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$4 \cdot 10^{-6}$ *I*	
		5 kHz	$6 \cdot 10^{-6}$ *I*	
		10 kHz	$8 \cdot 10^{-6}$ *I*	
	10 mA	10 Hz	$6 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz	$5 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz;	$4 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$4 \cdot 10^{-6}$ *I*	
		10 kHz	$4 \cdot 10^{-6}$ *I*	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC current / DC current Transfer	20 mA; 30 mA; 50 mA	10 Hz	$8 \cdot 10^{-6}$ *I*	*I* = measured value
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$5 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$4 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$5 \cdot 10^{-6}$ *I*	
	100 mA	10 Hz	$8 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$5 \cdot 10^{-6}$ *I*	
		400 Hz	$8 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz	$5 \cdot 10^{-6}$ *I*	
		2 kHz	$8 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$5 \cdot 10^{-6}$ *I*	
	200 mA	10 Hz	$7 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz	$6 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz	$5 \cdot 10^{-6}$ *I*	
		1 kHz	$8 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz; 10 kHz	$5 \cdot 10^{-6}$ *I*	
	300 mA; 500 mA	10 Hz; 20 Hz; 30 Hz	$6 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz	$5 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$4 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$5 \cdot 10^{-6}$ *I*	
	1 A	10 Hz	$7 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz	$6 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz	$7 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz;	$5 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$9 \cdot 10^{-6}$ *I*	
	2 A	10 Hz	$7 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz	$8 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz;	$7 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz; 2 kHz;	$7 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$7 \cdot 10^{-6}$ *I*	
	3 A; 5 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$14 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$14 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$14 \cdot 10^{-6}$ *I*	
	10 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$21 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$21 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$21 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibrianand Messomility (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC /	20 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$26 \cdot 10^{-6}$ /	/ = measured value
DC current		55 Hz; 400 Hz; 500 Hz;	$26 \cdot 10^{-6}$ /	
Transfer		1 kHz; 2 kHz; 5 kHz;	$26 \cdot 10^{-6}$ /	
		10 kHz	$30 \cdot 10^{-6}$ /	
	50 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$32 \cdot 10^{-6}$ /	
		55 Hz; 400 Hz; 500 Hz;	$32 \cdot 10^{-6}$ /	
		1 kHz; 2 kHz;	$32 \cdot 10^{-6}$ /	
		5 kHz; 10 kHz	$40 \cdot 10^{-6}$ /	
	100 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$47 \cdot 10^{-6}$ /	
		55 Hz; 400 Hz; 500 Hz;	$47 \cdot 10^{-6}$ /	
		1 kHz; 2 kHz; 5 kHz;	$47 \cdot 10^{-6}$ /	
		10 kHz	$92 \cdot 10^{-6}$ /	
AC power	100 µA	10 Hz	$83 \cdot 10^{-6}$ /	
Sources		20 Hz	$40 \cdot 10^{-6}$ /	
		30 Hz; 40 Hz	$34 \cdot 10^{-6}$ /	
		55 Hz	$0.11 \cdot 10^{-3}$ /	
		400 Hz	$64 \cdot 10^{-6}$ /	
		500 Hz; 1 kHz; 2 kHz	$42 \cdot 10^{-6}$ /	
		5 kHz; 10 kHz; 20 kHz; 30 kHz	$33 \cdot 10^{-6}$ /	
		50 kHz	$47 \cdot 10^{-6}$ /	
		70 kHz; 100 kHz	$77 \cdot 10^{-6}$ /	
	300 µA	10 Hz	$38 \cdot 10^{-6}$ /	
		20 Hz	$34 \cdot 10^{-6}$ /	
		30 Hz; 40 Hz	$32 \cdot 10^{-6}$ /	
		55 Hz	$42 \cdot 10^{-6}$ /	
		400 Hz	$36 \cdot 10^{-6}$ /	
		500 Hz; 1 kHz; 2 kHz;	$33 \cdot 10^{-6}$ /	
		5 kHz; 10 kHz; 20 kHz;	$33 \cdot 10^{-6}$ /	
		30 kHz; 50 kHz	$33 \cdot 10^{-6}$ /	
		70 kHz	$52 \cdot 10^{-6}$ /	
		100 kHz	$0.11 \cdot 10^{-3}$ /	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibrian and Messomility (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power Sources	1 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$32 \cdot 10^{-6}$ *I*	*I* = measured value
		55 Hz; 400 Hz; 500 Hz;	$32 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$32 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz; 50 kHz; 70 kHz	$32 \cdot 10^{-6}$ *I*	
		100 kHz	$34 \cdot 10^{-6}$ *I*	
	3 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$9 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz; 1 kHz;	$9 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz	$9 \cdot 10^{-6}$ *I*	
		10 kHz	$10 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz; 50 kHz; 70 kHz	$12 \cdot 10^{-6}$ *I*	
		100 kHz	$15 \cdot 10^{-6}$ *I*	
	5 mA	10 Hz; 20 Hz; 30 Hz	$9 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz;	$8 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz	$8 \cdot 10^{-6}$ *I*	
		10 kHz	$10 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz; 50 kHz; 70 kHz	$12 \cdot 10^{-6}$ *I*	
		100 kHz	$15 \cdot 10^{-6}$ *I*	
	10 mA	10 Hz	$9 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz; 55 Hz	$8 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$7 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz; 20 kHz; 30 kHz	$8 \cdot 10^{-6}$ *I*	
		50 kHz; 70 kHz	$10 \cdot 10^{-6}$ *I*	
		100 kHz	$12 \cdot 10^{-6}$ *I*	
	20 mA; 30 mA; 50 mA; 100 mA	10 Hz	$10 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz; 55 Hz;	$8 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz	$8 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz;	$8 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz	$8 \cdot 10^{-6}$ *I*	
		50 kHz; 70 kHz	$10 \cdot 10^{-6}$ *I*	
		100 kHz	$13 \cdot 10^{-6}$ *I*	
	200 mA	10 Hz	$9 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz; 55 Hz;	$8 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz	$8 \cdot 10^{-6}$ *I*	
		1 kHz	$10 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz; 10 kHz; 20 kHz	$9 \cdot 10^{-6}$ *I*	
		30 kHz; 50 kHz;	$13 \cdot 10^{-6}$ *I*	
		70 kHz; 100 kHz	$13 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power Sources	300 mA	10 Hz; 20 Hz	$9 \cdot 10^{-6}$ *I*	*I* = measured value
		30 Hz; 40 Hz; 55 Hz; 400 Hz;	$8 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz; 2 kHz; 5 kHz;	$8 \cdot 10^{-6}$ *I*	
		10 kHz; 20 kHz	$8 \cdot 10^{-6}$ *I*	
		30 kHz; 50 kHz	$9 \cdot 10^{-6}$ *I*	
		70 kHz; 100 kHz	$14 \cdot 10^{-6}$ *I*	
	500 mA	10 Hz; 20 Hz; 30 Hz	$9 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz; 500 Hz;	$8 \cdot 10^{-6}$ *I*	
		1 kHz: 2 kHz; 5 kHz;	$8 \cdot 10^{-6}$ *I*	
		10 kHz; 20 kHz	$8 \cdot 10^{-6}$ *I*	
		30 kHz; 50 kHz	$9 \cdot 10^{-6}$ *I*	
		70 kHz	$11 \cdot 10^{-6}$ *I*	
		100 kHz	$14 \cdot 10^{-6}$ *I*	
	1 A	10 Hz; 20 Hz; 30 Hz;	$9 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz	$9 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz	$8 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$11 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz; 50 kHz	$11 \cdot 10^{-6}$ *I*	
		70 kHz	$13 \cdot 10^{-6}$ *I*	
		100 kHz	$15 \cdot 10^{-6}$ *I*	
	2 A	10 Hz; 20 Hz; 30 Hz	$10 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz; 500 Hz	$8 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$9 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz; 50 kHz	$13 \cdot 10^{-6}$ *I*	
		70 kHz	$18 \cdot 10^{-6}$ *I*	
		100 kHz	$23 \cdot 10^{-6}$ *I*	
	3 A	10 Hz; 20 Hz; 30 Hz	$18 \cdot 10^{-6}$ *I*	
		40 Hz; 55 Hz; 400 Hz;	$17 \cdot 10^{-6}$ *I*	
		500 Hz; 1k Hz; 2 kHz; 5 kHz;	$17 \cdot 10^{-6}$ *I*	
		10 kHz; 20 kHz; 30 kHz	$17 \cdot 10^{-6}$ *I*	
		50 kHz	$18 \cdot 10^{-6}$ *I*	
		70 kHz	$27 \cdot 10^{-6}$ *I*	
		100 kHz	$29 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power	5 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$16 \cdot 10^{-6}$ *I*	*I* = measured value
Sources		55 Hz; 400 Hz; 500 Hz;	$16 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz;	$16 \cdot 10^{-6}$ *I*	
		10 kHz; 20 kHz; 30 kHz	$16 \cdot 10^{-6}$ *I*	
		50 kHz	$18 \cdot 10^{-6}$ *I*	
		70 kHz	$27 \cdot 10^{-6}$ *I*	
		100 kHz	$29 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power Sources	10 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$22 \cdot 10^{-6}$ *I*	*I* = measured value
		55 Hz; 400 Hz; 500 Hz;	$22 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz;	$22 \cdot 10^{-6}$ *I*	
		10 kHz; 20 kHz	$22 \cdot 10^{-6}$ *I*	
		30 kHz	$31 \cdot 10^{-6}$ *I*	
		50 kHz	$41 \cdot 10^{-6}$ *I*	
		70 kHz	$51 \cdot 10^{-6}$ *I*	
		100 kHz	$76 \cdot 10^{-6}$ *I*	
	20 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$27 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$27 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz; 10 kHz	$27 \cdot 10^{-6}$ *I*	
		20 kHz; 30 kHz	$31 \cdot 10^{-6}$ *I*	
		50 kHz	$46 \cdot 10^{-6}$ *I*	
		70 kHz	$0.13 \cdot 10^{-3}$ *I*	
		100 kHz	$0.17 \cdot 10^{-3}$ *I*	
	50 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$33 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$33 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz;	$33 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$40 \cdot 10^{-6}$ *I*	
	100 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$48 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$48 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz;	$48 \cdot 10^{-6}$ *I*	
		10 kHz	$93 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power Measuring instruments	100 µA	10 Hz	$83 \cdot 10^{-6}$ *I*	*I* = measured value
		20 Hz	$40 \cdot 10^{-6}$ *I*	
		30 Hz; 40 Hz	$34 \cdot 10^{-6}$ *I*	
		55 Hz	$0.11 \cdot 10^{-3}$ *I*	
		400 Hz	$64 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz; 2 kHz;	$42 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$42 \cdot 10^{-6}$ *I*	
	300 µA	10 Hz	$38 \cdot 10^{-6}$ *I*	
		20 Hz	$34 \cdot 10^{-6}$ *I*	
		30 Hz; 40 Hz	$32 \cdot 10^{-6}$ *I*	
		55 Hz	$42 \cdot 10^{-6}$ *I*	
		400 Hz	$36 \cdot 10^{-6}$ *I*	
		500 Hz; 1 kHz	$32 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz; 10 kHz	$33 \cdot 10^{-6}$ *I*	
	1 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$32 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz; 1 kHz;	$32 \cdot 10^{-6}$ *I*	
		2 kHz; 5 kHz; 10 kHz	$32 \cdot 10^{-6}$ *I*	
	3 mA; 5 mA	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$10 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$10 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz	$10 \cdot 10^{-6}$ *I*	
		10 kHz	$11 \cdot 10^{-6}$ *I*	
	10 mA	10 Hz	$9 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz; 55 Hz;	$8 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz;	$8 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$8 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power	20 mA; 30 mA;	10 Hz	$10 \cdot 10^{-6}$ *I*	*I* = measured value
Measuring instruments	50 mA; 100 mA	20 Hz; 30 Hz; 400 Hz; 55 Hz;	$8 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz	$8 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$9 \cdot 10^{-6}$ *I*	
	200 mA; 300 mA; 500 mA	10 Hz	$10 \cdot 10^{-6}$ *I*	
		20 Hz; 30 Hz; 40 Hz, 55 Hz;	$9 \cdot 10^{-6}$ *I*	
		400 Hz; 500 Hz; 1 kHz; 2 kHz;	$9 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$9 \cdot 10^{-6}$ *I*	
	1 A; 2 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$11 \cdot 10^{-6}$ *I*	
		55 Hz, 400 Hz; 500 Hz;	$11 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5kHz; 10 kHz	$11 \cdot 10^{-6}$ *I*	
	3 A; 5 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$18 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$18 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5kHz; 10 kHz	$18 \cdot 10^{-6}$ *I*	
	10 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$22 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$22 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5kHz; 10 kHz	$22 \cdot 10^{-6}$ *I*	
	20 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$27 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$27 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5kHz;	$27 \cdot 10^{-6}$ *I*	
		10 kHz	$31 \cdot 10^{-6}$ *I*	
	50 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$33 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$33 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz;	$33 \cdot 10^{-6}$ *I*	
		5 kHz; 10 kHz	$40 \cdot 10^{-6}$ *I*	
	100 A	10 Hz; 20 Hz; 30 Hz; 40 Hz;	$48 \cdot 10^{-6}$ *I*	
		55 Hz; 400 Hz; 500 Hz;	$48 \cdot 10^{-6}$ *I*	
		1 kHz; 2 kHz; 5 kHz;	$48 \cdot 10^{-6}$ *I*	
		10 kHz	$93 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power Sources and measuring instruments (ranges)	100 µA up to 1 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$120 \cdot 10^{-6}$ *I* $160 \cdot 10^{-6}$ *I* $60 \cdot 10^{-6}$ *I*	*I* = measured value
	> 1 mA up to 10 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$46 \cdot 10^{-6}$ *I*	
	> 10 mA up to 1 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$17 \cdot 10^{-6}$ *I*	
	> 1 A up to 10 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$32 \cdot 10^{-6}$ *I*	
	> 10 A up to 20 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$39 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC power sources and measuring instruments (ranges)	> 20 A up to 100 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$69 \cdot 10^{-6}$ *I* $69 \cdot 10^{-6}$ *I* $0.17 \cdot 10^{-3}$ *I*	*I* = measured value
AC current strength (ranges) Measuring instruments	0.1 mA up to 0.2 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	$0.40 \cdot 10^{-3}$ *I* $0.21 \cdot 10^{-3}$ *I* $0.40 \cdot 10^{-3}$ *I* $1.7 \cdot 10^{-3}$ *I*	*I* = measured value with Fluke 5720A
	> 0.2 mA up to 2.2 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	$0.44 \cdot 10^{-3}$ *I* $0.30 \cdot 10^{-3}$ *I* $0.72 \cdot 10^{-3}$ *I* $4.2 \cdot 10^{-3}$ *I*	
	> 2.2 mA up to 22 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	$0.44 \cdot 10^{-3}$ *I* $0.30 \cdot 10^{-3}$ *I* $0.46 \cdot 10^{-3}$ *I* $3.5 \cdot 10^{-3}$ *I*	
	> 22 mA up to 220 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	$0.44 \cdot 10^{-3}$ *I* $0.25 \cdot 10^{-3}$ *I* $0.37 \cdot 10^{-3}$ *I* $1.6 \cdot 10^{-3}$ *I*	
	> 220 mA up to 2.2 A	20 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	$0.43 \cdot 10^{-3}$ *I* $0.84 \cdot 10^{-3}$ *I* $7.6 \cdot 10^{-3}$ *I*	
	> 2.2 A up to 20 A	40 Hz up to 5 kHz	$0.81 \cdot 10^{-3}$ *I* / 1.2 mA	*I* = measured value with Fluke 5220 A
AC power Sources	0.1 mA up to 1 A	40 Hz up to 5 kHz	$2 \cdot 10^{-3}$ *I*	*I* = measured value with HP3458A
Alternating current Current clamps	1 mA up to 2.2 A > 2.2 A up to A > 20 A up to 800 A	40 Hz up to 5 kHz 40 Hz up to 5 kHz 40 Hz up to 65 Hz	$2 \cdot 10^{-3}$ *I* $3 \cdot 10^{-3}$ *I* $4 \cdot 10^{-3}$ *I*	*I* = measured value
AC current Current transformer	1 A up to 120 A 1 A up to 120 A > 120 A up to 600 A > 120 A up to 1000 A	40 Hz up to 850 Hz > 850 Hz up to 2 kHz 40 Hz up to 400 Hz 40 Hz up to 65 Hz	$0.16 \cdot 10^{-3}$ *I* $0.47 \cdot 10^{-3}$ *I* $0.52 \cdot 10^{-3}$ *I* $0.6 \cdot 10^{-3}$ *I*	
Resistance ratio AC/DC measuring bridges	0.16 up to 6.3	Direct and alternating current up up to 400 Hz	$0.2 \cdot 10^{-6}$	Uncertainty of measurement means here Absolute value

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Phase angle between voltage Measuring instruments and sources	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	*UREF* / *USIG* 50 mV / 50 mV Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1 kHz 5 kHz; 10 kHz; 50 kHz 100 kHz	 0,005° 0,008° 0,020°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	*UREF* / *USIG* 0.5 V / 0.5 V 1 V / 1 V 0.8 V / 1 V 1 V / 0.5 V 10 V / 10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz 1 kHz; 5 kHz 10 kHz 50 kHz 100 kHz	 0,005° 0,005° 0,007° 0,008° 0,009°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	*UREF* / *USIG* 100 V / 100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz 1 kHz; 5 kHz 10 kHz 50 kHz 100 kHz	 0,005° 0,005° 0,007° 0,008° 0,030°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	*UREF* / *USIG* 1 V/0.05 V 10 V/1 V 1 V /10 V 100 V/1 V 1 V/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz 1 kHz; 5 kHz 10 kHz 50 kHz 100 kHz	 0,009° 0,009° 0,020° 0,030° 0,070°	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Phase angle between tensions Measuring instruments and sources	-180° up to 180°	*UREF* / *USIG* 0.05 V up to 0.5 V Measurement frequency:		U_{SIG}: Signal voltage U_{REF}: Reference voltage Measuring ranges
		10 Hz up to 1 kHz	0,006°	
		> 1 kHz up to 50 kHz	0,010°	
		> 50 kHz up to 100 kHz	0,025°	
		UREF / *USIG* > 0.5 V up to 10 V Measurement frequency:		
		10 Hz up to 5 kHz	0,006°	
		> 5 kHz up to 100 kHz	0,015°	
		UREF / *USIG* > 10 V up to 100 V Measurement frequency:		
		10 Hz up to 5 kHz	0,006°	
		> 5 kHz up to 50 kHz	0,010°	
		> 50 kHz up to 100 kHz	0,035°	
		UREF / *USIG* > 100 V up to 630 V Measurement frequency:		
		10 Hz up to 2.5 kHz	0,008°	
		> 2.5 kHz up to 5 kHz	0,03°	
		> 5 kHz up to 10 kHz	0,04°	
		> 10 kHz up to 20 kHz	0,05°	
		> 20 kHz up to 50 kHz	0,1°	
		> 50 kHz up to 100 kHz	0,2°	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Phase angle between current and Voltage Sources	-180° up to 180°	*UREF* / *USIG* 1 mA up to 2 A/0.05 V up to 100 V Measurement frequency:		U_{SIG}: Signal voltage U_{REF}: Reference voltage Measuring ranges
		10 Hz up to 1 kHz	0,009°	
		> 1 kHz up to 10 kHz	0,045°	
		> 10 kHz up to 100 kHz	0,50°	
		UREF / *USIG* > 2 A up to 20 A /1 V up to 100 V Measurement frequency:		
		10 Hz up to 1 kHz	0,02°	
		> 1 kHz up to 10 kHz	0,1°	
		> 10 kHz up to 100 kHz	1,0°	
		UREF / *USIG* > 20 A up to 100 A /1 V up to 100 V Measurement frequency:		
		10 Hz up to 1 kHz	0,025°	
		> 1 kHz up to 10 kHz	0,20°	
		> 10 kHz up to 100 kHz	2,0°	
Phase angle between current and Voltage Measuring instruments	-180° up to 180°	*UREF* / *USIG* 1 mA up to 2 A/0.05 V up to 100 V Measurement frequency:		
		10 Hz up to 1 kHz	0,009°	
		> 1 kHz up to 10 kHz	0,045°	
		UREF / *USIG* > 2 A up to 20 A /1 V up to 100 V Measurement frequency:		
		10 Hz up to 1 kHz	0,02°	
		> 1 kHz up to 10 kHz	0,1°	
		UREF / *USIG* > 20A up to 100A /1V up to 100V Measurement frequency:		
		10 Hz up to 1 kHz	0,025°	
		> 1 kHz up to 10 kHz	0,20°	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Phase angle between current and Voltage Sources	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/0.0 5V 1 mA/0.5 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,007° 0,02° 0,08°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/1 V 10 mA/1 V 20 mA/1 V 50 mA/1 V 100 mA/1 V 200 mA/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,005° 0,010° 0,070°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/1 V 1 A/1 V 2 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,006° 0,040° 0,40°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/1 V 10 A/1 V 20 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,010° 0,090° 0,90°	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Phase angle between current and Voltage Sources	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/1 V 100 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,020° 0,15° 1,5°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/10 V 10 mA/10 V 20 mA/10 V 50 mA/10 V 100 mA/10 200 mA/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,006° 0,020° 0,080°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/10 V 1 A/10 V 2 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,007° 0,040° 0,40°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/10 V 10 A/10 V 20 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,015° 0,09° 0,90°	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Phase angle between current and Voltage Sources	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/10 V 100 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,020° 0,15° 1,5°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/100 V 10 mA/100 V 20 mA/100 V 50 mA/100 V 100 mA/100 V 200 mA/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,008° 0,025° 0,09°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/100 V 1 A/100 V 2 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,007° 0,04° 0,40°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/100 V 10 A/100 V 20 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,015° 0,09° 0,90°	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Phase angle between current and Voltage Sources	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/100 V 100 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz 50 kHz; 100 kHz	 0,020° 0,15° 1,5°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
Phase angle between current and Voltage Measuring instruments	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/0.05 V 1 mA/0.5 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,007° 0,02°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/1 V 10 mA/1 V 20 mA/1 V 50 mA/1 V 100 mA/1 V 200 mA/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,005° 0,010°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/1 V 1 A/1 V 2 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,006° 0,040°	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Phase angle between current and Voltage Measuring instruments	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/1 V 10 A/1 V 20 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,010° 0,090°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/1 V 100 A/1 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,020° 0,15°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/10 V 10 mA/10 V 20 mA/10 V 50 mA/10 V 100 mA/10 V 200 mA/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,006° 0,020°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/10 V 1 A/10 V 2 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,007° 0,040°	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Phase angle between current and Voltage Measuring instruments	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/10 V 10 A/10 V 20 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,015° 0,09°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/10 V 100 A/10 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,020° 0,15°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 1 mA/100 V 10 mA/100 V 20 mA/100 V 50 mA/100 V 100 mA/100 V 200 mA/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,008° 0,025°	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Phase angle between current and Voltage Measuring instruments	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 500 mA/100 V 1 A/100 V 2 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,007° 0,04°	U_{SIG}: Signal voltage U_{REF}: Reference voltage For discrete measured values and frequencies
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 5 A/100 V 10 A/100 V 20 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,015° 0,09°	
	0°; 30°; 60°; 75°; 90°; 150°; 180°; 270°; 300°	U_{REF} / U_{SIG} 50 A/100 V 100 A/100 V Measurement frequency: 10 Hz; 40 Hz; 55 Hz; 400 Hz; 1kHz 5 kHz; 10 kHz	 0,020° 0,15°	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Inductance	100 µH	1 kHz; 10 kHz	$0.3 \cdot 10^{-3}$	
Inductance meters	1 mH	1 kHz 10 kHz	$65 \cdot 10^{-6}$ $0.15 \cdot 10^{-3}$	
Sources Decade Standards	10 mH	1 kHz 10 kHz	$55 \cdot 10^{-6}$ $0.16 \cdot 10^{-3}$	
	100 mH	1 kHz 10 kHz	$65 \cdot 10^{-6}$ $0.21 \cdot 10^{-3}$	
	1 H	100 Hz 1 kHz	$0.1 \cdot 10^{-3}$ $70 \cdot 10^{-6}$	
	10 H	100 Hz 1 kHz	$0.2 \cdot 10^{-3}$ $0.2 \cdot 10^{-3}$	
Inductance	0.1 mH up to 1 mH	1 kHz up to 10 kHz	$5.5 \cdot 10^{-3}$	
Inductance meters, Sources	> 1 mH up to 10 mH	1 kHz up to 10 kHz	$1.5 \cdot 10^{-3}$	
	> 10 mH up to 100 mH	1 kHz up to 10 kHz	$0.4 \cdot 10^{-3}$	
	> 0.1 H up to 1 H	1 kHz	$0.4 \cdot 10^{-3}$	
	> 1 H up to 10 H	100 Hz up to 1 kHz	$1.5 \cdot 10^{-3}$	
Capacitance Capacitance meters Decadic standards	1 pF	50 Hz 100 Hz 1 kHz 10 kHz 100 kHz; 400 kHz; 1 MHz	$6 \cdot 10^{-3}$ $2.5 \cdot 10^{-3}$ $0.3 \cdot 10^{-3}$ $0.2 \cdot 10^{-3}$ $3.5 \cdot 10^{-3}$	
	10 pF	50 Hz 100 Hz 1 kHz 10 kHz 100 kHz; 400 kHz 1 MHz	$0.6 \cdot 10^{-3}$ $0.4 \cdot 10^{-3}$ $35 \cdot 10^{-6}$ $40 \cdot 10^{-6}$ $50 \cdot 10^{-6}$ $85 \cdot 10^{-6}$	
	100 pF	50 Hz 100 Hz 1 kHz; 10 kHz 100 kHz 400 kHz 1 MHz	$80 \cdot 10^{-6}$ $40 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $35 \cdot 10^{-6}$ $65 \cdot 10^{-6}$ $0.35 \cdot 10^{-3}$	
	1 nF	50 Hz 100 Hz 1 kHz 10 kHz 100 kHz 400 kHz 1 MHz	$25 \cdot 10^{-6}$ $15 \cdot 10^{-6}$ $10 \cdot 10^{-6}$ $20 \cdot 10^{-6}$ $55 \cdot 10^{-6}$ $0.45 \cdot 10^{-3}$ $3 \cdot 10^{-3}$	
	10 nF	50 Hz; 1 kHz 100 Hz; 10 kHz	$25 \cdot 10^{-6}$ $35 \cdot 10^{-6}$	
	100 nF	50 Hz; 10 kHz 100 Hz 1 kHz	$35 \cdot 10^{-6}$ $55 \cdot 10^{-6}$ $25 \cdot 10^{-6}$	
	1 µF	50 Hz 100 Hz 1 kHz 10 kHz	$40 \cdot 10^{-6}$ $70 \cdot 10^{-6}$ $35 \cdot 10^{-6}$ $55 \cdot 10^{-6}$	
	10 µF	50 Hz; 100 Hz; 1 kHz 10 kHz	0,2 · 10–3 0,4 · 10–3	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Capacity	10 pF up to 100 pF	50 Hz up 1 kHz	$2.3 \cdot 10^{-6}$ *C* 0.016 pF	*C* = measured value
Sources, measuring		> 1 kHz up to 10 kHz	$2.7 \cdot 10^{-6}$ *C* 0.009 pF	
instruments, Standards		> 10 kHz up 100 kHz	$10 \cdot 10^{-6}$ *C* 0.010 pF	
		> 100 kHz up to 400 kHz	$18 \cdot 10^{-6}$ *C* 0.010 pF	
		> 400 kHz up to 1 MHz	$0.29 \cdot 10^{-3}$ *C* 0.019 pF	
		up to		
	>100 pF up to 1 nF	50 Hz until 1 kHz	$2.2 \cdot 10^{-6}$ *C* 0.11 pF	
		> 1 kHz until 100 kHz	$3.1 \cdot 10^{-6}$ *C* 0.12 pF	
		> 100 kHz until 400 kHz	$0.42 \cdot 10^{-3}$ *C* 0.11 pF	
		> 400 kHz up to 1 MHz	$3.1 \cdot 10^{-3}$ *C* 0.46 pF	
	>1 nF up to 10 nF	50 Hz up to 1 kHz	$2.5 \cdot 10^{-6}$ *C* 2.0 pF	
		> 1 kHz up to 10 kHz	$2.3 \cdot 10^{-6}$ *C* 2.2 pF	
	>10 nF up to 100 nF	50 Hz up to 1 kHz	$4.7 \cdot 10^{-6}$ *C* 24 pF	
		> 1 kHz up to 10 kHz	$3.2 \cdot 10^{-6}$ *C* 16 pF	
	>100 nF up to 1 µF	50 Hz up to 100 Hz	$2.9 \cdot 10^{-6}$ *C* 0.31 nF	
		> 100 Hz up to 1 kHz	$9.5 \cdot 10^{-6}$ *C* 0.17 nF	
		> 1 kHz 10 kHz	$9.7 \cdot 10^{-6}$ *C* 0.09 nF	
	>1 µF up to 10 µF	50 Hz up to 100 Hz	$1.9 \cdot 10^{-4}$ *C* 0.0001 µF	
		> 100 Hz up to 1 kHz	$1.1 \cdot 10^{-4}$ *C* 0.0013 µF	
		> 1 kHz 10 kHz	$2.1 \cdot 10^{-4}$ *C* 0.0032 µF	
Capacity	190 pF up to < 400 pF	10 Hz up to 10 kHz	$4 \cdot 10^{-3}$ *C* 8 pF	With 5520A / 5522A
Measuring instruments	400 pF up to < 1.1 nF	10 Hz up to 10 kHz	$4.5 \cdot 10^{-3}$ *C* 8 pF	
	1.1 nF up to < 3.3 nF	10 Hz up to 3 kHz	$4.0 \cdot 10^{-3}$ *C* 8 pF	
	3.3 nF up to < 11 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}$ *C* 8 pF	
	11 nF up to < 33 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}$ *C* 80 pF	
	33 nF up to < 110 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}$ *C* 80 pF	
	110 nF up to < 330 nF	10 Hz up to 1 kHz	$4.5 \cdot 10^{-3}$ *C*	
	330 nF up to < 1.1 µF	10 Hz up to 600 Hz	$4.5 \cdot 10^{-3}$ *C*	
	1.1 µF up to < 3.3 µF	10 Hz up to 300 Hz	$4.5 \cdot 10^{-3}$ *C*	
	3.3 µF up to < 11 µF	10 Hz up to 150 Hz	$4.5 \cdot 10^{-3}$ *C*	
	11 µF up to < 33 µF	10 Hz up to 120 Hz	$6.0 \cdot 10^{-3}$ *C*	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Capacity Measuring instruments	33 µF up to < 110 µF 110 µF up to < 330 µF 330 µF up to < 1.1 mF 1.1 mF up to < 3.3 mF 3.3 mF up to < 11 mF 11 mF up to < 33 mF 33 mF up to 110 mF	10 Hz up to 80 Hz DC up to 50 Hz DC up to 20 Hz DC up to 6 Hz DC up to 2 Hz DC up to 200.6 Hz DC up to 0,2 Hz	$6.5 \cdot 10^{-3}\ C$ $6.0 \cdot 10^{-3}\ C$ $6.0 \cdot 10^{-3}\ C$ $6.0 \cdot 10^{-3}\ C$ $6.0 \cdot 10^{-3}\ C$ $8.0 \cdot 10^{-3}\ C$ $11 \cdot 10^{-3}\ C$	*C* = measured value
DC capacitance Sources, measuring instruments	1 µF up to 70 µF > 70 µF up to 200 µF > 200 µF up to 110 mF	DC method	$2.6 \cdot 10^{-3}$ $0.55 \cdot 10^{-3}$ $0.30 \cdot 10^{-3}$	
Voltage ratio	± 2 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.04 µV/V 0.05 µV/V 1.0 µV/V	Calibration of 350 Ω bridge standards and the associated indicators at discrete points in 10% increments
	± 2 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.05 µV/V 0.05 µV/V 1.0 µV/V	
	± 5 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 4.8 kHz	 0.15 µV/V 1.0 µV/V	
	± 10 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 4.8 kHz	 0.10 µV/V 0.30 µV/V	
	± 5 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.1 µV/V 0.1 µV/V 1.0 µV/V	
	± 10 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.4 µV/V 0.4 µV/V 0.4 µV/V	
	± 10 mV/V	Bridge voltage: 1 V Measuring frequency 600 Hz	 0.40 µV/V	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Voltage ratio	± 20 mV/V	Bridge voltage: 1 V Measuring frequency 4.8 kHz	0.60 µV/V	Calibration of 350 Ω bridge standards and the associated indicators at discrete points in 10% steps
	± 100 mV/V	Bridge voltage: 1 V Measuring frequency 4.8 kHz	5.0 µV/V	
	± 100 mV/V	Bridge voltage: 2,5 V Measuring frequency 4.8 kHz	5.0 µV/V	
Voltage ratio DC voltage Bridge standards	0 mV/V -2 mV/V up to 2 mV/V -5 mV/V up to 5 mV/V -10 mV/V up to 10 mV/V -20 mV/V up to 20 mV/V -100 mV/V up to 100 mV/V	DC voltage bridge voltage: 0,5 V	0.4 µV/V 0.35 µV/V 0.35 µV/V 0.35 µV/V 0.35 µV/V 0.35 µV/V	
	0 mV/V -2 mV/V up to 2 mV/V -5 mV/V up to 5 mV/V -10 mV/V up to 10 mV/V -20 mV/V up to 20 mV/V -100 mV/V up to 100 mV/V	DC voltage Bridge voltage: 1,0 V	0.2 µV/V 0.15 µV/V 0.15 µV/V 0.15 µV/V 0.15 µV/V 0.25 µV/V	
Voltage ratio DC voltage Bridge standards	0 mV/V -2 mV/V up to 2 mV/V -5 mV/V up to 5 mV/V -10 mV/V up to 10 mV/V -20 mV/V up to 20 mV/V -100 mV/V up to 100 mV/V	DC voltage bridge voltage: 2,5 V	0.1 µV/V 0.07 µV/V 0.07 µV/V 0.07 µV/V 0.07 µV/V 0.20 µV/V	
	0 mV/V -2 mV/V up to 2 mV/V -5 mV/V up to 5 mV/V -10 mV/V up to 10 mV/V -20 mV/V up to 20 mV/V -100 mV/V up to 100 mV/V	DC voltage Bridge voltage: 5,0 V	0.04 µV/V 0.035 µV/V 0.035 µV/V 0.035 µV/V 0.045 µV/V 0.15 µV/V	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Voltage ratio DC voltage Bridge standards		DC voltage bridge voltage:		
	0 mV/V		0.025 µV/V	
	-2 mV/V up to 2 mV/V		0.025 µV/V	
	-5 mV/V up to 5 mV/V	7,5 V	0.025 µV/V	
	-10 mV/V up to 10 mV/V		0.025 µV/V	
	-20 mV/V up to 20 mV/V		0.04 µV/V	
	-100 mV/V up to 100 mV/V		0.15 µV/V	
		DC voltage Bridge voltage:		
	0 mV/V		0.02 µV/V	
	-2 mV/V up to 2 mV/V		0.015 µV/V	
	-5 mV/V up to 5 mV/V	10,0 V	0.020 µV/V	
	-10 mV/V up to 10 mV/V		0.025 µV/V	
	-20 mV/V up to 20 mV/V		0.035 µV/V	
	-100 mV/V up to 100 mV/V		0.075 µV/V	
Voltage ratio DC voltage bridges, measuring instruments, measuring amplifiers		DC voltage bridge voltage:		With K148
	-2 mV/V up to 2 mV/V		0.35 µV/V	
	-5 mV/V up to 5 mV/V	0,5 V	0.35 µV/V	
	-10 mV/V up to 10 mV/V		0.40 µV/V	
	-20 mV/V up to 20 mV/V		0.55 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	
		DC voltage Bridge voltage:		
	-2 mV/V up to 2 mV/V		0.20 µV/V	
	-5 mV/V up to 5 mV/V	1 V	0.20 µV/V	
	-10 mV/V up to 10 mV/V		0.30 µV/V	
	-20 mV/V up to 20 mV/V		0.50 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	
		DC voltage Bridge voltage:		
	-2 mV/V up to 2 mV/V		0.10 µV/V	
	-5 mV/V up to 5 mV/V	2.5 V; 5 V; 7.5 V; 10 V	0.15 µV/V	
	-10 mV/V up to 10 mV/V		0.25 µV/V	
	-20 mV/V up to 20 mV/V		0.45 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power		1 mA / 0.05 V // 10 Hz up to 10 kHz		P = AC active power
Sources and measuring instruments	50.0 µW	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	Discrete points for
(discrete points)	43.3 µW	Phase angle: ±30 °	$0{,}3 \cdot 10^{-3} P$	Current, voltage and
	25.0 µW	Phase angle: ±60 °	$0{,}8 \cdot 10^{-3} P$	Phase angle
	12.9 µW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		1 mA / 0.5 V // 10 Hz up to 10 kHz		
	500 µW	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	
	433 µW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	250 µW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	129 µW	Phase angle: ±75 °	$0{,}7 \cdot 10^{-3} P$	
		1 mA / 1 V // 10 Hz up to 10 kHz		
	1.0 mW	Phase angle: 0 °	$0{,}1 \cdot 10^{-3} P$	
	0.9 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	0.5 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	0.3 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	
		10 mA / 1 V // 10 Hz up to 10 kHz		
	10.0 mW	Phase angle: 0 °	$0{,}1 \cdot 10^{-3} P$	
	8.7 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	5.0 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	2.6 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	
		20 mA / 1 V // 10 Hz up to 10 kHz		
	20.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	17.3 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	10.0 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	5.2 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	
		50 mA / 1 V // 10 Hz up to 10 kHz		
	50.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	47.3 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	25.0 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	12.9 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	
		100 mA / 1 V // 10 Hz up to 10 kHz		
	100.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	86.6 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	
	50.0 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	
	25.9 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power Sources and measuring instruments (discrete points)		200 mA / 1 V // 10 Hz up to 10 kHz		P = AC active power
	200.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	Discrete points for
	173.2 mW	Phase angle: ±30 °	$0{,}2 \cdot 10^{-3} P$	Current, voltage and
	100.0 mW	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} P$	Phase angle
	51.8 mW	Phase angle: ±75 °	$0{,}8 \cdot 10^{-3} P$	
		500 mA / 1 V // 10 Hz up to 10 kHz		
	500.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	433.0 mW	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	250.0 mW	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	129.4 mW	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		1 A / 1 V // 10 Hz up to 10 kHz		
	1,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	0,9 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	0,5 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	0,3 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		2 A / 1 V // 10 Hz up to 10 kHz		
	2,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	1,7 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	1,0 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	0,5 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		5 A / 1 V // 10 Hz up to 10 kHz		
	5,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	4,3 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	2,5 W	Phase angle: ±60 °	$4{,}0 \cdot 10^{-3} P$	
	1,3 W	Phase angle: ±75 °	$8{,}0 \cdot 10^{-3} P$	
		10 A / 1 V // 10 Hz up to 10 kHz		
	10,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	8,7 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	5,0 W	Phase angle: ±60 °	$4{,}0 \cdot 10^{-3} P$	
	2,6 W	Phase angle: ±75 °	$8{,}0 \cdot 10^{-3} P$	
		20 A / 1 V // 10 Hz up to 10 kHz		
	20,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	17,3 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	10,0 W	Phase angle: ±60 °	$4{,}0 \cdot 10^{-3} P$	
	5,2 W	Phase angle: ±75 °	$8{,}0 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power		50 A / 1 V // 10 Hz up to 10 kHz		*P* = AC active power
Sources and measuring instruments	50,0 W	Phase angle: 0 °	$0{,}3 \cdot 10^{-3} P$	Discrete points for
(discrete points)	43,3 W	Phase angle: ±30 °	$3{,}0 \cdot 10^{-3} P$	Current, voltage and
	25,0 W	Phase angle: ±60 °	$6{,}0 \cdot 10^{-3} P$	Phase angle
	12,9 W	Phase angle: ±75 °	$10 \cdot 10^{-3} P$	
		100 A / 1 V // 10 Hz up to 10 kHz		
	100,0 W	Phase angle: 0 °	$0{,}3 \cdot 10^{-3} P$	
	86,6 W	Phase angle: ±30 °	$3{,}0 \cdot 10^{-3} P$	
	50,0 W	Phase angle: ±60 °	$6{,}0 \cdot 10^{-3} P$	
	25,9 W	Phase angle: ±75 °	$10 \cdot 10^{-3} P$	
		1 mA / 10 V // 10 Hz up to 10 kHz		
	10.0 mW	Phase angle: 0 °	$0{,}1 \cdot 10^{-3} P$	
	8.7 mW	Phase angle: ±30 °	$0{,}3 \cdot 10^{-3} P$	
	5.0 mW	Phase angle: ±60 °	$0{,}7 \cdot 10^{-3} P$	
	2.6 mW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		10 mA / 10 V // 10 Hz up to 10 kHz		
	100.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	86.6 mW	Phase angle: ±30 °	$0{,}3 \cdot 10^{-3} P$	
	50.0 mW	Phase angle: ±60 °	$0{,}7 \cdot 10^{-3} P$	
	25.9 mW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		20 mA / 10 V // 10 Hz up to 10 kHz		
	200.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	173.2 mW	Phase angle: ±30 °	$0{,}3 \cdot 10^{-3} P$	
	100.0 mW	Phase angle: ±60 °	$0{,}7 \cdot 10^{-3} P$	
	51.8 mW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		50 mA / 10 V // 10 Hz up to 10 kHz		
	500.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	433.0 mW	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	250.0 mW	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	129.4 mW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		100 mA / 10 V // 10 Hz up to 10 kHz		
	1,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	0,9 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	0,5 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	0,3 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power		200 mA / 10 V // 10 Hz up to 10 kHz		P = AC active power
Sources and measuring instruments	2,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	Discrete points for
(discrete points)	1,7 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	Current, voltage and
	1,0 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	Phase angle
	0,5 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		1 A / 10 V // 10 Hz up to 10 kHz		
	10,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	8,7 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	5,0 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	2,6 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		2 A / 10 V // 10 Hz up to 10 kHz		
	20,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	17,3 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	10,0 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	5,2 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		5 A / 10 V // 10 Hz up to 10 kHz		
	50,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	43,3 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	25,0 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	12,9 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		10 A / 10 V // 10 Hz up to 10 kHz		
	100,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	86,6 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	50,0 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	25,9 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		20 A / 10 V // 10 Hz up to 10 kHz		
	200,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	173,2 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	100,0 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	51,8 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		50 A / 10 V // 10 Hz up to 10 kHz		
	500,0 W	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	
	433,0 W	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} P$	
	250,0 W	Phase angle: ±60 °	$5{,}0 \cdot 10^{-3} P$	
	129,4 W	Phase angle: ±75 °	$1{,}0 \cdot 10^{-2} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power		100 A / 10 V // 10 Hz up to 10 kHz		*P* = AC active power
Sources and measuring instruments	1000,0 W	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	Discrete points for
(discrete points)	866,0 W	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} P$	Current, voltage and
	500,0 W	Phase angle: ±60 °	$5{,}0 \cdot 10^{-3} P$	Phase angle
	258,8 W	Phase angle: ±75 °	1,0 · 10–2 *P*	
		1 mA / 100 V // 10 Hz up to 10 kHz		
	100.0 mW	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	86.6 mW	Phase angle: ±30 °	$0{,}3 \cdot 10^{-3} P$	
	50.0 mW	Phase angle: ±60 °	$0{,}8 \cdot 10^{-3} P$	
	25.9 mW	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		10 mA / 100 V // 10 Hz to 10 kHz		
	1,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	0,9 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	0,5 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	0,3 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		20 mA / 100 V // 10 Hz to 10 kHz		
	2,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	1,7 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	1,0 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	0,5 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		50 mA / 100 V // 10 Hz to 10 kHz		
	5,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	4,3 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	2,5 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	1,3 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		100 mA / 100 V // 10 Hz to 10 kHz		
	10,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	8,7 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	5,0 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	2,6 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	
		200 mA / 100 V // 10 Hz to 10 kHz		
	20,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	17,3 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	10,0 W	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} P$	
	5,2 W	Phase angle: ±75 °	$2{,}0 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC active power		1 A / 100 V // 10 Hz up to 10 kHz		*P* = AC active power
Sources and measuring instruments	100,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	Discrete points for
(discrete points)	86,6 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	Current, voltage and
	50,0 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	Phase angle
	25,9 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		2 A / 100 V // 10 Hz up to 10 kHz		
	200,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	173,2 W	Phase angle: ±30 °	$0{,}5 \cdot 10^{-3} P$	
	100,0 W	Phase angle: ±60 °	$2{,}0 \cdot 10^{-3} P$	
	51,8 W	Phase angle: ±75 °	$3{,}0 \cdot 10^{-3} P$	
		5 A / 100 V // 10 Hz up to 10 kHz		
	500,0 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	433,0 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	250,0 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	129,4 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		10 A / 100 V // 10 Hz up to 10 kHz		
	1000 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	866 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	500 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	258,8 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		20 A / 100 V // 10 Hz up to 10 kHz		
	2000 W	Phase angle: 0 °	$50 \cdot 10^{-6} P$	
	1732 W	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} P$	
	1000 W	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} P$	
	517,6 W	Phase angle: ±75 °	$7{,}0 \cdot 10^{-3} P$	
		50 A / 100 V // 10 Hz up to 10 kHz		
	5000 W	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	
	4330 W	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} P$	
	2500 W	Phase angle: ±60 °	$5{,}0 \cdot 10^{-3} P$	
	1294 W	Phase angle: ±75 °	$1{,}0 \cdot 10–2\ P$	
		100 A / 100 V // 10 Hz up to 10 kHz		
	10000 W	Phase angle: 0 °	$0{,}2 \cdot 10^{-3} P$	
	8660 W	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} P$	
	5000 W	Phase angle: ±60 °	$5{,}0 \cdot 10^{-3} P$	
	2588 W	Phase angle: ±75 °	$10 \cdot 10^{-3}\ P$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power Sources and measuring instruments (discrete points)	25 kW 21.7 kW 12,5 kW 6,5 kW	50 A / 500 V // 40 Hz up to 850 Hz Phase angle: 0 ° Phase angle: ±30 ° Phase angle: ±60 ° Phase angle: ±75 °	$85 \cdot 10^{-6} P$ $0{,}2 \cdot 10^{-3} P$ $0{,}5 \cdot 10^{-3} P$ $1{,}0 \cdot 10^{-3} P$	P = AC active power Discrete points for current, voltage and phase angle
	40 kW 34.6 kW 20 kW 10.4 kW	80 A / 500 V // 40 Hz up to 850 Hz Phase angle: 0 ° Phase angle: ±30 ° Phase angle: ±60 ° Phase angle: ±75 °	$85 \cdot 10^{-6} P$ $0{,}2 \cdot 10^{-3} P$ $0{,}5 \cdot 10^{-3} P$ $1{,}0 \cdot 10^{-3} P$	
AC active power sources and meters over ranges	50 µW up to 500 mW	50 mV ≤ U ≤ 5 V 1 mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 0 °	$0{,}17 \cdot 10^{-3} P$	
		50 mV ≤ U ≤ 5 V mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 0° up to ±30 °	$0{,}2 \cdot 10^{-3} P$	
	50 µW up to 500 mW	50 mV ≤ U ≤ 5 V mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 30 ° up to 60 ° Phase angle: $^{-3}$0 ° up to $^{-6}$ 0 °	$0{,}3 \cdot 10^{-3} P$	
		50 mV ≤ U ≤ 5 V mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 60 ° up to 75 ° Phase angle: $^{-6}$ 0 ° up to -75 °	$0{,}6 \cdot 10^{-3} P$	
	> 500 mW up to 500 W	5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 0 °	$0{,}1 \cdot 10^{-3} P$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 0° up to ±30 °	$0{,}1 \cdot 10^{-3} P$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: ±30 ° to± 60 °	$0{,}3 \cdot 10^{-3} P$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: ±60 ° up to ±75 °	$0{,}6 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power Sources and meters over ranges	> 500 W up up to 10 kW	25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 0 °	$0{,}1 \cdot 10^{-3} P$	P = AC active power
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 0° up to ±30 °	$0{,}15 \cdot 10^{-3} P$	
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: ±30 ° up to ± 60 °	$0{,}35 \cdot 10^{-3} P$	
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: ±60 ° up to ± 75 °	$0{,}75 \cdot 10^{-3} P$	
	50 µW up to 500 µW	0.05 V up to 0.5 V 1 mA >1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $0{,}3 \cdot 10^{-3} P$ $0{,}8 \cdot 10^{-3} P$ $7{,}0 \cdot 10^{-3} P$	
	> 0.5 mW up to 200 mW	0.5 V up to 1 V 1 mA up to 200 mA >1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $0{,}2 \cdot 10^{-3} P$ $0{,}4 \cdot 10^{-3} P$ $0{,}8 \cdot 10^{-3} P$	
	> 200 mW up to 20 W	0.1 V up to 1 V > 200 mA up up to 20 A >1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $1{,}0 \cdot 10^{-3} P$ $4{,}0 \cdot 10^{-3} P$ $8{,}0 \cdot 10^{-3} P$	
	> 20 W up to 100 W	0.1 V up to 1 V > 20 A up to 100 A >1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $3{,}0 \cdot 10^{-3} P$ $6{,}0 \cdot 10^{-3} P$ $10 \cdot 10^{-3} P$	
	10 mW up to 200 mW	> 1 V up to 10 V 1 mA up to < 200 mA > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $0{,}3 \cdot 10^{-3} P$ $0{,}7 \cdot 10^{-3} P$ $2{,}0 \cdot 10^{-3} P$	
	> 200 mW up to 20 W	> 1 V up to 10 V > 200 mA up up to 20 A > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $0{,}5 \cdot 10^{-3} P$ $2{,}0 \cdot 10^{-3} P$ $3{,}0 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC active power Sources and meters over ranges	> 20 W up to 1000 W	> 1 V up to 10 V > 20 A up to 100 A > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $2{,}0 \cdot 10^{-3} P$ $5{,}0 \cdot 10^{-3} P$ $10 \cdot 10^{-3} P$	P = AC active power
	100 mW up to 20 W	> 10 V up to 100 V 1 mA up to 200 mA > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $0{,}5 \cdot 10^{-3} P$ $1{,}0 \cdot 10^{-3} P$ $2{,}0 \cdot 10^{-3} P$	
	> 20 W up to 1000 W	> 10 V up to 100 V > 200 mA up to 10 A > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $1{,}5 \cdot 10^{-3} P$ $3{,}0 \cdot 10^{-3} P$ $7{,}0 \cdot 10^{-3} P$	
	> 1 kW up to 10 kW	> 10 V up to 100 V > 10 A up to 100 A > 1 kHz up to 10 kHz Phase angle: 0° up to ±30° Phase angle: >±30 ° up to ±60° Phase angle: >±60° up to ±75°	 $2{,}0 \cdot 10^{-3} P$ $5{,}0 \cdot 10^{-3} P$ $10 \cdot 10^{-3} P$	
	> 10 kW up to 80 kW	500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 0 °	$85 \cdot 10^{-6} P$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 0° up to ±30 °	$0{,}25 \cdot 10^{-3} P$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 30 ° up to 60 ° Phase angle: $^{-3}$0 ° up to $^{-6}$ 0 °	$0{,}65 \cdot 10^{-3} P$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 60 ° up to 75 ° Phase angle: $^{-6}$ 0 ° up to -75 °	$1{,}5 \cdot 10^{-3} P$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)	50.0 µVAr	1 mA / 0.05 V // 10 Hz up to 10 kHz	$0{,}2 \cdot 10^{-3} Q$	Q=AC reactive power Discrete points for current, voltage and phase angle
	43.3 µVAr	Phase angle: 90 °	$0{,}3 \cdot 10^{-3} Q$	
	25.0 µVAr	Phase angle: ±60 °	$0{,}8 \cdot 10^{-3} Q$	
	12.9 µVAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
		Phase angle: ±15 °		
	500 µVAr	1 mA / 0.5 V // 10 Hz up to 10 kHz	$0{,}2 \cdot 10^{-3} Q$	
	433 µVAr	Phase angle: 90 °	$0{,}2 \cdot 10^{-3} Q$	
	250 µVAr	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} Q$	
	129 µVAr	Phase angle: ±30 °	$0{,}7 \cdot 10^{-3} Q$	
		Phase angle: ±15 °		
	1.0 mVAr	1 mA / 1 V // 10 Hz up to 10 kHz		
	0.9 mVAr	Phase angle: 90 °	$0{,}1 \cdot 10^{-3} Q$	
	0.5 mVAr	Phase angle: ±60 °	$0{,}2 \cdot 10^{-3} Q$	
	0.3 mVAr	Phase angle: ±30 °	$0{,}4 \cdot 10^{-3} Q$	
		Phase angle: ±15 °	$0{,}8 \cdot 10^{-3} Q$	
	10.0 mVAr	10 mA / 1 V // 10 Hz up to 10 kHz		
	8.7 mVAr	Phase angle: 90 °	$0{,}1 \cdot 10^{-3} Q$	
	5.0 mVAr	Phase angle: ±60 °	$0{,}2 \cdot 10^{-3} Q$	
	2.6 mVAr	Phase angle: ±30 °	$0{,}4 \cdot 10^{-3} Q$	
		Phase angle: ±15 °	$0{,}8 \cdot 10^{-3} Q$	
	20.0 mVAr	20 mA / 1 V // 10 Hz up to 10 kHz		
	17.3 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	10.0 mVAr	Phase angle: ±60 °	$0{,}2 \cdot 10^{-3} Q$	
	5.2 mVAr	Phase angle: ±30 °	$0{,}4 \cdot 10^{-3} Q$	
		Phase angle: ±15 °	$0{,}8 \cdot 10^{-3} Q$	
	50.0 mVAr	50 mA / 1 V // 10 Hz up to 10 kHz		
	47.3 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	25.0 mVAr	Phase angle: ±60 °	$0{,}2 \cdot 10^{-3} Q$	
	12.9 mVAr	Phase angle: ±30 °	$0{,}4 \cdot 10^{-3} Q$	
		Phase angle: ±15 °	$0{,}8 \cdot 10^{-3} Q$	
	100.0 mVAr	100 mA / 1 V // 10 Hz up to 10 kHz	$50 \cdot 10^{-6} Q$	
	86.6 mVAr	Phase angle: 90 °	$0{,}2 \cdot 10^{-3} Q$	
	50.0 mVAr	Phase angle: ±60 °	$0{,}4 \cdot 10^{-3} Q$	
	25.9 mVAr	Phase angle: ±30 °	$0{,}8 \cdot 10^{-3} Q$	
		Phase angle: ±15 °		

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)		200 mA / 1 V // 10 Hz up to 10 kHz		*Q*=AC reactive power Discrete points for current, voltage and phase angle
	200.0 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	173.2 mVAr	Phase angle: ±60 °	$0{,}2 \cdot 10^{-3} Q$	
	100.0 mVAr	Phase angle: ±30 °	$0{,}4 \cdot 10^{-3} Q$	
	51.8 mVAr	Phase angle: ±15 °	$0{,}8 \cdot 10^{-3} Q$	
		500 mA / 1 V // 10 Hz up to 10 kHz		
	500.0 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	433.0 mVAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	250.0 mVAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
	129.4 mVAr	Phase angle: ±15 °	$3{,}0 \cdot 10^{-3} Q$	
		1 A / 1 V // 10 Hz up to 10 kHz		
	1.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	0.9 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
	0.3 VAr	Phase angle: ±15 °	$3{,}0 \cdot 10^{-3} Q$	
		2 A / 1 V // 10 Hz up to 10 kHz		
	2.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	1.7 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	1.0 VAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±15 °	$3{,}0 \cdot 10^{-3} Q$	
		5 A / 1 V // 10 Hz up to 10 kHz		
	5.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	4.3 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	2.5 VAr	Phase angle: ±30 °	$4{,}0 \cdot 10^{-3} Q$	
	1.3 VAr	Phase angle: ±15 °	$8{,}0 \cdot 10^{-3} Q$	
		10 A / 1 V // 10 Hz up to 10 kHz		
	10.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	8.7 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	5.0 VAr	Phase angle: ±30 °	$4{,}0 \cdot 10^{-3} Q$	
	2.6 VAr	Phase angle: ±15 °	$8{,}0 \cdot 10^{-3} Q$	
		20 A / 1 V // 10 Hz up to 10 kHz		
	20.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	17.3 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	10.0 VAr	Phase angle: ±30 °	$4{,}0 \cdot 10^{-3} Q$	
	5.2 VAr	Phase angle: ±15 °	$8{,}0 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)		50 A / 1 V // 10 Hz up to 10 kHz		*Q*=AC reactive power Discrete points for current, voltage and phase angle
	50.0 VAr	Phase angle: 90 °	$0{,}3 \cdot 10^{-3} Q$	
	43.3 VAr	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} Q$	
	25.0 VAr	Phase angle: ±30 °	$6{,}0 \cdot 10^{-3} Q$	
	12.9 VAr	Phase angle: ±15 °	$10 \cdot 10^{-3} Q$	
		100 A / 1 V // 10 Hz up to 10 kHz		
	100.0 VAr	Phase angle: 90 °	$0{,}3 \cdot 10^{-3} Q$	
	86.6 VAr	Phase angle: ±60 °	$3{,}0 \cdot 10^{-3} Q$	
	50.0 VAr	Phase angle: ±30 °	$6{,}0 \cdot 10^{-3} Q$	
	25.9 VAr	Phase angle: ±15 °	$10 \cdot 10^{-3} Q$	
		1 mA / 10 V // 10 Hz up to 10 kHz		
	10.0 mVAr	Phase angle: 90 °	$0{,}1 \cdot 10^{-3} Q$	
	8.7 mVAr	Phase angle: ±60 °	$0{,}3 \cdot 10^{-3} Q$	
	5.0 mVAr	Phase angle: ±30 °	$0{,}7 \cdot 10^{-3} Q$	
	2.6 mVAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
		10 mA / 10 V // 10 Hz up to 10 kHz		
	100.0 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	86.6 mVAr	Phase angle: ±60 °	$0{,}3 \cdot 10^{-3} Q$	
	50.0 mVAr	Phase angle: ±30 °	$0{,}7 \cdot 10^{-3} Q$	
	25.9 mVAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
		20 mA / 10 V // 10 Hz up to 10 kHz		
	200.0 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	173.2 mVAr	Phase angle: ±60 °	$0{,}3 \cdot 10^{-3} Q$	
	100.0 mVAr	Phase angle: ±30 °	$0{,}7 \cdot 10^{-3} Q$	
	51.8 mVAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
		50 mA / 10 V // 10 Hz up to 10 kHz		
	500.0 mVAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	433.0 mVAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	250.0 mVAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	129.4 mVAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
		100 mA / 10 V// 10 Hz up to 10 kHz		
	1.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	0.9 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	0.3 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)		200 mA / 10 V// 10 Hz up to 10 kHz		*Q*=AC reactive power Discrete points for current, voltage and phase angle
	2.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	1.7 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	1.0 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
		1 A / 10 V // 10 Hz up to 10 kHz		
	10.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	8.7 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	5.0 VAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
	2.6 VAr	Phase angle: ±15 °	$3{,}0 \cdot 10^{-3} Q$	
		2 A / 10 V // 10 Hz up to 10 kHz		
	20.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	17.3 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	10.0 VAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-3} Q$	
	5.2 VAr	Phase angle: ±15 °	$3{,}0 \cdot 10^{-3} Q$	
		5 A / 10 V // 10 Hz up to 10 kHz		
	50.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	43.3 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	25.0 VAr	Phase angle: ±30 °	$3{,}0 \cdot 10^{-3} Q$	
	12.9 VAr	Phase angle: ±15 °	$7{,}0 \cdot 10^{-3} Q$	
		10 A / 10 V // 10 Hz up to 10 kHz		
	100.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	86.6 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	50.0 VAr	Phase angle: ±30 °	$3{,}0 \cdot 10^{-3} Q$	
	25.9 VAr	Phase angle: ±15 °	$7{,}0 \cdot 10^{-3} Q$	
		20 A / 10 V // 10 Hz up to 10 kHz		
	200.0 VAr	Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	173.2 VAr	Phase angle: ±60 °	$1{,}0 \cdot 10^{-3} Q$	
	100.0 VAr	Phase angle: ±30 °	$3{,}0 \cdot 10^{-3} Q$	
	51.8 VAr	Phase angle: ±15 °	$7{,}0 \cdot 10^{-3} Q$	
		50 A / 10 V // 10 Hz up to 10 kHz		
	500.0 VAr	Phase angle: 90 °	$0{,}2 \cdot 10^{-3} Q$	
	433.0 VAr	Phase angle: ±60 °	2,0 · 10–2 *Q*	
	250.0 VAr	Phase angle: ±30 °	2,0 · 10–2 *Q*	
	129.4 VAr	Phase angle: ±15 °	1,0 · 10–2 *Q*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)	1000.0 VAr	100 A / 10 V // 10 Hz up to 10 kHz Phase angle: 90 °	$0{,}2 \cdot 10^{-3} Q$	Q=AC reactive power Discrete points for current, voltage and phase angle
	866.0 VAr	Phase angle: ±60 °	$2{,}0 \cdot 10^{-2} Q$	
	500.0 VAr	Phase angle: ±30 °	$2{,}0 \cdot 10^{-2} Q$	
	258.8 VAr	Phase angle: ±15 °	$1{,}0 \cdot 10^{-2} Q$	
	100.0 m VAr	1 mA / 100 V // 10 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	86.6 m VAr	Phase angle: ±60 °	$0{,}3 \cdot 10^{-3} Q$	
	50.0 m VAr	Phase angle: ±30 °	$0{,}8 \cdot 10^{-3} Q$	
	25.9 m VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
	1.0 VAr	10 mA /100 V // 10 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	0.9 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	0.3 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
	2.0 VAr	20 mA /100 V // 10 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	1.7 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	1.0 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	0.5 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
	5.0 VAr	50 mA / 100 V// 10 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	4.3 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	2.5 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	1.3 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
	10.0 VAr	100 mA /100 V//10 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	8.7 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	5.0 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	2.6 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	
	20.0 VAr	200 mA/100 V// 0 Hz up to 10 kHz Phase angle: 90 °	$50 \cdot 10^{-6} Q$	
	17.3 VAr	Phase angle: ±60 °	$0{,}5 \cdot 10^{-3} Q$	
	10.0 VAr	Phase angle: ±30 °	$1{,}0 \cdot 10^{-3} Q$	
	5.2 VAr	Phase angle: ±15 °	$2{,}0 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power		1 A / 100 V // 10 Hz up to 10 kHz		*Q*=AC reactive power
Sources and measuring instruments (discrete points)	100.0 VAr 86.6 VAr 50.0 VAr 25.9 VAr	Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$50 \cdot 10^{-6} Q$ $0{,}5 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$	Discrete points for current, voltage and phase angle
	200.0 VAr 173.2 VAr 100.0 VAr 51.8 VAr	2 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$50 \cdot 10^{-6} Q$ $0{,}5 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$	
	500.0 VAr 433.0 VAr 250.0 VAr 129.4 VAr	5 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$50 \cdot 10^{-6} Q$ $1{,}0 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$ $7{,}0 \cdot 10^{-3} Q$	
	1000 VAr 866 VAr 500 VAr 258.8 VAr	10 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$50 \cdot 10^{-6} Q$ $1{,}0 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$ $7{,}0 \cdot 10^{-3} Q$	
	2000 VAr 1732 VAr 1000 VAr 517.6 VAr	20 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$50 \cdot 10^{-6} Q$ $1{,}0 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$ $7{,}0 \cdot 10^{-3} Q$	
	5000 VAr 4330 VAr 2500 VAr 1294 VAr	50 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$0{,}2 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$ $5{,}0 \cdot 10^{-3} Q$ 1,0 · 10–2 *Q*	
	10000 VAr 8660 VAr 5000 VAr 2588 VAr	100 A / 100 V // 10 Hz up to 10 kHz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$0{,}2 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$ $5{,}0 \cdot 10^{-3} Q$ $1{,}0 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and measuring instruments (discrete points)	25 kVAr 21.7 kVAr 12.5 kVAr 6.5 kVAr	50 A / 500 V // 40 Hz up to 850 Hz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$85 \cdot 10^{-6} Q$ $0{,}2 \cdot 10^{-3} Q$ $0{,}5 \cdot 10^{-3} Q$ $1{,}0 \cdot 10^{-3} Q$	Q=AC reactive power *Discrete points for current, voltage and phase angle*
	40 kVAr 34.6 kVAr 20 kVAr 10.4 kVAr	80 A / 500 V // 40 Hz up to 850 Hz Phase angle: 90 ° Phase angle: ±60 ° Phase angle: ±30 ° Phase angle: ±15 °	$85 \cdot 10^{-6} Q$ $0{,}2 \cdot 10^{-3} Q$ $0{,}5 \cdot 10^{-3} Q$ $1{,}0 \cdot 10^{-3} Q$	
Alternating current reactive power Sources and meters over ranges	50 µVAr up to 500 mVAr	50 mV ≤ U ≤ 5 V 1 mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: ±90 °	$0{,}17 \cdot 10^{-3} Q$	Q=AC reactive power
		50 mV ≤ U ≤ 5 V 1 mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 90 ° up to 60 ° Phase angle: -90 ° up to $^{-6}$ 0 °	$0{,}2 \cdot 10^{-3} Q$	
		50 mV ≤ U ≤ 5 V 1 mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 60 ° up to 30 ° Phase angle: $^{-6}$ 0 ° up to $^{-3}$0 °	$0{,}3 \cdot 10^{-3} Q$	
		50 mV ≤ U ≤ 5 V 1 mA ≤ I ≤ 100 mA 10 Hz up to 1 kHz Phase angle: 30 ° up to 15 ° Phase angle: $^{-3}$0 ° up to -15 °	$0{,}6 \cdot 10^{-3} Q$	
	> 500 mVAr up to 500 VAr	5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 90 °	$0{,}1 \cdot 10^{-3} Q$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 90 ° up to 60 ° Phase angle: -90 ° up to $^{-6}$ 0 °	$0{,}1 \cdot 10^{-3} Q$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 60 ° up to 30 ° Phase angle: $^{-6}$ 0 ° up to $^{-3}$0 °	$0{,}3 \cdot 10^{-3} Q$	
		5 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 1 kHz Phase angle: 30 ° up to 15 ° Phase angle: $^{-3}$0 ° up to -15 °	$0{,}6 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and meters over ranges	> 500 VAr up up to 10 kVAr	25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 90 °	$0{,}1 \cdot 10^{-3} Q$	*Q*=AC reactive power
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 90 ° up to 60 ° Phase angle: -90 ° up to $^{-6}$ 0 °	$0{,}15 \cdot 10^{-3} Q$	
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 60 ° up to 30 ° Phase angle: $^{-6}$ 0 ° up to $^{-3}$0 °	$0{,}35 \cdot 10^{-3} Q$	
		25 V ≤ U ≤ 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 1 kHz Phase angle: 30 ° up to 15 ° Phase angle: $^{-3}$0 ° up to -15 °	$0{,}75 \cdot 10^{-3} Q$	
	50 µVAr up to 500 µVAr	0.05 V up to 0.5 V 1 mA > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: < ±60 ° up to ±30° Phase angle: < ±30° up to ±15°	$0{,}3 \cdot 10^{-3} Q$ $0{,}8 \cdot 10^{-3} Q$ $7{,}0 \cdot 10^{-3} Q$	
	> 0.5 mVAr up to 200 mVAr	0.5 V up to 1 V 1 mA up to < 200 mA > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: < ±60 ° up to ±30° Phase angle: < ±30° up to ±15°	$0{,}2 \cdot 10^{-3} Q$ $0{,}4 \cdot 10^{-3} Q$ $0{,}8 \cdot 10^{-3} Q$	
	> 200 mVAr up to 20 VAr	> 0.1 V up to 1 V > 200 mA up up to 20 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: < ±60 ° up to ±30° Phase angle: < ±30° up to ±15°	$1{,}0 \cdot 10^{-3} Q$ $4{,}0 \cdot 10^{-3} Q$ $8{,}0 \cdot 10^{-3} Q$	
	> 20 VAr up to 100 VAr	> 0.1 V up to 1 V > 20 A up to 100 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: < ±60 ° up to ±30° Phase angle: < ±30° up to ±15°	$3{,}0 \cdot 10^{-3} Q$ $6{,}0 \cdot 10^{-3} Q$ $10{,}0 \cdot 10^{-3} Q$	
	10 mVAr up to 200 mVAr	> 1 V up to 10 V 1 mA up to < 200 mA > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: < ±60 ° up to ±30° Phase angle: < ±30° up to ±15°	$0{,}3 \cdot 10^{-3} Q$ $0{,}7 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current reactive power Sources and meters over ranges	> 200 mVAr up to 20 VAr	> 1 V up to 10 V > 200 mA up up to 20 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: <±60 ° up to ±30° Phase angle: <±30° up to ±15°	$0{,}3 \cdot 10^{-3} Q$ $0{,}7 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$	Q=AC reactive power
	> 20 VAr up to 1000 VAr	> 1 V up to 10 V > 20 A up to 100 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: <±60 ° up to ±30° Phase angle: <±30° up to ±15°	$2{,}0 \cdot 10^{-3} Q$ $5{,}0 \cdot 10^{-3} Q$ $10 \cdot 10^{-3} Q$	
	100 mVAr up to 20 VAr	> 10 V up to 100 V 1 mA up to 200 mA > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: <±60 ° up to ±30° Phase angle: <±30° up to ±15°	$0{,}5 \cdot 10^{-3} Q$ $1{,}0 \cdot 10^{-3} Q$ $2{,}0 \cdot 10^{-3} Q$	
	> 20 VAr up to 1000 VAr	> 10 V up to 100 V > 200 mA up to 10 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: <±60 ° up to ±30° Phase angle: <±30° up to ±15°	$1{,}5 \cdot 10^{-3} Q$ $3{,}0 \cdot 10^{-3} Q$ $7{,}0 \cdot 10^{-3} Q$	
	> 1 kVAr up to 10 kVAr	> 10 V up to 100 V > 10 A up to 100 A > 1 kHz up to 10 kHz Phase angle: ±90° up to ±60° Phase angle: <±60 ° up to ±30° Phase angle: <±30° up to ±15°	$2{,}0 \cdot 10^{-3} Q$ $5{,}0 \cdot 10^{-3} Q$ $10{,}0 \cdot 10^{-3} Q$	
	> 10 kVAr up to 80 kVAr	500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle:± 90 °	$85 \cdot 10^{-6} Q$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 90 ° up to 60 ° Phase angle: -90 ° up to $^{-6}$ 0 °	$0{,}25 \cdot 10^{-3} Q$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 60 ° up to 30 ° Phase angle: $^{-6}$ 0 ° up to $^{-3}$0 °	$0{,}65 \cdot 10^{-3} Q$	
		500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz Phase angle: 30 ° up to 15 ° Phase angle: $^{-3}$0 ° up to -15 °	$1{,}5 \cdot 10^{-3} Q$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Alternating current apparent power Sources and meters over ranges	50 µVA up to 500 µVA	50 mV ≤ U ≤ 500 mV I = 1 mA 10 Hz up to 10 kHz	$0{,}17 \cdot 10^{-3} S$	S = AC apparent power
	500 µVA up up to 5 mVA	U = 500 mV 10 mA ≤ I ≤ 100 mA 10 Hz up to 10 kHz	$0{,}16 \cdot 10^{-3} S$	
	5 mVA up to 50 mVA	U = 500 mV 10 mA ≤ I ≤ 100 mA 10 Hz up to 10 kHz	$55 \cdot 10^{-6} S$	
	50 mVA up to 500 mVA	500 mV ≤ U ≤ 5 V I = 100 mA 10 Hz up to 10 kHz	$30 \cdot 10^{-6} S$	
	500 mVA up up to 5 VA	5 V ≤ U ≤ 50 V I = 100 mA 16 Hz up to 10 kHz	$25 \cdot 10^{-6} S$	
	5 VA up to 500 VA	50 V ≤ U ≤ 500 V 100 mA ≤ I ≤ 1 A 16 Hz up to 10 kHz	$50 \cdot 10^{-6} S$	
	500 VA up up to 5 kVA	U = 500 V 1 A ≤ I ≤ 10 A 16 Hz up to 5 kHz	$60 \cdot 10^{-6} S$	
	5 kVA up to 10 kVA	U = 500 V 1 A ≤ I ≤ 20 A 16 Hz up to 5 kHz	$60 \cdot 10^{-6} S$	
	10 kVA up to 80 kVA	500 V ≤ U ≤ 1000 V 20 A ≤ I ≤ 80 A 40 Hz up to 850 Hz	$85 \cdot 10^{-6} S$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Harmonic voltage Measuring instruments Sources Power Measuring instruments Sources	 1 V up to 1000 V 1 V up to 180 V 1 V up to 1000 V 1 V up to 180 V 0.01 A up up to 80 A 0.01 A up to 20 A 0.01 A up up to 80 A 0.01 A up to 20 A	 40 Hz up to 850 Hz > 850 Hz up to 5 kHz 40 Hz up to 850 Hz > 850 Hz up to 5 kHz 40 Hz up to 850 Hz > 850 Hz up to 5 kHz 40 Hz up to 850 Hz > 850 Hz up to 5 kHz	 $0.5 \cdot 10^{-3}$ $0.8 \cdot 10^{-3}$ $0.4 \cdot 10^{-3}$ $0.4 \cdot 10^{-3}$ $4.0 \cdot 10^{-3}$ 3,0 % $4.0 \cdot 10^{-3}$ 3,0 %	Maximum up up to 100. Harmonic harmonic
Frequency Frequency measurement Frequency synthesis Time interval	10 MHz 1 mHz up to 46 GHz 1 mHz up to 50 GHz 1 ns up to 1000 s	Measuring time > 30 min Measuring time > 5 min	$1 \cdot 10^{-11}\ f$ $\sqrt{(1 \cdot 10^{-10} \cdot f)^2 + U_{Tf}^2}$ $1 \cdot 10\text{-}10\ f$ $\sqrt{(1 \cdot 10^{-10} \cdot t)^2 + U_{Tt}^2 + 1\text{ns}^2}$	f = current measured value At low frequencies are possible trigger uncertainties U_{Tf} resp. U_{Tt} up to be taken inup to account.
Speed optical mechanical	1 min^{-1} up to $2 \cdot 10^5$ min^{-1} 1 min^{-1} up up to 10000 min^{-1}	with light pulse generator	$6 \cdot 10^{-6}$ but not less than 0.001 min^{-1} $4 \cdot 10^{-4}$ but not less than 0.01 min^{-1}	
Oscilloscope calibrators Deflection vertical	1 mV up to 5 V 1 mV up to 200 V	Square wave voltage 10 Hz up to 10 kHz R_i= 50 Ω R_i= 1 MΩ	$\sqrt{20 \cdot 10^{-6} \cdot 1\ \mu\text{V}}$	
Diversion horizontal	1 ns up to 1 s > 1 s up to 5 s	Timestamps Measuring time > 5 min R_i= 1 MΩ, 50 Ω	$\sqrt{(1 \cdot 10^{-10} \cdot t)^2 + U_{Tt}^2}$ $\sqrt{(5 \cdot 10^{-10} \cdot t)^2 + U_{Tt}^2}$	t = current measured value Trigger uncertainty U_{Tt} up to be considered
Rise time t_r	18 hp up to 100 hp > 100 ps up to 10 ms	20 mV to 1 V	8 ps $4{,}5 \cdot 10^{-2} \cdot t_r$ 3 ps	External trigger signal required

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Electrical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Oscilloscopes				
Deflection vertical	1 mV up to 5V	Square wave voltage 10 Hz up to 10 kHz	0,35 %	*Ri* Internal resistance
	1 mV 120 V	*Ri* = 50 Ω	0,35 %	
		Ri = 1 MΩ		
Deflection horizontal	50 ps up to < 1 µs	Time stamps or sine	6 ps	*t* = current measured value
	1 µs up to 5 s	< 1 V	$1{,}5 \cdot 10^{-3} - \cdot t$	
Rise time t_r	180 hp up to 450 hp	250 mV	40 ps	t_r = current rise time
	> 450 ps up to 10 ms	250 mV up to 1 V	$4{,}5 \cdot 10^{-2} \cdot t_r$	
Bandwidth *B*	f_c	0,2 V up to 2 V		f_c = frequency at the
		Ri= 50 Ω		$^{-3}$dB point
	50 MHz up to 26.5 GHz	$\lvert\Gamma_{OSCI}\rvert \le 0{,}05$	12 MHz	f_{Ref} = 5% f_c
		$\lvert\Gamma_{OSZI}\rvert \le 0{,}1$	13 MHz	$\lvert\Gamma_{OSZI}\rvert$: Reflection factor Oszi
		$\lvert\Gamma_{OSZI}\rvert \le 0{,}15$	14 MHz	
		$\lvert\Gamma_{OSZI}\rvert \le 0{,}2$	15 MHz	
Total Harmonic Distortion	0 up to 0,3	100 Hz up to 50 kHz	0.0001 0.0165 - *THD*	
THD / distortion factor	0 up to 0,3	100 kHz up to 2 GHz	0.0001 0.0675 - *THD*	
THDAudio	0 up to 0,3	100 Hz up to 50 kHz	0.001 0.007 - *THDAudio*	
Flicker				
ΔU / U	0,4 up to 5	DIN EN 61000-4-15:2011	$7 \cdot 10^{-3} - \Delta U / U$	
Frequency	0.0083 Hz 40 Hz		$3 \cdot 10^{-3} - \Delta U / U$	
Pst (Short Term)	10 2 Minutes	(115 V, 60 Hz); (230 V 50 Hz)	0,5 %	
P_{lt} (Long Term)	Hours	(115 V, 60 Hz); (230 V 50 Hz)	1,7%	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
HF power Power meters	> 1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.025 0.14 - |Γ|) - *P*	Connector system: N, PC^{-3}.5 ; 50 Ω; |Γ| KG ≤ 0.2
		> 2 GHz up to 18 GHz	(0.049 0.21 - |Γ|) - *P*	
		> 18 GHz up to 26.5 GHz	(0.071 0.32 - |Γ|) - *P*	Connector system: PC^{-3}.5 ; 50 Ω; |Γ| KG ≤ 0.2
HF power Signal generators	>1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.035 0.13 - |Γ|) - *P*	Connector system: N, PC^{-3}.5 ; 50 Ω; |Γ| KG ≤ 0.2
		> 2 GHz up to 18 GHz	(0.053 0.2 - |Γ|) - *P*	
		> 18 GHz up to 26.5 GHz	(0.074 0.31 - |Γ|) - *P*	Connector: PC^{-3}.5; 50 Ω¸ |Γ| KG ≤ 0.2
	0.1 mW up to 10 mW	9 kHz up to < 0.1 MHz	17 · 10^{-3} - · *P*	N connector; 50 Ω | Γ | ≤ 0,3
		0.1 MHz up to 50 MHz	10 · 10^{-3} - · *P*	
		> 50 MHz up to 6 GHz	15 · 10^{-3} - · *P*	
		> 6 GHz up to 18 GHz	20 · 10^{-3} - · *P*	
		0.1 MHz up to 50 MHz	20 · 10^{-3} - · *P*	| Γ | ≤ 0,5
		> 50 MHz up to 6 GHz	30 · 10^{-3} - · *P*	
		> 6 GHz up to 18 GHz	40 · 10^{-3} - · *P*	
	10 mW up to 50 W	0.1 MHz up to 2 GHz	48 · 10^{-3} - · *P*	| *Γ* | of the KG ≤ 0.1 N connector; PC^{-3}.5 For other connectors increases the Uncertainty of measurement
		0.1 MHz up to 2 GHz	63 · 10^{-3} - · *P*	| *Γ* | of the KG ≤ 0.3
		0.1 MHz up to 2 GHz	123 · 10^{-3} - · *P*	| *Γ* | of the KG ≤ 0.5
	0.1 mW up to 10 mW	10 MHz up to 1 GHz	20 · 10^{-3} - · *P*	Connector PC^{-3}.5; 50 Ω | Γ | ≤ 0,3
		> 1 GHz up to 10 GHz	30 · 10^{-3} - · *P*	
		> 10 GHz up to 18 GHz	40 · 10^{-3} - · *P*	
		> 18 GHz up to 26.5 GHz	45 · 10^{-3} - · *P*	
		10 MHz up to 1 GHz	40 · 10^{-3} - · *P*	| Γ | ≤ 0,5
		> 1 GHz up to 10 GHz	80 · 10^{-3} - · *P*	For other connectors
		> 10 GHz up to 18 GHz	100 · 10^{-3} - · *P*	increases the
		> 18 GHz up to 26.5 GHz	110 · 10^{-3} - · *P*	Uncertainty of measurement

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
HF power Power meters	0.1 mW up to 10 mW	9 kHz up to < 0.1 MHz 0.1 MHz up to 50 MHz > 50 MHz up to 6 GHz > 6 GHz up to 16 Hz	$17 \cdot 10^{-3} \cdot \cdot P$ $6.0 \cdot 10^{-3} \cdot \cdot P$ $12 \cdot 10^{-3} \cdot \cdot P$ $20 \cdot 10^{-3} \cdot \cdot P$	N connector; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ With other connectors the measurement uncertainty increases
	> 10 mW up to 50 W	32 MHz up to 1 GHz	$20 \cdot 10^{-3} \cdot \cdot P$	
	0.1 mW up to 10 mW	10 MHz up to 1 GHz > 1 GHz up to 10 GHz > 10 GHz up to 18 GHz > 18 GHz up to 26.5 GHz	$10 \cdot 10^{-3} \cdot \cdot P$ $15 \cdot 10^{-3} \cdot \cdot P$ $20 \cdot 10^{-3} \cdot \cdot P$ $25 \cdot 10^{-3} \cdot \cdot P$	Connector $PC^{-3}.5$; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ With other connectors the measurement uncertainty increases
Phase noise Signal generators	Phase noise related up to carrier amplitude in dBc/Hz > -87 dBc/Hz > -99 dBc/Hz > -104 dBc/Hz > -111 dBc/Hz > -131 dBc/Hz > -137 dBc/Hz	Offset frequency referred up to carrier frequency 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	Carrier Frequency: 100 MHz - 1 GHz
	> -80 dBc/Hz > -96 dBc/Hz > -101 dBc/Hz > -109 dBc/Hz > -126 dBc/Hz > -136 dBc/Hz	100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	> 1 MHz - 3 GHz
	> -72 dBc/Hz > -93 dBc/Hz > -98 dBc/Hz > -106 dBc/Hz > -120 dBc/Hz > -135 dBc/Hz	100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	> 3 GHz - 6 GHz

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
HF noise display Receiver / Measuring instruments	10 Hz up to 50 GHz	-165 dbm/Hz up to 0 dBm/Hz	1 dB	
Signal level difference Measuring instruments / sources	0 dBc up to 90 dBc	9 kHz up to 7 GHz > 7 GHz up to 13.6 GHz > 13.6 GHz up to 26.5 GHz	1.5 dB 2.3 dB 3 dB	SNR > 20 dB
	> 90 dBc up to 100 dBc	9 kHz up to 7 GHz > 7 GHz up to 13.6 GHz > 13.6 GHz up to 26.5 GHz	4.5 dB 4.8 dB 5.3 dB	SNR > 20 dB
Filter bandwidth Measuring instruments	1 Hz up to 40 MHz		1 %	SNR > 70 dB
Form factor Measuring instruments	1:1 up to 4:1 > 4:1 up to 10:1 > 10:1 up to 18:1		5,5 % 7 % 8,5 %	SNR > 20 dB
Amplitude modulation: Modulation depth *m*	0.0 up to ≤ 1.0	f_{MOD} < 1 MHz	0,004 0,025 m	*fHF* = carrier frequency *fHF* < 4 GHz *fMOD* = modulation freq. Absolute measurement uncertainty
Frequency modulation Frequency deviation *Δf*	0 Hz up to 5 MHz	f_{MOD} < 1 MHz	0,041 Δf25 Hz	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *Δf* = frequency deviation Absolute measurement uncertainty
Phase modulation Phase deviation *ΔΦ*	0 up to (4 MHz / fMOD) rad	f_{MOD} < 1 MHz	0.025 rad 0.041 ΔΦ	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *ΔΦ* = phase deviation Absolute measurement uncertainty
Distortion factor k	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	AM demodulation method *fHF*: 150 kHz up to 2 GHz f_{MOD} = 1kHz $_{PHF}$ = 0 dBm	0,030 0,029 0,025	*fHF*=Carrier frequency *fMOD* = Modulation frequency $_{PHF}$ = Carrier level
	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	FM & PM-Demodulation method f_{HF}:150 kHz up to 2 GHz f_{MOD} = 1kHz P_{HF} = 0 dBm $\Delta f \leq$ 50 kHz	0,09	Absolute measurement uncertainty

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Pulse-shaped measurement Spectral voltage amplitude density (Measure/ Display)	S_0 = 13.5 µVs	CISPR Band A 9 kHz up to 0.15 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.30 dB	Pulse rate 1 Hz up to 100 Hz $\Gamma_G, \Gamma_L \leq 0.05$ (represent)
	S_0 = 0.316 µVs	CISPR Band B > 0.15 MHz up to 30 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.30 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq 0.07$ (represent)
	S_0 = 0.0044 µVs	CISPR Band C > 30 MHz up to 300 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.36 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq 0.12$ (represent)
	S_0 = 0.0044 µVs	CISPR Band D > 300 MHz up to 1 GHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.40 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq 0.12$ (represent)
HF current transformer clamp Transmission resistance dB(Ω)	9 kHz up to 100 MHz > 100 MHz up to 400 MHz > 400 MHz up to 1 GHz	DIN EN 55016-1-2:2015 4.4 mA	0.3 dB 0.5 dB 0.8 dB	
HF Bulk Current Injection Transducer Clamp Insertion loss dB	9 kHz up to 100 MHz > 100 MHz up to 400 MHz > 400 MHz up to 1 GHz	DIN EN 61000-4-6 :2014 4.4 mA	0.3 dB 0.5 dB 0.8 dB	
Burst Generators Voltage pulse	100 V up up to 4400 V	DIN EN 61000-4-4:2012 at Load (RL) at R_L = 50 Ω at R_L = 1 kΩ	2,2 %	R_L = load resistance
Rise time and Pulse width	3 ns up to 1 µs		2,5 %	
Burst duration and Burst period	100 ns up to 1 s		0,25 %	
Surge Generators Voltage Amplitude Measurement and Display	250 V up to 7000 V	DIN EN 61000-4-5:2015 with or without Coupling and	3,5 %	
Current amplitude	5 A up to 5 kA	Decoupling network	3,5 %	
Rise time and Pulse width	400 ns up to 1 ms		3,5 %	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Electrostatic Discharge (ESD) Current pulse $_{IP}$	1 A up to 35 A	DIN EN 61000-4-2:2009	3,0 %	$_{IP}$ = first discharge current peak I_{30} = current at 30 ns I_{60} = current at 60 ns
Support values current pulse *I30* Current pulse *I60*	1 A up to 35 A 1 A up to 35 A		3,5 % 3,5 %	
Rise time $_{tr}$	0.6 ns up to 1 µs		5,0 %	
Direct voltage U_L	1 kV up to 25 kV		0,5 %	
Reflection factor Amount | Γ | Single measurement |S11|	0.0 up to 1.0	45 MHz up to 5 GHz	0,005 0,005 |Γ|	Connector: PC-7; 50 Ω With other connectors, the measurement uncertainty increases safety. Uncertainty of measurement in units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,008 0,005 | Γ |	
	0.0 up to 1.0	9 kHz up to 45 MHz	0,004 0,005 | Γ |	Connector: N; 50 Ω. With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the amount of Reflection factor.
	0.0 up to 1.0	> 45 MHz up to 5 GHz	0,005 0,005 | Γ |	
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,008 0,005 | Γ |	
	0.0 up to 1.0	45 MHz up to 5 GHz	0,005 0,002 | Γ |	Connector: PC^{-3}.5; 50 Ω. With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,007 0,005 | Γ |	
	0.0 up to 1.0	> 18 GHz up to 26.5 GHz	0,01 0,015 | Γ |	
	0.0 u to 1.0	45 MHz up to 5 GHz	0,006 0,001 | Γ |	Connector: PC-2.4; 50 Ω. With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the amount of Reflection factor.
	0.0 up to 1.0	> 5 GHz up to 20 GHz	0,011 0,002 | Γ |	
	0.0 up to 1.0	> 20 GHz up to 50 GHz	0,017 0,01 | Γ |	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Reflection factor Amount | Γ | Two-port measurement |S11|& |S22| |S12|or |S21|> $^{-3}$ dB	0.0 up to 1.0	45 MHz up to 5 GHz	0,01 0,005 | Γ |	Connector: PC-7; 50 Ω With other connectors, the measurement uncertainty increases safety. Uncertainty of measurement in units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,015 0,005 | Γ |	
	0.0 up to 1.0	9 kHz up to 45 MHz	0,007 0,005 | Γ |	Connector: N; 50 Ω. With other connectors, the measurement uncertainty increases. Uncertainty of measurement in Units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 45 MHz up to 5 GHz	0,009 0,005 | Γ |	
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,012 0,005 | Γ |	
	0.0 up to 1.0	45 MHz up to 5 GHz	0,008 0,002 | Γ |	Connector: PC^{-3}.5; 50 Ω. For other connectors, the measurement uncertainty increases - Measurement uncertainty in units of the magnitude of the reflection factor.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,011 0,005 | Γ |	
	0.0 up to 1.0	> 18 GHz up to 26.5 GHz	0,016 0,015 | Γ |	
	0.0 up to 1.0	45 MHz up to 5 GHz	0,01 0,001 | Γ |	Connector PC-2,4; 50 Ω With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the amount of Reflection factor.
	0.0 up to 1.0	> 5 GHz up to 20 GHz	0,015 0,002 | Γ |	
	0.0 up to 1.0	> 20 GHz up to 50 GHz	0,025 0,01 | Γ |	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Reflection factor Amount | Γ | Two-port measurement |S11|& |S22| |S12|or |S21|≤ $^{-3}$ dB	0.0 up to 1.0	45 MHz up to 5 GHz	0,006 0,005 | Γ |	Connector: PC-7; 50 Ω With other connectors, the measurement uncertainty increases safety. Uncertainty of measurement in Units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,01 0,005 | Γ |	
	0.0 up to 1.0	9 kHz up to 45 MHz	0,005 0,005 | Γ |	N connector; 50 Ω. With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the magnitude of the reflection coefficient.
	0.0 up to 1.0	> 45 MHz up to 5 GHz	0,006 0,005 | Γ |	
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,01 0,005 | Γ |	
	0.0 up to 1.0	45 MHz up to 5 GHz	0,006 0,002 | Γ |	PC^{-3}.5; 50 Ω. For other connectors, the measurement uncertainty increases - Measurement uncertainty in units of the magnitude of the reflection factor.
	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,009 0,005 | Γ |	
	0.0 up to 1.0	> 18 GHz up to 26.5 GHz	0,012 0,015 | Γ |	
	0.0 up to 1.0	45 MHz up to 5 GHz	0,007 0,001 | Γ |	Connector PC-2,4; 50 Ω With other connectors, the measurement uncertainty increases. Uncertainty of measurement in units of the amount of Reflection factor.
	0.0 up to 1.0	> 5 GHz up to 20 GHz	0,013 0,002 | Γ |	
	0.0 up to 1.0	> 20 GHz up to 50 GHz	0,02 0,01 | Γ |	
Reflection factor for single-port calibration objects and two-port calibration objects Phase φ	-180° up to 180°	9 kHz up to 18 GHz 0.1 < | Γ | < 1	$\frac{U(\Gamma)\ 180°}{\arcsin \Gamma \bullet \pi}$	Connectors: N,
		45 MHz up to 18 GHz 0.1 < | Γ | < 1		Connectors: PC-7;
		45 MHz up to 26.5 GHz 0.1 < | Γ | < 1		Connectors: PC^{-3}.5
		45 MHz up to 50 GHz 0.1 < | Γ | < 1		Connectors: PC-2.4

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory High-frequency measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Damping Switchable attenuators, Fixed attenuators Absolute Damping values	0 dB up to 60 dB > 60 dB up to 90 dB	9 kHz up to 18 GHz	0.11 dB 0.12 dB	Connector: N; 50 Ω IΓI ≤ 0.1 Attenuation in 1 dB and 10 dB steps
	0 dB up to 60 dB 0 dB up to 60 dB > 60 dB up to 90 dB > 60 dB up to 90 dB	45 MHz up to 20 GHz > 20 GHz up to 26.5 GHz 45 MHz up to 20 GHz > 20 GHz up to 26.5 GHz	0.11 dB 0.19 dB 0.13 dB 0.21 dB	Connector: PC^{-3}.5; 50 Ω 45 MHz up to 20 GHz: IΓI ≤ 0.1 > 20 GHz up to 26.5 GHz: IΓI ≤ 0.15
	0 dB, 10 dB, 20 dB, 30 dB 40 dB, 50 dB, 60 dB	50 MHz up to 20 GHz > 20 GHz up to 40 GHz > 40 GHz up to 50 GHz	0.12 dB 0.2 dB 0.32 dB	Connector system: PC-2.4; 50 Ω 50 MHz up to 20 GHz: IΓI ≤ 0.1 > 20 GHz up to 40 GHz: IΓI ≤ 0.15 > 40 GHz up to 50 GHz: IΓI ≤ 0.2 IΓI = Reflection of the KG
Incremental damping values	0 dB up to 60 dB > 60 dB up to 90 dB	9 kHz up to 18 GHz	0.16 dB 0.17 dB	Connector system: N; 50 Ω IΓI ≤ 0.1
	0 dB up to 60 dB 0 dB up to 60 dB > 60 dB up to 90 dB > 60 dB up to 90 dB	45 MHz up to 20 GHz > 20 GHz up to 26.5 GHz 45 MHz up to 20 GHz > 20 GHz up to 26.5 GHz	0.16 dB 0.27 dB 0.19 dB 0.30 dB	Connector system PC^{-3}.5; 50 Ω 45 MHz up to 20 GHz: IΓI ≤ 0.1 > 20 GHz up to 26.5 GHz: IΓI ≤ 0.15
Incremental Damping values	0 dB, 10 dB, 20 dB, 30 dB 40 dB, 50 dB, 60 dB	50 MHz up to 20 GHz > 20 GHz up to 40 GHz > 40 GHz up to 50 GHz	0.17 dB 0.29 dB 0.45 dB	Connector system: PC-2.4; 50 Ω 50 MHz up to 20 GHz: IΓI ≤ 0.1 > 20 GHz up to 40 GHz: IΓI ≤ 0.15 > 40 GHz up to 50 GHz: IΓI ≤ 0.2 IΓI = Reflection of the KG Attenuation in 10 dB steps

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Length

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Length Cylindrical setting standards, ring gauges: Diameter	1 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006	0.8 µm 2 · 10^{-6} · *d*	*d* = is the measured Diameter
Plug gauges: Diameter	1 mm up to 200 mm	Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	0.8 µm 2 · 10^{-6} · *d*	
Test Probes: Diameter	0.1 mm up to 30 mm	VDI/VDE/DGQ 2618 Sheet 4.2:2007 Point 3.2.2 (Opt. 1)	0.8 µm 2 · 10^{-6} · *d*	
Thread gauges (one and multiple-start cylindrical external and internal threads with straight flanks, symmetrical profile) Threaded mandrels: simple Flank diameter	1.4 mm up to 200 mm nominal pitch: 0.3 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.8:2006 Point 3.2.2 (Opt. 1)	3 µm 10 · 10^{-6} · *d*	Three-wire method *d* = is the measured diameter
Threaded rings: simpler Flank diameter	3 mm up to 200 mm nominal pitch: 0.5 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.9:2006 Point 3.2.2 (Opt. 1)	3 µm 10 · 10^{-6} · *d*	Two-ball method *d* = is the measured diameter
Threaded mandrels: simple pitch diameter	1.4 mm up up to 200 mm Nominal diameter	VDI/VDE/DGQ 2618 Sheet 4.8:2006	3 µm 10 · 10^{-6} · *d*	Scanning procedure *d* = is the measured
Outer diameter		Point 3.2.2 (Opt. 1)	2 µm	Diameter
Core diameter resp. Piercing diameter		up to Point 3.2.6 (Opt. 5)	5 µm	
Gradient or pitch	0.5 mm up to 8 mm		1.5 µm	
Thread profile angle α	> 27°		(3 1 / *l* F)', but not less than 6'	*l*F = flank length in mm
Threaded rings: simple pitch diameter	5 mm up to 200 mm nominal diameter	VDI/VDE/DGQ 2618 Sheet 4.9:2006	3 µm 10 · 10^{-6} · *d*	Scanning procedure *d* = is the measured
Outer diameter		Point 3.2.2 (Opt. 1)	5 µm	Diameter
Core diameter resp. Piercing diameter		up to Point 3.2.6 (Opt. 5)	2 µm	
Gradient or pitch	0.5 mm up to 8 mm		1.5 µm	
Thread profile angle α	> 27°		(3 1 / *l* F)', but not less than 6'	*l*F = flank length in mm

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Length

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Length				
of plane-parallel,	0,01 mm up to 500 mm	VDI/VDE/DGQ 2618	1.5 µm $2 \cdot 10^{-6} \cdot l$	l is the measured
spherical or	>500 mm up to 1000 mm	Sheet 19.1:2014	2.5 µm $2 \cdot 10^{-6} \cdot l$	Length
cylindrical				
Measuring surfaces				
Diameter	0,01 mm up to 200 mm	VDI/VDE/DGQ 2618	1.5 µm $2 \cdot 10^{-6} \cdot d$	d is the measured
		Sheet 4.1:2006		Diameter
		Point 3.3.4 (Opt. 3),		
		Point 3.3.5 (Opt. 4)		
Feeler gauges	0.03 mm up to 2.00 mm	DIN 2275:2014	1.5 µm $2 \cdot 10^{-6} \cdot l$	l is the measured
				length
Adjustment dimensions for	25 mm up to 500 mm	VDI/VDE/DGQ 2618	1.5 µm $2 \cdot 10^{-6} \cdot l$	
Outside micrometers		Sheet 4.4:2009		
Throat gauges	3 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.7:2005	0.8 µm $2 \cdot 10^{-6} \cdot d$	d is the measured
		Point 3.3.2 (Opt. 2)		Diameter
Caliper for	0 mm up to 300 mm	VDI/VDE/DGQ 2618		Calibration with a
Exterior, interior and		Sheet 9.1:2006		automatic
Depth measurements				Measuring device
Scale display			9 µm $11 \cdot 10^{-6} \cdot l$	l is the measured
Numerical display			10 µm $10 \cdot 10^{-6} \cdot l$	Length
Caliper for				
Exterior, interior and				
Depth measurements	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 9.1:2006	30 µm $30 \cdot 10^{-6} \cdot l$	l is the measured
Depth calipers,	>500 mm 1000 mm	VDI/VDE/DGQ 2618 Sheet 9.2:2006	50 µm $30 \cdot 10^{-6} \cdot l$	Length
Height caliper		VDI/VDE/DGQ 2618 Sheet 9.3:2006		
Outside micrometers	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.1:2001	3 µm $10 \cdot 10^{-6} \cdot l$	
Precision micrometer heads	0 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 10.3:2002	3 µm $10 \cdot 10^{-6} \cdot l$	
Micrometer head screws	0 mm up to 50 mm	VDI/VDE/DGQ 2618 Sheet 10.4:2008	3 µm $10 \cdot 10^{-6} \cdot l$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Length

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Depth gauges	0 mm up to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.5:2010	3 µm $10 \cdot 10^{-6} \cdot l$	l is the measured length
Internal micrometers with 2-point contact on the object up to be calibrated	13 mm up to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.7:2010	3 µm $10 \cdot 10^{-6} \cdot l$	
	>300 mm up to 1000 mm		5 µm $10 \cdot 10^{-6} \cdot l$	
Inside micrometers with 3-line contact on the calibration object	3 mm up to 150 mm	VDI/VDE/DGQ 2618 Sheet 10.8:2002	3 µm $10 \cdot 10^{-6} \cdot d$	d is the measured diameter
Lever gauges (quick probe) for outdoor measurements	up to 200 mm	VDI/VDE/DGQ 2618 Sheet 12.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	l is the measured length
Lever gauges (quick feelers) for Internal measurements	2 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 13.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	
Dial gauges	0 mm up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.1:2021	3 µm $10 \cdot 10^{-6} \cdot l$	mechanical dial indicators
		VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	3 µm $10 \cdot 10^{-6} \cdot l$	electronic digital dial gauges
Fine pointer	0 mm up to 3 mm	VDI/VDE/DGQ 2618 Sheet 11.2:2002	0.6 µm	
Lever gauges	0 mm up to 1.6 mm	VDI/VDE/DGQ 2618 Sheet 11.3:2002	1.0 µm	
electr. inductive Linear Encoders	up to 100 mm	VDI/VDE/DGQ 2618 Sheet 14.1:2010	0.6 µm $1 \cdot 10^{-6} \cdot l$	
electr. incremental Linear Encoders	up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	0.6 µm $1 \cdot 10^{-6} \cdot l$	
Length Gauge blocks off Steel to DIN EN ISO 3650	0.5 mm up to 150 mm	VDI/VDE/DGQ 2618 Sheet 3.1:2004 Measurement of the deviation of the center dimension l_c from Nominal dimension l_n through Differential measurement	For the center dimension: 0.08 µm $0.7 \cdot 10^{-6} \cdot l$ For $f0$ and fu: 0.07 µm	l is the length of the dimension For the smallest measuring Uncertainties are the pushability and Start-up features of both
Gauge blocks off Ceramics after DIN EN ISO 3650	0.5 mm up to 150 mm	Measurement of deviations f_0 and f_u from the center dimension through 5-point Differential measurement	For the center dimension: 0.1 µm $0.8 \cdot 10^{-6} \cdot l$ For $f0$ and fu: 0.07 µm	Measuring surfaces of the Calibration object with a suitable Flat glass plate up to be tested

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Length

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Gauge blocks off Tungsten carbide according to DIN EN ISO 3650	0.5 mm up to 150 mm		For the center dimension: 0.1 µm 0.8 · 10^{-6} · *l* For *f*0 and *f*u: 0.07 µm	
Angle Perpendicularity-deviation Flatness and Straightness deviation	up to 30 µm	VDI/VDE/DGQ/DKD 2618 Sheet 7.1:2019 (Opt. 2)	2.5 µm 1 · 10^{-6} · *l*z 4 µm 5 · 10^{-6} · *l*z	*l*z = length of the forming or locating element up up to 500 mm Leg length
Protractor Graduation 1° Scale interval 5'	-180° up to 180° 0° up to 360°	VDI/VDE/DGQ 2618 Sheet 7.2:2008	30' 1'	
Flat rulers Parallelism deviation Flatness deviation	up to 500 mm	VDI/VDE/DGQ 2618 Sheet 5.1:2013	4 µm 5 · 10^{-6} · *l* 2.2 µm 3.5 · 10^{-6} · *l*	*l* is the measured Length
Straight edge Straightness deviation	up to 500 mm	VDI/VDE/DGQ 2618 Sheet 5.2:2013	2.2 µm 3.5 · 10^{-6} · *l*	*l* is the measured length
Tape measures and scales Tape measures Standards	0 m up to 100 m 3 m 0 m	4_VB_00237_EN V1	50 µm 20 · 10^{-6} · *l*	
Inclinometers	-2000 µm/m up to 2000 µm/m (-412“) (412“)	4_VB_00244_EN V1	1.7 µm/m (0,35“)	Max. Leg length of the KG: 500 mm

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Mechanical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Streaming velocity of gases	0.1 m/s up to 68 m/s	Measurement with low-turbulence free jet	0,5 %; but not less than 0,01 m/s	
Torque Calibration equipment	1 N-m up to 1000 N-m	DKD-R 3-8:2018	$5 \cdot 10^{-3}$	
Torque Hand-operated turning tools actuating / indicating	1 N-m up to 1000 N-m	DIN EN ISO 6789:2017	$5 \cdot 10^{-3}$	
Force (tensile force, compressive force) Force measuring instruments, Force transducer	10 N up to 250 kN	Tensile and compressive force according up to DKD-R 3-3:2018	$1 \cdot 10^{-3}$	
Acceleration Vibration transducer Vibration measuring device Vibration calibrators	0.1 m/s² up to 20 m/s²	Sinusoidal excitation frequencies: 0.2 Hz up to < 0.4 Hz 0.4 Hz up to < 1 Hz 1 Hz up to < 16 Hz 16 Hz > 16 Hz up to 63 Hz > 63 Hz up to 160 Hz	 2,5 % / 1,6 ° 1,5 % / 1,6 ° 0,8 % / 0,8 ° 0,55 % / 0,6 ° 0,8 % / 0,8 ° 1,0 % / 1,1 °	Complex transfer coefficient (magnitude / phase). Transducer mass up up to 0.9 kg, displacement amplitude up up to 100 mm
	1 m/s² up to 200 m/s²	Sinusoidal excitation frequencies: 10 Hz up to < 20 Hz 20 Hz up to < 80 Hz 80 Hz > 80 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 9 kHz > 9 kHz up to 10 kHz	 1,0 % / 1,5 ° 0,8 % / 0,8 ° 0,55 % / 0,6 ° 0,8 % / 0,8 ° 1,0 % / 1,1 ° 2,0 % / 2,1 ° 3,0 % / 2,1 °	Complex transfer coefficient (magnitude / phase). Transducer mass up up to 0.2 kg, displacement amplitude up up to 8 mm

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent laboratory Mechanical measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Acceleration Vibration transducer Vibration measuring device Vibration calibrators	1 m/s² up to 500 m/s²	Sinus excitation Frequencies: 3 Hz up to < 5 Hz 5 Hz up to < 20 Hz 80 Hz 20 Hz up to 1 kHz > 1 kHz up to 5 kHz > 5 kHz up to 10 kHz	1,6 % / 1,1° 1,1 % / 1,1° 0,55 % / 0,6 ° 0,8 % / 0,8° 1,3 % / 1,1° 2,3 % / 1,1°	More complex Transfer coefficient (amount / phase). Transducer mass up to 0.5 kg, displacement amplitude up up to 10 mm
Negative and positive Overpressure p_e	-1 bar up to 0.0 bar	DKD-R 6-1:2014	$1 \cdot 10^{-4}$ *pe* but not less than 20 µbar	$_{pe}$ = measured value Print Medium: Gas
	> 0 mbar up to 0.2 mbar		0.5 µbar 0.01 · *pe*	
	>0.2 mbar up to 160 mbar		$2 \cdot 10^{-4}$ *pe* but not less than 1,0 µbar	
	> 0.16 bar up to 2 bar		20 µbar $3 \cdot 10^{-5}$ *pe*	
	> 2 bar up to 20 bar		$6 \cdot 10^{-5}$ *pe*	
	> 20 bar up to 70 bar		$7 \cdot 10^{-5}$ *pe*	
	> 70 bar up to 250 bar		$2 \cdot 10^{-4}$ *pe*	
	0.5 bar up to 55 bar		$7 \cdot 10^{-5}$ *pe* but not less than 0,34 mbar	Print Medium: Oil
	> 55 bar up to 1200 bar		$7 \cdot 10^{-5}$ *pe* but not less than 7,5 mbar	
Absolute pressure p_{abs}	0.03 bar up to 20 bar		$6 \cdot 10^{-5}$ *pabs* but not less than 0.012 mbar	p_{abs} = measured value Print Medium: Gas Uncertainty of the
	> 20 bar up to 70 bar		$7 \cdot 10^{-5}$ *pabs*	Vacuum gauge is too take inup to account
	1 bar up to 56 bar		$7 \cdot 10^{-5}$ *pabs* but not less than 0.34 mbar	p_{abs} = measured value Print Medium: Oil Uncertainty of the
	> 56 bar up to 1201 bar		$7 \cdot 10^{-5}$ *pabs* but not less than 7.5 mbar	Barometer is too take inup to account

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Acoustics Measuring microphone/ Free-field open-circuit or free-field operational transfer measurement	$^{-6}$ 0 dB up to 20 dB (referred up to 1 V/Pa)	Substitution method in a low-reflection chamber with 1/2'' - Reference Microphone. 125 Hz to 8 kHz > 8 kHz up to 20 kHz	0.35 dB 0.50 dB	
Measuring microphone/ Pressure-idle or pressure-operating transmission dimension	$^{-6}$ 0 dB up to 20 dB (referred up to 1 V/Pa) 250 Hz / 114 dB 1000 Hz / 94 dB 1000 Hz / 114 dB	Calibration with reference standard Pistonfon Calibrator Calibrator	0.2 dB	
	$^{-6}$ 0 dB up to 20 dB (referred up to 1 V/Pa)	Comparative measurement with an electro-acoustic coupler SQ- 4.2 31.5 Hz up to 5 kHz > 5 kHz up to 16 kHz	0.25 dB 0.50 dB	Only 1/2'' - Microphones
Sound level meter/ Sound pressure level indicator (free field)	250 Hz / 114 dB 1000 Hz / 94 dB 1000 Hz / 114 dB	Calibration with reference standard Pistonfon Calibrator Calibrator	0.2 dB	
		Comparative measurement with an electro-acoustic coupler SQ- 4.2 31.5 Hz up to 10 kHz > 10 kHz up to 16 kHz	0.35 dB 0.60 dB	Only 1/2'' - Microphones
	74 dB up to 94 dB (referred up to 20 µPa)	Substitution method in an anechoic chamber with 1/2'' reference microphone 125 Hz up to < 250 Hz 50 Hz up to 8 kHz > 8 kHz up to 20 kHz	0.50 dB 0.40 dB 0.60 dB	
Sound calibrator/ sound pressure level	70 dB to 130 dB	Calibration with ½''-reference microphone 250 Hz or 1 kHz	0.15 dB	
	Frequency: 250 Hz or 1 kHz		0.1 Hz	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Thermodynamic Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Temperature measurands Fixed point cells	-189,3442 °C	Argon triple point	4.0 mK	Comparison with reference Fixed point cells with the aid of standard resistance thermometers
	$^{-3}$8,8344 °C	Mercury triple point	1.0 mK	
	0,01 °C	Water triple point	0.5 mK	
	29,7646 °C	Gallium melting point	0.8 mK	
	156,5985 °C	Indium Initial Point	2.5 mK	
	231,928 °C	Tin solidification point	1.5 mK	
	419,527 °C	Zinc frostbite point	2.0 mK	
	660,323 °C	Aluminium solidification point	7.0 mK	
Resistance thermometers (SPRT) and direct-reading resistance thermometers Measuring instruments with SPRT	-189,3442 °C	Argon triple point	4.0 mK	Calibration at fixed temperature points of the ITS-90
	$^{-3}$8,8344 °C	Mercury triple point	1.5 mK	
	0,01 °C	Water triple point	0.5 mK	
	29,7646 °C	Gallium melting point	1.0 mK	
	156,5985 °C	Indium Initial Point	2.5 mK	
	231,928 °C	Tin solidification point	2.5 mK	
	419,527 °C	Zinc frostbite point	2.5 mK	
	660,323 °C	Aluminium solidification point	7.0 mK	
	-196 °C up to -189 °C	Extrapolation according to EURAMET tg-1:03/2010	8.0 mK	Calibration at fixed temperature points with deviation function according up to ITS-90
	-189 °C up to 0 °C	Ar, Hg, TPW fixed point	6.0 mK	
	-40 °C up to 30 °C	Hg, TPW, Ga fixed point	2.0 mK	
	0 °C up to 156 °C	TPW, In fixed point	3.5 mK	
	0 °C up to 232 °C	TPW, In, Sn fixed point	3.5 mK	
	>232 °C up to 420 °C	TPW, Sn, Zn fixed points	4.0 mK	
	>232 °C up to 660 °C	TPW-, Sn-, Zn-, Al-, fixed point	8.0 mK	
Resistance thermometers (SPRT and IPRT) and direct reading Resistance thermometers, measuring equipment	0,00 °C	DKD-R 5-1:2010, ice point	5 mK	Comparison with standard resistance thermometers in thermostated baths
	-196 °C	DKD-R 5-1:2018 liquid nitrogen	15 mK	
	-120 °C up to <-80 °C	DKD-R 5-1:2018 Argon thermostat	10 mK	
	-80 °C up to < 0 °C	DKD-R 5-1:2018, Ethanol	10 mK	
	0 °C up to 200 °C	DKD-R 5-1:2018 Silicone oil bath		
	> 200 °C up to 300 °C	DKD-R 5-1:2018 Salt Bath	15 mK	
	> 300 °C up to 420 °C		20 mK	
	> 420 °C up to 500 °C		50 mK	
	> 500 °C up to 660 °C	DKD-R 5-1:2018 Tube furnace with Na heat pipe	0,2 K	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Mechanical Measurands, Acoustics

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Thermocouples Type Au/Pt Type Pt/Pd	0,01 °C	Water triple point	0,4 K	Comparison at temperature fixed points of the ITS 90
	231,928 °C	Tin solidification point	0,4 K	
	419,527 °C	Zinc frostbite point	0,4 K	
	660,323 °C	Aluminium solidification point	0,4 K	
	961,78 °C	Silver initial point	0,5 K	
	0 °C up to 1000 °C	Calibration at fixed points	0,6 K	Comparison with normal Resistance thermometers
Precious metal thermocouples	0,01 °C	Water triple point	0,4 K	Comparison at temperature fixed points of the ITS 90
	231,928 °C	Tin solidification point	0,4 K	
	419,527 °C	Zinc frostbite point	0,4 K	
	660,323 °C	Aluminium solidification point	0,4 K	
	961,78 °C	Silver initial point	0,5 K	
	0 °C to 1000 °C	Calibration at fixed points	0,6 K	
Precious metal thermocouples *)	-40 °C to 500 °C	DKD-R 5-3:2018 in thermostatically controlled baths	0,5 K	Comparison with standard resistance thermometer
	> 500 °C to 1000 °C	DKD-R 5-3:2018 in the tube furnace with Na heat pipe	0,8 K	Comparison with normal thermocouples
Measured temperature variables Non-precious metal thermocouples *)	-196 °C	DKD-R 5-3:2018 in liquid nitrogen	0,5 K	Comparison with normal Resistance thermometers
	-80 °C to 200 °C	DKD-R 5-3:2018 in thermostatically controlled baths	0,2 K	
	> 200 °C to 400 °C		0,4 K	
	> 400 °C to 500 °C		0,5 K	
	> 500 °C to 1000 °C	DKD-R 5-3:2018 in the tube furnace with Na heat pipe	1,0 K	Comparison with normal thermocouples
Temperature transmitter with connected resistance thermometer *)	-80 °C to 200 °C	DKD-R 5-1:2018 in calibration baths	15 mK	Comparison with standard resistance thermometers
	> 200 °C to 500 °C	DKD-R 5-1:2018 in a salt bath	25 mK	
Temperature transmitter with connected thermocouple *)	-80 °C to 200 °C	DKD-R 5-1:2018 in calibration baths	0,3 K	Comparison with resistance thermometers
	> 200 °C to 500 °C	DKD-R 5-1:2018 in a salt bath	1,0 K	
	> 500 °C to 1000 °C	DKD-R 5-1:2018 in the tube furnace with Na heat pipe	2,0 K	Comparison with Thermocouples

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Mechanical Measurands, Acoustics

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Temperature measurement variables Liquid-in-glass thermometer	-80 °C to < 0 °C 0 °C to 200 °C	PTB Test Rule Volume 2: 1999	20 mK 10 mK	Comparison with standard resistance thermometers
Circulating thermostats, precision baths	-80 °C to < 200 °C 200 °C to 300 °C	4_VB_00155_EN, V. 4.0	10 mK 15 mK	
Temperature block calibrators •)	-40 °C to 150 °C	DKD-R 5-4:2018	0,05 K	Comparison with Resistance thermometers
	> 150 °C to 300 °C		0,25 K	
	> 300 °C to 650 °C		0,50 K	
	> 650 °C to 800 °C		2,5 K	Comparison with normal thermocouples
	> 800 °C to 1000 °C		4 K	
Surface temperature sensor	50 °C to 100 °C	4_VB_00016_EN, V. 7.0	0,8 K	
	> 100 °C to 500 °C		0.008 K · t / °C	t = measured value in °C
Radiation thermometer	-18 °C to 60 °C	Spectral range 8 µm up to 14 µm	0,6 K	Calibration against liquid-surrounded cavity radiator
	> 60 °C to 100 °C		0,9 K	
	> 100 °C to 350 °C		1,2 K	
Temperature measuring instruments, data loggers	-40 °C to < 0 °C	cryogenic	0,30 K	Comparison with resistance thermometers
	> 0 °C to 50 °C		0,15 K	
	> 50 °C to 80 °C		0,25 K	
	> 80 °C to 120 °C		0,40 K	
	> 120 °C to 180 °C		0,90 K	
	-18 °C to 0 °C	in the closet	0,65 K	
	> 0 °C to 25 °C		0,36 K	
	> 25 °C to 50 °C		0,25 K	
	> 50 °C to 80 °C		0,55 K	
Temperature measuring device, data logger, transmitter	0 °C to 90 °C	Humidity generator or 2-pressure/2-temperature-Generator	0,2 K	
	-10 °C to < 0 °C 0 °C to 70 °C	2-pressure/1-temperature Generator with flow box	0,35 K 0,20 K	
	-10 °C to 70 °C	2-pressure/1-temperature Generator in volume	0,35 K	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Mechanical Measurands, Acoustics

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Temperature simulators for resistance thermometers *)	-200 °C up to 850 °C	DKD-R 5-5:2018	0,016 K	Characteristic according to DIN EN 60751:2009
Temperature indicators for resistance thermometers *)	-200 °C up to 850 °C		0,03 K	
Temperature indicators and simulators for Precious Metals Thermocouples *)	-200 °C up to 1750 °C	DKD-R 5-5:2018	0,1 K	Characteristic according to DIN EN 60584-1:1998
Temperature indicators and simulators for Non-Precious Metals Thermocouples *)	-200 °C up to 1300 °C	DKD-R 5-5:2018	0,05 K	Characteristic according to DIN EN 60584-1:1998

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Mechanical Measurands, Acoustics

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Frost and dew point temperature Dew point mirror, transmitter, hygrometer	$^{-3}$2 °C up to < -25 °C	1-Temperature 2-Pressure Humidity Generator 4_VB_00036_EN, V. 7.7	90 mK	
	-25 °C up to < 0 °C 0 °C up to < 70 °C 70 °C up to < 90 °C 90 °C up to 95°C	1-temp. 1-/ 2-pressure humidity generator 4_VB_00035_EN, V. 4.24	35 mK 30 mK 40 mK 45 mK	Primary generator
	-20 °C up to 50 °C > 50 °C up to 70 °C	in the closet 4_VB_00037_EN, V.7.0	0,2 K 0,25 K	
Relative humidity Dew point mirror	2 % up to 98 %	1-temp. - 1-/ 2-pressure-Humidity generator with temperature chamber 3 °C up to 98 °C 4_VB_00035_EN, V. 4.24	0.1 % 0.003 - *rH*	*rH* = measured value Uncertainty of measurement is absolute value of relative humidity Frost point not lower as low as -25 °C
Electrical psychrometers	2 % up to 98 %		0.3 % 0.007 - *rH*	
Hygrometers, data loggers, transmitters (no psychrometers)	2 % up to 98 %	DKD-R 5-8:2019 1-temp. - 1-/ 2-pressure-Humidity generator with temperature chamber 3 °C up to 98 °C	0.2 % 0.003 - *rH*	
	5 % up to 30 % > 30 % up to 60 % > 60 % up to 95 %	DKD-R 5-8:2019 in the climatic chamber temperature range: -18 °C up to 0 °C	2,0 % 3,9 % 6,2 %	Uncertainty of measurement is absolute value of relative humidity Frost point not lower than $^{-3}$2 °C References: Dew point mirror and resistance thermometer
	5 % up to 30 % > 30 % up to 60 % > 60 % up to 95 %	DKD-R 5-8:2019 in the climatic chamber temperature range: > 0 °C up to 25 °	1,0 % 1,8 % 3,3 %	
	5 % up to 30 % > 30 % up to 60 % > 60 % up to 95 %	DKD-R 5-8:2019 in the climatic chamber temperature range: > 25 °C up to 50 °C	0,6 % 1,1 % 1,8 %	
	5 % up to 30 % > 30 % up to 60 % > 60 % up to 95 %	DKD-R 5-8:2019 in the climatic chamber temperature range: > 50 °C up to 80 °C	0,8 % 1,5 % 2,4 %	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Permanent Laboratory Chemical and Medical Measurements

C a l i b r i a n a n d M e s s o m i l i t y (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Electrolytic conductivity **Condu** ctivity meters and facilities	1.3 µS/cm^{-1} up to < 5 µS/cm^{-1} 5 µS/cm^{-1} up to < 100 µS/cm^{-1} 100 µS/cm^{-1} up to < 706 µS/cm^{-1}; 706 µS/ cm^{-1} up to 100 mS/cm^{-1}	4 VB00265 EN:2020, Rev 1.0	1,5 % 0,7 % 0,5 % 0,3 %	discrete values
pH value pH - measuring instruments and instruments	1.68 pH up to 10 pH	4 VB00266 EN:2020, Rev 1.0	0.03 pH	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Thermodynamic measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Temperature electrical resistance thermometers, electrical thermometers, non-precious metal thermometers Thermocouples *)	0,00 °C	DKD-R 5-1:2018 in an ice bath	10 mK	Calibration on Temperature fixed point
	-80°C up to < 0 °C	DKD-R 5-1:2018 in an ethanol bath	10 mK	Comparison with normal resistance thermometers in thermostated Baths
	0 °C up to 200 °C	DKD-R 5-1:2018 in glycol bath / silicone oil bath		
	> 200 °C up to 300 °C	DKD-R 5-1:2018 in the block calibrator	0,5 K	Comparison with normal Resistance therm.
	> 300 °C up to 1000 °C	DKD-R 5⁻³:2018 in a high temperature furnace	3,0 K	Comparison with normal Thermocouples
Temperature Circulated thermostats, Precision Baths	-80 °C up to 200 °C > 200 °C up to 300 °C	4_VB_00155_EN, V. 4.0	10 mK 15 mK	Comparison with standard resistance thermometers
Temperature Temperature block calibrators *)	-40 °C up to 150 °C	DKD-R 5-4:2018	0,05 K	Comparison with Resistance thermometers
	> 150 °C up to 300 °C		0,25 K	
	> 300 °C up to 650 °C		0,5 K	
	> 650 °C up to 800 °C > 800 °C up to 1000 °C		2,5 K 4 K	Comparison with standard thermocouples
Temperature measurement variables Temperature transmitter with connected resistance transmitter Thermometer *)	-80 °C up to 200 °C	DKD-R 5-1:2018 in calibration baths	20 mK	Comparison with resistance thermometers
	> 200 °C up to 500 °C		25 mK	
Temperature measurement variables Temperature transmitter with connected Thermocouple *)	-80 °C up to 200 °C	DKD-R 5⁻³:2018 in calibration baths	0,3 K	
	> 200 °C up to 1000 °C	DKD-R 5⁻³:2018 in the temperature block calibrator or high temperature furnace	3,5 K	Comparison with thermocouples

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Thermodynamic measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Temperature	-40 °C up to < 0 °C	cryogenic	0,30 K	Comparison
measurement variables	> 0 °C up to 50 °C		0,15 K	with
Temperature	> 50 °C up to 80 °C		0,25 K	resistance
measurement	> 80 °C up to 120 °C		0,40 K	thermometers
instruments, data	> 120 °C up to 180 °C		0,90 K	
loggers				
Temperature measurement	-90 °C up to 0 °C		0,5 K	Comparison
values Air-conditioning	> 0 °C up to 100 °C	DKD-R 5-7:2018	0,3 K	with
cabinets with circulating	> 100 °C up to 200 °C	Method A and B	0,5 K	resistance
air	> 200 °C up to 350 °C		0,8 K	thermometers
Temperature measurement	-90 °C up to 0 °C		0,8 K	
Climatic chambers	> 0 °C up to 100 °C		0,5 K	
without	> 100 °C up to 200 °C		0,8 K	Measuring medium: Air
Circulating air	> 200 °C up to 350 °C		1,2 K	
Temperature	-90 °C up to 0 °C		0,3 K	
measurement variables	> 0 °C up to 100 °C		0,2 K	
Measurement locations	> 100 °C up to 200 °C	DKD-R 5-7:2018	0,3 K	
in climatic chambers	> 200 °C up to 350 °C	Method C	0,5 K	
with circulating air				
Temperature	-90 °C up to 0 °C		0,5 K	
measurement variables	> 0 °C up to 100 °C		0,3 K	
Measurement locations	> 100 °C up to 200 °C		0,5 K	
in climatic chambers	> 200 °C up to 350 °C		0,8 K	
without recirculation				
relative humidity	5 % up to 30 %	DKD-R 5-7:2018 Method C	0,3 %	Measuring medium air
Measuring points in	> 30 % up to 60 %		0,4 %	
climatic chambers	> 60 % up to 98 %	Temperature range: -10 °C up to 95 °C	0,6 %	Uncertainty of measurement expressed as absolute value of relative humidity
with Circulating air				
relative humidity	5 % up to 30 %	DKD-R 5-7:2018 Method A and B	0,4 %	
climatic cabinets	> 30 % up to 60 %		0,6 %	
with circulating air	> 60 % up to 98 %	Temperature range: -10 °C up to 95 °C	0,8 %	Humidity reference is calculated from dew point and air temperature
in empty or defined				
loaded cargo space				

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Relative humidity hygrometers, data loggers, transmitters, no psychrometers	10 % up to 95 %	DKD-R 5-8:2019 1-Temperature 2-Pressure Humidity Generator Chamber temperature: 0 °C up to 70 °C	0,6 %	Measurement uncertainty is absolute value of relative humidity References: Dew point mirror and resistance thermo-meter
Dew point temperature Dew point meters, hygrometers	-25 °C up to 70 °C	1-Temperature 2-Pressure Humidity Generator 4_VB_00164_EN, V.6	0,09 K	Comparison with dew point mirror

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Thermodynamic measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Relative humidity hygrometers, data loggers, transmitters, no psychrometers	10 % up to 95 %	DKD-R 5-8:2019 Humidity generator restricted useful volume Chamber temperature: 0 °C up to 40 °C	0,9 %	Measurement uncertainty is absolute value of relative humidity References: Dew point mirror and resistance thermometer
		DKD-R 5-8:2019 Humidity generator restricted useful volume Chamber temperature: > 40 °C up to 70 °C	2,0 %	
Temperature measurement variables Temperature measurement instruments, data loggers, Transmitter *)	0 °C up to 70 °C	DKD-R 5-1:2018 1-Temperature 2-Pressure Humidity generator with temperature chamber	0,05 K	Comparison with resistance thermometer
Temperature simulators for Resistance thermometer *)	-200 °C up to 850 °C	DKD-R 5-5:2018	0,016 K	Characteristic according to DIN EN 60751:2009
Temperature display instruments for resistance thermometer *)	-200 °C up to 850 °C	DKD-R 5-5:2018	0,03 K	
Temperature display-instruments and simulators for Precious metal thermocouples *)	-200 °C up to 1750 °C	DKD-R 5-5:2018	0,1 K	Characteristic according to DIN EN 60584-1:1998
Temperature display-instruments and simulators for non-precious metal thermo-Elements *)	-200 °C up to 1300 °C	DKD-R 5-5:2018	0,05 K	Characteristic according to DIN EN 60584-1:1998

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Mechanical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range			Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Scales non-automatic electronic scales	0 kg > 10 kg	up to	10 kg 80 kg	EURAMET cg-18 Version 4.0 Calibration on Site	$1 \cdot 10^{-6}$ $5 \cdot 10^{-6}$	with weights of class E2
Torque Hand-operated torque wrench tools,	1 Nm	up to	1000 Nm	DIN EN ISO 6789:2017	1 %	actuating / indicating
Negative and positive overpressure p_e	-1 bar	up to	0.0 bar	DKD-R 6-1:2014	$1 \cdot 10^{-4}$ *pe* but not less than 20 µbar	P_e = measured value pressure medium: Gas
	0.2 mbar	up to	160 mbar		$2 \cdot 10^{-4}$ *pe* but not less than 1,0 µbar	
	> 0.6 bar	up to	2 bar		20 bar $3 \cdot 10^{-5}$ *pe*	
	> 2 bar	up to	20 bar		6 $\cdot 10^{-5}$ *pe*	
	>20 bar	up to	70 bar		$7 \cdot 10^{-5}$ *pe*	
Negative and positive overpressure p_e	> 70 bar	up to	250 bar	DKD-R 6-1:2014	$2 \cdot 10^{-4}$ *pe*	
	0.5 bar	up to	55 bar		$7 \cdot 10^{-5}$ *pe* but not less than 0,34 mbar	Print Medium: Oil
	>55 bar	up to	1200 bar		$7 \cdot 10^{-5}$ *pe* but not less than 7,5 mbar	
Absolute pressure p_{abs}	0.03 bar	up to	20 bar		$6 \cdot 10^{-5}$ *pabs* but not smaller than 0.012 mbar	p_{abs} = measured value Print Medium: Gas Measuring uncertainty of the vacuum gauge is up to be considered
	>20 bar	up to	70 bar		$7 \cdot 10^{-5}$ *pabs*	
	1 bar	up to	56 bar		$7 \cdot 10^{-5}$ *pabs* but not less than 0,34 mbar	p_{abs} = measured value Print Medium: Oil Uncertainty
	> 56 bar	up to	1201 bar		$7 \cdot 10^{-5}$ *pabs* but not less than 7,5 mbar	Of the barometer is up to be considered.

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Mechanical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Flow rate of liquids Volume flow rate dV/dt of flowing liquids	0.01 l/min up to 250 l/min	Volumetric comparison measurement (references: Turbines, gear counters, Coriolis; MID,...) Density from 700 kg/m³ up to 1100 kg/m³ Viscosity from 0.8 mm²/s to 1600 mm²/s	0,15 %	Measuring instruments with analog output, Frequency output and visual indication
Mass flow rate dm/dt of flowing liquids	0.01 kg/min up to 250 kg/min		0,20 %	
Flow rate of liquids Volume flow rate dV/dt of flowing liquids	0.01 l/min up to 250 l/min	Volumetric comparison measurement (references: Turbines, gear meters, Coriolis, MID,...) Density from 700 kg/m³ up to 1100 kg/m³ Viscosity from 0.8 mm²/s up to 1600 mm²/s	0,15 %	Measuring instruments with analog output, frequency output, visual display
Mass flow rate dm/dt of flowing liquids	0,01kg/min up to 250 kg/min		0,20 %	
Flow rate of gases Volume flow rate dV/dt of flowing gases	0.001 l/min up to 250 l/min	Volumetric comparison measurement (references: Coriolis, piston calibrator,...) Calibration medium: Compressed air (with compressed air qualities according up to Din ISO 8573-1; clean & oil-free air with a max. RH 55%) at room temperature up up to a maximum of 10 bar overpressure	0,50 %	Measuring instruments with analog output, frequency output, visual display in the standard state P_N =1013.25 mbar T_N = 0 °C
Mass flow rate dm/dt of flowing gases	1.3 mg/min up to 312 g/min		0,50 %	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Dimensional measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Length Cylindrical setting standards, ring gauges: Diameter	1mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006 Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	0.8 µm 2 · 10^{-6} · *d*	*d* = is the measured Diameter
Plug gauges: Diameter	1 mm up to 200 mm		0.8 µm 2 · 10^{-6} · *d*	
Test Probes: Diameter	0,1 mm up to 30 mm	VDI/VDE/DGQ 2618 Sheet 4.2:2007 Point 3.2.2 (Opt. 1)	0.8 µm 2 · 10^{-6} · *d*	
Thread gauges (one and multiple-start cylindrical external and internal threads with straight flanks, symmetrical profile) Threaded mandrels: simple Flank diameter	1.4 mm up to 200 mm nominal pitch: 0.3 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.8:2006 Point 3.2.2 (Opt. 1)	3 µm 10 · 10^{-6} · *d*	Three-wire method *d* = is the measured diameter
Threaded rings: simpler Flank diameter	3 mm up to 200 mm nominal pitch: 0.5 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.9:2006 Point 3.2.2 (Opt. 1)	3 µm 10 · 10^{-6} · *d*	Two-ball method *d* = is the measured Diameter
Length of plane-parallel, spherical or cylindrical measuring surfaces	0,01 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 19.1:2014	1.5 µm 2 · 10^{-6} · *l*	*l* is the measured length
Diameter	0,01 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006 Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	1.5 µm 2 · 10^{-6} · *d*	*d* is the measured diameter
Feeler gauges	0.03 mm up to 2.00 mm	DIN 2275:2014	1.5 µm 2 · 10^{-6} · *l*	*l* is the measured length
Adjustment dimensions for Outside micrometers	25 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 4.4:2009	1.5 µm 2 · 10^{-6} · *l*	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Dimensional measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Throat gauges	3 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.7:2005 Point 3.3.2 (Opt. 2)	0.8 µm $2 \cdot 10^{-6} \cdot d$	*d* is the measured Diameter
Caliper for Exterior, interior and Depth measurements	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 9.1:2006	30 µm $30 \cdot 10^{-6} \cdot l$	*l* is the measured Length
Depth calipers,	> 500 mm 1000 mm	VDI/VDE/DGQ 2618 Sheet 9.2:2006	50 µm $30 \cdot 10^{-6} \cdot l$	
Height caliper		VDI/VDE/DGQ 2618 Sheet 9.3:2006		
Outside micrometers	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.1:2001	3 µm $10 \cdot 10^{-6} \cdot l$	
Precision micrometer heads	0 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 10.3:2002	3 µm $10 \cdot 10^{-6} \cdot l$	
Micrometer head screws	0 mm up to 50 mm	VDI/VDE/DGQ 2618 Sheet 10.4:2008	3 µm $10 \cdot 10^{-6} \cdot l$	
Depth gauges	0 mm up to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.5:2010	3 µm $10 \cdot 10^{-6} \cdot l$	
Inside micrometers with 2-point contact on the object up to be calibrated	13 mm up to 300 mm > 300 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.7:2010	3 µm $10 \cdot 10^{-6} \cdot l$ 5 µm $10 \cdot 10^{-6} \cdot l$	
Inside micrometers with 3-line contact on the object up to be calibrated	3 mm up to 150 mm	VDI/VDE/DGQ 2618 Sheet 10.8:2002	3 µm $10 \cdot 10^{-6} \cdot d$	*d* is the measured diameter
Lever gauges (quick probe) for outdoor measurements	up to 200 mm	VDI/VDE/DGQ 2618 Sheet 12.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	*l* is the measured length
Lever gauges (quick probe) for internal measurements	2 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 13.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	
Dial gauges	0 mm up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.1:2021	3 µm $10 \cdot 10^{-6} \cdot l$	mechanical dial indicators
		VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	3 µm $10 \cdot 10^{-6} \cdot l$	electronic digital dial gauges
Fine pointer	0 mm up to 3 mm	VDI/VDE/DGQ 2618 Sheet 11.2:2002	0.6 µm	
Lever gauges	0 mm up to 1.6 mm	VDI/VDE/DGQ 2618 Sheet 11.3:2002	1.0 µm	
electr. inductive Linear Encoders	up to 100 mm	VDI/VDE/DGQ 2618 Sheet 14.1:2010	0.6 µm $1 \cdot 10^{-6} \cdot l$	
electr. incremental Linear Encoders	up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	0.6 µm $1 \cdot 10^{-6} \cdot l$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Dimensional measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Coordinate Measuring Technology Coordinate measuring instruments with optical sensing Measuring projectors, Measuring microscopes	Instruments with one measuring level with a Area diagonals ≤ 450 mm	Calibration of the metrological Properties according to DKD-R 4-3 Sheet 18.1:2018, and the below mentioned Standards and guidelines DIN EN ISO 10360 VDI/VDE 2617		Measuring systems with visual touch or electronic Edge detection
		Determination of the Probing deviation P_{SX}, P_{SY} and P_{S2D} up up to means of a Circle standard according to VDI/VDE 2617 Sheet 6.1:2019	0.5 µm	
		Determination of the Probing deviation of the Image processing system P_{SVX}, P_{SVY} and P_{SV2D} up up to means of a Circle standard according to VDI/VDE 2617 Sheet 6.1:2019	0.5 µm	
		Determination of the Length measurement deviation E_{UXY}, E_{UX} and E_{UY} up up to means of a Line scale or Circular matrix according to DIN EN ISO 10360-7:2011	0.5 µm $0.7 \cdot 10^{-6} \cdot l$	l is the measured Length

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Dimensional measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Coordinate Measuring Technology Coordinate measuring instruments with optical		Determination of the Length measurement deviation of the Image processing system E_{UV} up up to means of a Line scale or Circular matrix according to DIN EN ISO 10360-7:2011	0.5 µm	
	up to 100 mm up to 100 µm	Determination of the Length measurement deviation E_{IP} up up to means of gauge blocks or Depth setting standard according to DIN EN ISO 10360-7:2011	0.5 µm $0.7 \cdot 10^{-6} \cdot l$ 0.25 µm	l is the measured Length

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range			Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC voltage	0 V				0.1 µV	*U* = set value
Measuring instruments	0,01 V	up to	2,2 V		$7 \cdot 10^{-6}$ *U* 1 µV	
	> 2,2 V	up to	11 V		$9 \cdot 10^{-6}$ *U*	
	> 11 V	up to	22 V		$8 \cdot 10^{-6}$ *U*	
	> 22 V	up to	220 V		$12 \cdot 10^{-6}$ *U*	
	> 220 V	up to	1000 V		$12 \cdot 10^{-6}$ *U*	
DC voltage	0 V				0.1 µV	*U* = measured value
Sources	1 mV	up to	100 mV		$8 \cdot 10^{-6}$ *U* 1 µV	
	> 100 V	up to	1 V		$11 \cdot 10^{-6}$ *U*	
	> 1 V	up to	10 V		$9 \cdot 10^{-6}$ *U*	
	> 10 V	up to	100 V		$13 \cdot 10^{-6}$ *U*	
	> 100 V	up to	1000 V		$16 \cdot 10^{-6}$ *U*	
High Voltage	> 1 kV	up to	10 kV		$2.5 \cdot 10^{-3}$ *U* 2.5 V	*U* = measured value
Direct current strength	0 A				0.2 nA	*I* = set value
Measuring instruments	10 µA	up to	220 µA		$50 \cdot 10^{-6}$ *I* 8 nA	
	> 220 µA	up to	2.2 mA		$87 \cdot 10^{-6}$ *I*	
	> 2.2 mA	up to	22 mA		$87 \cdot 10^{-6}$ *I*	
	> 22 mA	up to	220 mA		$89 \cdot 10^{-6}$ *I*	
	> 220 mA	up to	2,2 A		$0.2 \cdot 10^{-3}$ *I*	
	> 2,2 A	up to	11 A		$0.55 \cdot 10^{-3}$ *I*	
	> 11 A	up to	20 A		$1.2 \cdot 10^{-3}$ *I*	
	> 20 A	up to	200 A	Voltage drop with	$1.0 \cdot 10^{-3}$ *I*	
	> 200 A	up to	2000 A	Normal resistance		
Direct current strength	0 A				0.2 nA	*I* = measured value
Sources	0.1 µA	up to	1 µA		$400 \cdot 10^{-6}$ *I*	
	> 1 µA	up to	10 µA		$120 \cdot 10^{-6}$ *I*	
	> 10 µA	up to	100 µA		$100 \cdot 10^{-6}$ *I*	
	> 100 µA	up to	1 mA		$70 \cdot 10^{-6}$ *I*	
	> 1 mA	up to	10 mA		$70 \cdot 10^{-6}$ *I*	
	> 10 mA	up to	100 mA		$85 \cdot 10^{-6}$ *I*	
	> 100 mA	up to	1 A		$200 \cdot 10^{-6}$ *I*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Direct current strength	> 1 A up to 10 A	Voltage drop with	$0.5 \cdot 10^{-3}\ I$	I = measured value
Sources	> 10 A up to 200 A	Normal resistance	$1 \cdot 10^{-3}\ I$	
	> 200 A up to 2000 A	with current transformer	$2 \cdot 10^{-3}\ I$	
Direct current strength	1 mA up to 2,2 A		$1 \cdot 10^{-3}\ I$	
Current clamps	> 2,2 A up to 20 A		$2 \cdot 10^{-3}\ I$	
	> 20 A up to 1000 A		$3 \cdot 10^{-3}\ I$	
DC resistance	0 Ω		50 µ Ω	R = set value
	1 Ω; 1.9 Ω		$95 \cdot 10^{-6}\ R$	Fluke 5700A
	10 Ω		$28 \cdot 10^{-6}\ R$	
	19 Ω		$27 \cdot 10^{-6}\ R$	
	100 Ω; 190 Ω		$17 \cdot 10^{-6}\ R$	
	1 kΩ		$13 \cdot 10^{-6}\ R$	
	1.9 kΩ		$13 \cdot 10^{-6}\ R$	
	10 kΩ		$12 \cdot 10^{-6}\ R$	
	19 kΩ		$12 \cdot 10^{-6}\ R$	
	100 kΩ		$14 \cdot 10^{-6}\ R$	
	190 kΩ		$14 \cdot 10^{-6}\ R$	
	1 MΩ		$20 \cdot 10^{-6}\ R$	
	1.9 MΩ		$21 \cdot 10^{-6}\ R$	
	10 MΩ		$40 \cdot 10^{-6}\ R$	
	19 MΩ		$48 \cdot 10^{-6}\ R$	
	100 MΩ		$110 \cdot 10^{-6}\ R$	
	0 Ω		100 µΩ	R = measured value
	1 Ω up to 10 Ω		$16 \cdot 10^{-6}\ R$ 50 µΩ	HP 3458A
	> 10 Ω up to 100 Ω		$12 \cdot 10^{-6}\ R$ 500 µΩ	
	> 100 Ω up to 1 kΩ		$14 \cdot 10^{-6}\ R$	
	> 1 kΩ up to 10 kΩ		$15 \cdot 10^{-6}\ R$	
	> 10 kΩ up to 100 kΩ		$16 \cdot 10^{-6}\ R$	
	> 100 kΩ up to 1 MΩ		$35 \cdot 10^{-6}\ R$	
	> 1 MΩ up to 10 MΩ		$150 \cdot 10^{-6}\ R$	
	> 10 MΩ up to 100 MΩ		$600 \cdot 10^{-6}\ R$	
	> 100 MΩ up to 1 GΩ		$5 \cdot 10^{-3}\ R$	
	0,001 Ω up to 0,1 Ω	Substitution procedure	$50 \cdot 10^{-6}\ R$	
	> 0,1 Ω up to 1 MΩ	with normal resistance	$20 \cdot 10^{-6}\ R$	
	> 1 MΩ up to 100 MΩ		$30 \cdot 10^{-6}\ R$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range			Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC resistance	1 Ω	up to	< 11 Ω		$120 \cdot 10^{-6}$ *R*	*R* = set value
(areas)	11 Ω	up to	< 33 Ω		$33 \cdot 10^{-6}$ *R*	Fluke 5520A /5522A
Measuring instruments	33 Ω	up to	< 110 Ω		$29 \cdot 10^{-6}$ *R*	
	110 Ω	up to	< 330 Ω		$28 \cdot 10^{-6}$ *R*	
	330 Ω	up to	< 1.1 kΩ		$28 \cdot 10^{-6}$ *R*	
	1.1 kΩ	up to	< 3.3 kΩ		$28 \cdot 10^{-6}$ *R*	
	3.3 kΩ	up to	< 11 kΩ		$28 \cdot 10^{-6}$ *R*	
	11 kΩ	up to	< 33 kΩ		$28 \cdot 10^{-6}$ *R*	
	33 kΩ	up to	< 110 kΩ		$28 \cdot 10^{-6}$ *R*	
	110 kΩ	up to	< 330 kΩ		$32 \cdot 10^{-6}$ *R*	
	330 kΩ	up to	< 1.1 MΩ		$33 \cdot 10^{-6}$ *R*	
	1.1 MΩ	up to	< 3.3 MΩ		$62 \cdot 10^{-6}$ *R*	
	3.3 MΩ	up to	< 11 MΩ		$0.13 \cdot 10^{-3}$ *R*	
	11 MΩ	up to	< 33 MΩ		$0.25 \cdot 10^{-3}$ *R*	
	33 MΩ	up to	< 110 MΩ		$0.5 \cdot 10^{-3}$ *R*	
	110 MΩ	up to	< 330 MΩ		$3 \cdot 10^{-3}$ *R*	
	330 MΩ	up to	< 1.1 GΩ		$15 \cdot 10^{-3}$ *R*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage meters and sources	1 mV up to 2.2 mV	10 Hz up to 20 Hz	$0.52 \cdot 10^{-3}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$0.52 \cdot 10^{-3}$ *U*	
		> 40 Hz up to 20 kHz	$0.40 \cdot 10^{-3}$ *U*	
		> 20 kHz up to 50 kHz	$0.40 \cdot 10^{-3}$ *U*	
		> 50 kHz up to 100 kHz	$0.41 \cdot 10^{-3}$ *U*	
		> 100 kHz up to 300 kHz	$0.46 \cdot 10^{-3}$ *U*	
		> 300 kHz up to 500 kHz	$0.55 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.60 \cdot 10^{-3}$ *U*	
	> 2.2 mV up to 7 mV	10 Hz up to 20 Hz	$0.22 \cdot 10^{-3}$ *U*	
		> 20 Hz up to 40 Hz	$0.22 \cdot 10^{-3}$ *U*	
		> 40 Hz up to 20 kHz	$0.16 \cdot 10^{-3}$ *U*	
		> 20 kHz up to 50 kHz	$0.16 \cdot 10^{-3}$ *U*	
		> 50 kHz up to 100 kHz	$0.20 \cdot 10^{-3}$ *U*	
		> 100 kHz up to 300 kHz	$0.22 \cdot 10^{-3}$ *U*	
		> 300 kHz up to 500 kHz	$0.33 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.45 \cdot 10^{-3}$ *U*	
	> 7 mV up to 22 mV	10 Hz up to 20 Hz	$80 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$80 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$65 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$75 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$75 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$95 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$0.19 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.21 \cdot 10^{-3}$ *U*	
	> 22 mV up to 70 mV	10 Hz up to 20 Hz	$70 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$58 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$35 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$35 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$45 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$55 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$0.11 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage meters and sources	> 70 mV up to 220 mV	10 Hz up to 20 Hz	$39 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$35 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$25 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$25 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$28 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$42 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$85 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.1 \cdot 10^{-3}$ *U*	
	> 220 mV up to 700 mV	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$22 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$12 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$12 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$14 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$27 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$40 \cdot 10^{-6}$ *U*	
	> 700 mV up to 2.2 V	10 Hz up to 20 Hz	$20 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$14 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$10 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$10 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$11 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$22 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$68 \cdot 10^{-6}$ *U*	
	> 2.2 V up to 7 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$12 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$13 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$95 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage meters and sources	> 7 V up to 22 V	10 Hz up to 20 Hz	$17 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1MHz	$0.11 \cdot 10^{-3}$ *U*	
	> 22 V up to 70 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$15 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$15 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$25 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$40 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	
	> 70 V up to 220 V	10 Hz up to 20 Hz	$19 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$18 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$17 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$17 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$32 \cdot 10^{-6}$ *U*	
	> 220 V up to 1000 V	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$27 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$45 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$45 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$65 \cdot 10^{-6}$ *U*	
High Voltage	> 0.7 kV up to 1 kV	50 Hz	$2.5 \cdot 10^{-3}$ *U* 0.25 V	
	> 1 kV up to 7 kV		$3.5 \cdot 10^{-3}$ *U* 2.0 V	
AC power Sources and measuring instruments	100 µA up to 1 mA	10 Hz up to 40 Hz	$120 \cdot 10^{-6}$ *I*	*I* = measured value
		> 40 Hz up to 1 kHz;	$160 \cdot 10^{-6}$ *I*	
		> 1 kHz up to 10 kHz;	$60 \cdot 10^{-6}$ *I*	
	> 1 mA up to 10 mA	10 Hz up to 40 Hz	$46 \cdot 10^{-6}$ *I*	
		> 40 Hz up to 1 kHz;		
		> 1 kHz up to 10 kHz;		

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC power Sources and measuring instruments	> 10 mA up to 1 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$17 \cdot 10^{-6}$ *I*	*I* = measured value
	> 1 A up to 10 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$32 \cdot 10^{-6}$ *I*	
	> 10 A up to 20 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$39 \cdot 10^{-6}$ *I*	
	> 20 A up to 100 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$69 \cdot 10^{-6}$ *I* $69 \cdot 10^{-6}$ *I* $0.17 \cdot 10^{-3}$ *I*	
AC power Sources	100 A up to 2000 A	50 Hz	$3.0 \cdot 10^{-3} \cdot$ I	Current transformer
Alternating current Current clamps	1 mA up to 2.2 A > 2.2 A up to 20 A > 20 A up to 800 A	40 Hz up to 5 kHz 40 Hz up to 5 kHz 40 Hz up to 65 Hz	$2 \cdot 10^{-3}$ *I* $3 \cdot 10^{-3}$ *I* $4 \cdot 10^{-3}$ *I*	*I* = measured value
Capacity gauges	190 pF up to < 400 pF 400 pF up to < 1.1 nF 1.1 nF up to < 3.3 nF 3.3 nF up to < 11 nF 11 nF up to < 33 nF 33 nF up to < 110 nF 110 nF up to < 330 nF 330 nF up to < 1.1 µF 1.1 µF up to < 3.3 µF 3.3 µF up to < 11 µF 11 µF up to < 33 µF 33 µF up to < 110 µF 110 µF up to < 330 µF 330 µF up to < 1.1 mF 1.1 mF up to < 3.3 mF 3.3 mF up to < 11 mF 11 mF up to < 33 mF 33 mF up to 110 mF	10 Hz up to 10 kHz 10 Hz up to 10 kHz 10 Hz up to kHz 10 Hz up to 1 kHz 10 Hz up to 1 kHz 10 Hz up to 1 kHz 10 Hz up to 1 kHz 10 Hz up to 600 Hz 10 Hz up to 300 Hz 10 Hz up to 150 Hz 10 Hz up to 120 Hz 10 Hz up to 80 Hz DC up to 50 Hz DC up to Hz DC up to 6 Hz DC up to 2 Hz DC up to 200.6 Hz DC up to 0,2 Hz	$4 \cdot 10^{-3}$ C 8 pF $4.5 \cdot 10^{-3}$ C 8 pF $4.0 \cdot 10^{-3}$ C 8 pF $2.5 \cdot 10^{-3}$ C 8 pF $2.5 \cdot 10^{-3}$ C 80 pF $2.5 \cdot 10^{-3}$ C 80 pF $4.5 \cdot 10^{-3}$ C $4.5 \cdot 10^{-3}$ C $4.5 \cdot 10^{-3}$ C $4.5 \cdot 10^{-3}$ C $6.0 \cdot 10^{-3}$ C $6.5 \cdot 10^{-3}$ C $6.0 \cdot 10^{-3}$ C $6.0 \cdot 10^{-3}$ C $6.0 \cdot 10^{-3}$ C $6.0 \cdot 10^{-3}$ C $8.0 \cdot 10^{-3}$ C $11 \cdot 10^{-3}$ C	With 5520A / 5522A

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration Electrical measurement

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Frequency	1 mHz up to 46 GHz		$2 \cdot 10^{-9} \cdot f_{UTf}$	f = current measured value $_{UTf}$ =Trigger uncertainty
Time interval	1 µs up to 1000 s		$2 \cdot 10^{-9} \cdot t$ 2 ns	t = current measured value
Speed visual	1 min^{-1} up to 100.000 min^{-1}	with light pulse generator	$8 \cdot 10^{-6}$ but not less than 0.006 min^{-1}	
	1 rpm up to 99.99 rpm 100 rpm up to 999.9 rpm 1000 rpm up to 99999 rpm	with reflex marks and Tesup to 465	$2 \cdot 10^{-4}$ 0.01 rpm $2 \cdot 10^{-4}$ 0.1 rpm $2 \cdot 10^{-4}$ 1 rpm	
AC active power	109 µW up to < 11kW	33 mV up to 1000 V 45 Hz up to 65 kHz PF = 1 33 mA up to < 11A	$1.4 \cdot 10^{-3} P$	P = set value with Fluke 5520A/5522A *PF:* Power factor
	363 mW up up to 20 kW	11 A up to 20 A	$2.0 \cdot 10^{-3} P$	
DC power	1 mW up to 300 W > 300 W up to 20 kW		$0.5 \cdot 10^{-3} P$ $1.0 \cdot 10^{-3} P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Measurand / calibration item
Oscilloscopes				
Vertical deflection	5 mV up to 5 V	R_i = 50 Ω	$3.5 \cdot 10^{-3}$ U 35 µV	Square wave voltage
	5 mV up to 120 V	R_i = 1 MΩ	$2.4 \cdot 10^{-3}$ U 40 µV	10 Hz up to 10 kHz
Horizontal deflection	5 ns up to 520 ms		$3 \cdot 10^{-6}$ t 1 ns	t: current time
	20 ms up to 5 s		$30 \cdot 10^{-6}$ t 1.2 $\cdot 10^{-3}$ t^2	
Rise time	600 ps up to 10 ms	25 mV up to 1V R_i = 50 Ω	40 $\cdot 10^{-3}$ tr 7 ps	
HF impedance (reflection factor)	0,0 up to 1,0	45 MHz up to 5 GHz	0,01 0,01 |Γ|	Connector; PC-7; 50 Ω For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
		> 5 GHz up to 18 GHz	0,015 0,01 |Γ|	
Single measurement |S11| Amount |Γ|		9 kHz up to 5 GHz	0,01 0,01 |Γ|	N connector; 50 Ω For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
		> 5 GHz up to 18 GHz	0,015 0,01 |Γ|	
		45 MHz up to 5 GHz	0,01 0,005 |Γ|	Connector; PC^{-3}.5; 50 Ω For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
		>5 GHz up to 18 GHz	0,015 0,01 |Γ|	
		> 18 GHz up to 26.5 GHz	0,02 0,02 |Γ|	
Phase φ	-180° up to 180°	9 kHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1	$\arcsin \frac{\frac{\lvert\lvert}{\lvert\lvert} \overline{\quad}}{\Gamma} \frac{U(\Gamma)\,180°}{\pi}$	N connector; 50 Ω.
		45 MHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1		PC-7; 50 Ω
		45 MHz up to 26.5 GHz 0,1 ≤ |Γ| ≤ 1		PC^{-3}.5

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
HF impedance (reflection factor)	0,0 up to 1,0	45 MHz up to 5 GHz > 5 GHz up to 18 GHz	0,015 0,01 |Γ| 0,02 0,01 |Γ|	PC-7; 50 Ω For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
Two-port measurement |S11|&amp |S22| Amount |Γ|		9 kHz up to 5 GHz > 5 GHz up to 18 GHz	0,015 0,01 |Γ| 0,02 0,01 |Γ|	N connector; 50 Ω. For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
		45 MHz up to 5 GHz > 5 GHz up to 18 GHz > 18 GHz up to 26.5 GHz	0,01 0,005 |Γ| 0,015 0,01 |Γ| 0,02 0,02 |Γ|	PC^{-3}.5 For others Connectors the measuring un-safety. Uncertainty of measurement in Units of the amount of the Reflection factor.
Phase φ	-180° up to 180°	9 kHz to 18 GHz 0,1 ≤ |Γ| ≤ 1 45 MHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1 45 MHz up to 26.5 GHz 0,1 ≤ |Γ| ≤ 1	$\arcsin \frac{U(\Gamma) \cdot 180°}{\Gamma \quad \pi}$	N connector; 50 Ω. PC-7; 50 Ω PC^{-3}.5

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
HF - Attenuation Switchable-Attenuators,	0 dB up to 60 dB	9 kHz up to 18 GHz	0.3 dB	Connector system: N; 50 Ω IΓI ≤ 0.1
Fixed attenuators	> 60 dB up to 90 dB		0.3 dB	
Absolute attenuation values	0 dB up to 60 dB	45 MHz up to 20 GHz	0.3 dB	Connector system PC^{-3}.5; 50 Ω 45 MHz up to 20 GHz IΓI ≤ 0.1 <20 GHz up to 26.5 GHz IΓI ≤ 0.15
		> 20 GHz up to 26.5 GHz	0.5 dB	
	> 60 dB up to 90 dB	45 MHz up to 20 GHz	0.3 dB	
		> 20 GHz up to 26.5 GHz	0.5 dB	
HF power Power meters	> 1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.025 0.14 - |Γ|) - *P*	Connector system: N, PC^{-3}.5 ; 50 Ω; | Γ/ /KG ≤ 0.2
		> 2 GHz up to 18 GHz	(0.049 0.21 - |Γ|) - *P*	
		> 18 GHz up to 26.5 GHz	(0.071 0.32 - |Γ|) - *P*	
HF power Signal generators	> 1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.035 0.13 - |Γ|) - *P*	Connector system: N, PC^{-3}.5 ; 50 Ω |Γ| $_{KG}$ ≤ 0.2
		> 2 GHz up to 18 GHz	(0.053 0.2 - |Γ|) - *P*	
		> 18 GHz up to 26.5GHz	(0.074 0.31 - |Γ|) - *P*	
	0.1 mW up to 10 mW	9 kHz up to 50 MHz	17 · 10^{-3} - · *P*	N connector; 50 Ω |Γ| ≤ 0,3 For others Connectors increases the Uncertainty of measurement
		> 50 MHz up to 5 GHz	22 · 10^{-3} - · *P*	
		> 5 GHz up to 18 GHz	30 · 10^{-3} - · *P*	
	0.1 mW up to 10 mW	50 MHz up to 5 GHz	22 · 10^{-3} - · *P*	Connector PC^{-3}.5; 50 Ω |Γ| ≤ 0,3 For other connectors increases the Uncertainty of measurement
		> 5 GHz up to 18 GHz	32 · 10^{-3} - · *P*	
		> 18 GHz up to 26.5 GHz	40 · 10^{-3} - · *P*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
HF power Power meters	0.1 mW up to 10 mW	9 kHz up to 50 MHz > 50 MHz up to 5 GHz > 5 GHz 18 GHz	$17 \cdot 10^{-3} \cdot \cdot P$ $21 \cdot 10^{-3} \cdot \cdot P$ $28 \cdot 10^{-3} \cdot \cdot P$	N connector; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ For other connectors increases the Uncertainty of measurement
	0.1 mW up to 10 mW	50 MHz up to 5 GHz > 5 GHz up to 18 GHz > 18 GHz up to 26.5 GHz	$22 \cdot 10^{-3} \cdot \cdot P$ $32 \cdot 10^{-3} \cdot \cdot P$ $40 \cdot 10^{-3} \cdot \cdot P$	Connector PC^{-3}.5; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ For other connectors increases the Uncertainty of measurement
Signal level difference Measuring instruments / sources	0 dBc up to 90 dBc	9 kHz up up to 7 GHz > 7 GHz up up to 13.6 GHz > 13.6 GHz up to 26.5 GHz	1.5 dB 2.3 dB 3 dB	SNR > 20 dB
	> 90 dBc up to 100 dBc	9 kHz up to 7 GHz > 7 GHz 13.6 GHz > 13.6 GHz 26.5 GHz	4.5 dB 4.8 dB 5.3 dB	SNR > 20 dB
Filter bandwidth Measuring instruments	1 Hz up to 40 MHz		1 %	SNR > 70 dB

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
HF noise display Receiver / Measuring instruments	10 Hz up to 50 GHz	-165 dbm/Hz to 0 dBm/Hz	1 dB	
Form factor Measuring instruments	1:1 up to 4:1 > 4:1 up to 10:1 > 10:1 up to 18:1		5,5 % 7 % 8,5 %	SNR > 20 dB
Amplitude modulation: Modulation depth *m*	0.0 up to ≤ 1.0	f_{MOD} < 1 MHz	0,004 0,025 m	*fHF* = carrier frequency *fHF* < 4 GHz *fMOD* = modulation freq. Absolute measurement uncertainty
Frequency modulation Frequency deviation *Δf*	0 Hz up to 5 MHz	f_{MOD} < 1 MHz	0.041 Δf 25 Hz	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *Δf* = frequency deviation Absolute measurement uncertainty
Phase modulation Phase deviation *ΔΦ*	0 up to (4 MHz / fMOD) rad	f_{MOD} < 1 MHz	0.025 rad 0.041 ΔΦ	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *ΔΦ* = phase deviation Absolute measurement uncertainty
Distortion factor k	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	AM demodulation method *fHF*: 150 kHz up to 2 GHz f_{MOD} = 1kHz $_{PHF}$ = 0 dBm	0,030 0,029 0,025	*fHF*=Carrier frequency *fMOD* = Modulation frequency $_{PHF}$ = Carrier level
	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	FM & PM-Demodulation method f_{HF}:150 kHz up to 2 GHz f_{MOD} = 1kHz P_{HF} = 0 dBm *Δf* ≤ 50 kHz	0,09	Absolute measurement uncertainty
Pulse-shaped measurement Spectral voltage amplitude density (Measure/ Display)	S_0 = 13.5 µVs	CISPR Band A 9 kHz up to 0.15 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.50 dB	Pulse rate 1 Hz up to 100 Hz Γ_G, Γ_L ≤ 0.05 (represent)
	S_0 = 0.316 µVs	CISPR Band B > 0.15 MHz up to 30 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.50 dB	Pulse rate 1 Hz up to 1000 Hz Γ_G, Γ_L ≤ 0.07 (represent)

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Pulse-shaped measurement Spectral voltage amplitude density (Measure/ Display)	S_0 = 0.0044 µVs	CISPR Band C > 30 MHz up to 300 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.6 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq 0.12$ (represent)
	S_0 = 0.0044 µVs	CISPR Band D > 300 MHz up to 1 GHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.6 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq 0.12$ (represent)
HF Current transformer clamp Transmission certificate Resistance dB(Ω)	9 kHz up to 100 MHz > 100 MHz up to 400 MHz > 400 MHz up to 1 GHz	DIN EN 55016-1-2:2015 4.4 mA	0.3 dB 0.5 dB 0.8 dB	
HF Bulk Current Injection Transducer clamp Insertion loss dB	9 kHz up to 100 MHz > 100 MHz up to 400 MHz > 400 MHz up to 1 GHz	DIN EN 61000-4^{-6} :2014 4.4 mA	0.3 dB 0.5 dB 0.8 dB	
Phase noise Signal generators	Phase noise related up to carrier amplitude in dBc/Hz > -87 dBc/Hz > -99 dBc/Hz > -104 dBc/Hz > -111 dBc/Hz > -131 dBc/Hz > -137 dBc/Hz	Offset frequency referred up to carrier frequency 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	Carrier Frequency: 100 MHz - 1 GHz
	> -80 dBc/Hz > -96 dBc/Hz > -101 dBc/Hz > -109 dBc/Hz > -126 dBc/Hz > -136 dBc/Hz	100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	> 1 MHz - 3 GHz
	> -72 dBc/Hz > -93 dBc/Hz > -98 dBc/Hz > -106 dBc/Hz > -120 dBc/Hz > -135 dBc/Hz	100 Hz 1 kHz 10 kHz 100 kHz 1 MHz 10 MHz	2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB 2.5 dB	> 3 GHz - 6 GHz

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Voltage ratio	± 2 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.04 µV/V 0.05 µV/V 1.0 µV/V	Calibration of 350 Ω bridge standards and the associated indicators at discrete points in 10% increments
	± 2 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.05 µV/V 0.05 µV/V 1.0 µV/V	
	± 5 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 4.8 kHz	 0.15 µV/V 1.0 µV/V	
	± 10 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 4.8 kHz	 0.10 µV/V 0.30 µV/V	
	± 5 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.1 µV/V 0.1 µV/V 1.0 µV/V	
	± 10 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz Measuring frequency 4.8 kHz	 0.4 µV/V 0.4 µV/V 0.4 µV/V	Calibration of 350 Ω bridge standards and the associated indicators at discrete points in 10% increments
	± 10 mV/V	Bridge voltage: 1 V Measuring frequency 600 Hz	 0.40 µV/V	
	± 20 mV/V	Bridge voltage: 1 V Measuring frequency 4.8 kHz	 0.60 µV/V	
	± 100 mV/V	Bridge voltage: 1 V Measuring frequency 4.8 kHz	 5.0 µV/V	
	± 100 mV/V	Bridge voltage: 2,5 V Measuring frequency 4.8 kHz	 5.0 µV/V	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Voltage ratio DC voltage Bridge standards		Bridge voltage:		
	0 mV/V		2.0 µV/V	
	-2 mV/V up to 2 mV/V		2.5 µV/V	
	-5 mV/V up to 5 mV/V	0,5 V	2.5 µV/V	
	-10 mV/V up to 10 mV/V		2.5 µV/V	
	-20 mV/V up to 20 mV/V		2.5 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	
		Bridge voltage:		
	0 mV/V		1.0 µV/V	
	-2 mV/V up to 2 mV/V		2.0 µV/V	
	-5 mV/V up to 5 mV/V	1,0 V	2.0 µV/V	
	-10 mV/V up to 10 mV/V		2.0 µV/V	
	-20 mV/V up to 20 mV/V		2.0 µV/V	
	-100 mV/V up to 100 mV/V		2.0 µV/V	
		Bridge voltage:		
	0 mV/V		0.5 µV/V	
	-2 mV/V up to 2 mV/V		0.5 µV/V	
	-5 mV/V up to 5 mV/V	2,5 V	0.5 µV/V	
	-10 mV/V up to 10 mV/V		0.5 µV/V	
	-20 mV/V up to 20 mV/V		0.5 µV/V	
	-100 mV/V up to 100 mV/V		1.5 µV/V	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

On-site calibration of high-frequency and radiation measurement quantities

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Voltage ratio DC voltage Bridge standards		Bridge voltage:		
	0 mV/V		0.3 µV/V	
	-2 mV/V up to 2 mV/V		0.25 µV/V	
	-5 mV/V up to 5 mV/V	5,0 V	0.25 µV/V	
	-10 mV/V up to 10 mV/V		0.25 µV/V	
	-20 mV/V up to 20 mV/V		0.35 µV/V	
	-100 mV/V up to 100 mV/V		1.5 µV/V	
		Bridge voltage:		
	0 mV/V		0.2 µV/V	
	-2 mV/V up to 2 mV/V		0.2 µV/V	
	-5 mV/V up to 5 mV/V	7,5 V	0.2 µV/V	
	-10 mV/V up to 10 mV/V		0.2 µV/V	
	-20 mV/V up to 20 mV/V		0.3 µV/V	
	-100 mV/V up to 100 mV/V		1.5 µV/V	
		Bridge voltage:		
	0 mV/V		0.1 µV/V	
	-2 mV/V up to 2 mV/V		0.15 µV/V	
	-5 mV/V up to 5 mV/V	10,0 V	0.15 µV/V	
	-10 mV/V up to 10 mV/V		0.2 µV/V	
	-20 mV/V up to 20 mV/V		0.3 µV/V	
	-100 mV/V up to 100 mV/V		1.5 µV/V	
Voltage ratio DC voltage bridges, measuring instruments, measuring amplifiers		Bridge voltage: 0,5 V		With K148
	-2 mV/V up to 2 mV/V		0.35 µV/V	
	-5 mV/V up to 5 mV/V		0.35 µV/V	
	-10 mV/V up to 10 mV/V		0.40 µV/V	
	-20 mV/V up to 20 mV/V		0.55 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	
		Bridge voltage:		
	-2 mV/V up to 2 mV/V		0.20 µV/V	
	-5 mV/V up to 5 mV/V	1 V	0.20 µV/V	
	-10 mV/V up to 10 mV/V		0.30 µV/V	
	-20 mV/V up to 20 mV/V		0.50 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	
		Bridge voltage:		
	-2 mV/V up to 2 mV/V		0.10 µV/V	
	-5 mV/V up to 5 mV/V	2.5 V; 5 V; 7.5 V; 10 V	0.15 µV/V	
	-10 mV/V up to 10 mV/V		0.25 µV/V	
	-20 mV/V up to 20 mV/V		0.45 µV/V	
	-100 mV/V up to 100 mV/V		2.5 µV/V	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range			Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
DC voltage	0 V				0.1 µV	*U* = set value
Measuring instruments	0,01 V	up to	2,2 V		$7 \cdot 10^{-6}$ *U* 1 µV	Fluke 5700A
	> 2,2 V	up to	11 V		$9 \cdot 10^{-6}$ *U*	
	> 11 V	up to	22 V		$8 \cdot 10^{-6}$ *U*	
	> 22 V	up to	220 V		$12 \cdot 10^{-6}$ *U*	
	> 220 V	up to	1000 V		$12 \cdot 10^{-6}$ *U*	
DC voltage	0 V				0.1 µV	*U* = measured value
Sources	1 mV	up to	100 mV		$8 \cdot 10^{-6}$ *U* 1 µV	HP 3458A
	> 100 V	up to	1 V		$11 \cdot 10^{-6}$ *U*	
	> 1 V	up to	10 V		$9 \cdot 10^{-6}$ *U*	
	> 10 V	up to	100 V		$13 \cdot 10^{-6}$ *U*	
	> 100 V	up to	1000 V		$16 \cdot 10^{-6}$ *U*	
Direct current strength	0 A				0.2 nA	*I* = set value
Measuring instruments	10 µA	up to	220 µA		$50 \cdot 10^{-6}$ *I* 8 nA	Fluke 5700A
	> 220 µA	up to	2.2 mA		$87 \cdot 10^{-6}$ *I*	
	> 2.2 mA	up to	22 mA		$87 \cdot 10^{-6}$ *I*	
	> 22 mA	up to	220 mA		$89 \cdot 10^{-6}$ *I*	
	> 220 mA	up to	2,2 A		$0.2 \cdot 10^{-3}$ *I*	
	> 2,2 A	up to	11 A		$0.55 \cdot 10^{-3}$ *I*	with 5520A/5522A
	> 11 A	up to	20 A		$1.2 \cdot 10^{-3}$ *I*	
	> 20 A	up to	200 A	Voltage drop with Normal resistance	$1.0 \cdot 10^{-3}$ *I*	
Direct current strength	0 A				0.2 nA	*I* = measured value
Sources	0.1 µA	up to	1 µA		$400 \cdot 10^{-6}$ *I*	HP 3458A
	> 1 µA	up to	10 µA		$120 \cdot 10^{-6}$ *I*	
	> 10 µA	up to	100 µA		$100 \cdot 10^{-6}$ *I*	
	> 100 µA	up to	1 mA		$70 \cdot 10^{-6}$ *I*	
	> 1 mA	up to	10 mA		$70 \cdot 10^{-6}$ *I*	
	> 10 mA	up to	100 mA		$85 \cdot 10^{-6}$ *I*	
	> 100 mA	up to	1 A		$200 \cdot 10^{-6}$ *I*	
	> 1 A	up to	10 A	Voltage drop with	$0.5 \cdot 10^{-3}$ *I*	*I* = measured value
	> 10 A	up to	200 A	Normal resistance	$1 \cdot 10^{-3}$ *I*	
Direct current strength	1 mA	up to	2,2 A		$1 \cdot 10^{-3}$ *I*	
Current clamps	> 2,2 A	up to	20 A		$2 \cdot 10^{-3}$ *I*	
	> 20 A	up to	1000 A		$3 \cdot 10^{-3}$ *I*	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC resistance	0 Ω		50 µ Ω	R = set value
	1 Ω; 1.9 Ω		$95 \cdot 10^{-6}$ R	Fluke 5700A
	10 Ω		$28 \cdot 10^{-6}$ R	
	19 Ω		$27 \cdot 10^{-6}$ R	
	100 Ω; 190 Ω		$17 \cdot 10^{-6}$ R	
	1 kΩ		$13 \cdot 10^{-6}$ R	
	1.9 kΩ		$13 \cdot 10^{-6}$ R	
	10 kΩ		$12 \cdot 10^{-6}$ R	
	19 kΩ		$12 \cdot 10^{-6}$ R	
	100 kΩ		$14 \cdot 10^{-6}$ R	
	190 kΩ		$14 \cdot 10^{-6}$ R	
	1 MΩ		$20 \cdot 10^{-6}$ R	
	1.9 MΩ		$21 \cdot 10^{-6}$ R	
	10 MΩ		$40 \cdot 10^{-6}$ R	
	19 MΩ		$48 \cdot 10^{-6}$ R	
	100 MΩ		$110 \cdot 10^{-6}$ R	
DC resistance	0 Ω		100 µΩ	R = measured value
(areas)	1 Ω up to 10 Ω		$16 \cdot 10^{-6}$ R 50 µΩ	
	> 10 Ω up to 100 Ω		$12 \cdot 10^{-6}$ R 500 µΩ	
	> 100 Ω up to 1 kΩ		$15 \cdot 10^{-6}$ R	
	> 1 kΩ up to 10 kΩ		$15 \cdot 10^{-6}$ R	
	> 10 kΩ up to 100 kΩ		$15 \cdot 10^{-6}$ R	
	> 100 kΩ up to 1 MΩ		$35 \cdot 10^{-6}$ R	
	> 1 MΩ up to 10 MΩ		$150 \cdot 10^{-6}$ R	
	> 10 MΩ up to 100 MΩ		$600 \cdot 10^{-6}$ R	
	> 100 MΩ up to 1 GΩ		$5 \cdot 10^{-3}$ R	
	0,001 Ω up to 0,1 Ω	Substitution procedure	$50 \cdot 10^{-6}$ R	
	> 0,1 Ω up to 1 MΩ	with normal resistance	$20 \cdot 10^{-6}$ R	
	> 1 MΩ up to 100 MΩ		$30 \cdot 10^{-6}$ R	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range			Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
DC resistance	1 Ω	up to	< 11 Ω		$120 \cdot 10^{-6}\ R$	R = set value
(areas)	11 Ω	up to	< 33 Ω		$33 \cdot 10^{-6}\ R$	
Measuring instruments	33 Ω	up to	< 110 Ω		$29 \cdot 10^{-6}\ R$	
	110 Ω	up to	< 330 Ω		$28 \cdot 10^{-6}\ R$	
	330 Ω	up to	< 1.1 kΩ		$28 \cdot 10^{-6}\ R$	
	1.1 kΩ	up to	< 3.3 kΩ		$28 \cdot 10^{-6}\ R$	
	3.3 kΩ	up to	< 11 kΩ		$28 \cdot 10^{-6}\ R$	
	11 kΩ	up to	< 33 kΩ		$28 \cdot 10^{-6}\ R$	
	33 kΩ	up to	< 110 kΩ		$28 \cdot 10^{-6}\ R$	
	110 kΩ	up to	< 330 kΩ		$32 \cdot 10^{-6}\ R$	
	330 kΩ	up to	< 1.1 MΩ		$33 \cdot 10^{-6}\ R$	
	1.1 MΩ	up to	< 3.3 MΩ		$62 \cdot 10^{-6}\ R$	
	3.3 MΩ	up to	< 11 MΩ		$0.13 \cdot 10^{-3}\ R$	
	11 MΩ	up to	< 33 MΩ		$0.25 \cdot 10^{-3}\ R$	
	33 MΩ	up to	< 110 MΩ		$0.5 \cdot 10^{-3}\ R$	
	110 MΩ	up to	< 330 MΩ		$3 \cdot 10^{-3}\ R$	
	330 MΩ	up to	< 1.1 GΩ		$15 \cdot 10^{-3}\ R$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage meters and sources	1 mV up to 2.2 mV	10 Hz up to 20 Hz	$0.52 \cdot 10^{-3}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$0.52 \cdot 10^{-3}$ *U*	
		> 40 Hz up to 20 kHz	$0.40 \cdot 10^{-3}$ *U*	
		> 20 kHz up to 50 kHz	$0.40 \cdot 10^{-3}$ *U*	
		> 50 kHz up to 100 kHz	$0.41 \cdot 10^{-3}$ *U*	
		> 100 kHz up to 300 kHz	$0.46 \cdot 10^{-3}$ *U*	
		> 300 kHz up to 500 kHz	$0.55 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.60 \cdot 10^{-3}$ *U*	
	> 2.2 mV up to 7 mV	10 Hz up to 20 Hz	$0.22 \cdot 10^{-3}$ *U*	
		> 20 Hz up to 40 Hz	$0.22 \cdot 10^{-3}$ *U*	
		> 40 Hz up to 20 kHz	$0.16 \cdot 10^{-3}$ *U*	
		> 20 kHz up to 50 kHz	$0.16 \cdot 10^{-3}$ *U*	
		> 50 kHz up to 100 kHz	$0.20 \cdot 10^{-3}$ *U*	
		> 100 kHz up to 300 kHz	$0.22 \cdot 10^{-3}$ *U*	
		> 300 kHz up to 500 kHz	$0.33 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.45 \cdot 10^{-3}$ *U*	
	> 7 mV up to 22 mV	10 Hz up to 20 Hz	$80 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$80 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$65 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$75 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$75 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$95 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$0.19 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.21 \cdot 10^{-3}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC voltage meters and sources	> 22 mV up to 70 mV	10 Hz up to 20 Hz	$70 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$58 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$35 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$35 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$45 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$55 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$0.11 \cdot 10^{-3}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	
	> 70 mV up to 220 mV	10 Hz up to 20 Hz	$39 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$35 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$25 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$25 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$28 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$42 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$85 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.1 \cdot 10^{-3}$ *U*	
	> 220 mV up to 700 mV	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$22 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$12 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$12 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$14 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$27 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$40 \cdot 10^{-6}$ *U*	
	> 700 mV up to 2.2 V	10 Hz up to 20 Hz	$20 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$14 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$10 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$10 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$11 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$22 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$68 \cdot 10^{-6}$ *U*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC voltage meters and sources	> 2.2 V up to 7 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	*U* = measured value
		> 20 Hz up to 40 Hz	$12 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$13 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$13 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$95 \cdot 10^{-6}$ *U*	
	> 7 V up to 22 V	10 Hz up to 20 Hz	$17 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$11 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$11 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$11 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$30 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1MHz	$0.11 \cdot 10^{-3}$ *U*	
	> 22 V up to 70 V	10 Hz up to 20 Hz	$18 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$16 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$15 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$15 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$25 \cdot 10^{-6}$ *U*	
		> 100 kHz up to 300 kHz	$25 \cdot 10^{-6}$ *U*	
		> 300 kHz up to 500 kHz	$40 \cdot 10^{-6}$ *U*	
		> 500 kHz up to 1 MHz	$0.13 \cdot 10^{-3}$ *U*	
	> 70 V up to 220 V	10 Hz up to 20 Hz	$19 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$18 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$17 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$17 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$32 \cdot 10^{-6}$ *U*	
	> 220 V up to 1000 V	10 Hz up to 20 Hz	$25 \cdot 10^{-6}$ *U*	
		> 20 Hz up to 40 Hz	$27 \cdot 10^{-6}$ *U*	
		> 40 Hz up to 20 kHz	$45 \cdot 10^{-6}$ *U*	
		> 20 kHz up to 50 kHz	$45 \cdot 10^{-6}$ *U*	
		> 50 kHz up to 100 kHz	$65 \cdot 10^{-6}$ *U*	
High Voltage	> 0.7 kV up to 1 kV	50 Hz	$2.5 \cdot 10^{-3}$ *U* 0.25 V	
	> 1 kV up to 7 kV		$3.5 \cdot 10^{-3}$ *U* 2.0 V	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC power sources and meters	100 µA up to 1 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$120 \cdot 10^{-6}$ *I* $160 \cdot 10^{-6}$ *I* $60 \cdot 10^{-6}$ *I*	*I* = measured value
	> 1 mA up to 10 mA	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$46 \cdot 10^{-6}$ *I*	
AC power sources and meters	> 10 mA up to 1 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$17 \cdot 10^{-6}$ *I*	
	> 1 A up to 10 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$32 \cdot 10^{-6}$ *I*	
	> 10 A up to 20 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$39 \cdot 10^{-6}$ *I*	
	> 20 A up to 100 A	10 Hz up to 40 Hz > 40 Hz up to 1 kHz; > 1 kHz up to 10 kHz;	$69 \cdot 10^{-6}$ *I* $69 \cdot 10^{-6}$ *I* $0.17 \cdot 10^{-3}$ *I*	
AC power Sources	100 A up to 2000 A	50 Hz	$3.0 \cdot 10^{-3} \cdot I$	Current transformer

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
AC power	1 mA up to 2,2 A	40 Hz up to 5 kHz	$2 \cdot 10^{-3}\ I$	I = measured value
Current clamps	> 2,2 A up to 20 A	40 Hz up to 5 kHz	$3 \cdot 10^{-3}\ I$	
	> 20 A up to 800 A	40 Hz up to 65 Hz	$4 \cdot 10^{-3}\ I$	
Frequency	1 mHz up to 46 GHz		$2 \cdot 10^{-9} \cdot f_{UTf}$	f = current measured value $_{UTf}$ =Trigger uncertainty
Time interval	1 µs up to 1000 s		$2 \cdot 10^{-9} \cdot t$ 2 ns	t = current measured value
Capacity	190 pF up to < 400 pF	10 Hz up to 10 kHz	$4 \cdot 10^{-3}\ C$ 8 pF	With 5520A / 5522A
Gauges,	400 pF up to < 1.1 nF	10 Hz up to 10 kHz	$4.5 \cdot 10^{-3}\ C$ 8 pF	
	1.1 nF up to < 3.3 nF	10 Hz up to 3 kHz	$4.0 \cdot 10^{-3}\ C$ 8 pF	
	3.3 nF up to < 11 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}\ C$ 8 pF	
	11 nF up to < 33 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}\ C$ 80 pF	
	33 nF up to < 110 nF	10 Hz up to 1 kHz	$2.5 \cdot 10^{-3}\ C$ 80 pF	
	110 nF up to < 330 nF	10 Hz up to 1 kHz	$4.5 \cdot 10^{-3}\ C$	
	330 nF up to < 1.1 µF	10 Hz up to 600 Hz	$4.5 \cdot 10^{-3}\ C$	
	1.1 µF up to < 3.3 µF	10 Hz up to 300 Hz	$4.5 \cdot 10^{-3}\ C$	
	3.3 µF up to < 11 µF	10 Hz up to 150 Hz	$4.5 \cdot 10^{-3}\ C$	
	11 µF up to < 33 µF	10 Hz up to 120 Hz	$6.0 \cdot 10^{-3}\ C$	
	33 µF up to < 110 µF	10 Hz up to 80 Hz	$6.5 \cdot 10^{-3}\ C$	
	110 µF up to < 330 µF	DC up to 50 Hz	$6.0 \cdot 10^{-3}\ C$	
	330 µF up to < 1.1 mF	DC up to 20 Hz	$6.0 \cdot 10^{-3}\ C$	
	1.1 mF up to < 3.3 mF	DC up to 6 Hz	$6.0 \cdot 10^{-3}\ C$	
	3.3 mF up to < 11 mF	DC up to 2 Hz	$6.0 \cdot 10^{-3}\ C$	
	11 mF up to < 33 mF	DC up to 0.6 Hz	$8.0 \cdot 10^{-3}\ C$	
	33 mF up to 110 mF	DC up to 0.2 Hz	$11 \cdot 10^{-3}\ C$	
Oscilloscopes	5 mV up to 5 V	R_i = 50 Ω	$3.5 \cdot 10^{-3}\ U$ 35 µV	Square wave voltage
Vertical deflection	5 mV up to 120 V	R_i = 1 MΩ	$2.4 \cdot 10^{-3}\ U$ 40 µV	10 Hz up to 10 kHz
Horizontal deflection	5 ns up to 520 ms		$3 \cdot 10^{-6}\ t$ 1 ns	t: current time
	> 20 ms up to 5 s		$30 \cdot 10^{-6}\ t$ 1.2 $\cdot 10^{-3}\ t^2$	
Rise time	600 ps up to 10 ms	25 mV up to 1V R_i = 50 Ω	$40 \cdot 10^{-3}\ tr$ 7 ps	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Electrical Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
AC active power		33 mV up to 1000 V 45 Hz up to 65 kHz *PF* = 1		*P* : set value with Fluke 5520A/5522A *PF*: Power factor
	109 µW up to < 11kW	33 mA up < 11A	$1.4 \cdot 10^{-3}\ P$	
	363 mW up to 20 kW	11 A to 20 A	$2.0 \cdot 10^{-3}\ P$	
DC power	1 mW up to 300 W		$0.5 \cdot 10^{-3}\ P$	
	> 300 W up to 20 kW		$1.0 \cdot 10^{-3}\ P$	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory for high frequency and radiation measurements

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
HF impedance (reflection factor)	0,0 up to 1,0	45 MHz up to 5 GHz > 5 GHz up to 18 GHz	0,01 0,01 |Γ| 0,015 0,01 |Γ|	Connector; PC-7; 50 Ω For others Connectors increases the Uncertainty of measurement
Single measurement |S11| Amount |Γ|		9 kHz up to 5 GHz > 5 GHz up to 18 GHz	0,01 0,01 |Γ| 0,015 0,01 |Γ|	N connector; 50 Ω For others Connectors increases the Uncertainty of measurement
		45 MHz up to 5 GHz > 5 GHz up to 18 GHz >18 GHz up to 26.5 GHz	0,01 0,005 |Γ| 0,015 0,01 |Γ| 0,02 0,02 |Γ|	Connector system PC⁻³.5; 50 Ω For others Connectors increases the Uncertainty of measurement
Phase φ	-180° up to 180°	9 kHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1	$\arcsin \frac{U(\Gamma) \cdot 180°}{\Gamma \cdot \pi}$	N connector; 50 Ω.
		45 MHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1		Connector; PC-7; 50 Ω
		45 MHz up to 26.5 GHz 0,1 ≤ |Γ| ≤ 1		PC⁻³.5

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory for high frequency and radiation measurements

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
HF impedance		45 MHz up to 5 GHz	0,015 0,01 |Γ|	PC-7; 50 Ω For others Connectors increases the Uncertainty of measurement
(reflection factor)	0.0 up to 1.0	> 5 GHz up to 18 GHz	0,02 0,01 |Γ|	
Two-port measurement |S11|& |S22|		9 kHz up to 5 GHz	0,015 0,01 |Γ|	N connector; 50 Ω. For others Connectors increases the Uncertainty of measurement
Amount |Γ|		> 5 GHz up to 18 GHz	0,02 0,01 |Γ|	
		45 MHz up to 5 GHz	0,01 0,005 |Γ|	PC-3.5 For other connectors increases the
		> 5 GHz up to 18 GHz	0,015 0,01 |Γ|	
		> 18 GHz up to 26.5 GHz	0,02 0,02 |Γ|	
Phase φ	-180° up to 180	9 kHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1	$\arcsin\left(\frac{U(\Gamma)}{\|\Gamma\|}\right) \cdot \frac{180°}{\pi}$	N connector; 50 Ω.
		45 MHz up to 18 GHz 0,1 ≤ |Γ| ≤ 1		PC-7; 50 Ω
		45 MHz up to 26.5 GHz 0,1 ≤ |Γ| ≤ 1		PC-3.5
HF - Attenuation Switchable-Attenuators,	0 dB up to 60 dB	9 kHz up to 18 GHz	0.3 dB	Connector system: N; 50 Ω |Γ| ≤ 0.1
Fixed attenuators	> 60 dB up to 90 dB		0.3 dB	
Absolute	0 dB up to 60 dB	45 MHz up to 20 GHz	0.3 dB	Connector system PC-3.5; 50 Ω 45 MHz up to 20 GHz |Γ| ≤ 0.1 <20 GHz up to 26.5 GHz |Γ| ≤ 0.15
attenuation		> 20 GHz up to 26.5 GHz	0.5 dB	
values	> 60 dB up to 90 dB	45 MHz up to 20 GHz	0.3 dB	
		> 20 GHz up to 26.5 GHz	0.5 dB	
HF power	> 1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.025 0.14 - |Γ|) - *P*	Connector system: N, PC-3.5 ; 50 Ω; |Γ|/KG ≤ 0.2
Power meters		> 2 GHz up to 18 GHz	(0.049 0.21 - |Γ|) - *P*	
		> 18 GHz up to 26.5 GHz	(0.071 0.32 - |Γ|) - *P*	
HF power				Connector system: N, PC-3,5 ; 50 Ω |Γ| $_{KG}$ ≤ 0.2
Signal generators	> 1 pW up to 0.1 mW	2.5 MHz up to 2 GHz	(0.035 0.13 - |Γ|) - *P*	
		> 2 GHz up to 18 GHz	(0.053 0.2 - |Γ|) - *P*	
		> 18 GHz up to 26.5 GHz	(0.08 0.4 - |Γ|) - *P*	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory for high frequency and radiation measurements

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
HF power Signal generators	0.1 mW up to 10 mW	9 kHz up to 50 MHz > 50 MHz up to 5 GHz > 5 GHz up to 18 GHz	$17 \cdot 10^{-3} \cdot P$ $22 \cdot 10^{-3} \cdot P$ $30 \cdot 10^{-3} \cdot P$	N connector; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$
	0.1 mW up to 10 mW	50 MHz up to 5 GHz > 5 GHz up to 18 GHz > 18 GHz up to 26.5 GHz	$22 \cdot 10^{-3} \cdot P$ $32 \cdot 10^{-3} \cdot P$ $40 \cdot 10^{-3} \cdot P$	Connector PC^{-3}.5; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ For others Connectors increases the Uncertainty of measurement
HF power Power meters	0.1 mW up to 10 mW	9 kHz up to 50 MHz > 50 MHz up to 5 GHz > 5 GHz up to 18 GHz	$17 \cdot 10^{-3} \cdot P$ $21 \cdot 10^{-3} \cdot P$ $28 \cdot 10^{-3} \cdot P$	N connector; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ For other connectors increases the Uncertainty of measurement
	0.1 mW up to 10 mW	50 MHz up to 5 GHz > 5 GHz up to 18 GHz > 18 GHz up to 26.5 GHz	$22 \cdot 10^{-3} \cdot P$ $32 \cdot 10^{-3} \cdot P$ $40 \cdot 10^{-3} \cdot P$	Connector PC^{-3}.5; 50 Ω $\lvert \Gamma \rvert \leq 0{,}3$ For other connectors increases the Uncertainty of measurement
Signal level difference Measuring instruments / sources	0 dBc up to 90 dBc	9 kHz up to 7 GHz > 7 GHz up to 13.6 GHz > 13.6 GHz up to 26.5 GHz	1.5 dB 2.3 dB 3 dB	SNR > 20 dB
	90 dBc up to 100 dBc	9 kHz up to 7 GHz > 7 GHz up to 13.6 GHz > 13.6 GHz up to 26.5 GHz	4.5 dB 4.8 dB 5.3 dB	SNR > 20 dB
Filter bandwidth Measuring instruments	1 Hz up to 40 MHz		1 %	SNR > 70 dB
HF noise display Receiver / Measuring instruments	10 Hz up to 50 GHz	-165 dbm/Hz up to 0 dBm/Hz	1 dB	
Form factor Measuring instruments	1:1 up to 4:1 > 4:1 up to 10:1 > 10:1 up to 18:1		5,5 % 7 % 8,5 %	SNR > 20 dB

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory for high frequency and radiation measurements

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Amplitude modulation: Modulation depth *m*	0.0 up to ≤ 1.0	f_{MOD} < 1 MHz	0,004 0,025 m	*fHF* = carrier frequency *fHF* < 4 GHz *fMOD* = modulation freq. Absolute measurement uncertainty
Frequency modulation Frequency deviation *Δf*	0 Hz up to 5 MHz	f_{MOD} < 1 MHz	0.041 Δf 25 Hz	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *Δf* = frequency deviation Absolute measurement uncertainty
Phase modulation Phase deviation *ΔΦ*	0 up to (4 MHz / fMOD) rad	f_{MOD} < 1 MHz	0.025 rad 0.041 ΔΦ	*fHF* = Carrier frequency *fHF* < 4 GHz *fMOD* = Modulation frequency *ΔΦ* = phase deviation Absolute measurement uncertainty
Phase noise	Phase noise related up to carrier amplitude in dBc/Hz	Offset frequency referred up to carrier frequency		Carrier Frequency:
Signal generators	> -87 dBc/Hz	100 Hz	2.5 dB	100 MHz - 1 GHz
	> -99 dBc/Hz	1 kHz	2.5 dB	
	> -104 dBc/Hz	10 kHz	2.5 dB	
	> -111 dBc/Hz	100 kHz	2.5 dB	
	> -131 dBc/Hz	1 MHz	2.5 dB	
	> -137 dBc/Hz	10 MHz	2.5 dB	
	> -80 dBc/Hz	100 Hz	2.5 dB	> 1 MHz - 3 GHz
	> -96 dBc/Hz	1 kHz	2.5 dB	
	> -101 dBc/Hz	10 kHz	2.5 dB	
	> -109 dBc/Hz	100 kHz	2.5 dB	
	> -126 dBc/Hz	1 MHz	2.5 dB	
	> -136 dBc/Hz	10 MHz	2.5 dB	
	> -72 dBc/Hz	100 Hz	2.5 dB	> 3 GHz - 6 GHz
	> -93 dBc/Hz	1 kHz	2.5 dB	
	> -98 dBc/Hz	10 kHz	2.5 dB	
	> -106 dBc/Hz	100 kHz	2.5 dB	
	> -120 dBc/Hz	1 MHz	2.5 dB	
	> -135 dBc/Hz	10 MHz	2.5 dB	

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory for high frequency and radiation measurements

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Distortion factor k	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	AM demodulation method *fHF*: 150 kHz up to 2 GHz f_{MOD} = 1kHz $_{PHF}$ = 0 dBm	0,030 0,029 0,025	*fHF*=Carrier frequency *fMOD* = Modulation frequency $_{PHF}$ = Carrier level
	> 0.0001 up to 0.01 > 0.01 up to 0.1 > 0.1 up to 0.2	FM & PM-Demodulation method f_{HF}:150 kHz up to 2 GHz f_{MOD} = 1kHz P_{HF} = 0 dBm $\Delta f \leq$ 50 kHz	0,09	Absolute measurement uncertainty
Pulse-shaped measurement Spectral voltage amplitude density (Measure/ Display)	S_0 = 13.5 µVs	CISPR Band A 9 kHz up to 0.15 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.50 dB	Pulse rate 1 Hz up to 100 Hz $\Gamma_G, \Gamma_L \leq$ 0.05 (represent)
	S_0 = 0.316 µVs	CISPR Band B > 0.15 MHz up to 30 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.50 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq$ 0.07 (represent)
	S_0 = 0.044 µVs	CISPR Band C > 30 MHz up to 300 MHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.6 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq$ 0.12 (represent)
	S_0 = 0.044 µVs	CISPR Band D > 300 MHz up to 1 GHz DIN EN 55016-1-1:2015 CISPR 16-1-1:2010	0.6 dB	Pulse rate 1 Hz up to 1000 Hz $\Gamma_G, \Gamma_L \leq$ 0.12 (represent)
HF current transformer clamp Transmission resistance dB(Ω)	9 kHz up to 100 MHz >100 MHz up to 400 MHz >400 MHz up up to 1 GHz	DIN EN 55016-1-2:2015 4.4 mA	0.3 dB 0.5 dB 0.8 dB	
HF Bulk Current Injection Transducer clamp Insertion loss dB	9 kHz up to 100 MHz >100 MHz up to 400 MHz >400 MHz up up to 1 GHz	DIN EN 61000-4^{-6} :2014 4.4 mA	0.3 dB 0.5 dB 0.8 dB	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile Laboratory Thermodynamic Measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1)]	Remarks
Temperature simulators for resistance thermometers	-200 °C up to 850 °C	DKD-R 5-5:2018	0,016 K	Characteristic according to DIN EN 60751:2009
Temperature display-instruments for resistance thermometers	-200 °C up to 850 °C		0,03 K	
Temperature display-instruments and -simulators for Precious Metals Thermocouples *)	-200 °C up to 1750 °C	DKD-R 5-5:2018	0,1 K	Characteristic according to DIN EN 60584-1:1998
Temperature display-instruments and -simulators for Non-Precious Metals Thermocouples *)	-200 °C up to 1300 °C	DKD-R 5-5:2018	0,05 K	Characteristic according to DIN EN 60584-1:1998

[1)] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Mobile laboratory Dimensional measurands

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Length Cylindrical setting standards, ring gauges: Diameter	1 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006	0.8 µm $2 \cdot 10^{-6} \cdot d$	d = is the measured Diameter
Plug gauges: Diameter	1 mm up to 200 mm	Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	0.8 µm $2 \cdot 10^{-6} \cdot d$	
Test Probes: Diameter	0.1 mm up to 30 mm	VDI/VDE/DGQ 2618 Sheet 4.2:2007 Point 3.2.2 (Opt. 1)	0.8 µm $2 \cdot 10^{-6} \cdot d$	
Thread gauges (one and multiple-start cylindrical external and internal threads with straight flanks, symmetrical profile) Threaded mandrels: simple Flank diameter	1.4 mm up to 200 mm nominal pitch: 0.3 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.8:2006 Point 3.2.2 (Opt. 1)	3 µm $10 \cdot 10^{-6} \cdot d$	Three-wire method d = is the measured diameter
Threaded rings: simple pitch diameter	3 mm up to 200 mm nominal pitch: 0.5 mm up to 6 mm	VDI/VDE/DGQ 2618 Sheet 4.9:2006 Point 3.2.2 (Opt. 1)	3 µm $10 \cdot 10^{-6} \cdot d$	Two-ball method d = is the measured diameter
Length of plane-parallel, spherical or cylindrical measuring surfaces	0,01 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 19.1:2014	1.5 µm $2 \cdot 10^{-6} \cdot l$	l is the measured length
Diameter	0,01 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006 Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	1.5 µm $2 \cdot 10^{-6} \cdot d$	d is the measured diameter
Feeler gauges	0.03 mm up to 2.00 mm	DIN 2275:2014	1.5 µm $2 \cdot 10^{-6} \cdot l$	l is the measured length
Adjustment dimensions for Outside micrometers	25 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 4.4:2009	1.5 µm $2 \cdot 10^{-6} \cdot l$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Calibration and Measurement Capabilities (CMC)

Measurand / calibration item	Measuring range	Measuring conditions / Procedures	Expanded uncertainty of measurement [1]	Remarks
Throat gauges	3 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.7:2005 Point 3.3.2 (Opt. 2)	0.8 µm $2 \cdot 10^{-6} \cdot d$	*d* is the measured Diameter
Caliper for Exterior, interior and Depth measurements	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 9.1:2006	30 µm $30 \cdot 10^{-6} \cdot l$	*l* is the measured Length
Depth calipers,	> 500 mm up to 1000 mm	VDI/VDE/DGQ 2618 Sheet 9.2:2006	50 µm $30 \cdot 10^{-6} \cdot l$	
Height caliper		VDI/VDE/DGQ 2618 Sheet 9.3:2006		
Outside micrometers	0 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.1:2001	3 µm $10 \cdot 10^{-6} \cdot l$	
Fine pointer measuring-screws	0 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 10.3:2002	3 µm $10 \cdot 10^{-6} \cdot l$	
Micrometer head screws	0 mm up to 50 mm	VDI/VDE/DGQ 2618 Sheet 10.4:2008	3 µm $10 \cdot 10^{-6} \cdot l$	
Depth gauges	0 mm up to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.5:2010	3 µm $10 \cdot 10^{-6} \cdot l$	
Inside micrometers with 2-point contact on the object up to be calibrated	13 mm up to 300 mm > 300 mm up to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.7:2010	3 µm $10 \cdot 10^{-6} \cdot l$ 5 µm $10 \cdot 10^{-6} \cdot l$	
Inside micrometers with 3-line contact on the calibration object	3 mm up to 150 mm	VDI/VDE/DGQ 2618 Sheet 10.8:2002	3 µm $10 \cdot 10^{-6} \cdot d$	*d* is the measured diameter
Lever gauges (quick probe) for outdoor measurements	up to 200 mm	VDI/VDE/DGQ 2618 Sheet 12.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	*l* is the measured length
Lever gauges (quick feelers) for Internal measurements	2 mm up to 200 mm	VDI/VDE/DGQ 2618 Sheet 13.1:2005	7 µm $10 \cdot 10^{-6} \cdot l$	
Dial gauges	0 mm up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.1:2021	3 µm $10 \cdot 10^{-6} \cdot l$	mechanical dial indicators
		VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	3 µm $10 \cdot 10^{-6} \cdot l$	electronic digital dial gauges
Fine pointer	0 mm up to 3 mm	VDI/VDE/DGQ 2618 Sheet 11.2:2002	0.6 µm	
Lever gauges	0 mm up to 1.6 mm	VDI/VDE/DGQ 2618 Sheet 11.3:2002	1.0 µm	
electr. inductive Linear Encoders	up to 100 mm	VDI/VDE/DGQ 2618 Sheet 14.1:2010	0.6 µm $1 \cdot 10^{-6} \cdot l$	
electr. incremental Linear Encoders	up to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	0.6 µm $1 \cdot 10^{-6} \cdot l$	

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.

Abbreviations used:

CMC Calibration and measurement capabilities DIN German Institute for Standardization e.V.
DKD-R Guideline of the German Calibration Service (DKD), published up up to the Physikalisch-Technische Bundesanstalt (PTB)
VB Self-developed calibration method of the laboratory

[1] The CMCs contain the extended measurement uncertainties according up to EA-4/02 M:2013. Within the framework of accreditation, these are the smallest measurement uncertainties that can be specified with a coverage probability of about 95 % and, unless otherwise specified, have the coverage factor k = 2. Uncertainties of measurement without indication of units are relative values related up to the measured value, unless otherwise stated.