

German Accreditation Body

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

Valid from:

12.02.2026

Date of issue: 25.02.2026

This annex to the certificate is part of the accreditation certificate D-K-15070-01-00.

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

Holder of the accreditation certificate:

**Testo Industrial Services GmbH
Gewerbestraße 3, 79199 Kirchzarten**

with the locations

**Testo Industrial Services GmbH
Calibration laboratory Kirchzarten
Gewerbestraße 3, 79199 Kirchzarten**

**Testo Industrial Services GmbH
Calibration laboratory
Kirchzarten
Erich-Rieder-Straße 4, 79199 Kirchzarten**

**Testo Industrial Services GmbH
Calibration laboratory Munich
Nikolaus-Otto-Straße 2, 85221 Dachau**

**Testo Industrial Services GmbH
Calibration laboratory Essen
Hermann-Drescher-Weg 4 a-d, 45329 Essen**

*This certificate was issued by the Deutsche Akkreditierungsstelle GmbH and is digitally sealed.
It is only valid together with the written certificate and reflects the status at the time of issue. The current status of valid and monitored accreditation can be found in the database of accredited bodies of the German Accreditation Body (www.dakks.de)*

Annex to the accreditation certificate D-K-15070-01-01

**Testo Industrial Services GmbH
Calibration laboratory
Hamburg
Meiendorfer Straße 205, 22145 Hamburg**

**Testo Industrial Services GmbH
Calibration laboratory Mörfelden-
Walldorf
Kurhessenstraße 11, 64546 Mörfelden-Walldorf**

**Testo Industrial Services GmbH
Calibration laboratory Winsen
Tönnhäuser Weg 100-106, 21423 Winsen (Luhe)**

**Testo Industrial Services GmbH
Calibration laboratory
Heidenheim
Alexanderstraße 18, 89522 Heidenheim an der Brenz**

The calibration laboratory fulfils the requirements according to DIN EN ISO/IEC 17025:2018 to perform the conformity assessment activities listed in this annex. The calibration laboratory complies with additional legal and normative requirements, including those in relevant sectoral programmes, where applicable, provided these are explicitly confirmed below.

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

Valid from:
12.02.2026

Date of issue: 25 February 2026

Electrical measured variables

Direct current and low-frequency measured variables

- Direct voltage ^{a), b)}
- AC voltage ^{a), b)}
- Direct current ^{a), b)}
- Actuating current ^{a), b)}
- AC/DC-Transfer
- Electrical power ^{a), b)}
- Phase angle
- Direct current resistance ^{a), b)}
- Actuating current resistance ^{b)}
- Capacity ^{a), b)}
- Inductance
- Voltage ratio ^{a), b)}
- High-voltage measured variables

Time and frequency

- Time interval ^{a), b)}
- Frequency and speed ^{a), b)}

High-frequency measured variables

- HF impedance (reflection factor) ^{a), b)}
- HF-power ^{a), b)}
- HF-attenuation ^{a), b)}
- HF-noise
- Modulation parameters
- Oscilloscope measured variables ^{a), b)}
- Rise time ^{a), b)}
- Bandwidth ^{a), b)}
- Pulse-shaped measured variables ^{a), b)}

Dimensional measurands

Length

- Diameter ^{a), b)}
- Thread ^{a), b)}
- Parallel end dimensions
- Length measures ^{a), b)}
- Length measuring device
- Stroke dimensions, distances angles
- Inclinometers
- Rotation angle

Coordinate metrology

- Application of coordinate measuring machines

^{a)} also on-site calibration

^{b)} Mobile laboratory

Within the measurands/calibration items marked with ^{*}, the calibration laboratory is permitted to use the standards/calibration guidelines listed here with different issue statuses without being required to inform and obtain prior approval from DAkkS. The calibration laboratory has an up-to-date list of all standards/calibration guidelines in the flexible accreditation area.

Location Calibration laboratory Kirchzarten, Erich-Rieder Straße 4, 79199 Kirchzarten

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
DC voltage measuring devices	0 V 1 μ V to 220 mV > 220 mV to 2.2 V > 2.2 V to 11 V 11 V to 22 V 22 V to 220 V > 220 V to 1000 V		0.1 μ V $7,5 \cdot 10^{-6} U + 0,5 \mu$ V $5 \cdot 10^{-6} U + 0,7 \mu$ V $3,5 \cdot 10^{-6} U + 2,5 \mu$ V $3,5 \cdot 10^{-6} U + 4 \mu$ V $5 \cdot 10^{-6} U + 40 \mu$ V $6,5 \cdot 10^{-6} U + 0,4$ mV	$U =$ measured value
Sources	0 V 1 μ V to 200 mV > 200 mV to 2 V > 2 V to 20 V 20 V to 200 V > 200 V to 1000 V		0.1 μ V $5,8 \cdot 10^{-6} U + 0,2 \mu$ V $2,9 \cdot 10^{-6} U + 0,3 \mu$ V $2,9 \cdot 10^{-6} U + 0,55 \mu$ V $4 \cdot 10^{-6} U + 35 \mu$ V $4,5 \cdot 10^{-6} U + 0,55$ mV	
High voltage	> 1 kV to 50 kV		$0,4 \cdot 10^{-3} U$	
Direct current sources and measuring devices	0 A 0.1 μ A to < 1 μ A 1 μ A to < 10 μ A 10 μ A to < 100 μ A 100 μ A to 320 mA > 320 mA to 1 A 1 A to 10 A > 10 A to 1000 A		0.2 nA $35 \cdot 10^{-6} I + 21$ pA $50 \cdot 10^{-6} I + 6$ pA $15 \cdot 10^{-6} I + 0,4$ nA $18 \cdot 10^{-6} I$ $15 \cdot 10^{-6} I + 6 \mu$ A $0,2 \cdot 10^{-3} I$ $0,3 \cdot 10^{-3} I$	$I =$ measured value
Current clamps	1 mA to 2.2 A > 2.2 A to 20 A > 20 A to 1000 A		$1 \cdot 10^{-3} I$ $2 \cdot 10^{-3} I$ $3 \cdot 10^{-3} I$	
Current transformer	1 A to 120 A > 120 A to 1000 A		$0,22 \cdot 10^{-3} I$ $0,25 \cdot 10^{-3} I$	
DC resistance	0 to < 1 m Ω 1 m Ω to 10 m Ω > 10 m Ω to 10 M Ω 10 M Ω to 100 M Ω > 100 M Ω to 10 G Ω 10 G Ω to 100 G Ω > 100 G Ω to 1 T 1 T to 10 T > 10 T to 100 T		$1,3 \mu \Omega$ $10^{-6} R$ $10^{-6} R$ $10^{-6} R$ $0,17 \cdot 10^{-3} R$ $0,21 \cdot 10^{-3} R$ $0,35 \cdot 10^{-3} R$ $0,6 \cdot 10^{-3} R$ $29 \cdot 10^{-3} R$	$R =$ measured value

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
DC power measuring devices	1 mW to < 220 W	1 mV to 0.22 V 1 A to 1000 A	$0,6 \cdot 10^{-3} P$	
	1 mW to 320 W	0.22 V to 1000 V 0.1 mA to 0.32 A	$20 \cdot 10^{-6} P$	
	> 70 mW to 1 kW	0.22 V to 1000 V > 0.32 A to 1 A	$35 \cdot 10^{-6} P$	
	> 0.22 W to 10 kW	0.22 V to 1000 V > 1 A to 10 A	$0,2 \cdot 10^{-3} P$	
	> 2.2 W to 1 MW	0.22 V to 1000 V > 10 A to 1000 A	$0,3 \cdot 10^{-3} P$	
Direct current power sources	1 mW to < 200 W	1 mV to 0.2 V 1 A to 1000 A	$0,4 \cdot 10^{-3} P$	
	1 mW to 320 W	0.2 V to 1000 V 0.1 mA to 0.32 A	$20 \cdot 10^{-6} P$	
	> 64 mW to 1 kW	0.2 V to 1000 V > 0.32 A to 1 A	$35 \cdot 10^{-6} P$	
	> 0.2 W to 10 kW	0.2 V to 1000 V > 1 A to 10 A	$0,2 \cdot 10^{-3} P$	
	> 2 W to 1 MW	0.2 V to 1000 V > 10 A to 1000 A	$0,3 \cdot 10^{-3} P$	
AC voltage measuring devices and sources	1 mV to 2.2 mV	10 Hz to 20 Hz >	$0,52 \cdot 10^{-3} U$	<i>U</i> = measured value
		20 Hz to 40 Hz	$0,52 \cdot 10^{-3} U$	
> 40 Hz to 20 kHz	$0,40 \cdot 10^{-3} U$			
> 20 kHz to 50 kHz	$0,40 \cdot 10^{-3} U$			
> 50 kHz to 100 kHz >	$0,41 \cdot 10^{-3} U$			
100 kHz to 300 kHz >	$0,46 \cdot 10^{-3} U$			
300 kHz to 500 kHz	$0,55 \cdot 10^{-3} U$			
> 500 kHz to 1 MHz	$0,60 \cdot 10^{-3} U$			
> 2.2 mV to 7 mV	10 Hz to 20 Hz >	$0,22 \cdot 10^{-3} U$		
	20 Hz to 40 Hz	$0,22 \cdot 10^{-3} U$		
	> 40 Hz to 20 kHz	$0,16 \cdot 10^{-3} U$		
	> 20 kHz to 50 kHz	$0,16 \cdot 10^{-3} U$		
	> 50 kHz to 100 kHz >	$0,20 \cdot 10^{-3} U$		
	100 kHz to 300 kHz >	$0,22 \cdot 10^{-3} U$		
	300 kHz to 500 kHz	$0,33 \cdot 10^{-3} U$		
> 500 kHz to 1 MHz	$0,45 \cdot 10^{-3} U$			

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
AC voltage measuring devices and sources	> 7 mV to 22 mV	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$80 \cdot 10^{-6} U$ $80 \cdot 10^{-6} U$ $65 \cdot 10^{-6} U$ $75 \cdot 10^{-6} U$ $75 \cdot 10^{-6} U$ $95 \cdot 10^{-6} U$ $0,19 \cdot 10^{-3} U$ $0,21 \cdot 10^{-3} U$	U = measured value
	> 22 mV to 70 mV	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$70 \cdot 10^{-6} U$ $58 \cdot 10^{-6} U$ $35 \cdot 10^{-6} U$ $35 \cdot 10^{-6} U$ $45 \cdot 10^{-6} U$ $55 \cdot 10^{-6} U$ $0,11 \cdot 10^{-3} U$ $0,13 \cdot 10^{-3} U$	
	> 70 mV to 220 mV	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$39 \cdot 10^{-6} U$ $35 \cdot 10^{-6} U$ $25 \cdot 10^{-6} U$ $25 \cdot 10^{-6} U$ $28 \cdot 10^{-6} U$ $42 \cdot 10^{-6} U$ $85 \cdot 10^{-6} U$ $0,1 \cdot 10^{-3} U$	
	> 220 mV to 700 mV	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$25 \cdot 10^{-6} U$ $22 \cdot 10^{-6} U$ $12 \cdot 10^{-6} U$ $12 \cdot 10^{-6} U$ $13 \cdot 10^{-6} U$ $14 \cdot 10^{-6} U$ $27 \cdot 10^{-6} U$ $40 \cdot 10^{-6} U$	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
AC voltage measuring devices and sources	> 700 mV to 2.2 V	10 Hz to 20 Hz >	$20 \cdot 10^{-6} U$	<i>U</i> = measured value
		20 Hz to 40 Hz	$14 \cdot 10^{-6} U$	
		> 40 Hz to 20 kHz	$10 \cdot 10^{-6} U$	
		> 20 kHz to 50 kHz	$10 \cdot 10^{-6} U$	
		> 50 kHz to 100 kHz >	$11 \cdot 10^{-6} U$	
		100 kHz to 300 kHz >	$11 \cdot 10^{-6} U$	
> 2.2 V to 7 V	> 2.2 V to 7 V	10 Hz to 20 Hz >	$18 \cdot 10^{-6} U$	
		20 Hz to 40 Hz	$12 \cdot 10^{-6} U$	
		> 40 Hz to 20 kHz	$11 \cdot 10^{-6} U$	
		> 20 kHz to 50 kHz	$11 \cdot 10^{-6} U$	
		> 50 kHz to 100 kHz >	$13 \cdot 10^{-6} U$	
		100 kHz to 300 kHz >	$13 \cdot 10^{-6} U$	
> 7 V to 22 V	> 7 V to 22 V	10 Hz to 20 Hz >	$17 \cdot 10^{-6} U$	
		20 Hz to 40 Hz	$16 \cdot 10^{-6} U$	
		> 40 Hz to 20 kHz	$11 \cdot 10^{-6} U$	
		> 20 kHz to 50 kHz	$11 \cdot 10^{-6} U$	
		> 50 kHz to 100 kHz >	$11 \cdot 10^{-6} U$	
		100 kHz to 300 kHz >	$25 \cdot 10^{-6} U$	
> 22 V to 70 V	> 22 V to 70 V	10 Hz to 20 Hz >	$18 \cdot 10^{-6} U$	
		20 Hz to 40 Hz	$16 \cdot 10^{-6} U$	
		> 40 Hz to 20 kHz	$15 \cdot 10^{-6} U$	
		> 20 kHz to 50 kHz	$15 \cdot 10^{-6} U$	
		> 50 kHz to 100 kHz >	$25 \cdot 10^{-6} U$	
		100 kHz to 300 kHz >	$25 \cdot 10^{-6} U$	
> 70 V to 220 V	> 70 V to 220 V	10 Hz to 20 Hz >	$19 \cdot 10^{-6} U$	
		20 Hz to 40 Hz	$18 \cdot 10^{-6} U$	
		> 40 Hz to 20 kHz	$17 \cdot 10^{-6} U$	
		> 20 kHz to 50 kHz	$17 \cdot 10^{-6} U$	
		> 50 kHz to 100 kHz	$32 \cdot 10^{-6} U$	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Measured variable / measuring devices and sources	Calibration and measurement capabilities (CMC)			Remarks
	Measuring range / measuring span	Measuring conditions /	Expanded measurement	
AC voltage measuring devices and sources	> 220 V to 1000 V	10 Hz to 20 Hz > 20 Hz to 40 Hz > 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$25 \cdot 10^{-6} U$ $27 \cdot 10^{-6} U$ $45 \cdot 10^{-6} U$ $45 \cdot 10^{-6} U$ $65 \cdot 10^{-6} U$	$U =$ measured value
High voltage	> 1 kV to 30 kV > 30 kV to 50 kV	50 Hz 50 Hz	$0,5 \cdot 10^{-3} U$ $0,6 \cdot 10^{-3} U$	
Alternating current sources and measuring devices (ranges)	100 μ A to 1 mA > 1 mA to 10 mA > 10 mA to 1 A > 1 A to 10 A > 10 A to 20 A > 20 A to 100 A	10 Hz to 40 Hz > 40 Hz to 1 kHz; > 1 kHz to 10 kHz; 10 Hz to 40 Hz > 40 Hz to 1 kHz; > 1 kHz to 10 kHz; 10 Hz to 40 Hz > 40 Hz to 1 kHz; > 1 kHz to 10 kHz; 10 Hz to 40 Hz > 40 Hz to 1 kHz; > 1 kHz to 10 kHz;	$120 \cdot 10^{-6} I$ $160 \cdot 10^{-6} I$ $60 \cdot 10^{-6} I$ $46 \cdot 10^{-6} I$ $17 \cdot 10^{-6} I$ $32 \cdot 10^{-6} I$ $39 \cdot 10^{-6} I$ $69 \cdot 10^{-6} I$ $69 \cdot 10^{-6} I$ $0,17 \cdot 10^{-3} I$	$I =$ measured value
Current clamps	1 mA to 2.2 A > 2.2 A to 20 A > 20 A to 800 A	40 Hz to 5 kHz 40 Hz to 5 kHz 40 Hz to 65 Hz	$2 \cdot 10^{-3} I$ $3 \cdot 10^{-3} I$ $4 \cdot 10^{-3} I$	$I =$ measured value
Current transformer	1 A to 120 A 1 A to 120 A > 120 A to 600 A > 120 A to 1000 A	40 Hz to 850 Hz > 850 Hz to 2 kHz 40 Hz to 400 Hz 40 Hz to 65 Hz	$0,16 \cdot 10^{-3} I$ $0,47 \cdot 10^{-3} I$ $0,52 \cdot 10^{-3} I$ $0,6 \cdot 10^{-3} I$	
AC resistance Areas	0.1 Ω to < 0.316 Ω 0.316 Ω to 3.16 Ω	10 Hz to < 20 Hz 20 Hz to 500 Hz > 500 Hz to 1 kHz 10 Hz to 30 Hz > 30 Hz to 55 Hz > 55 Hz to 1 kHz	$0,2 \cdot 10^{-3} R$ $50 \cdot 10^{-6} R$ $0,2 \cdot 10^{-3} R$ $30 \cdot 10^{-6} R$ $20 \cdot 10^{-6} R$ $30 \cdot 10^{-6} R$	$R =$ measured value
Alternating current		10 Hz to 30 Hz	$25 \cdot 10^{-6} R + 40 \mu\Omega$	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
resistance Areas	> 3.16 Ω to 10 Ω	> 30 Hz to 55 Hz > 55 Hz to 1 kHz	9 - 10 ⁻⁶ R + 60 μΩ 25 - 10 ⁻⁶ R + 40 μΩ	
Charge charge amplifier, Load measuring devices	10 pC to 10 ⁵ pC	50 Hz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz	0,4 % 0,6 % 1,0 %	
Phase angle between current and voltage Measuring devices	-180° to 180°	10 V to 1000 V 0.1 A to 50 A 45 Hz to 65 Hz > 65 Hz to 180 Hz > 180 Hz to 450 Hz > 450 Hz to 850 Hz > 850 Hz to 3 kHz > 3 kHz to 6 kHz	0,0051° 0,0075° 0,018° 0,033° 0,12° 0,23°	
		10 V to 1000 V > 50 A to 80 A 45 Hz to 65 Hz > 65 Hz to 180 Hz > 180 Hz to 450 Hz > 450 Hz to 850 Hz > 850 Hz to 3 kHz	0,0052° 0,0083° 0,025° 0,05° 0,25°	
		10 V to 1000 V > 80 A to 120 A 45 Hz to 65 Hz > 65 Hz to 180 Hz > 180 Hz to 450 Hz > 450 Hz to 850 Hz > 850 Hz to 3 kHz > 3 kHz to 6 kHz	0,0055° 0,0091° 0,020° 0,035° 0,25° 0,5°	
Phase angle between voltages Measuring devices	-180° to 180°	10 V to 1000 V 45 Hz to 65 Hz > 65 Hz to 180 Hz > 180 Hz to 450 Hz > 450 Hz to 850 Hz > 850 Hz to 3 kHz > 3 kHz to 6 kHz	0,006° 0,0075° 0,025° 0,043° 0,15° 0,3°	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measurement

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
Phase angle between voltages Sources	-180° to 180°	0.05 V to 10 V Measuring frequency: 40 Hz to 65 Hz 0.05 V to 0.2 V Measuring frequency: > 65 Hz to 1 kHz > 1 kHz to 2 kHz > 0.2 V to 10 V Measuring	0,015° 0,03° 0,055° 0,02° 0,035°	
Electrical power AC active power	5 mW to 50 kW > 2.5 W to 120 kW	1 V to 1000 V 45 Hz to 65 Hz $\pm 0.05 \leq \cos \Phi \leq \pm 1$ 0.1 A to 50 A > 50 A to 120 A	$2\sqrt{w(U_F)^2 + w(I_F)^2 + w(\Phi_F)^2}$ But not smaller than 80 - 10 ⁻⁶ 0.14 - 10 ⁻³	: Uncertainty of the amplitude of the stress-fundamental : Uncertainty of the amplitude of the current fundamentals Φ : Uncertainty of the phase shift angle : Uncertainty of the effective voltage value : Uncertainty of the effective current value
AC reactive current performance	5 mvar to 50 kvar > 2.5 var to 120 kvar	1 V to 1000 V 45 Hz to 65 Hz $\pm 0.05 \leq \sin \Phi \leq \pm 1$ 0.1 A to 50 A > 50 A to 120 A	$2\sqrt{w(U_F)^2 + w(I_F)^2 + w(\Phi_F)^2}$ But not smaller than 80 - 10 ⁻⁶ 0.14 - 10 ⁻³	
Apparent power	0.1 VA to 50 kVA > 50 VA to 120 kVA	1 V to 1000 V 45 Hz to 65 Hz 0.1 A to 50 A > 50 A to 120 A	$2\sqrt{w(U_F)^2 + w(I_F)^2 + w(\Phi_F)^2}$ But not smaller than 80 - 10 ⁻⁶ 0.14 - 10 ⁻³	
Tension ratio	± 2 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz Measuring frequency 600 Hz	0.04 μ V/V 0.05 μ V/V 0.12 μ V/V	Calibration of 350 Ω bridge standards and the associated display devices
	± 2 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz	0.04 μ V/V 0.04 μ V/V 0.12 μ V/V	at discrete points In 10 % increments
	± 5 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz	0.06 μ V/V 0.22 μ V/V	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks	
Tension ratio	± 10 mV/V	Bridge voltage: 5 V Measuring frequency 225 Hz	0.06 µV/V 0.45 µV/V		
	± 5 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz	0.06 µV/V 0.06 µV/V 0.22 µV/V		
	± 10 mV/V	Bridge voltage: 2,5 V Measuring frequency 225 Hz Measuring frequency 600 Hz	0.06 µV/V 0.10 µV/V 0.45 µV/V		Calibration of 350 Ω bridge standards and the associated display devices
	± 10 mV/V	Bridge voltage: 1 V Measuring frequency 600	0.11 µV/V		at discrete points In 10 % increments
	± 20 mV/V	Bridge voltage: 1 V Measuring frequency 4.8	0.6 µV/V		
	± 100 mV/V	Bridge voltage: 1 V Measuring frequency 4.8	3.5 µV/V		
	± 100 mV/V	Bridge voltage: 2,5 V Measuring frequency 4.8	4.0 µV/V		
Voltage ratio DC voltage, bridge standards	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 0,5 V	2.0 µV/V 2.5 µV/V 2.5 µV/V 2.5 µV/V 2.5 µV/V 2.5 µV/V		
	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 1 V	1.0 µV/V 2.0 µV/V 2.0 µV/V 2.0 µV/V 2.0 µV/V 2.0 µV/V		

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
Voltage ratio DC voltage, bridge standards	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 2,5 V	0.5 µV/V 0.5 µV/V 0.5 µV/V 0.5 µV/V 0.5 µV/V 0.5 µV/V	
	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 5 V	0.30 µV/V 0.25 µV/V 0.25 µV/V 0.25 µV/V 0.35 µV/V 1.5 µV/V	
	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 7,5 V	0.20 µV/V 0.20 µV/V 0.20 µV/V 0.20 µV/V 0.3 µV/V 1.5 µV/V	
	0 mV/V -2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 10 V	0.10 µV/V 0.15 µV/V 0.15 µV/V 0.20 µV/V 0.3 µV/V 1.5 µV/V	
Voltage ratio DC voltage Bridges, measuring devices, measuring amplifiers	-2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 0,5 V	0.35 µV/V 0.35 µV/V 0.40 µV/V 0.55 µV/V 2.5 µV/V	
	-2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 1 V	0.20 µV/V 0.20 µV/V 0.3 µV/V 0.5 µV/V 2.5 µV/V	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
Voltage ratio DC voltage Bridges, measuring devices, measuring amplifiers	-2 mV/V to +2 mV/V -5 mV/V to +5 mV/V -10 mV/V to +10 mV/V -20 mV/V to +20 mV/V -100 mV/V to +100 mV/V	Bridge voltage: 2.5 V; 5 V; 7.5 V; 10 V	0.10 μ V/V 0.15 μ V/V 0.25 μ V/V 0.45 μ V/V 2.5 μ V/V	
Frequency	10 MHz	Measuring time > 30	$1 \cdot 10^{-11} f$	f = current measured value
Frequency measurement	1 MHz to 46 GHz		$1 \cdot 10^{-10} f$	
Frequency synthesis	1 MHz to 50 GHz	Measuring time > 5 min	$1 \cdot 10^{-10} f$	
Time interval	1 ns to 1000 s		$1 \cdot 10^{-10} f$ not less than 1 ns	Trigger uncertainties are to be considered
Optical speed	1 min ⁻¹ bis 2 · 10 ⁵ min ⁻¹	with light pulse generator	6 · 10 ⁻⁶ not smaller than 0,001 min ⁻¹	
mechanical	1 min ⁻¹ to 10000 min ⁻¹		4 · 10 ⁻⁴ not smaller than 0,01 min ⁻¹	

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
Capacity measuring devices	1 nF to 100 nF	50 Hz to 10 kHz	$1,0 \cdot 10^{-3} C$	C: measured value with standard capacitances
	> 100 nF to 1000 nF	50 Hz to 1 kHz	$1,0 \cdot 10^{-3} C$	
		> 1 kHz to 10 kHz	$2,5 \cdot 10^{-3} C$	
	190 pF to < 400 pF	10 Hz to 10 kHz	$4 \cdot 10^{-3} C + 8 \text{ pF}$	with 5520A / 5522A
	400 pF to < 1.1 nF	10 Hz to 10 kHz	$4,5 \cdot 10^{-3} C + 8 \text{ pF}$	
	1.1 nF to < 3.3 nF	10 Hz to 3 kHz	$4,0 \cdot 10^{-3} C + 8 \text{ pF}$	
	3.3 nF to < 11 nF	10 Hz to 1 kHz	$2,5 \cdot 10^{-3} C + 8 \text{ pF}$	
	11 nF to < 33 nF	10 Hz to 1 kHz	$2,5 \cdot 10^{-3} C + 80 \text{ pF}$	
	33 nF to < 110 nF	10 Hz to 1 kHz	$2,5 \cdot 10^{-3} C + 80 \text{ pF}$	
	110 nF to < 330 nF	10 Hz to 1 kHz	$4,5 \cdot 10^{-3} C$	
	330 nF to < 1.1 µF	10 Hz to 600 Hz	$4,5 \cdot 10^{-3} C$	
	1.1 µF to < 3.3 µF	10 Hz to 300 Hz	$4,5 \cdot 10^{-3} C$	
	3.3 µF to < 11 µF	10 Hz to 150 Hz	$4,5 \cdot 10^{-3} C$	
	11 µF to < 33 µF	10 Hz to 120 Hz	$6,0 \cdot 10^{-3} C$	
	33 µF to < 110 µF	10 Hz to 80 Hz	$6,5 \cdot 10^{-3} C$	
	110 µF to < 330 µF	DC to 50 Hz	$6,0 \cdot 10^{-3} C$	
	330 µF to < 1.1 mF	DC to 20 Hz	$6,0 \cdot 10^{-3} C$	
	1.1 mF to < 3.3 mF	DC to 6 Hz	$6,0 \cdot 10^{-3} C$	
3.3 mF to < 11 mF	DC to 2 Hz	$6,0 \cdot 10^{-3} C$		
11 mF to < 33 mF	DC to 0.6 Hz	$8,0 \cdot 10^{-3} C$		
33 mF to 110 mF	DC to 0.2 Hz	$11 \cdot 10^{-3} C$		
Alternating current strength Current transformer	1 A to 750 A >	40 Hz to 1.2 kHz	$90 \cdot 10^{-6} \cdot I$	I = measured value
	750 A to 2000 A	40 Hz to 100 Hz	$95 \cdot 10^{-6} \cdot I$	
	1 A to 450 A	> 1.2 kHz to 2 kHz	$0,40 \cdot 10^{-3} \cdot I$	
	1 A to 100 A	> 2 kHz to 7.5 kHz	$0,41 \cdot 10^{-3} \cdot I$	
DC resistance Measuring devices	330 MΩ to < 1 GΩ	$U < 1575 \text{ V}$	$4 \cdot 10^{-3} \cdot R$	
	1 GΩ to < 10 GΩ	$U < 1575 \text{ V}$	$8 \cdot 10^{-3} \cdot R$	
	10 GΩ to < 100 GΩ 0.1	with x 1000	$25 \cdot 10^{-3} \cdot R$	
	TΩ to < 1 TΩ	multiplier $U \leq$	$30 \cdot 10^{-3} \cdot R$	
	1 TΩ to 10 TΩ	10 kV	$35 \cdot 10^{-3} \cdot R$	
Alternating current resistance discrete values Measuring devices	1 mΩ	50 Hz to 1 kHz	$1,0 \cdot 10^{-3} R$	R ... Measured value
	3 mΩ			
	10 mΩ			
	30 mΩ			
	0.1 Ω	50 Hz to 1 kHz	$0,4 \cdot 10^{-3} R$	
	0.3 Ω			
1 Ω				
3 Ω				

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measured variables

Calibration and measurement capabilities (CMC)				
Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
AC resistance measuring devices for earthing resistance, internal battery resistance	0.1 Ω to < 5 Ω	$I_{max} < 700 \text{ mA}$	$2.3 \cdot 10^{-3} \cdot R + 8 \text{ m}\Omega$	R: Measured value 50 Hz to 400 Hz
	5 Ω to < 30 Ω	$I_{max} < 250 \text{ mA}$	$1.6 \cdot 10^{-3} \cdot R + 8 \text{ m}\Omega$	
	30 Ω to < 200 Ω	$I_{max} < 100 \text{ mA}$	$1.6 \cdot 10^{-3} \cdot R + 8 \text{ m}\Omega$	
	200 Ω to < 500 Ω	$I_{max} < 45 \text{ mA}$	$1.6 \cdot 10^{-3} \cdot R + 1.6 \cdot R$	
	0.5 kΩ to < 2 kΩ	$I_{max} < 25 \text{ mA}$	$10^{-3} \cdot R + 1.6 \cdot 10^{-3} \cdot R$	
Protective conductor resistance measuring devices	2 kΩ to < 5 kΩ	$I_{max} < 10 \text{ mA}$	$1.6 \cdot 10^{-3} \cdot R$	50 Hz and 60 Hz
	5 kΩ to 10 kΩ	$I_{max} < 5 \text{ mA}$		
	7 mΩ to 38 mΩ	$I_{max} < 40 \text{ A}$	0.5 mΩ	
	38 mΩ to 75 mΩ	$I_{max} < 40 \text{ A}$	0.6 mΩ	
	75 mΩ to 130 mΩ	$I_{max} < 40 \text{ A}$	1.0 mΩ	
	130 mΩ to 260 mΩ	$I_{max} < 40 \text{ A}$	1.6 mΩ	
	260 mΩ to 410 mΩ	$I_{max} < 40 \text{ A}$	2.2 mΩ	
	410 mΩ to 440 mΩ	$I_{max} < 40 \text{ A}$	4 mΩ	
	440 mΩ to 0.8 Ω	$I_{max} < 40 \text{ A}$	7 mΩ	
	0.8 Ω to 1.1 Ω	$I_{max} < 40 \text{ A}$	20 mΩ	
	1.1 Ω to 1.5 Ω	$I_{max} < 30 \text{ A}$	35 mΩ	
	1.5 Ω to 2.0 Ω	$I_{max} < 21 \text{ A}$	35 mΩ	
	2.0 Ω to 4.2 Ω	$I_{max} < 15 \text{ A}$	mΩ	
4.2 Ω to 5.5 Ω	$I_{max} < 10 \text{ A}$	0.25 Ω		
5.5 Ω to 8 Ω	$I_{max} < 5 \text{ A}$	0.4 Ω		
8 Ω to 11 Ω	$I_{max} < 3 \text{ A}$	0.8 Ω		
11 Ω to 15 Ω	$I_{max} < 1.35 \text{ A}$	2 Ω		
15 Ω to 20 Ω	$I_{max} < 0.6 \text{ A}$	4 Ω		
20 Ω to 42 Ω	$I_{max} < 0.3 \text{ A}$	8 Ω		
42 Ω to 55 Ω	$I_{max} < 0.15 \text{ A}$			
55 Ω to 80 Ω				
80 Ω to 110 Ω				
110 Ω to 150 Ω				
150 Ω to 200 Ω				
200 Ω to 420 Ω				
420 Ω to 550 Ω				
550 Ω to 0.8 kΩ				
0.8 kΩ to 1.1 kΩ				
1.1 kΩ to 1.5 kΩ				
1.5 kΩ to 2.0 kΩ				
Measuring devices for loop resistance, internal system resistance	7 mΩ to 38 mΩ	$I_{max} < 40 \text{ A}$	16 mΩ	R: Measured value 50 Hz to 400 Hz
	38 mΩ to 75 mΩ	$I_{max} < 40 \text{ A}$	16 mΩ	
	75 mΩ to 130 mΩ	$I_{max} < 40 \text{ A}$	16 mΩ	
	130 mΩ to 260 mΩ	$I_{max} < 40 \text{ A}$	20 mΩ	
	260 mΩ to 410 mΩ	$I_{max} < 40 \text{ A}$	22 mΩ	
	410 mΩ to 440 mΩ	$I_{max} < 40 \text{ A}$	27 mΩ	
	440 mΩ to 0.8 Ω	$I_{max} < 40 \text{ A}$	40 mΩ	
	0.8 Ω to 1.1 Ω	$I_{max} < 30 \text{ A}$	$15 \cdot 10^{-3} \cdot R$	
	1.1 Ω to 1.5 Ω	$I_{max} < 21 \text{ A}$	$14 \cdot 10^{-3} \cdot R$	
	1.5 Ω to 2.0 Ω	$I_{max} < 15 \text{ A}$	$13 \cdot 10^{-3} \cdot R$	
	2.0 Ω to 4.2 Ω	$I_{max} < 10 \text{ A}$	$13 \cdot 10^{-3} \cdot R$	
	4.2 Ω to 5.5 Ω	$I_{max} < 5 \text{ A}$	$13 \cdot 10^{-3} \cdot R$	
	5.5 Ω to 8 Ω	$I_{max} < 3 \text{ A}$	$12 \cdot 10^{-3} \cdot R$	
8 Ω to 11 Ω	$I_{max} < 1.35 \text{ A}$	$12 \cdot 10^{-3} \cdot R$		
11 Ω to 15 Ω	$I_{max} < 0.6 \text{ A}$	$12 \cdot 10^{-3} \cdot R$		
15 Ω to 20 Ω	$I_{max} < 0.3 \text{ A}$	$12 \cdot 10^{-3} \cdot R$		
20 Ω to 42 Ω	$I_{max} < 0.15 \text{ A}$	$12 \cdot 10^{-3} \cdot R$		
42 Ω to 55 Ω				
55 Ω to 80 Ω				
80 Ω to 110 Ω				
110 Ω to 150 Ω				
150 Ω to 200 Ω				
200 Ω to 420 Ω				
420 Ω to 550 Ω				
550 Ω to 0.8 kΩ				
0.8 kΩ to 1.1 kΩ				
1.1 kΩ to 1.5 kΩ				
1.5 kΩ to 2.0 kΩ				
Time interval	> 10 ³ s bis 10 ⁵ s		1.5 - 10 ⁻⁶ - t	t: Measured value

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Electrical measurement

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range / measuring span	Measuring conditions /	Expanded measurement	Remarks
Phase angle voltage-current Sources	-180 ° to +180 °	0.05 V to 10 V, 10 mA to 20 A 40 Hz to 1 kHz > 1 kHz to 2 kHz	0,065° 0,1 °	
		0.05 V to 10 V, > 20 A to 100 A 40 Hz to 1 kHz > 1 kHz to 2 kHz	0,045 ° 0,15 °	
Phase angle current-current	-180 ° to +180 °	10 mA to 20 A, 1 A to 100 A 40 Hz to 1 kHz > 1 kHz to 2 kHz	0,07 ° 0,17 °	
Phase angle current transformer	-180 ° to +180 °	10 mA to 20 A, 0.05 V to 10 V Secondary voltage 1 A to 1000 A 40 Hz to 65 Hz	0,05 °	Secondary current Secondary voltage Primary current
		> 100 A to 600 A > 65 Hz to 400 Hz	0,09 °	Primary current
		1 A to 100 A, > 65 Hz to 1 kHz > 1 kHz to 2 kHz	0,07 ° 0,17 °	
AC active energy single-phase Measuring devices	150 Ws to 5.76 MWs	45 Hz to 65 Hz $0.25 \leq \cos \varphi_F \leq 1$ t = 100 s 30 V to 480 V 0.2 A to 120 A	0,15·10	Measurement uncertainty related to the apparent energy
Alternating current reactive energy single-phase Measuring devices	150 vars to 5.76 Mvars	45 Hz to 65 Hz $0.25 \leq \sin \varphi_F \leq 1$ t = 100 s 30 V to 480 V 0.2 A to 120 A	0,15·10	
Alternating current apparent energy	600 VAs to 5.76 MVAs	45 Hz to 65 Hz t = 100 s 30 V to 480 V 0.2 A to 120 A	0,15·10	

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Permanent Laboratory Kirchzarten, Erich-Rieder-Straße 4 - High-frequency measurands

Measured variable /	Calibration and measurement capabilities (CMC)			Remarks
	Measuring range /	Measuring conditions /	Expanded measurement	
Oscilloscope measured variables		Rectangular voltage 10 Hz to 10 kHz		
Vertical deflection	1 mV to 5V		0,35 %	R_i = Innenwiderstand
Horizontal deflection	1 mV to 120 V	R_i = 1 M time stamps or sine	0,35 %	
	50 ps to < 1 μ s	< 1 V	6 ps	
	1 μ s to 5 s		$1,5 \cdot 10^{-3} t$	
Anstiegszeit t_r	25 hp to 245 hp	500 mV	9 ps	t_r = Intrinsic rise time of the oscilloscope
	> 245 ps to 10 ms		$35 \cdot 10^{-3} t_r$	
	150 ps to 10 ms	250 mV	$35 \cdot 10^{-3} t_r + 5$ ps	
	250 ps to 10 ms	> 250 mv to 2.5 V	$35 \cdot 10^{-3} t_r + 8$ ps	
Bandbreite B	f_c 50 MHz to 26.5 GHz	0.2 V to 2 V R_i = 50 Ω	3 % f_c	f_c = frequency -3dB point
HF attenuation	0 dB to 60 dB	300 kHz to 6 GHz	0.3 dB	Connector 50 Ω : N50
HF-Transmission Phasenwinkel ϕ	-180° to 180°	300 kHz to 6 GHz	$U_T - 180^\circ/\pi + K - f$	$U_T = \arcsin(10^{U/20} - 1)$ K: 0.1°/GHz U: Uncertainty of the Attenuation in dB
HF impedance Reflection factor Betrag $ r $	0 to 1	300 kHz to 2 GHz > 2 GHz to 6 GHz	0.005 + 0.005 f^2 0.009 + 0.005 f^2	Connector 50 Ω : N50
Phasenwinkel ϕ	-180° to 180°	0.1 < $ r $ < 1 300 kHz to 6 GHz	$\arcsin \frac{ r }{1} \cdot 180^\circ$	Connector 50 Ω : N50
HF power	0.1 mW to 10 mW	9 kHz to 50 MHz > 50 MHz to 5 GHz > 5 GHz to 18 GHz > 18 GHz to 26.5 GHz	$17 \cdot 10^{-3} P$ $22 \cdot 10^{-3} P$ $30 \cdot 10^{-3} P$ $40 \cdot 10^{-3} P$	Connector 50 Ω : N50; PC-3.5
Amplitudenmodulation Modulationsgrad m	0 to 1.0	$f_{MOD} < 1$ MHz	0.025 m + 0.004	f_{HF} = Trägerfrequenz $f_{HF} < 4$ GHz f_{MOD} = Modulationsfrequenz
Frequency modulation Frequenzhub Δf	0 to 5 MHz			

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - High-frequency measurands

Measured variable /	Calibration and measurement capabilities (CMC)			Remarks
	Measuring range /	Measuring conditions /	Expanded measurement	
Phase modulation Phasenhub $\Delta\Phi$	0 to (4 MHz / f_{mod}) rad		$0.041 \Delta\Phi + 0.025$ rad	$\Delta\Phi$ = Phasenhub
Total Harmonic Distortion THD / distortion factor THD_{Audio}	0 to 0.3 0 to 0.3 0 to 0.3	100 Hz to 50 kHz 100 kHz to 2 GHz 100 Hz to 50 kHz	$0.0165 THD + 0.0001$ $0.0675 THD + 0.0001$ $0,007 THD_{Audio} + 0,001$	
Flicker*) $\Delta U / U$	0.4 to 5	DIN EN 61000-4-15:2011 (115 V, 60 Hz); (230 V 50 Hz) (115 V, 60 Hz); (230 V 50 Hz)	$7 \cdot 10^{-3} \Delta U / U$	
Frequenc	0.0083 Hz to 40 Hz		$3 \cdot 10^{-3} \Delta U / U$	
Y	10 minutes		0,5 %	
P_{st} (Short Term)	2 hours		1,7 %	

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Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Dimensional measurement

Measured variable /	Calibration and measurement capabilities (CMC)			Remarks
	Measuring range /	Measuring conditions /	Expanded measurement	
Länge Zylindrische Einstellnormale, Lehrringe: Durchmesser *)	1 mm to 200 mm > 200 mm to 300 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006 Point 3.3.4 (Opt. 3)	0,8 µm + 2 · 10 ⁻⁶ · d 1,5 µm + 2 · 10 ⁻⁶ · d	d is the measured Diameter
Plug gauges: Durchmesser *)	1 mm to 200 mm	Point 3.3.5 (Opt. 4)	0,8 µm + 2 · 10 ⁻⁶ · d	
Test pins: Durchmesser *)	0.1 mm to 30 mm	VDI/VDE/DGQ 2618 Sheet 4.2:2007 Section 3.2.2	0,8 µm + 2 · 10 ⁻⁶ · d	
Thread gauges (single and multi- course cylindrical External and internal threads with straight flanks, symmetrical profile) Threaded mandrels: einfacher Flankendurchmesser *)	1.4 mm to 200 mm nominal pitch: 0.3 mm 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: einfacher Flankendurchmesser *)	3 mm to 200 mm nominal pitch: 0.5 mm 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: Single flank diameter *) Außendurchmesser *) Core diameter / Einstichdurchmesser *) Slope / pitch *) Gewindeprofilwinkel α *)	1.4 mm to 200 mm Nominal diameter 0.5 mm to 8 mm > 27°	VDI/VDE/DGQ 2618 Sheet 4.8:2006 Point 3.2.2 (Opt. 1) to point 3.2.6 (Opt. 5)	3 µm + 10 · 10 ⁻⁶ · d 2 µm 5 µm 1.5 µm (3 + 1 / l f), but not smaller than 6'	Scanning process D is the measured Diameter l/F : Flank length in mm
Threaded rings: Single flank diameter *) Außendurchmesser *) Core diameter / recess diameter *) Slope / pitch *) Gewindeprofilwinkel α *)	5 mm to 200 mm Nominal diameter 0.5 mm to 8 mm > 27°	VDI/VDE/DGQ 2618 Sheet 4.9:2006 Point 3.2.2 (Opt. 1) to point 3.2.6 (Opt. 5)	3 µm + 10 · 10 ⁻⁶ · d 5 µm 2 µm 1.5 µm (3 + 1 / l f), but not smaller than 6'	Scanning process d is the measured Diameter l/F : Flank length in mm

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Dimensional measurement

Measured variable /	Calibration and measurement capabilities (CMC)				Remarks
	Measuring range /	Measuring conditions /	Expanded measurement		
Length of plane-parallel, spherical or cylindrical Messflächen Durchmesser *)	0.01 mm to 500 mm	VDI/VDE/DGQ 2618 Sheet 19.1:2014	$1,5 \mu\text{m} + 2 \cdot 10^{-6} \cdot l$	/ is the measured Length	
	>500mm to 1000 mm		$2,5 \mu\text{m} + 2 \cdot 10^{-6} \cdot l$		
	0.01 mm to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.1:2006 Point 3.3.4 (Opt. 3), Point 3.3.5 (Opt. 4)	$1,5 \mu\text{m} + 2 \cdot 10^{-6} \cdot d$	d is the measured diameter	
Fühlerlehren *)	0.03 mm to 2.00 mm	DIN 2275:2014	$1,5 \mu\text{m} + 2 \cdot 10^{-6} \cdot l$	/ is the measured length	
Setting dimensions for outside micrometers *)	25 mm to 500 mm	VDI/VDE/DGQ 2618 Sheet 4.4:2009	$1,5 \mu\text{m} + 2 \cdot 10^{-6} \cdot l$		
Rachenlehren *)	3 mm to 200 mm	VDI/VDE/DGQ 2618 Sheet 4.7:2005 Point 3.3.2 (Opt. 2)	$0,8 \mu\text{m} + 2 \cdot 10^{-6} \cdot d$	d is the measured Diameter	
Calipers for external, internal and Depth measurements: Ziffernanzeige *)	0 mm to 300 mm	VDI/VDE/DGQ 2618 Sheet 9.1:2006	$9 \mu\text{m} + 11 \cdot 10^{-6} \cdot l$	Automated measuring system / is the measured	
			$10 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$		
Calipers for external, internal and depth	0 mm to 500 mm	VDI/VDE/DGQ 2618 Sheet 9.1:2006	$30 \mu\text{m} + 30 \cdot 10^{-6} \cdot l$	/ is the measured	
Depth caliper / Höhenmessschieber*)	> 500mm to 1000 mm	VDI/VDE/DGQ 2618 Sheet 9.2:2006	$50 \mu\text{m} + 30 \cdot 10^{-6} \cdot l$	Length	
		VDI/VDE/DGQ 2618 Sheet 9.3:2006			
Bügelmessschrauben *)	0 mm to 500 mm	VDI/VDE/DGQ 2618 Sheet 10.1:2001	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$		
Precision indicator *)	0 mm to 200 mm	VDI/VDE/DGQ 2618 Sheet 10.3:2002			
Einbaumessschrauben *)	0 mm to 50 mm	VDI/VDE/DGQ 2618 Sheet 10.4:2008			
Tiefenmessschrauben *)	0 mm to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.5:2010			
Inside micrometers with 2-point contact on the calibration item *)	13 mm to 300 mm	VDI/VDE/DGQ 2618 Sheet 10.7:2010	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$		
	> 300mm to 1000 mm		$5 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$		

Permanent laboratory Kirchzarten, Erich-Rieder-Straße 4 - Dimensional measurement variables

Measured variable /	Calibration and measurement capabilities (CMC)			Remarks
	Measuring range /	Measuring conditions /	Expanded measurement	
Inside micrometers with 3-line contact on the calibration item *)	3 mm to 150 mm	VDI/VDE/DGQ 2618 Sheet 10.8:2002	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot d$	<i>d</i> is the measured Diameter
Inside micrometers with 2-line contact on the calibration item	5 mm to 100 mm	3-APD-0-0025-EN 2023-07	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot d$	<i>d</i> is the measured Diameter
Lever gauges (rapid sensor) for external	to 200 mm	VDI/VDE/DGQ 2618 Sheet 12.1:2005	$7 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$	<i>l</i> is the measured length
Lever gauges (quick probe) for internal	2 mm to 200 mm	VDI/VDE/DGQ 2618 Sheet 13.1:2005	$7 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$	
Messuhren *)	0 mm to 100 mm	VDI/VDE/DGQ/DKD 2618 Sheet 11.1:2021	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$	Mechanical dial gauges
		VDI/VDE/DGQ/DKD 2618 Sheet 11.4:2020	$3 \mu\text{m} + 10 \cdot 10^{-6} \cdot l$	Electronic digital dial gauges
Feinzeiger *)	0 mm to 3 mm	VDI/VDE/DGQ 2618 Sheet 11.2:2002	0.6 μm	
Fühlhebelmessgeräte *)	0 mm to 1.6 mm	VDI/VDE/DGQ 2618 Sheet 11.3:2002	1.0 μm	
electrical inductive length measuring	to 100 mm	VDI/VDE/DGQ 2618 Sheet 14.1:2010	$0,6 \mu\text{m} + 1 \cdot 10^{-6} \cdot l$	
electr. incremental Length measuring devices	to 100 mm	3-APD-0-0027-EN 2023-08		
Parallel gauge blocks made of steel according to DIN EN ISO 3650 *)	0.5 mm to 150 mm	VDI/VDE/DGQ 2618 Sheet 3.1:2004 Measurement of the deviation of the centre dimension l_c of the nominal dimension l_n durch Unterschiedsmessung	For the centre dimension:	<i>l</i> is the length of the dimension For the smallest measuring Uncertainties are the push-on and push-off characteristics of both measuring surfaces of the Calibration item with a suitable flat glass plate
			Für f_0 und f_u : 0.07 μm	
Parallel gauge blocks made of ceramic according to DIN EN ISO 3650 *)	0.5 mm to 150 mm	Measurement of deviations f_0 and f_u from the centre dimension by 5-Punkt-Unterschiedsmessung	For the centre dimension:	
			Für f_0 und f_u : 0.07 μm	
Parallel gauge blocks made of tungsten carbide to DIN EN ISO 3650 *)	0.5 mm to 150 mm		For the centre dimension:	
			Für f_0 und f_u : 0.07 μm	

Permanent Laboratory Kirchzarten, Erich-Rieder-Straße 4 - Dimensional Measurement

Measured variable /	Calibration and Measurement Capabilities (CMC)			Remarks
	Measuring range /	Measuring conditions /	Expanded measurement	
Angle Squareness deviation Ebenheits- und Geradheitsabweichung*)	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 moulding and positional scaffolding up to 500 mm leg length
protractor scale graduation 1° *) scale graduation 5°*)	-180° up to 180°	VDI/VDE/DGQ 2618 Sheet 7.2:2008	30'	
	0° to 360°		1'	
Flachlineale Parallelitätsabweichung*) Ebenheitsabweichung *)	up to 500 mm	VDI/VDE/DGQ 2618 Sheet 5.1:2022	4 µm + 5 · 10 ⁻⁶ · l	/ ist die gemessene Length
			2.2 µm + 3,5 · 10 ⁻⁶ · l	
Straight edge Geradheitsabweichung*)	up to 500 mm	VDI/VDE/DGQ 2618 Sheet 5.2:2013	2.2 µm + 3,5 · 10 ⁻⁶ · l	/ ist die gemessene Länge
Tape dimensions and scales Belt dimensions Scales	0 m up to 100 m	VDI/VDE/DGQ 2618 Sheet 8.2:2023	50 µm + 20 · 10 ⁻⁶ · l	
	0 m up to 3 m			
Inclinometers	-2000 µm/m (-412") unti 2000 µm/m (412")	3-APD-0-0244-EN 2023-01	1.7 µm/m (0.35")	max. leg length Coordinate machine: 500 mm
Displacement sensors	0 mm to 1000 mm	3-APD-0-0025-EN 2023-10	8 µm + 2 · 10 ⁻⁵ · l	Displacement sensors with and without contact and attachment to the measurement object

Location Calibration laboratory Kirchzarten, Gewerbestraße 3, 79199 Kirchzarten

Permanent laboratory Kirchzarten, Gewerbestraße 3 - Dimensional measurement

Measured variable /	Calibration and measurement capabilities (CMC)				Remarks
	Measuring range /	Measuring conditions	Extended Measurement		
Coordinate metrology Prismatic, conical and spherical workpieces	Coordinate measuring machine with a calibrated measuring volume from: X = 3000 mm Y = 1200 mm Z = 900 mm	3-APD-0-0292-EN: 2023-01 Tactile measurement in the form of single-point probing with a coordinate measuring machine and determination of control geometries, that are determined by geometric parameters (single points, straight lines, planes, circles, spheres, cylinders, tori) with the evaluation software of the CMM. The single-point probing is with a fixed, specified measuring force or with extrapolation to zero measuring force. Single-point probing as "self-centring probing" is not used in the context of accreditation. To ensure traceability, the calibration of a comparable standard is performed. In addition the following restrictions must be observed: Measurement points must be distributed evenly across mould elements ; Abdeckung von mindestens 50 % der Oberfläche von Formelementen; Auswertung mittlerer	The measurement uncertainty is determined by a measurement uncertainty balance on the basis of guideline VDI/VDE 2617 Sheet 11:2011.. It is task-specific and is specified for a coverage probability of 95 % (extension factor k = 2). Example of measurement uncertainty for a measurement task: Parallelendmaß mit zwei Nennmaßen, verwendet wurde ein seitlich ausragender Taster mit einer Länge von 150 mm, ermittelt wurde die erweiterte Messunsicherheit des Prüfmerkmals „Abstand“: L = 50 mm, U = 1.8 µm L = 3000 mm, U = 26 µm	Die ermittelte Messunsicherheit kann sich von der beispielhaft angegebenen Unsicherheit deutlich für einfache Messaufgaben unterscheiden.	

Annex to the accreditation certificate D-K-15070-01-01

Permanent laboratory Kirchzarten, Gewerbestraße 3 - Electrical measured variables

Calibration and measurement capabilities (CMC)

Measured variable /	Measuring range /	Measuring conditions /	Expanded measurement	Remarks
DC voltage	0 V		0,1 μ V	U = measured value
	10 mV		$12 \cdot 10^{-6} U$	
	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 μ V to 100 mV > 100 mV to 100 V > 100 V to 1000 V		$1,4 \cdot 10^{-6} U + 0,15 \mu$ V $0,5 \cdot 10^{-6} U$ $1,4 \cdot 10^{-6} U$	
High voltage	> 1 kV to 50 kV		$0,4 \cdot 10^{-3} U$	
Direct current intensity	0 A to 10 pA >		$1,6 \cdot 10^{-3} I + 2$ fA	I = measured value
	10 pA to 100 pA		$0,3 \cdot 10^{-3} I$	
	> 100 pA to 1 nA >		$0,2 \cdot 10^{-3} I$	
	1 nA to 10 nA		$28 \cdot 10^{-6} I$	
	> 10 nA to 100 nA		$10 \cdot 10^{-6} I$	
	> 100 nA to 1 μ A		$1,0 \cdot 10^{-6} I$	
	> 1 μ A to 100 mA		$0,8 \cdot 10^{-6} I$	
	> 100 mA to 20 A > 20 A to 1000 A		$1,5 \cdot 10^{-6} I$ $9 \cdot 10^{-6} I$	
Direct current current clamps	1 mA to 2.2 A		$1 \cdot 10^{-3} I$	
	> 2.2 A to 20 A		$2 \cdot 10^{-3} I$	
	> 20 A to 1000 A		$3 \cdot 10^{-3} I$	
Direct current intensity Current transformer	1 A to 120 A		$0,22 \cdot 10^{-3} I$	
	> 120 A to 1000 A		$0,25 \cdot 10^{-3} I$	
