Deutsche Akkreditierungsstelle

Annex to the Partial Accreditation Certificate D-K-15089-01-01 according to DIN EN ISO/IEC 17025:2018

Valid from: **09.08.2023**

Date of issue: 27.05.2024

This annex is a part of the accreditation certificate D-K-15089-00.

Holder of partial accreditation certificate:

Perschmann Calibration GmbH
Hauptstr. 46d, 38110 Braunschweig

with the location

Perschmann Calibration GmbH
Hauptstr. 46d, 38110 Braunschweig

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

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

Calibration in the areas:

Dimensional quantities

Length

- **Gauge blocks**
- **Length measuring instruments**
- **Line scales, distances**
- **Length measuring devices** [a)]
- **Diameter**
- **Form error**
- **Flatness** [a)]
- **Straightness** [a)]
- **Thread**

Coordinate measuring technology

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

Electrical quantities

DC and low frequency

- **DC voltage**
- **AC voltage**
- **DC current**
- **AC current**
- **DC resistance**

Time and frequency

- **Frequency and speed**

[a)] also on-site calibration [b)] only on-site calibration

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

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

Permanent Laboratory

Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Length				
Gauge blocks * made of steel according to DIN EN ISO 3650:1999	0,5 mm to 100 mm featuring the nominal values of the standard made of steel	VDI/VDE/DGQ 2618 part 3.1:2004 Measurement of the deviation of the central length l_x from the nominal value l_n by comparison measurement Measurement of the deviations f_o and f_u from the central length by 5 points comparison For the smallest measurement uncertainties, the wringability and the wringing characteristics of both measuring surfaces must be checked using an appropriate optical flat	For the central length: $0.05\ \mu m + 0.5 \cdot 10^{-6} \cdot l$ For the deviations f_o and f_u from the central length: 0.05 µm	Measuring surfaces quality as stated in QMH rsp. In the test specifications l = gauge block length
	> 100 mm to 150 mm featuring the nominal values of the standard made of steel		For the central length: $0.05\ \mu m + 0.7 \cdot 10^{-6} \cdot l$ For the deviations f_o and f_u from the central length: 0.07 µm	
Gauge blocks * made of ceramics according to DIN EN ISO 3650:1999	0.5 mm to 100 mm featuring the nominal values of the standard made of steel		For the central length: $0.07\ \mu m + 0.6 \cdot 10^{-6} \cdot l$ For the deviations f_o and f_u from the central length: 0.05 µm	
	> 100 mm to 150 mm featuring the nominal values of the standard made of steel		For the central length: $0.07\ \mu m + 0.8 \cdot 10^{-6} \cdot l$ For the deviations f_o and f_u from the central length: 0.07 µm	

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Gauge blocks * made of steel with special cross section (round or square), also with drilling in the middle	0.5 mm to 100 mm featuring the nominal values of the standard made of steel	VDI/VDE/DGQ 2618 part 3.1:2004 Measurement of the deviation of the central length l_x from the nominal value l_n by comparison measurement Measurement of the deviations f_o and f_u from the central length by 5 points comparison For the smallest measurement uncertainties, the wringability and the wringing characteristics of both measuring surfaces must be checked using an appropriate optical flat	For the central length: 0.1 µm + 0.5 · 10^{-6} · l For the deviations f_o and f_u from the central length: 0.1 µm	At square gauge blocks with drilling the mean size is substituted by ANSI-ASME B89.1.9M measured between hole and front side
Gauge blocks * made of tungsten carbide according to DIN EN ISO 3650:1999	0.5 mm to 100 mm featuring the nominal values of the standard made of steel		For the central length: 0.08 µm + 1.2 · 10^{-6} · l For the deviations f_o and f_u from the central length: 0.05 µm	
Gauge blocks * made of steel	> 150 mm to 1000 mm in the nominal dimensions, which differ of the standard with a max. of 50 mm	VDI/VDE/DGQ 2618 part 3.1:2004 Measurement of the deviation of the central length l_x from the nominal value l_n by comparison measurement	For the central length: 0.2 µm + 0.7 · 10^{-6} · l	
Setting ring gauges made of steel * diameter	2 mm to 200 mm	VDI/VDE/DGQ 2618 part 4.1:2006	0.4 µm + 2 · 10^{-6} · d	The measurement uncertainty applies to the complete calibration of diameter, roundness, straightness and parallelism. For the calibration of the diameter without form measurement, the best measurement uncertainty increases by 0.2 µm. d = measured diameter
Setting plug gauges made of steel * diameter	1 mm to 200 mm	VDI/VDE/DGQ 2618 part 4.1: 2006	0.4 µm + 2 · 10^{-6} · d	
Measuring pins made of steel * diameter	0.17 mm to 20 mm	VDI/VDE/DGQ 2618 part 4.2: 2006	0.4 µm	
Roundness deviation * of abovementioned rings, inside cylinders, plugs or outside cylinders	to 40 µm	VDI/VDE/DGQ 2618 part 4.1: 2006	0.2 µm + 1 · 10^{-2} · RONt	Diameter: 2 mm to 200 mm
Straightness deviation * of abovementioned rings, inside cylinders, plugs or outside cylinders	to 10 µm	VDI/VDE/DGQ 2618 part 4.1: 2006	0.5 µm	axial length: to 30 mm

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Parallelism * of abovementioned rings, inside cylinders, plugs or outside cylinders	to 10 µm	VDI/VDE/DGQ 2618 part 4.1: 2006	0.7 µm	axial length: to 30 mm
Setting dimension *	25 mm to 900 mm	VDI/VDE/DGQ 2618 part 4.4:2009	0.7 µm + 1.5 · 10^{-6} · l	l = measured length
Caliper gauge *	5 mm to 170 mm	VDI/VDE/DGQ 2618 part 4.7:2005	1.5 µm + 10 · 10^{-6} · l	l = measured length
Reference and setting gauge	to 12 mm	Annex F/43:2017-11	3 µm	Feeler gauge, gap gauge of plastic, delrin, teflon, brass or steel
Radius gauge	to 40 mm	Annex F/42:2018-01	3 µm	to 40 mm radii
Angel meter *	0° to 360°	VDI/VDE/DGQ 2618 part 7.2:2008	1‘ 30‘‘	
Graduator	0° to 180°	Annex F/46:2017-11	12‘	
Measuring tape Circumference tape measure	0 m to 50 m	Annex F/47-1:2017-12 Annex F/47-2:2017-12	50 µm + 15 · 10^{-6} · l	l = measured length
Diameter tape measure	0 m to 10 m	Annex F/47-2:2017-12	50 µm + 15 · 10^{-6} · d	d = measured diameter
Rules	0 m to 10 m	Annex F/47-3:2017-12 Annex F/47-4:2017-11	50 µm + 15 · 10^{-6} · l	l = measured length Graduated metal rules, reference- and plotting scale, rules, folding rules
Calipers for external, internal and depth dimensions *	0 mm to 1000 mm	VDI/VDE/DGQ 2618 part 9.1:2006	30 µm + 30 · 10^{-6} · l	l = measured length
Depth calipers *	0 mm to 1000 mm	VDI/VDE/DGQ 2618 part 9.2:2006	30 µm + 30 · 10^{-6} · l	l = measured length
Height gauge *	0 mm to 1000 mm	VDI/VDE/DGQ 2618 part 9.3:2006	20 µm + 10 · 10^{-6} · l	with contact help
Indicating caliper micrometers *	0 mm to 600 mm	VDI/VDE/DGQ 2618 part 10.1:2001	3 µm + 10 · 10^{-6} · l	600 mm = final value of the measuring range
Indicating caliper gap gauge *	0 mm to 100 mm	VDI/VDE/DGQ 2618 part 10.3:2002	2 µm + 10 · 10^{-6} · l	l = measured length
Dial indicator snap gauge	0 mm to 100 mm	Annex F/39:2017-12	2 µm + 10 · 10^{-6} · l	
Depth micrometers *	0 mm to 300 mm	VDI/VDE/DGQ 2618 part 10.5:2010	3 µm + 10 · 10^{-6} · l	with interchangeable contact points
Internal micrometers with two-point contact *	25 mm to 950 mm	VDI/VDE/DGQ 2618 part 10.7:2010	3.5 µm + 5 · 10^{-6} · d	d = measured diameter
Internal micrometers with jaws	5 mm to 100 mm	Annex F/37:2021-09	5 µm + 5 · 10^{-6} · d	
Internal micrometers with three-point contact *	3 mm to 200 mm	VDI/VDE/DGQ 2618 part 10.8:2002	3 µm + 5 · 10^{-6} · d	d = measured diameter

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Dial gauges with scales *scale interval > 1 µm	to 100 mm	DKD-R 4-3 part 11.1:2018	3 µm + 10 · 10^{-6} · l	l = measured length
Dial gauges with scales * scale interval 1 µm	to 5 mm		1.5 µm	error of measurement y_i
			2 µm	Deviation span f_e, f_{ges}, f_u, f_t and f_w
Dial gauges with scales * scale interval > 1 µm	to 100 mm	VDI/VDE/DGQ 2618 part 11.1:2014	3 µm + 10 · 10^{-6} · l	l = measured length
Dial gauges with scale * scale interval 1 µm	to 5 mm		1.5 µm	error of measurement y_i
			2 µm	deviation span MPE_r, MPE_e, MPE_{ges}, $MPE_{1/1}$, $MPE_{1/2}$, $MPE_{1/10}$, MPE_u
Dial gauges with digital display numerical interval 0.1 µm	to 25 mm	Annex F/04-2:2014-12	0.6 µm + 10 · 10^{-6} · l	error of measurement y_i
			0.8 µm + 10 · 10^{-6} · l	deviation span f_e, f_t and f_w
Dial gauges with digital display numerical interval 1 µm	to 100 mm		1 µm + 10 · 10^{-6} · l	error of measurement y_i
			1.5 µm + 10 · 10^{-6} · l	deviation span f_e, f_t and f_w
Dial gauges with digital display * numerical interval 0.1 µm	to 25 mm	VDI/VDE/DGQ/DKD 2618 part 11.4:2020	0.6 µm + 10 · 10^{-6} · l	error of measurement y_i
			0.8 µm + 10 · 10^{-6} · l	deviation span MPE_R, MPE_H, MPE_E, MPE_P
Dial gauges with digital display * numerical interval 1 µm	to 100 mm		1 µm + 10 · 10^{-6} · l	error of measurement y_i
			1.5 µm + 10 · 10^{-6} · l	deviation span MPE_R, MPE_H, MPE_E, MPE_P
Dial indicator * scale interval > 0.5 µm	to 3 mm	VDI/VDE/DGQ 2618 part 11.2:2002	0.6 µm	
Lever gauges *	to 1,6 mm	VDI/VDE/DGQ 2618 part 11.3:2002	1 µm	
Lever gauges for external measurements *	0 mm to 70 mm	VDI/VDE/DGQ 2618 part 12.1:2005	7 µm + 10 · 10^{-6} · l	up to a probe length of 200 mm
Lever gauges for internal measurements *	2,5 mm to 80 mm	VDI/VDE/DGQ 2618 part 13.1:2005	7 µm + 10 · 10^{-6} · l	l = measured length
Thickness gauges	0 mm to 30 mm	Annex F/17:2011-12	7 µm + 10 · 10^{-6} · l	l = measured length up to a measuring depth of 200 mm

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Bore gauges with 2-point contact *	1 mm to 3 mm	VDI/VDE/DGQ 2618 part 13.2:2005 (image 1)	0.8 µm	Range of application: with gauge slider d = 1.75 mm to d = 25 mm
		VDI/VDE/DGQ 2618 part 13.2:2005 (image 2)	0.8 µm	Range of application: to d = 300 mm
			1.2 µm	Range of application: d > 300 mm to d = 600 mm
		VDI/VDE/DGQ 2618 part 13.2:2005 (image 3)	0.8 µm	Range of application: pluge gauge to d = 100 mm
Height gauges *	0 mm to 1000 mm	VDI/VDE/DGQ 2618 part 16.1:2009	1.5 µm + 3 · 10^{-6} · L	L = measured length
Deviation from straightness and perpendicularity	to 30 µm	to 800 mm lead length	2.5 µm + 1 · 10^{-6} · l_z	l_z = lead length
90° Squares Perpendicularity	to 30 µm	Annex F/12:2017-02 to 750 mm leg length	2 µm + 2 · 10^{-6} · l_z	l_z = length of form respectively position embodiment
Deviation from straightness and parallelism	to 30 µm	Annex F/13:2020-10 to 750 mm length	1 µm + 2 · 10^{-6} · l_z	
Flatness deviation	to 30 µm	Annex F/13:2020-10 to 750 mm edge length	1 µm + 2 · 10^{-6} · l_z	
Deviation from flatness Horizontal flatness standard, e.g., surface plates as per DIN 876:1984	to 50 µm	Annex F/18:2020-10 to 2 m edge length electronic inclination measuring	0.9 µm + 1.7 · 10^{-6} · l	l = longest edge length of the measuring standard For calibration in the permanent calibration laboratory, the uncertainty increases starting by an edge length l > 1 m by a factor of 1.2
Deviation from straightness Horizontal flatness standard, e.g., surface plates as per DIN 876:1984	bis 50 µm	Annex F/18:2020-10 to 3 m edge length electronic inclination measuring	2.2 µm + 1.7 · 10^{-6} · l	

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
Thread gauges * (single-start and multi-start cylindrical and conical external and internal threads with straight flanks, symmetrical and asymmetrical profile)				
External thread	3 mm to 150 mm		2.5 µm + 5 · 10^{-6} · d	d = measured diameter
Simple pitch diameter	Nominal diameter	Scanning method		
Outside diameter		VDI/VDE/DGQ 2618 part 4.8:2006, Option 1 to Option 4	2 µm	
Core diameter or recess diameter		(Specifying the thread angle α)	5 µm	
Lead or pitch	0.5 mm to 8 mm		1 µm	
Thread angle α	≥ 27°		(1.2 + 3 mm / l_F)', but not lower at 6'	l_F = side length
Internal thread	3 mm to 160 mm			
Simple pitch diameter	Nominal diameter	Scanning method	2.5 µm + 5 · 10^{-6} · d	
Outside diameter or recess diameter		VDI/VDE/DGQ 2618 part 4.9:2006, Option 1 to Option 4	5 µm	
Core diameter		(Specifying the thread angle α)	2 µm	
Lead or pitch	0.5 mm to 8 mm		1 µm	
Thread angle α	≥ 27°		(1.2 + 3 mm / l_F)', but not lower at 6'	
Stand off	3 mm to 150 mm	Annex F/09-3:2021-09	50 µm	
Thread plug gauge * Simple pitch diameter	1.4 mm to 150 mm	VDI/VDE/DGQ 2618 part 4.8:2006, Option 1 (Three wire procedure)	2.5 µm + 7,5 · 10^{-6} · d	d = measured diameter P_h = lead P_h ≥ 0.3 mm to ≤ 6 mm

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range			Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
DC and low frequency quantities						
DC voltage	0 mV	to	220 mV	Annex F/23-1:2020-05	0.65 µV + 6.6 · 10^{-6} · U	U = measuring value
measuring instruments	> 0.22 V	to	2.2 V		1.2 µV + 4.7 · 10^{-6} · U	
	> 2.2 V	to	11 V		2.6 µV + 3.5 · 10^{-6} · U	
	> 11 V	to	22 V		4 µV + 3.5 · 10^{-6} · U	
	> 22 V	to	220 V		5 µV + 5 · 10^{-6} · U	
	> 220 V	to	1100 V		0.4 mV + 6.5 · 10^{-6} · U	
DC voltage sources	0 V	to	0.2 V	Annex F/29-1:2020-05	0.53 µV + 2.9 · 10^{-6} · U	U = measuring value
	> 2.2 V	to	2 V		1 µV + 2.7 · 10^{-6} · U	
	> 2 V	to	20 V		4.1 µV + 3.0 · 10^{-6} · U	
	> 20 V	to	200 V		40 µV + 4.5 · 10^{-6} · U	
	> 200 V	to	1000 V		0.5 mV + 4.5 · 10^{-6} · U	
DC current	0 µA	to	220 µA	Annex F/23-2:2020-05	6 nA + 40 · 10^{-6} · I	I = measuring value
Measuring instruments	> 0.22 mA	to	2.2 mA		9.3 nA + 34 · 10^{-6} · I	
		to	22 mA		40 nA + 35 · 10^{-6} · I	
	> 2.2 mA	to	220 mA		0.7 µA + 45 · 10^{-6} · I	
	> 22 mA	to	2.2 A		13 µA + 79 · 10^{-6} · I	
	> 0.22 A	to	3 A		31 µA + 0.29 · 10^{-3} · I	
	> 2.2 A	to	11 A		0.39 mA + 0.39 · 10^{-3} · I	
	> 3 A	to	20.5 A		0.58 mA + 0.78 · 10^{-3} · I	
	> 11 A					
DC current sources	10 µA	to	200 µA	Annex F/29-2:2020-05	0.4 nA + 12 · 10^{-6} · I	
	> 0.2 mA	to	2 mA		8.9 nA + 10 · 10^{-6} · I	
	> 2 mA	to	20 mA		41 nA + 13 · 10^{-6} · I	
	> 20 mA	to	200 mA		0.8 µA + 36 · 10^{-6} · I	
	> 0.2 A	to	2.0 A		17 µA + 0.17 · 10^{-3} · I	
	> 2 A	to	20 A		0.4 mA + 0.38 · 10^{-3} · I	
DC current clamps	0.2 A	to	< 10 A	Annex F/23-2:2020-05	10 mA + 2 · 10^{-3} · I	with current coil with 2, 10 and 50 windings
	10 A	to	100 A		0.1 A + 2 · 10^{-3} · I	
	> 100 A	to	1000 A		0.8 A + 2.5 · 10^{-3} · I	

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Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
AC voltage AC voltage measuring instruments		Annex F/23-3:2020-05		
	0.02 V to 0.22 V	40 Hz to 20 kHz	4 µV + 80 · 10^{-6} · U	U = measuring value
	> 0.22 V to 2.2 V	40 Hz to 20 kHz	8 µV + 42 · 10^{-6} · U	
	> 2.2 V to 22 V	40 Hz to 20 kHz	50 µV + 42 · 10^{-6} · U	
	> 22 V to 220 V	40 Hz to 20 kHz	0.64 mV + 60 · 10^{-6} · U	
	> 220 V to 1100 V	50 Hz to 1 kHz	3.5 mV + 70 · 10^{-6} · U	
AC voltage sources		Annex F/29-3:2020-05		
	10 mV to 200 mV	40 Hz to 100 Hz > 100 Hz to 2 kHz Hz to 10kHz > 2 kHz to 10 kHz > 10 kHz to 30 kHz	4 µV + 0.11 · 10^{-3} · U 2 µV + 0.11 · 10^{-3} · U 4 µV + 0.13 · 10^{-3} · U 8 µV + 0.34 · 10^{-3} · U	
	> 0.2 V to 2.0 V	40 Hz to 100 Hz > 100 Hz to 2 kHz Hz to 10 kHz > 2 kHz to 10 kHz > 10 kHz 30 kHz	20 µV + 90 · 10^{-6} · U 20 µV + 75 · 10^{-6} · U 20 µV + 0.11 · 10^{-3} · U 40 µV + 0.22 · 10^{-3} · U	
	> 2.0 V to 20 V	40 Hz to 100 Hz > 100 Hz to 2 kHz Hz to 10 kHZ > 2 kHz to 10 kHz > 10 kHz 30 kHz	0.2 mV + 90 · 10^{-6} · U 0.2 mV + 75 · 10^{-6} · U 0.2 mV + 0.11 · 10^{-3} · U 0.4 mV + 0.22 · 10^{-3} · U	
	> 20 V to 200 V	40 Hz to 100 Hz > 100 Hz to 2 kHz Hz to 10kHz > 2 kHz to 30 kHz > 10 kHz	2 mV + 90 · 10^{-6} · U 2 mV + 75 · 10^{-6} · U 2 mV + 0.11 · 10^{-3} · U 4 mV + 0.22 · 10^{-3} · U	
	> 200 V to 1000 V	40 kHz to 10 kHz > 10 kHz to 30 kHz	20 mV + 0.11 · 10^{-3} · U 40 mV + 0.22 · 10^{-3} · U	
AC current Measuring instruments		Annex F/23-4:2020-05		
	20 µA to 220 µA	40 Hz to 1 kHz	8 nA + 0.12 · 10^{-3} · I	I = measuring value
	> 0.22 mA to 2.2 mA	40 Hz to 1 kHz	36 nA + 0.1 · 10^{-3} · I	
	> 2.2 mA to 22 mA	40 Hz to 1 kHz	0.35 µA + 0.1 · 10^{-3} · I	
	> 22 mA to 220 mA	40 Hz to 1 kHz	2.5 µA + 0.1 · 10^{-3} · I	
	> 0.22 A to 2.2 A	40 Hz to 1 kHz	36 µA + 0.24 · 10^{-3} · I	
	> 2.2 A to 3 A	45 Hz to 1 kHz	78 µA + 0.47 · 10^{-3} · I	
	> 3 A to 11 A	45 Hz to 100 Hz	1.6 mA + 0.78 · 10^{-3} · I	
	> 11 A to 20.5 A	45 Hz to 100 Hz	3.9 mA + 1.2 · 10^{-3} · I	

Permanent Laboratory

Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement	Remarks
AC current clamps		Annex F/23-4:2020-05		
	0.2 A to < 10 A	50 Hz	10 mA + 2 · 10^{-3} · I	I = measuring value with current coil with 2, 10 and 50 windings
	10 A to 100 A	50 Hz	0.1 A + 2 · 10^{-3} · I	
	> 100 A to 500 A	50 Hz	0.4 A + 2.5 · 10^{-3} · I	
	> 500 A to 1000 A	50 Hz	0.8 A + 2.5 · 10^{-3} · I	
AC current sources		Annex F/29-4:2020-05		
	0.2 mA to 2.0 mA	10 Hz to 10 kHz	0.2 µA + 0.3 · 10^{-3} · I	I = measuring value
	> 2.0 mA to 20 mA	10 Hz to 10 kHz	2 µA + 0.3 · 10^{-3} · I	
	> 20 mA to 200 mA	10 Hz to 10 kHz	20 µA + 0.29 · 10^{-3} · I	
	> 0.2 A to 2.0 A	10 Hz to 2 kHz	0.2 mA + 0.62 · 10^{-3} · I	
	> 2.0 A to 20 A	10 Hz to 2 kHz	2 mA + 0.82 · 10^{-3} · I	
DC resistance Measuring instruments 4-wire connection	0 Ω	Annex F/23-5:2020-05	2.3 mΩ	Fixed resistors
	1 Ω		2.4 mΩ	
	10 Ω		2.8 mΩ	
	100 Ω		4.8 mΩ	
	1 kΩ		37 mΩ	
	10 kΩ		0.37 Ω	
	100 kΩ		3.7 Ω	
DC resistances 4-wire connection	0 Ω to 2 Ω	Annex F/30:2020-05	0.11 mΩ + 3 · 10^{-6} · R	R = measuring value
	> 2 Ω to 20 Ω		0.1 mΩ + 6.1 · 10^{-6} · R	
	> 20 Ω to 200 Ω		91 µΩ + 7.8 · 10^{-6} · R	
	> 200 Ω to 2 kΩ		0.12 Ω + 0.59 · 10^{-3} · R	
	> 2 kΩ to 20 kΩ		0.11 Ω + 4.4 · 10^{-6} · R	
Measuring instruments 2-wire connection	1 MΩ	Annex F/23-5:2020-05	0.06 kΩ	Fixed resistors
	10 MΩ		1.8 kΩ	
	100 MΩ		0.24 MΩ	
DC resistance DC resistances 2-wire connection	> 20 kΩ to 200 kΩ	Annex F/30:2020-05	91 mΩ + 7.8 · 10^{-6} · R	R = measuring value
	> 200 kΩ to 2 MΩ		0.12 kΩ + 0.77 · 10^{-3} · R	
	> 2 MΩ to 20 MΩ		0.14 kΩ + 0.81 · 10^{-3} · R	
	> 20 MΩ to 200 MΩ		10 kΩ + 0.12 · 10^{-3} · R	
	> 200 MΩ to 2 GΩ		1 MΩ + 0.51 · 10^{-3} · R	
Time and Frequency				
frequency measuring instruments	0.01 Hz to 120 Hz	Annex F/23-6:2020-05	12 mHz + 50 · 10^{-6} · F	F = measuring value
	> 120 Hz to 1.2 kHz		0.12 Hz + 50 · 10^{-6} · F	
	> 1.2 kHz to 12 kHz		1.2 Hz + 50 · 10^{-6} · F	
	> 12 kHz to 120 kHz		12 Hz + 50 · 10^{-6} · F	
	> 120 kHz to 1.2 MHz		0.12 kHz + 50 · 10^{-6} · F	
Revolution speed revolution counter - optical	120 min^{-1} to 100000 min^{-1}	Annex F/24:2020-05	0.05 min^{-1} + 18 · 10^{-6} · n	Direct optical excitation n = measuring value

On-site calibration

Calibration- and Measurement Capabilities (CMC)

Measurement quantity/ Calibration item	Range	Measurement conditions/procedure	Expanded uncertainty of measurement [1)]	Remarks
Length				
Deviation from flatness Horizontal flatness standard, e.g., surface plates as per DIN 876:1984	to 50 µm	Annex F/18:2020-10 to 2 m edge length Electronic inclination measuring	0.9 µm + 1.7 · 10^{-6} · l	l = longest edge length of the measuring standard
Deviation from straightness Horizontal flatness standard, e.g., surface plates as per DIN 876:1984	to 50 µm	Annex F/18:2020-10 to 3 m edge length Electronic inclination measuring	2.2 µm + 1.7 · 10^{-6} · l	
Height gauges *	0 mm to 600 mm	VDI/VDE/DGQ 2618 part 16.1:2009	2.5 µm + 5 · 10^{-6} · l	l = measured length
Coordinate measuring technology *				
Measuring projectors Measuring microscopes	Devices featuring a measuring surface with a face diagonal ≤ 530 mm	Calibration of metrological characteristics according to DKD-R 4-3 part 18.1:2018, and the following standards and guidelines DIN EN ISO 10360 VDI/VDE 2617		
		Determination of probing error *PS-1D(OT)* with a graduated scale made of glass according to VDI/VDE 2617 part 6.1:2007	0.4 µm	Measuring projectors and measuring microscopes with visual proving with crosshairs or electronic edge detection
		The error of indication for size measurement *E-1D(OT)* und *E-2D(OT)* is determined with a graduated scale made of glass according to VDI/VDE 2617 part 6.1:2007	0.5 µm + 0.5 · 10^{-6} · L	L = measured length

Abbreviations used:

Annex F	Calibration Guide of Perschmann Calibration GmbH
CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DGQ	Deutsche Gesellschaft für Qualität e.V.
DIN	Deutsches Institut für Normung e.V.
DKD	Deutscher Kalibrierdienst
DKD-R	Guideline of Deutscher Kalibrierdienst, published by Physikalisch-Technischen Bundesanstalt
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik e.V.
VDI	Verein Deutscher Ingenieure e.V.