

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV

Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation



The Deutsche Akkreditierungsstelle GmbH attests that the calibration laboratory

Mahr GmbH

Carl-Mahr-Straße 1, 37073 Göttingen

is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out calibrations in the following fields:

Dimensional quantities

Length

- Roughness
- Form error
- Contours
- Stylus instruments ^{a)}
- Length measuring devices ^{a)}

^{a)} also on-site calibration

The accreditation certificate shall only apply in connection with the notice of accreditation of 19.12.2019 with the accreditation number D-K-15074-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 5 pages.

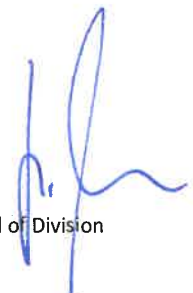
Registration number of the certificate: **D-K -15074-01-00**

Braunschweig,
19.12.2019

Dr. Heike Manke
Head of Division

Translation issued:
19.12.2019

Head of Division



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 Deutsche Akkreditierungsstelle GmbH.
<https://www.dakks.de/en/content/accredited-bodies-dakks>

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

See notes overleaf.

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15074-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 19.12.2019

Date of issue: 19.12.2019

Holder of certificate:

Mahr GmbH
Carl-Mahr-Straße 1, 37073 Göttingen

Calibration in the fields:

Dimensional quantities

Length

- **Roughness**
- **Form error**
- **Contours**
- **Stylus instruments ^{a)}**
- **Length measuring devices ^{a)}**

^{a)} also on-site calibration

Abbreviations used: see last page

Annex to the accreditation certificate D-K-15074-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Length Groove depth <i>Pt</i> and <i>d</i> on depth setting standards	0.2 µm to 0.8 µm (7.9 µin) (31.5 µin) 0.8 µm to 1.5 µm (31.5 µin) (59.1 µin) 1.5 µm to 3.5 µm (59.1 µin) (137.8 µin) 3.5 µm to 12 µm (137.8 µin) (472.5 µin)	DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 5436-1:2000	0.03 µm (1.2 µin) 0.04 µm (1.6 µin) 0.04 µm (1.6 µin) 0.05 µm (2.0 µin)	
Roughness on extra fine roughness standards <i>Ra</i> <i>Rz</i> <i>Rmax</i>	0.025 µm to 0.1 µm (1.0 µin) (3.9 µin) 0.15 µm to 0.8 µm (5.9 µin) (31.5 µin) 0.15 µm to 0.8 µm (5.9 µin) (31.5 µin)	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21:2013	0.08 · <i>Ra</i> 0.09 · <i>Rz</i> 0.10 · <i>Rmax</i>	
Roughness on roughness standards <i>Ra</i> <i>Rz</i> <i>Rmax</i>	0.1 µm to 4 µm (3.9 µin) (157.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin)	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21:2013	0.05 · <i>Ra</i> 0.05 · <i>Rz</i> 0.05 · <i>Rmax</i>	
Roughness on roughness standards <i>Rpk</i> <i>Rk</i> <i>Rvk</i> <i>Mr1</i> <i>Mr2</i>	On surfaces in the range 0.1 µm ≤ <i>Ra</i> ≤ 4 µm (3.9 µin) (157.5 µin) 0.8 µm ≤ <i>Rz</i> ≤ 20 µm (31.5 µin) (787.5 µin)	DIN 4768:1990 DIN EN ISO 13565-1:1998 DIN EN ISO 13565-2:1998	0.04 · <i>Rz</i> 0.05 · <i>Rz</i> 0.04 · <i>Rz</i> 4 % 6 %	Relative measuring uncertainty relative to <i>Rz</i> Absolute measuring uncertainty relative to 100% material ratio
Roughness on roughness standards <i>Ra</i> <i>Rz</i> <i>Rmax</i>	0.1 µm to 4 µm (3.9 µin) (157.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin)	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21:2013	0.03 · <i>Ra</i> 0.03 · <i>Rz</i> 0.03 · <i>Rmax</i>	If necessary, the filter cutoff wavelength λ_c can be used one level lower or higher than as per ISO 4288:1998

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

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Stylus instruments to DIN EN ISO 3274:1998 <i>Pt</i> and <i>d</i> <i>Ra</i> <i>Rz</i> <i>Rmax</i>	0.2 µm to 12 µm (7.9 µin) (472.5 µin) 0.1 µm to 4 µm (3.9 µin) (157.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin) 0.8 µm to 20 µm (31.5 µin) (787.5 µin)	DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000	$U_{\text{standard}} + 0.01 \mu\text{m}$ ($U_{\text{standard}} + 0.4 \mu\text{in}$) $U_{\text{standard}} + 0.01 \cdot Ra$ ($U_{\text{standard}} + 0.4 \mu\text{in} \cdot Ra$) $U_{\text{standard}} + 0.01 \cdot Rz$ ($U_{\text{standard}} + 0.4 \mu\text{in} \cdot Rz$) $U_{\text{standard}} + 0.01 \cdot Rmax$ ($U_{\text{standard}} + 0.4 \mu\text{in} \cdot Rmax$)	U_{standard} is the measuring uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
Roundness standards Roundness deviation	to 0.1 µm (3.9 µin)	DIN ISO 1101:2014	0.025 µm (1.0 µin)	Diameter: 3 mm to 100 mm (0.12 to 3.94 in)
Magnification standards Roundness deviation for cylinder with flat area (flick)	0.5 µm to 20 µm (19.7 µin) (787.5 µin)		$0.05 \mu\text{m} + 2.5 \cdot 10^{-2} \cdot RONt$ ($2.0 \mu\text{in} + 2.5 \cdot 10^{-2} \cdot RONt$)	Diameter: 3 mm to 100 mm (0.12 to 3.94 in)
Magnification standards Roundness deviation Multi-wave standard	to 20 µm (787.5 µin)		$0.1 \mu\text{m} + 2.5 \cdot 10^{-2} \cdot RONt$ ($3.9 \mu\text{in} + 2.5 \cdot 10^{-2} \cdot RONt$)	Diameter: 50 mm to 150 mm (1.97 to 5.91 in)
Cylinder square Roundness deviation	to 20 µm (787.5 µin)	DIN ISO 1101:2014	$0.1 \mu\text{m} + 2.5 \cdot 10^{-2} \cdot RONt$ ($3.9 \mu\text{in} + 2.5 \cdot 10^{-2} \cdot RONt$)	Diameter: 3 mm to 100 mm (0.12 to 3.94 in)
Straightness deviation of the generatrices	to 20 µm (787.5 µin)		$0.2 \mu\text{m} + 2.0 \cdot 10^{-2} \cdot STRt$ ($7.9 \mu\text{in} + 2.0 \cdot 10^{-2} \cdot STRt$)	Length: 10 mm to 400 mm (0.39 to 15.75 in)
Parallelism deviation of the generatrices	to 20 µm (787.5 µin)		$0.3 \mu\text{m} + 1.5 \cdot 10^{-2} \cdot PART$ ($11.8 \mu\text{in} + 1.5 \cdot 10^{-2} \cdot PART$)	$RONt$ = roundness deviation $STRt$ = Straightness deviation
Cylindricity deviation	to 20 µm (787.5 µin)		$0.4 \mu\text{m} + 3.0 \cdot 10^{-2} \cdot CYLt$ ($15.8 \mu\text{in} + 3.0 \cdot 10^{-2} \cdot CYLt$)	$STRt$ = Straightness deviation $PART$ = Parallelism deviation $CYLt$ = Cylindricity deviation
Contour standards X length Lateral distances	5 mm to 100 mm (0.20 in) (3.94 in)	Substitution measurement with reference contour standard	0.6 µm (23.6 µin)	
Z length Vertical distances	to 10 mm (0.39 in)	Procedure according to DIN ISO/TS 15530-3:2008	0.75 µm (29.5 µin)	
Radii	2 mm to 12 mm (0.079 in) (0.47 in)		0.75 µm (29.5 µin)	
Angles	40° to 135°		0.01°	

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

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Dial gauge checkers	to 100 mm (3.94 in)	MK03/05:2014 Calibration with traceable electronic linear reference gauge	0.22 μm (8.7 μin)	
Horizontal Length measuring machines	0 mm to 1000 mm (0 μin) (39.37 in)	VDI/VDE/DGQ 2618 part 17.1:2014	0.08 μm + 0.7 · 10 ⁻⁶ · l (3.1 μin + 0.7 · 10 ⁻⁶ · l)	l = measured length The measurement uncertainty of the length measurement uncertainty in mechanical probing of gauge blocks and is valid for horizontal length measuring machines of the Mahr GmbH
	> 1000 mm to 2000 mm (> 39.37 in) (78.74 in)		0.1 μm + 0.5 · 10 ⁻⁶ · l (3.9 μin + 0.5 · 10 ⁻⁶ · l)	

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Length Stylus instruments to DIN EN ISO 3274:1998		DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000		<i>U</i> _{standard} is the measuring uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
<i>Pt</i>	0.2 μm to 12 μm (7.9 μin) (472.5 μin)		<i>U</i> _{standard} + 0.01 μm (<i>U</i> _{standard} + 0.4 μin)	
<i>Ra</i>	0.1 μm to 4 μm (3.9 μin) (157.5 μin)		<i>U</i> _{standard} + 0.01 · <i>Ra</i> (<i>U</i> _{standard} + 0.4 μin · <i>Ra</i>)	
<i>Rz</i>	0.8 μm to 20 μm (31.5 μin) (787.5 μin)		<i>U</i> _{standard} + 0.01 · <i>Rz</i> (<i>U</i> _{standard} + 0.4 μin · <i>Rz</i>)	
<i>Rmax</i>	0.8 μm to 20 μm (31.5 μin) (787.5 μin)		<i>U</i> _{standard} + 0.01 · <i>Rmax</i> (<i>U</i> _{standard} + 0.4 μin · <i>Rmax</i>)	
Dial gauge checkers	to 100 mm (3.94 in)	MK03/05:2014 Calibration with traceable electronic linear reference gauge	0.22 μm (8.7 μin)	

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

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On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Horizontal Length measuring machines	0 mm to 1000 mm (0 µin)	VDI/VDE/DGQ 2618 part 17.1:2014	0.08 µm + 0.7 · 10 ⁻⁶ · l (3.1 µin + 0.7 · 10 ⁻⁶ · l)	l = measured length The measurement uncertainty of the length measurement uncertainty in mechanical probing of gauge blocks and is valid for horizontal length measuring machines of the Mahr GmbH
	> 1000 mm to 2000 mm (> 39.37 in)		0.1 µm + 0.5 · 10 ⁻⁶ · l (3.9 µin + 0.5 · 10 ⁻⁶ · l)	

Abbreviations used:

CMC	Calibration and measurement capabilities
DIN	Deutsches Institut für Normung e.V.
DKD-R	Guideline on Deutscher Kalibrierdienst (DKD), published by Physikalisch-Technischen Bundesanstalt
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik
VDI	Verein Deutscher Ingenieure
MK	Calibration instruction of the Mahr GmbH

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