DAkkS
Deutsche
Akkreditierungsstelle

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 22.07.2021 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 6 pages.

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

Braunschweig,
22.07.2021

Dr Heike Manke
Head of Division

Translation issued:
22.07.2021

Head of Division

The certificate together with the annex reflects the status as indicated by the date of issue.
The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH https://www.dakks.de/en/content/accredited-bodies-dakks.

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

See notes overleaf.

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

Valid from: **22.07.2021**

Date of issue 22.07.2021

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

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

The certificate together with the annex reflects the status as indicated by the date of issue.
The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH https://www.dakks.de/en/content/accredited-bodies-dakks.

Abbreviations used: see last page

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Length				
Groove depth *Pt* and *d* 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 *Ra* *Rz* *Rmax*	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 · *Ra* 0.09 · *Rz* 0.10 · *Rmax*	
Roughness on roughness standards *Ra* *Rz* *Rmax*	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 · *Ra* 0.05 · *Rz* 0.05 · *Rmax*	
Roughness on roughness standards *Rpk* *Rk* *Rvk* *Mr1* *Mr2*	On surfaces in the range 0.1 µm ≤ *Ra* ≤ 4 µm (3.9 µin) (157.5 µin) 0.8 µm ≤ *Rz* ≤ 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 · *Rz* 0.05 · *Rz* 0.04 · *Rz* 4 % 6 %	Relative measuring uncertainty relative to *Rz* Absolute measuring uncertainty relative to 100% material ratio
Roughness on roughness standards *Ra* *Rz* *Rmax*	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 · *Ra* 0.03 · *Rz* 0.03 · *Rmax*	If necessary, the filter cutoff wavelength λc 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.

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement [1]	Remarks
Stylus instruments (Surface) to DIN EN ISO 3274:1998				DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000		$U_{standard}$ is the measuring uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
Pt and d	0.2 µm (7.9 µin)	to	12 µm (472.5 µin)		$U_{standard}$ + 0.01 µm ($U_{standard}$ + 0.4 µin)	
Ra	0.1 µm (3.9 µin)	to	4 µm (157.5 µin)		$U_{standard}$ + 0.01 · Ra ($U_{standard}$ + 0.4 µin · Ra)	
Rz	0.8 µm (31.5 µin)	to	20 µm (787.5 µin)		$U_{standard}$ + 0.01 · Rz ($U_{standard}$ + 0.4 µin · Rz)	
$Rmax$	0.8 µm (31.5 µin)	to	20 µm (787.5 µin)		$U_{standard}$ + 0.01 · $Rmax$ ($U_{standard}$ + 0.4 µin · $Rmax$)	
Stylus instruments (Contour) to DIN EN ISO 3274 and VDI/VDE/DGQ 2604 Bl.1				MK03/07:2021		The measuring uncertainty of mechanical scanning of contour standards and contour stylus instruments of the Mahr GmbH
Distance X		to	100 mm (3.94 in)		1.25 µm (49.2 µin)	
Distance Z		to	10 mm (0.39 in)		1.1 µm (43.3 µin)	
Radii	2 mm (0.079 in)	to	12 mm (0.47 in)		1.6 µm (63.0 µin)	
Angle	40°	to	135°		0.025°	
Straightness		to	20 µm (787.5 µin)		0.36 µm (14.2 µin)	
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 (19.7 µin)	to	20 µm (787.5 µin)		0.05 µm + 2.5 · 10^{-2} · $RONt$ (2.0 µin + 2.5 · 10^{-2} · $RONt$)	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 µm + 2.5 · 10^{-2} · $RONt$ (3.9 µin+ 2.5 · 10^{-2} · $RONt$)	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 µm + 2.5 · 10^{-2} · $RONt$ (3.9 µin + 2.5 · 10^{-2} · $RONt$)	Diameter: 3 mm to 100 mm (0.12 to 3.94 in)
Straightness deviation of the generatices		to	20 µm (787.5 µin)		0.2 µm + 2.0 · 10^{-2} · $STRt$ (7.9 µin + 2.0 · 10^{-2} · $STRt$)	

[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
Parallelism deviation of the generatices		to	20 µm (787.5 µin)		0.3 µm + 1.5 · 10^{-2} · $PARt$ (11.8 µin + 1.5 · 10^{-2} · $PARt$)	Length: 10 mm to 400 mm (0.39 to 15.75 in) $RONt$ = roundness deviation $STRt$ = Straightness deviation $PARt$ = Parallelism deviation $CYLt$ = Cylindricity deviation
Cylindricity deviation		to	20 µm (787.5 µin)		0.4 µm + 3.0 · 10^{-2} · $CYLt$ (15.8 µin + 3.0 · 10^{-2} · $CYLt$)	
Contour standards X length Lateral distances	5 mm (0.20 in)	to	100 mm (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 (0.079 in)	to	12 mm (0.47 in)		0.75 µm (29.5 µin)	
Angles	40 °	to	135 °		0.01 °	
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 (0 µin)	to	1000 mm (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 (> 39.37 in)	to	2000 mm (78.74 in)		0.1 µm + 0.5 · 10^{-6} · l (3.9 µin + 0.5 · 10^{-6} · l)	

[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
Length						
Stylus instruments (surface) to DIN EN ISO 3274:1998				DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000		$U_{standard}$ is the measuring uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
Pt	0.2 µm (7.9 µin)	to	12 µm (472.5 µin)		$U_{standard}$ + 0.01 µm ($U_{standard}$ + 0.4 µin)	
Ra	0.1 µm (3.9 µin)	to	4 µm (157.5 µin)		$U_{standard}$ + 0.01 · *Ra* ($U_{standard}$ + 0.4 µin · *Ra*)	
Rz	0.8 µm (31.5 µin)	to	20 µm (787.5 µin)		$U_{standard}$ + 0.01 · *Rz* ($U_{standard}$ + 0.4 µin · *Rz*)	
Rmax	0.8 µm (31.5 µin)	to	20 µm (787.5 µin)		$U_{standard}$ + 0.01 · *Rmax* ($U_{standard}$ + 0.4 µin · *Rmax*)	
Stylus instruments (Contour) to DIN EN ISO 3274 and VDI/VDE/DGQ 2604 Bl.1				MK03/07:2021		The measuring uncertainty of mechanical scanning of contour standards and contour stylus instruments of the Mahr GmbH
Distance X		to	100 mm (3.94 in)		1.25 µm (49.2 µin)	
Distance Z		to	10 mm (0.39 in)		1.1 µm (43.3 µin)	
Radii	2 mm (0.079 in)	to	12 mm (0.47 in)		1.6 µm (63.0 µin)	
Angle	40°	to	135°		0.025°	
Straightness		to	20 µm (787.5 µin)		0.36 µm (14.2 µin)	
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 (0 µin)	to	1000 mm (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 (> 39.37 in)	to	2000 mm (78.74 in)		0.1 µm + 0.5 · 10^{-6} · *l* (3.9 µin + 0.5 · 10^{-6} · *l*)	

[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.

DAkkS Deutsche Akkreditierungsstelle

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.