

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15030-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 09.12.2020

Date of issue 09.12.2020

Holder of certificate:

**JENOPTIK Industrial Metrology Germany GmbH
Drachenloch 5, 78052 Villingen-Schwenningen**

Calibration in the fields:

Dimensional quantities

Length

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

^{a)} also on-site calibration

The management system requirements in DIN EN ISO/IEC 17025 are written in language relevant to operations of calibration laboratories and operate generally 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 Deutsche Akkreditierungsstelle GmbH.
<https://www.dakks.de/en/content/accredited-bodies-dakks>*

Abbreviations used: see last page

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

Annex to the accreditation certificate D-K-15030-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Length Groove depth P_t on depth setting standards	0,2 μm to 0,8 μm 0,9 μm to 1,5 μm 1,6 μm to 3,5 μm 3,6 μm to 12 μm 13 μm to 100 μm	DIN EN ISO 4287:2010 DIN EN ISO 3274:1998	0,010 μm 0,015 μm 0,025 μm 0,050 μm 0,4 % $\cdot P_t$	
Roughness on geometric standards R_a R_z R_{max} , $R_z I_{max}$ R_{Sm}	0,1 μm to 3,5 μm 0,5 μm to 20 μm 0,5 μm to 20 μm 40 μm to 400 μm	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21: 2013	3 % $\cdot R_a$ 3 % $\cdot R_z$ 3 % $\cdot R_{max}$ 3 μm	If necessary, the cutoff length λ_c can be selected one step shorter or up to two steps longer than specified in the standard, but not more than $\lambda_c = 2,5 \text{ mm}$
Steel test specification 1940 R_a R_z RP_c	0,1 μm to 3,5 μm 0,5 μm to 20 μm $25 \leq RP_c \leq 150$	SEP 1940: issue 10.02 DIN EN 10049:2014	5 % $\cdot R_a$ 5 % $\cdot R_z$ 2 cm^{-1}	Depending on the profile height other intersection line distances can be chosen (as specified)
Roughness on aperiodic roughness standards R_a R_z R_{max} , $R_z I_{max}$	0,1 μm to 3,5 μm 0,5 μm to 20 μm 0,5 μm to 20 μm	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21: 2013	5 % $\cdot R_a$ 5 % $\cdot R_z$ 5 % $\cdot R_{max}$	
R_{pk} R_k R_{vk}	On surfaces in the range	DIN 4776:1990 DIN EN ISO 13565-1:2008 DIN EN ISO 13565-2:2009	4 % 5 % 4 %	Relative measuring uncertainty relative to R_z
$Mr1$ $Mr2$	0,1 $\mu\text{m} \leq R_a \leq 3,5 \mu\text{m}$ 0,5 $\mu\text{m} \leq R_z \leq 20 \mu\text{m}$		4 % 6 %	Relative measuring uncertainty relative to 100 % material ratio
Steel test specification 1940 R_a R_z RP_c	0,1 μm to 3,5 μm 0,5 μm to 20 μm $25 \leq RP_c \leq 100$	SEP 1940: issue 10.02 DIN EN 10049:2014	8 % $\cdot R_a$ 8 % $\cdot R_z$ 2 cm^{-1}	Depending on the profile height other intersection line distances can be chosen (as specified)

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
Roughness on extra fine aperiodic roughness standards <i>Ra</i> <i>Rz</i> <i>Rmax, RzI_{max}</i>	0,015 µm to 0,1 µm 0,1 µm to 0,8 µm 0,1 µm to 0,8 µm	DIN 4768:1990 DIN EN ISO 3274:1998 DIN EN ISO 4287:2010 DIN EN ISO 4288:1998 DIN EN ISO 16610-21:2013	8 % · <i>Ra</i> 9 % · <i>Rz</i> 10 % · <i>Rmax</i>	
<i>Rpk</i> <i>Rk</i> <i>Rvk</i>	On surfaces in the range	DIN 4776:1990 DIN EN ISO 13565-1:2008 DIN EN ISO 13565-2:2009	5 % 6 % 5 %	Relative measuring uncertainty relative to <i>Rz</i>
<i>Mr1</i> <i>Mr2</i>	0,015 µm ≤ <i>Ra</i> ≤ 0,1 µm 0,1 µm ≤ <i>Rz</i> ≤ 0,8 µm		4 % 4 %	Relative measuring uncertainty relative to 100 % material ratio
Stylus instruments according to DIN 4772:1979 DIN EN ISO 3274:1998 Groove depth <i>Pt</i> <i>Ra</i> <i>Rz</i> <i>Rmax, RzI_{max}</i>	0,2 µm to 12 µm 0,1 µm to 3,5 µm 0,5 µm to 20 µm 0,5 µm to 20 µm	DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000	$U_{\text{normal}} + 0,01 \mu\text{m}$ $U_{\text{normal}} + 1 \% \cdot Ra$ $U_{\text{normal}} + 1 \% \cdot Rz$ $U_{\text{normal}} + 1 \% \cdot Rmax$	U_{normal} is the measurement uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
Roundness standards, Diameter: 5 mm to 300 mm:		DIN EN ISO 1101:2017 LSCI and MZCI 500, 150, 50 and 15 W/U		
Roundness deviation	to 10 µm > 10 µm to 20 µm		0,05 µm 0,1 µm	
Magnification standards (flick standards) non-circular balls		DIN EN ISO 1101:2017 LSCI, MZCI and MCCI		
Roundness deviation	2 µm to 20 µm > 20 µm to 60 µm > 60 µm to 500 µm	500, 150, 50 and 15 W/U	0,2 µm 0,3 µm 0,5 % of measured value	
Cylindrical form standards Diameter: 3 mm to 300 mm Length: 5 mm to 300 mm:		DIN EN ISO 1101:2017 LSCI and MZCI 500, 150, 50 and 15 W/U		
Roundness deviation	to 20 µm		0,1 µm	

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Straightness deviation of the generatrices Length: 2 mm to 300 mm	to 10 µm	DIN EN ISO 1101:2017 LSLI and MZLI lc = 0,25 mm, lc = 0,8 mm, lc = 2,5 mm	0,2 µm	
	> 10 µm to 20 µm		0,2 µm	
	> 100 mm to 300 mm		0,3 µm	
Cylindrical form standards Parallelism deviation of the generatrices Length: 2 mm to 300 mm	to 10 µm	DIN EN ISO 1101:2017 LSLI and MZLI lc = 0,25 mm, lc = 0,8 mm, lc = 2,5 mm	0,3 µm	
	> 10 µm to 20 µm		0,3 µm	
	> 100 mm to 300 mm		0,4 µm	
Contour standards X Length Lateral distances	5 mm to 100 mm	Substitution measurement with reference contour standard according to VDI 2629 part 1:2008 Procedure according to DIN EN ISO 15530-3:2012	0,6 µm	
	to 10 mm		0,75 µm	
	2 mm to 12 mm		0,75 µm	
	40° to 135°		0,01°	
Cam standards Cams (N1 and N2) Thickness	10 mm to 100 mm	Substitution measurement with reference cam standard Procedure according to DIN EN ISO 15530-3:2012	1,5 µm	Reference element: - Base circle - Bearings L1, L2 or L2, L3
	to 20 µm		1,5 µm	
	to 20 µm		1,5 µm	
	to 20 µm		1,5 µm	
	to 20 µm		1,5 µm	
	to 20 µm		1,5 µm	
	1 mm to 20 mm		1,5 µm	
	10 mm to 100 mm		1,5 µm	
	10 mm to 50 mm		1,5 µm	

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Base circle run-out	to 50 µm	Substitution measurement with reference cam standard	1,5 µm	Reference element: - Bearings L1, L2 or L2, L3
Straightness deviation	to 20 µm	Procedure according to DIN EN ISO 15530-3:2012	0,4 µm	
Parallelism deviation	to 20 µm		0,5 µm	
Angle N2 – N1	0° to 360°		0,01°	Reference element: - Base circle - Bearings L1, L2 or L2, L3
Eccentric (Ex1 and Ex2) Diameter	10 mm to 100 mm		1,5 µm	
Eccentricity deviation	1 mm to 20 mm		1,5 µm	Reference element: - Bearings L1, L2 or L2, L3
Roundness deviation	to 10 µm		0,3 µm	
Straightness deviation	to 10 µm		0,3 µm	
Parallelism deviation	to 10 µm		0,5 µm	
Cylindricity deviation	to 10 µm		0,5 µm	
Bearings (L1, L2 and L3) Diameter	10 mm to 100 mm	Substitution measurement with reference cam standard	1,5 µm	
Roundness deviation	to 10 µm	Procedure according to DIN EN ISO 15530-3:2012	0,3 µm	
Straightness deviation	to 10 µm		0,3 µm	
Parallelism deviation	to 10 µm		0,5 µm	
Cylindricity deviation	to 10 µm		0,5 µm	

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 according to DIN 4772:1979 DIN EN ISO 3274:1998 Groove depth P_t R_a R_z R_{max} , $R_z I_{max}$	 0,2 µm to 12 µm 0,1 µm to 3,5 µm 0,5 µm to 20 µm 0,5 µm to 20 µm	 DKD-R 4-2 part 2:2018 DIN EN ISO 12179:2000	 $U_{normal} + 0,01 \mu m$ $U_{normal} + 1 \% \cdot R_a$ $U_{normal} + 1 \% \cdot R_z$ $U_{normal} + 1 \% \cdot R_{max}$	 U_{normal} is the measurement uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.

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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Abbreviations used:

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DIN	Deutsches Institut für Normung e.V.
DKD-R	Guideline of Deutschen Kalibrierdienstes (DKD), published by the Physikalisch-Technischen Bundesanstalt
VDI	Verein Deutscher Ingenieure e.V.

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