

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

JENOPTIK Industrial Metrology Germany GmbH
Alte Tuttlinger Straße 20, 78056 Villingen-Schwenningen

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out calibrations in the following fields:

Dimensionelle Messgrößen

Länge

- Rauheit
- Formabweichung
- Kontur
- Tastschnittgeräte ^{a)}

^{a)} auch Vor-Ort-Kalibrierung

The accreditation certificate shall only apply in connection with the notice of accreditation of 03.05.2018 with the accreditation number D-K-15030-01 and is valid until 02.05.2023. 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 -15030-01-00**

Braunschweig,
03.05.2018

Dr. Heike Manke
Head of Division

Translation issued:
15.11.2018

Head of Division

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

See notes overleaf.



Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Europa-Allee 52
60327 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkKS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:

EA: www.european-accreditation.org

ILAC: www.ilac.org

IAF: www.iaf.nu

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15030-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 03.05.2018 to 02.05.2023

Date of issue: 03.05.2018

Holder of certificate:

JENOPTIK Industrial Metrology Germany GmbH
Alte Tuttlinger Straße 20, 78056 Villingen-Schwenningen

Head:

Dr. Raimund Volk

Deputy head:

Dipl.-Ing. (FH) Stefan Feifel

Accredited as calibration laboratory since: 23.09.1980

Calibration in the fields:

Dimensional quantities

Length

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

^{a)} also on-site calibration

Abbreviations used: see last page

Permanent Laboratory

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability 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 % · P_t	
Roughness on geometric standards R_a R_z R_{max} , R_{z1max} 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 % · R_a 3 % · R_z 3 % · R_{max} 3 µm	If necessary, the cutoff length λ_c can be select- ed one step shorter or up to two steps longer than specified in the standard, but not more than $\lambda_c = 2,5$ 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 % · R_a 5 % · 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_{z1max}	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 % · R_a 5 % · R_z 5 % · 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 un- certainty 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 % · R_a 8 % · R_z 2 cm^{-1}	Depending on the profile height other intersection line distances can be chosen (as specified)
Roughness on extra fine aperiodic roughness standards R_a R_z R_{max} , R_{z1max}	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 % · R_a 9 % · R_z 10 % · 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	5 % 6 % 5 %	Relative measuring un- certainty relative to R_z
$Mr1$ $Mr2$	$0,015 \mu\text{m} \leq R_a \leq 0,1 \mu\text{m}$ $0,1 \mu\text{m} \leq R_z \leq 0,8 \mu\text{m}$		4 % 4 %	Relative measuring uncertainty relative to 100% material ratio

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 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.

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

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
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	DAkkS-DKD-R 4-2 Blatt 2:2010 DIN EN ISO 12179:2000	$U_{\text{normal}} + 0,01 \mu\text{m}$ $U_{\text{normal}} + 1 \% \cdot R_a$ $U_{\text{normal}} + 1 \% \cdot R_z$ $U_{\text{normal}} + 1 \% \cdot R_{max}$	U_{normal} is the measure- ment uncertainty of the standards used. Smaller measuring ranges for which stand-ards are available can also be calibrated.
Roundness standards, Diameter: 5 mm to 300 mm:		LSC and MZC 500, 150, 50 and 15 W/U		
Roundness deviation	to 10 μm	Gauss filter 50 % 2 RC 75 %	0,05 μm	
	> 10 μm to 20 μm		0,1 μm	
Magnification standards (flick standards) non-circular balls		LSC, MZC and MCC		
Roundness deviation	2 μm to 20 μm	500, 150, 50 and 15 W/U	0,2 μm	
	> 20 μm to 60 μm	Gauss filter 50 % 2 RC 75 %	0,3 μm	
	> 60 μm to 500 μm		0,5 % of measured value	
Cylindrical form standards Diameter: 3 mm to 300 mm Length: 5 mm to 300 mm:		LSC and MZC 500, 150, 50 and 15 W/U Gauss filter 50 % 2 RC 75 %		
Roundness deviation	to 20 μm		0,1 μm	
Straightness deviation of the generatrices Length: 2 mm to 300 mm	to 10 μm	LSS and MZS $l_c = 0,25 \text{ mm}$,	0,2 μm	
Length: 2 mm to 100 mm	> 10 μm to 20 μm	$l_c = 0,8 \text{ mm}$, $l_c = 2,5 \text{ mm}$	0,2 μm	
Length: > 100 mm to 300 mm		Gauss filter 50 % 2 RC 75 %	0,3 μm	
Cylindrical form standards Parallelism deviation of the generatrices Length: 2 mm to 300 mm	to 10 μm	LSS and MZS $l_c = 0,25 \text{ mm}$,	0,3 μm	
Length: 2 mm to 100 mm	> 10 μm to 20 μm	$l_c = 0,8 \text{ mm}$, $l_c = 2,5 \text{ mm}$	0,3 μm	
Length: > 100 mm to 300 mm		Gauss filter 50 % 2 RC 75 %	0,4 μm	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
Contour standards X Length Lateral distances	5 mm to 100 mm	Substitution measure- ment with reference contour standard according to VDI 2629 part 1:2008 Procedure according to DIN EN ISO 15530-3:2012	0,6 µm	
Z Length Vertical distances	to 10 mm		0,75 µm	
Radii	2 mm to 12 mm		0,75 µm	
Angles	40° to 135°		0,01°	
Cam standards Cams (N1 and N2) Thickness	10 mm to 100 mm	Substitution measure- ment 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
Form deviation maximum	to 20 µm		1,5 µm	
Form deviation positive base circle	to 20 µm		1,5 µm	
Form deviation negative base circle	to 20 µm		1,5 µm	
Form deviation positive main cam	to 20 µm		1,5 µm	
Form deviation negative main cam	to 20 µm		1,5 µm	
Cam pitch	1 mm to 20 mm		1,5 µm	
Cam height	10 mm to 100 mm		1,5 µm	
Base circle radius	10 mm to 50 mm		1,5 µm	
Base circle run-out	to 50 µm		1,5 µm	Reference element: - Bearings L1, L2 or L2, L3
Straightness deviation	to 20 µm		0,4 µm	
Parallelism deviation	to 20 µm		0,5 µm	Reference element: - Base circle - Bearings L1, L2 or L2, L3
Angle N2 – N1	0° to 360°		0,01°	
Eccentric (Ex1 and Ex2) Diameter	10 mm to 100 mm		1,5 µm	Reference element: - Bearings L1, L2 or L2, L3
Eccentricity deviation	1 mm to 20 mm		1,5 µm	
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	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
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

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
according to DIN 4772:1979 DIN EN ISO 3274:1998				U_{normal} is the measurement uncertainty of the standards used. Smaller measuring ranges for which standards are available can also be calibrated.
Groove depth P_t	0,2 µm to 12 µm	DAKKS-DKD-R 4-2	$U_{\text{normal}} + 0,01 \mu\text{m}$	
R_a	0,1 µm to 3,5 µm	part 2:2010	$U_{\text{normal}} + 1 \% \cdot R_a$	
R_z	0,5 µm to 20 µm	DIN EN ISO 12179:2000	$U_{\text{normal}} + 1 \% \cdot R_z$	
$R_{\text{max}}, R_{z1\text{max}}$	0,5 µm to 20 µm		$U_{\text{normal}} + 1 \% \cdot R_{\text{max}}$	

verwendete Abkürzungen:

DAKKS-DKD-R Calibration Guideline of Deutschen Akkreditierungsstelle GmbH
VDI/VDE 2629 Guideline: Accuracy of contour-measuring systems

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 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.