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Annex to the Accreditation Certificate D-K-15199-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: **02.08.2022**

Date of issue: 30.08.2022

Holder of accreditation certificate:

FRENCO GmbH
Jacob-Baier-Straße 3, 90518 Altdorf

The calibration laboratory meets the minimal requirements of DIN EN ISO/IEC 17025:2018 and, if applicable, additional legal and normative requirements, including those in relevant sectoral schemes, in order to carry out the conformity assessment activities listed below.
The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories and confirm generally with the principles of DIN EN ISO 9001.

Calibration in the fields:

Dimensional quantities
Length
– **Gear quantities**

This certificate annex is only valid together with the written accreditation certificate and reflects the status as indicated by the date of issue. The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at https://www.dakks.de.

Abbreviations used: see last page

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded measurement of uncertainty	Remarks
Length				
Gear quantities Involute artefact	Base diameter: d_b Evaluation range: L_α	VDI/VDE 2612-1:2018 Substitution measuring with gear devices:		External gears
F_α $f_{H\alpha}$ $f_{f\alpha}$	15 mm ≤ d_b ≤ 50 mm 3 mm ≤ L_α ≤ 8 mm	Correction of F_α, $f_{H\alpha}$ by comparision against involute artefact with	1.1 µm 0.9 µm 0.6 µm	Symbols according to ISO 1328-1:2018
F_α $f_{H\alpha}$ $f_{f\alpha}$	10 mm ≤ d_b ≤ 60 mm 2 mm ≤ L_α ≤ 15 mm	d_b = 29.8779 mm L_α = 5 mm	1.6 µm 1.4 µm 0.6 µm	
F_α $f_{H\alpha}$ $f_{f\alpha}$	80 mm ≤ d_b ≤ 120 mm 14 mm ≤ L_α ≤ 42 mm	Correction of F_α, $f_{H\alpha}$ by comparision against involute artefact with	1.1 µm 0.9 µm 0.6 µm	
F_α $f_{H\alpha}$ $f_{f\alpha}$	60 mm ≤ d_b ≤ 130 mm 8 mm ≤ L_α ≤ 48 mm	d_b = 93.96 mm L_α = 37 mm	1.6 µm 1.4 µm 0.6 µm	
F_α $f_{H\alpha}$ $f_{f\alpha}$	d_b ≤ 60 mm L_α ≤ 15 mm	VDI/VDE 2612-1:2018 Measurement without correction; traceability proved by involute artefact with d_b = 28.8779 mm, L_α = 5 mm	1.8 µm 1.6 µm 0.6 µm	
F_α $f_{H\alpha}$ $f_{f\alpha}$	8 mm ≤ d_b ≤ 150 mm L_α ≤ 74 mm	Measurement without correction; traceability proved by involute artefact with d_b = 93.96 mm L_α = 37 mm	1.8 µm 1.6 µm 0.6 µm	

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded measurement of uncertainty	Remarks
Gear quantities Helix artefacts	Reference diameter: d Helix angle: β Evaluation range: L_β	VDI/VDE 2612-1:2018 Substitution measuring with gear devices:		External gears
F_β $f_{H\beta}$ $f_{f\beta}$	15 mm ≤ d ≤ 40 mm β = 0° 20 mm ≤ L_β ≤ 50 mm	Correction of F_β, $f_{H\beta}$ by comparision against helix artefact with	1.1 µm 0.9 µm 0.7 µm	Symbols according to ISO 1328-1:2018
F_β $f_{H\beta}$ $f_{f\beta}$	10 mm ≤ d ≤ 80 mm 0° ≤ β ≤ 20° 10 mm ≤ L_β ≤ 60 mm	d = 34.5 mm β = 0° L_β = 35 mm	1.4 µm 1.2 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	85 mm ≤ d ≤ 125 mm β = 0° 56 mm ≤ L_β ≤ 102 mm	Correction of F_β, $f_{H\beta}$ by comparision against helix artefact with	1.1 µm 0.9 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	70 mm ≤ d ≤ 135 mm β = 0° 30 mm ≤ L_β ≤ 120 mm	d = 100 mm β = 0° β = 15° r+l β = 30° r+l L_β = 94 mm	1.3 µm 1.1 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	85 mm ≤ d ≤ 125 mm 10° ≤ β ≤ 20° 56 mm ≤ L_β ≤ 102 mm		1.2 µm 1.0 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	70 mm ≤ d ≤ 135 mm 7° ≤ β ≤ 23° 46 mm ≤ L_β ≤ 112 mm		1.4 µm 1.2 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	85 mm ≤ d ≤ 125 mm 25° ≤ β ≤ 35° 56 mm ≤ L_β ≤ 102 mm		1.5 µm 1.3 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	70 mm ≤ d ≤ 135 mm 23° ≤ β ≤ 37° 46 mm ≤ L_β ≤ 112 mm		1.7 µm 1.5 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	d ≤ 80 mm 0° ≤ β ≤ 20° L_β ≤ 60 mm	VDI/VDE 2612-1:2018 Measurement without correction; traceability proved by helix artefact with d = 34.5 mm β = 0° L_β = 35 mm	1.4 µm 1.2 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	10 mm ≤ d ≤ 160 mm β = 0° 10 mm ≤ L_β ≤ 130 mm	Measurement without correction; traceability proved by helix artefact with d = 100 mm, L_β = 94 mm β = 0° β = 15° r+l β = 30° r+l	1.4 µm 1.2 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	10 mm ≤ d ≤ 160 mm 0° ≤ β ≤ 20° 10 mm ≤ L_β ≤ 130 mm		1.5 µm 1.3 µm 0.7 µm	
F_β $f_{H\beta}$ $f_{f\beta}$	10 mm ≤ d ≤ 160 mm 20° ≤ β ≤ 40° 10 mm ≤ L_β ≤ 130 mm		1.8 µm 1.6 µm 0.7 µm	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded measurement of uncertainty	Remarks
Pitch and runout F_P f_P F_r	Reference diameter: d Normal module: M_n 5 mm ≤ d ≤ 350 mm M_n ≥ 0.5	AA-05:2022-04 According to „Rosette method“ on gear measuring device.	 0.7 µm 0.6 µm 1.0 µm	External gears Symbols according to ISO 1328-1:2018
Pitch and runout F_P f_P F_r	Reference diameter: d Normal module: M_n 5 mm ≤ d ≤ 350 mm M_n ≥ 0.5	AA-05:2022-04 According to „reduced three-rosette method“ on gear measuring device.	 0.7 µm 0.6 µm 1.0 µm	
Dimension over balls M_{dK}	Dimension over balls: M_{dK} Helix angle: β Normal module: M_n M_{dK} ≤ 240 mm β ≥ 0° M_n ≥ 0.5	VDI/VDE 2613:2003 Measurement of M_{dK} on length comparator compared to traceable setting standard	 1.2 µm	

Abbreviations used:

AA	Calibration Guide of FRENCO GmbH
CMC	Calibration and measurement capabilities
DIN	Deutsches Institut für Normung e.V.
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik e.V.
VDI	Verein Deutscher Ingenieure e.V.

β	Helix angle
d	Reference diameter
d_b	Base diameter
F_α	Total profile deviation
$f_{H\alpha}$	Profile angle deviation
$f_{f\alpha}$	Profile form deviation
F_β	Total helix deviation
$f_{f\beta}$	Helix form deviation
$f_{H\beta}$	Helix slope deviation
F_p	Total pitch error
f_p	Single pitch deviation
F_r	Runout error
L_α	Profile evaluation range
L_β	Helix evaluation range
M_{dK}	Dimension over balls
M_n	Normal module
r+l	Right hand and left hand