

Deutsche Akkreditierungsstelle

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>.

Annex to the Accreditation Certificate D-K-15199-01-00

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 $f_{H\alpha}$ $f_{i\alpha}$	$15 \text{ mm} \leq d_b \leq 50 \text{ mm}$ $3 \text{ mm} \leq L_\alpha \leq 8 \text{ mm}$	Correction of $F_\alpha, f_{H\alpha}$ by comparison against involute artefact with	1.1 μm 0.9 μm 0.6 μm	Symbols according to ISO 1328-1:2018
F_α $f_{H\alpha}$ $f_{i\alpha}$	$10 \text{ mm} \leq d_b \leq 60 \text{ mm}$ $2 \text{ mm} \leq L_\alpha \leq 15 \text{ mm}$	$d_b = 29.8779 \text{ mm}$ $L_\alpha = 5 \text{ mm}$	1.6 μm 1.4 μm 0.6 μm	
F_α $f_{H\alpha}$ $f_{i\alpha}$	$80 \text{ mm} \leq d_b \leq 120 \text{ mm}$ $14 \text{ mm} \leq L_\alpha \leq 42 \text{ mm}$	Correction of $F_\alpha, f_{H\alpha}$ by comparison against involute artefact with	1.1 μm 0.9 μm 0.6 μm	
F_α $f_{H\alpha}$ $f_{i\alpha}$	$60 \text{ mm} \leq d_b \leq 130 \text{ mm}$ $8 \text{ mm} \leq L_\alpha \leq 48 \text{ mm}$	$d_b = 93.96 \text{ mm}$ $L_\alpha = 37 \text{ mm}$	1.6 μm 1.4 μm 0.6 μm	
F_α $f_{H\alpha}$ $f_{i\alpha}$	$d_b \leq 60 \text{ mm}$ $L_\alpha \leq 15 \text{ mm}$	VDI/VDE 2612-1:2018 Measurement without correction; traceability proved by involute artefact with $d_b = 28.8779 \text{ mm}$, $L_\alpha = 5 \text{ mm}$	1.8 μm 1.6 μm 0.6 μm	
F_α $f_{H\alpha}$ $f_{i\alpha}$	$8 \text{ mm} \leq d_b \leq 150 \text{ mm}$ $L_\alpha \leq 74 \text{ mm}$	Measurement without correction; traceability proved by involute artefact with $d_b = 93.96 \text{ mm}$ $L_\alpha = 37 \text{ mm}$	1.8 μm 1.6 μm 0.6 μm	

Annex to the Accreditation Certificate D-K-15199-01-00

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 $f_{H\beta}$ $f_{I\beta}$	15 mm $\leq d \leq$ 40 mm $\beta = 0^\circ$ 20 mm $\leq L_\beta \leq$ 50 mm	Correction of $F_\beta, f_{H\beta}$ by comparison against helix artefact with	1.1 μm 0.9 μm 0.7 μm	Symbols according to ISO 1328-1:2018
F_β $f_{H\beta}$ $f_{I\beta}$	10 mm $\leq d \leq$ 80 mm $0^\circ \leq \beta \leq$ 20° 10 mm $\leq L_\beta \leq$ 60 mm	$d = 34.5$ mm $\beta = 0^\circ$ $L_\beta = 35$ mm	1.4 μm 1.2 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	85 mm $\leq d \leq$ 125 mm $\beta = 0^\circ$ 56 mm $\leq L_\beta \leq$ 102 mm	Correction of $F_\beta, f_{H\beta}$ by comparison against helix artefact with	1.1 μm 0.9 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	70 mm $\leq d \leq$ 135 mm $\beta = 0^\circ$ 30 mm $\leq L_\beta \leq$ 120 mm	$d = 100$ mm $\beta = 0^\circ$ $\beta = 15^\circ r+l$ $\beta = 30^\circ r+l$ $L_\beta = 94$ mm	1.3 μm 1.1 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	85 mm $\leq d \leq$ 125 mm $10^\circ \leq \beta \leq$ 20° 56 mm $\leq L_\beta \leq$ 102 mm		1.2 μm 1.0 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	70 mm $\leq d \leq$ 135 mm $7^\circ \leq \beta \leq$ 23° 46 mm $\leq L_\beta \leq$ 112 mm		1.4 μm 1.2 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	85 mm $\leq d \leq$ 125 mm $25^\circ \leq \beta \leq$ 35° 56 mm $\leq L_\beta \leq$ 102 mm		1.5 μm 1.3 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	70 mm $\leq d \leq$ 135 mm $23^\circ \leq \beta \leq$ 37° 46 mm $\leq L_\beta \leq$ 112 mm		1.7 μm 1.5 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	$d \leq$ 80 mm $0^\circ \leq \beta \leq$ 20° $L_\beta \leq$ 60 mm	VDI/VDE 2612-1:2018 Measurement without correction; traceability proved by helix artefact with $d = 34.5$ mm $\beta = 0^\circ$ $L_\beta = 35$ mm	1.4 μm 1.2 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	10 mm $\leq d \leq$ 160 mm $\beta = 0^\circ$ 10 mm $\leq L_\beta \leq$ 130 mm	Measurement without correction; traceability proved by helix artefact with	1.4 μm 1.2 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	10 mm $\leq d \leq$ 160 mm $0^\circ \leq \beta \leq$ 20° 10 mm $\leq L_\beta \leq$ 130 mm	$d = 100$ mm, $L_\beta = 94$ mm $\beta = 0^\circ$ $\beta = 15^\circ r+l$ $\beta = 30^\circ r+l$	1.5 μm 1.3 μm 0.7 μm	
F_β $f_{H\beta}$ $f_{I\beta}$	10 mm $\leq d \leq$ 160 mm $20^\circ \leq \beta \leq$ 40° 10 mm $\leq L_\beta \leq$ 130 mm		1.8 μm 1.6 μm 0.7 μm	

Valid from: 02.08.2022

Date of issue: 30.08.2022

Annex to the Accreditation Certificate D-K-15199-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded measurement of uncertainty	Remarks
Pitch and runout F_P $f_{\bar{P}}$ F_r	Reference diameter: d Normal module: M_n $5 \text{ mm} \leq d \leq 350 \text{ mm}$ $M_n \geq 0.5$	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 $f_{\bar{P}}$ F_r	Reference diameter: d Normal module: M_n $5 \text{ mm} \leq d \leq 350 \text{ mm}$ $M_n \geq 0.5$	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 $M_{dK} \leq 240 \text{ mm}$ $\beta \geq 0^\circ$ $M_n \geq 0.5$	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	F_P	Total pitch error
d	Reference diameter	$f_{\bar{P}}$	Single pitch deviation
d_b	Base diameter	F_r	Runout error
F_α	Total profile deviation	L_α	Profile evaluation range
$f_{H\alpha}$	Profile angle deviation	L_β	Helix evaluation range
$f_{i\alpha}$	Profile form deviation	M_{dK}	Dimension over balls
F_β	Total helix deviation	M_n	Normal module
$f_{i\beta}$	Helix form deviation	r+l	Right hand and left hand
$f_{H\beta}$	Helix slope deviation		