Deutsche Akkreditierungsstelle GmbH

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

Valid from: 22.06.2020

Date of issue: 22.06.2020

Holder of certificate:

FRENCO GmbH
Jacob-Baier-Straße 3, 90518 Altdorf

Calibration in the fields:

Dimensional quantities
Length
- **Gear quantities**

Abbreviations used: see last page

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

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1]	Remarks
Length				
Gear quantities Involute artefact	Base diameter: d_b Evaluation range: L_α	Substitution measuring with gear devices:		Niveau I 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	Evaluation according to guidelines
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	VDI/VDE 2607:2000 VDI/VDE 2612:2018
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	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	

[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
Gear quantities Helix artefacts	Reference diameter: d Helix angle: β Evaluation range: L_β	Substitution measuring with gear devices:		Niveau I 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	Evaluation according to guidelines
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	VDI/VDE 2607:2000 VDI/VDE 2612:2018
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	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	

[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
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	According to „Rosette method“ on gear measuring device. To be carried out according to working instructions of the Laboratory QM	 0,7 µm 0,6 µm 1,0 µm	Niveau I External gears Symbols according to ISO 1328-1:2018 Evaluation according to guidelines VDI/VDE 2613:2003
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	Measurement of M_{dK} on length comparator compared to traceable setting standard in accordance with working instructions of the Laboratory QM	 1,2 µm	

Abbreviations used:

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

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

[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.