Στοιχεία Μηχανών – ΙΙ

Εργαστηριακή Άσκηση –

Πίνακες ανοχών οδοντωτών τροχών

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Ανοχές οδοντωτών τροχών – Πρότυπα

INTERNATIONAL STANDARD

ISO 1328-1

Second edition
2013-09-01

Cylindrical gears — ISO system of flank tolerance classification —

Part 1:
Definitions and allowable values of deviations relevant to flanks of gear teeth

Engrenages cylindriques — Système ISO de classification des tolérances sur flancs —

Partie 1: Définitions et valeurs admissibles des écarts pour les flancs de la denture

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ISO 1328-2

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Cylindrical gears — ISO system of accuracy —

Part 2:
Definitions and allowable values of deviations relevant to radial composite deviations and runout information

Engrenages cylindriques — Système ISO de précision —

Partie 2: Définitions et valeurs admissibles des écarts composés radiaux et information sur le faux-rond

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Ανοχές οδοντωτών τροχών – Πρότυπα ISO 1328

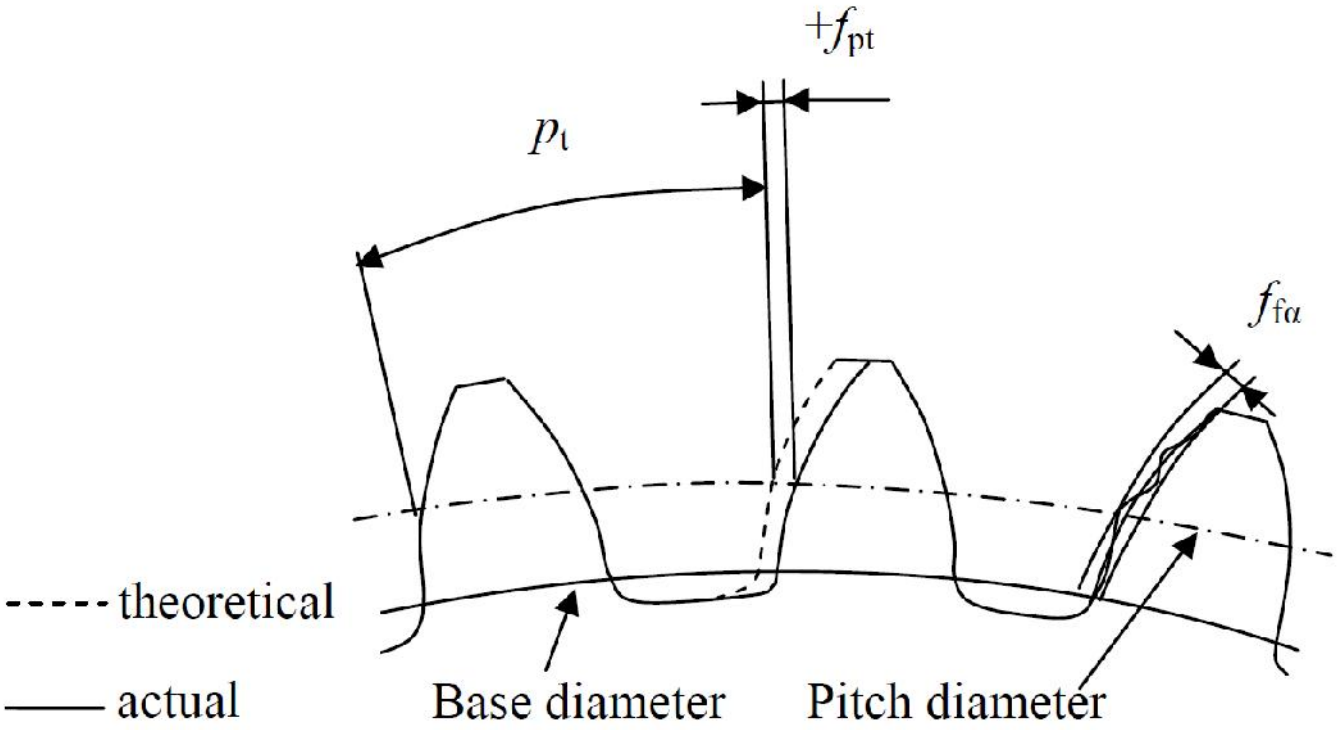
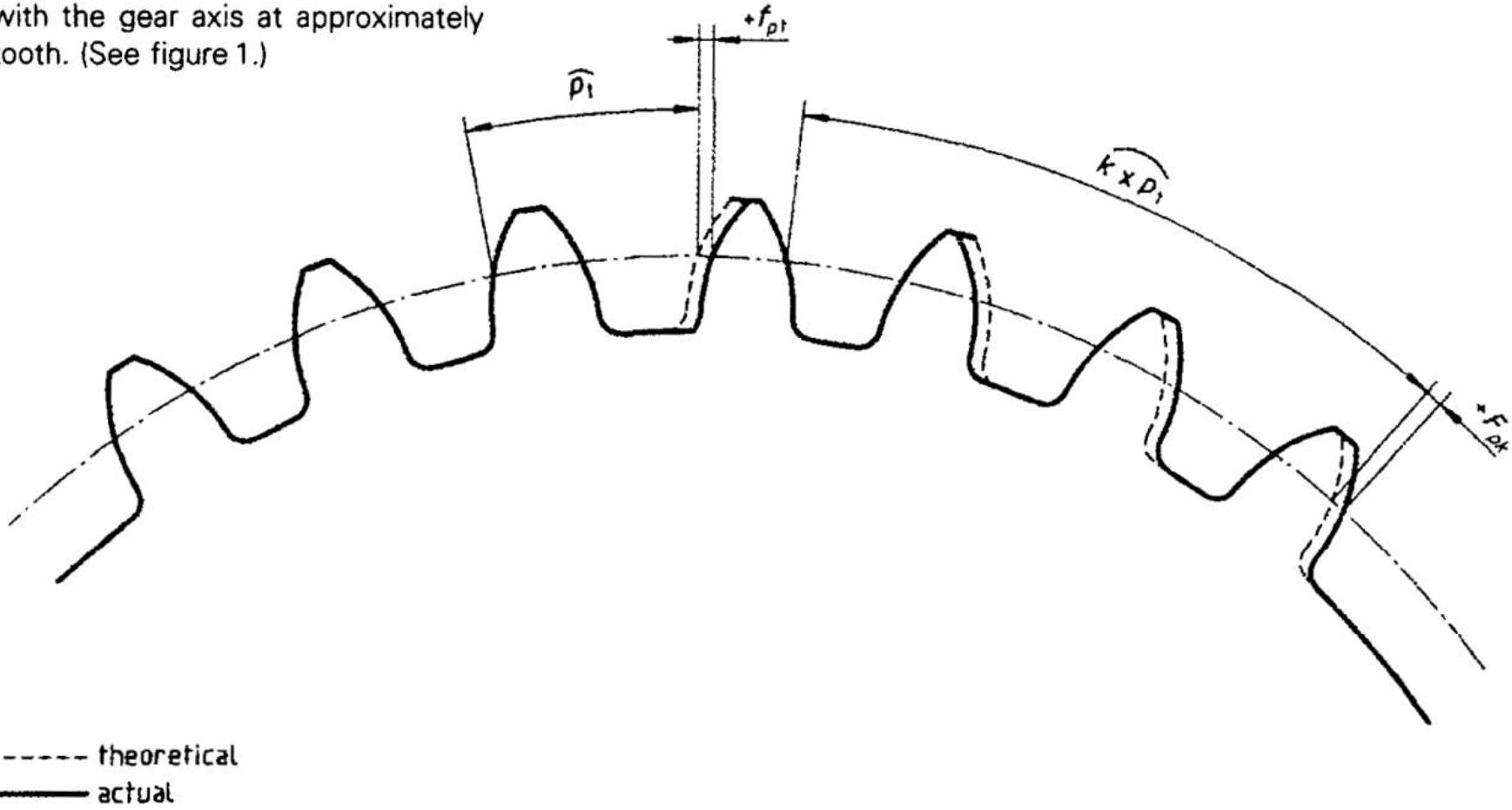


Figure 2. Schematic illustration of the transverse pitch deviation p_p, the single pitch deviation f_{pt}, and the profile form deviation $f_{f\alpha}$.

3.1.1 single pitch deviation (f_{pt}): Algebraic difference between the actual pitch and the corresponding theoretical pitch in the transverse plane, defined on a circle concentric with the gear axis at approximately mid-depth of the tooth. (See figure 1.)



In this example $F_{pk} = F_{p3}$

Figure 1 — Pitch deviations

3.1.2 cumulative pitch deviation (F_{pk}): Algebraic difference, over any sector of k pitches, between the actual length and the theoretical length of the relevant arc. (See figure 1.) In theory, it is equal to the algebraic sum of the single pitch deviations of the same k pitches.

3.1.3 total cumulative pitch deviation (F_p): Maximum cumulative pitch deviation of any sector (with $k = 1$ up to $k = z$) of the corresponding flanks of a gear. It is represented by the total amplitude of the cumulative pitch deviation curve.

1 General

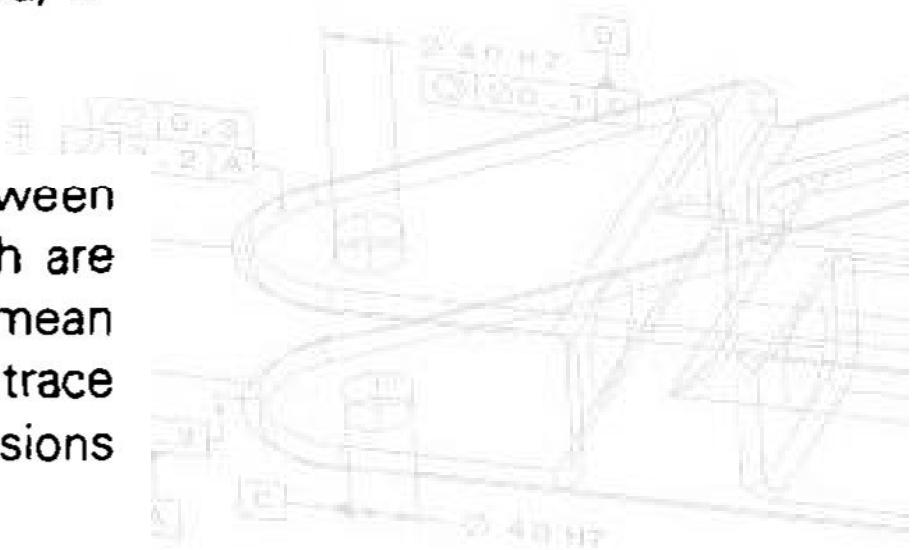
1.1 Symbols and designations

a	Centre distance
a_d	Reference centre distance
a''	Two-flank working distance
b	Facewidth
d	Reference diameter
f_f	Profile form deviation
f_i'	Single-flank working error
f_i''	Two-flank working error
f_p	Individual pitch deviation
f_{pe}	Normal base pitch deviation
f_u	Pitch error
$f_{H\alpha}$	Profile angle deviation
$f_{H\beta}$	Tooth trace angle deviation
$f_{f\beta}$	Tooth trace form deviation
$f_{w\beta}$	Tooth trace waviness
m	Module
m_n	Normal module
m_t	Transverse module
s_n	Normal tooth thickness on the reference cylinder
s_t	Transverse tooth thickness on the reference cylinder
z	Number of teeth
z_1	Number of teeth of pinion
z_2	Number of teeth of gear
A^*	Allowance factor
A, B, C	Test groups
C_b	Tooth trace relief with longitudinal crowning
F_f	Total profile deviation
F_i'	Single-flank working deviation
F_i''	Two-flank working deviation
F_p	Total pitch deviation
F_{pk}	Pitch-span deviation over k pitches
$F_{pz/8}$	Pitch-span deviation over 1/8 of gear periphery
F_r	Concentricity deviation
F_E	Generator total deviation
F_β	Tooth trace total deviation
G, L, N, T	Function groups
L	Arc length on reference circle
R_s	Tooth thickness fluctuation
R_t	Peak-to-valley height
R_{Md}	Fluctuation of diametral two-ball or two-roller dimension
R_W	Base tangent length fluctuation
TRA	Bearing surface
T_s	Tooth thickness tolerance
α	Pressure angle
α_n	Normal pressure angle
α_t	Transverse pressure angle
α_{wt}	Working pressure angle
α''	Pressure angle with two-flank working test with master gear
β	Helix angle
φ	Tolerance increment from gear tooth quality to gear tooth quality

3.2 Profile deviations

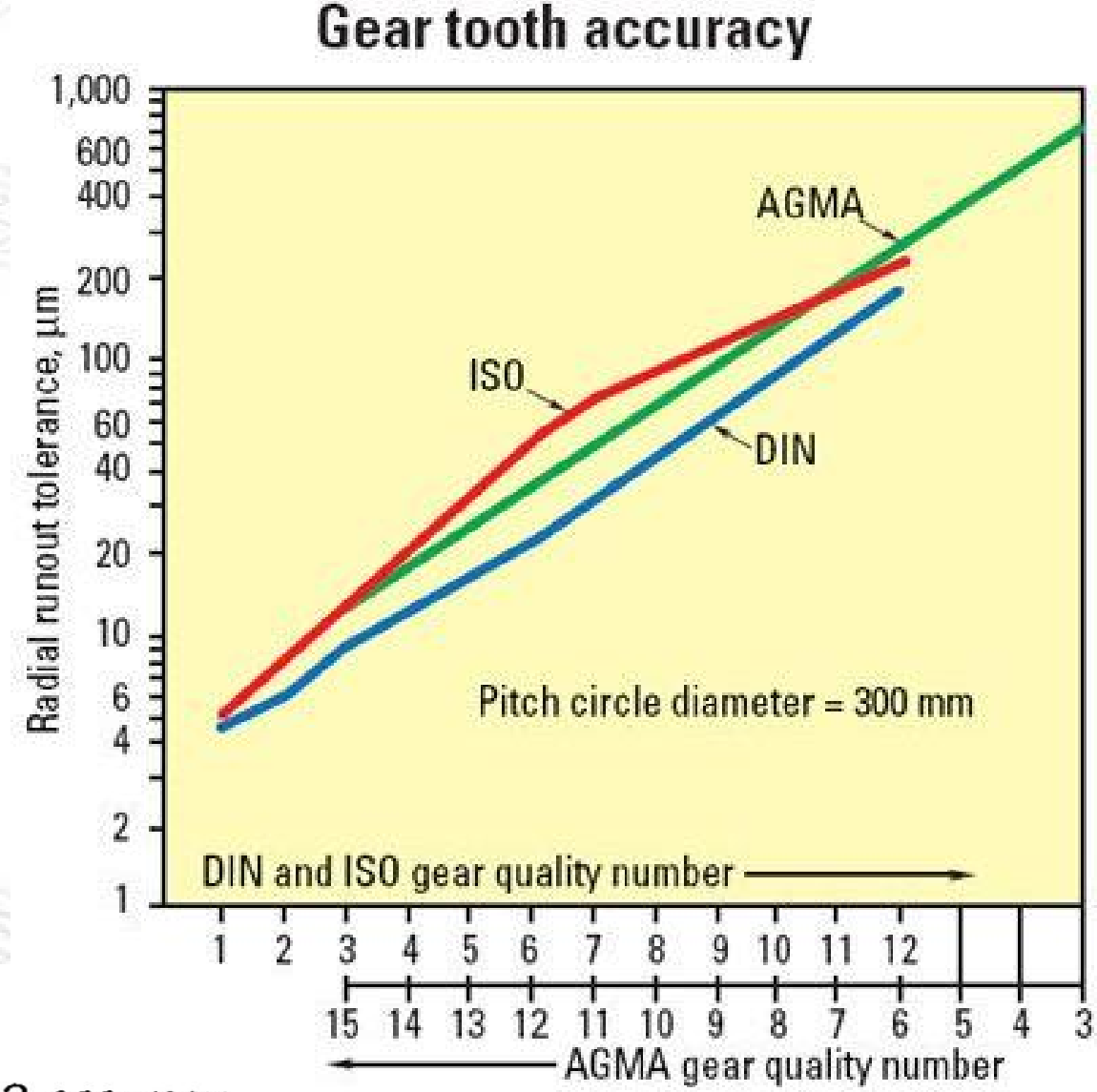
3.2.1 profile deviation: Amount by which an actual profile deviates from the design profile. It is in the transverse plane and normal to the involute profile.

3.2.1.4 design profile: A profile consistent with the design specification. When not otherwise qualified, it is the profile in a transverse plane.



3.2.3 profile form deviation ($f_{f\alpha}$): Distance between two facsimiles of the mean profile trace, which are each placed with constant separation from the mean profile trace, so as to enclose the actual profile trace over the evaluation range L_α, subject to the provisions of 3.2.1.3. [See figure 2 b).]

3.2.4 profile slope deviation ($f_{H\alpha}$): Distance between two design profile traces which intersect the mean profile trace at the endpoints of the evaluation range L_α. [See figure 2 c).]



5.1 ISO system of accuracy

The ISO system of accuracy comprises 13 accuracy grades of which grade 0 is the highest and grade 12 is the lowest degree of accuracy.

When a statement concerning required accuracy is made in documents, reference to ISO 1328-1 or ISO 1328-2, as appropriate, shall be included.

Table 1 — Single pitch deviation, $\pm f_{pt}$

Reference diameter d mm	Module m mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		$\pm f_{pt}$ µm												
$5 \leqslant d \leqslant 20$	$0{,}5 \leqslant m \leqslant 2$	0,8	1,2	1,7	2,3	3,3	4,7	6,5	9,5	13,0	19,0	26,0	37,0	53,0
	$2 < m \leqslant 3{,}5$	0,9	1,3	1,8	2,6	3,7	5,0	7,5	10,0	15,0	21,0	29,0	41,0	59,0
$20 < d \leqslant 50$	$0{,}5 \leqslant m \leqslant 2$	0,9	1,2	1,8	2,5	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0	56,0
	$2 < m \leqslant 3{,}5$	1,0	1,4	1,9	2,7	3,9	5,5	7,5	11,0	15,0	22,0	31,0	44,0	62,0
	$3{,}5 < m \leqslant 6$	1,1	1,5	2,1	3,0	4,3	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0
	$6 < m \leqslant 10$	1,2	1,7	2,5	3,5	4,9	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0
$50 < d \leqslant 125$	$0{,}5 \leqslant m \leqslant 2$	0,9	1,3	1,9	2,7	3,8	5,5	7,5	11,0	15,0	21,0	30,0	43,0	61,0
	$2 < m \leqslant 3{,}5$	1,0	1,5	2,1	2,9	4,1	6,0	8,5	12,0	17,0	23,0	33,0	47,0	66,0
	$3{,}5 < m \leqslant 6$	1,1	1,6	2,3	3,2	4,6	6,5	9,0	13,0	18,0	26,0	36,0	52,0	73,0
	$6 < m \leqslant 10$	1,3	1,8	2,6	3,7	5,0	7,5	10,0	15,0	21,0	30,0	42,0	59,0	84,0
	$10 < m \leqslant 16$	1,6	2,2	3,1	4,4	6,5	9,0	13,0	18,0	25,0	35,0	50,0	71,0	100,0
	$16 < m \leqslant 25$	2,0	2,8	3,9	5,5	8,0	11,0	16,0	22,0	31,0	44,0	63,0	89,0	125,0
$125 < d \leqslant 280$	$0{,}5 \leqslant m \leqslant 2$	1,1	1,5	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	67,0
$6\,000 < d \leqslant 8\,000$	$10 \leqslant m \leqslant 16$	3,1	4,4	6,5	9,0	13,0	18,0	25,0	36,0	50,0	71,0	101,0	142,0	201,0
	$16 < m \leqslant 25$	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0	57,0	80,0	113,0	160,0	226,0
	$25 < m \leqslant 40$	4,1	6,0	8,5	12,0	17,0	23,0	33,0	47,0	66,0	94,0	133,0	188,0	266,0
	$40 < m \leqslant 70$	5,5	7,5	11,0	15,0	21,0	30,0	42,0	60,0	84,0	119,0	169,0	239,0	338,0
$8\,000 < d \leqslant 10\,000$	$10 \leqslant m \leqslant 16$	3,4	4,8	7,0	9,5	14,0	19,0	27,0	38,0	54,0	77,0	108,0	153,0	217,0
	$16 < m \leqslant 25$	3,8	5,5	7,5	11,0	15,0	21,0	30,0	43,0	60,0	85,0	121,0	171,0	242,0
	$25 < m \leqslant 40$	4,4	6,0	9,0	12,0	18,0	25,0	35,0	50,0	70,0	99,0	140,0	199,0	281,0
	$40 < m \leqslant 70$	5,5	8,0	11,0	16,0	22,0	31,0	44,0	62,0	88,0	125,0	177,0	250,0	353,0

Table 2 — Total cumulative pitch deviation, F_p

Reference diameter d mm	Module m mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		F_p µm												
$5 \leqslant d \leqslant 20$	$0{,}5 \leqslant m \leqslant 2$	2,0	2,8	4,0	5,5	8,0	11,0	16,0	23,0	32,0	45,0	64,0	90,0	127,0
	$2 < m \leqslant 3{,}5$	2,1	2,9	4,2	6,0	8,5	12,0	17,0	23,0	33,0	47,0	66,0	94,0	133,0
$20 < d \leqslant 50$	$0{,}5 \leqslant m \leqslant 2$	2,5	3,6	5,0	7,0	10,0	14,0	20,0	29,0	41,0	57,0	81,0	115,0	162,0
	$2 < m \leqslant 3{,}5$	2,6	3,7	5,0	7,5	10,0	15,0	21,0	30,0	42,0	59,0	84,0	119,0	168,0
	$3{,}5 < m \leqslant 6$	2,7	3,9	5,5	7,5	11,0	15,0	22,0	31,0	44,0	62,0	87,0	123,0	174,0
	$6 < m \leqslant 10$	2,9	4,1	6,0	8,0	12,0	16,0	23,0	33,0	46,0	65,0	93,0	131,0	185,0
$50 < d \leqslant 125$	$0{,}5 \leqslant m \leqslant 2$	3,3	4,6	6,5	9,0	13,0	18,0	26,0	37,0	52,0	74,0	104,0	147,0	208,0
	$2 < m \leqslant 3{,}5$	3,3	4,7	6,5	9,5	13,0	19,0	27,0	38,0	53,0	76,0	107,0	151,0	214,0
	$3{,}5 < m \leqslant 6$	3,4	4,9	7,0	9,5	14,0	19,0	28,0	39,0	55,0	78,0	110,0	156,0	220,0
	$6 < m \leqslant 10$	3,6	5,0	7,0	10,0	14,0	20,0	29,0	41,0	58,0	82,0	116,0	164,0	231,0
	$10 < m \leqslant 16$	3,9	5,5	7,5	11,0	15,0	22,0	31,0	44,0	62,0	88,0	124,0	175,0	248,0
	$16 < m \leqslant 25$	4,3	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0	96,0	136,0	193,0	273,0
$125 < d \leqslant 280$	$0{,}5 \leqslant m \leqslant 2$	4,3	6,0	8,5	12,0	17,0	24,0	35,0	49,0	69,0	98,0	138,0	195,0	276,0
	$2 < m \leqslant 3{,}5$	4,4	6,0	9,0	12,0	18,0	25,0	35,0	50,0	70,0	100,0	141,0	199,0	282,0
	$3{,}5 < m \leqslant 6$	4,5	6,5	9,0	13,0	18,0	25,0	36,0	51,0	72,0	102,0	144,0	204,0	288,0
	$6 < m \leqslant 10$	4,7	6,5	9,5	13,0	19,0	26,0	37,0	53,0	75,0	106,0	149,0	211,0	299,0
	$10 < m \leqslant 16$	4,9	7,0	10,0	14,0	20,0	28,0	39,0	56,0	79,0	112,0	158,0	223,0	316,0
	$16 < m \leqslant 25$	5,5	7,5	11,0	15,0	21,0	30,0	43,0	60,0	85,0	120,0	170,0	241,0	341,0
	$25 < m \leqslant 40$	6,0	8,5	12,0	17,0	24,0	34,0	47,0	67,0	95,0	134,0	190,0	269,0	380,0
$280 < d \leqslant 560$	$0{,}5 \leqslant m \leqslant 2$	5,5	8,0	11,0	16,0	23,0	32,0	46,0	64,0	91,0	129,0	182,0	257,0	364,0
	$2 < m \leqslant 3{,}5$	6,0	8,0	12,0	16,0	23,0	33,0	46,0	65,0	92,0	131,0	185,0	261,0	370,0
	$3{,}5 < m \leqslant 6$	6,0	8,5	12,0	17,0	24,0	33,0	47,0	66,0	94,0	133,0	188,0	266,0	376,0
	$6 < m \leqslant 10$	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0	97,0	137,0	193,0	274,0	387,0
	$10 < m \leqslant 16$	6,5	9,0	13,0	18,0	25,0	36,0	50,0	71,0	101,0	143,0	202,0	285,0	404,0
	$16 < m \leqslant 25$	6,5	9,5	13,0	19,0	27,0	38,0	54,0	76,0	107,0	151,0	214,0	303,0	428,0

Table 3 — Total profile deviation, F_α

Reference diameter	Module	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
d mm	m mm	F_α µm												
$5 \leqslant d \leqslant 20$	$0{,}5 \leqslant m \leqslant 2$	0,8	1,1	1,6	2,3	3,2	4,6	6,5	9,0	13,0	18,0	26,0	37,0	52,0
	$2 < m \leqslant 3{,}5$	1,2	1,7	2,3	3,3	4,7	6,5	9,5	13,0	19,0	26,0	37,0	53,0	75,0
$20 < d \leqslant 50$	$0{,}5 \leqslant m \leqslant 2$	0,9	1,3	1,8	2,6	3,6	5,0	7,5	10,0	15,0	21,0	29,0	41,0	58,0
	$2 < m \leqslant 3{,}5$	1,3	1,8	2,5	3,6	5,0	7,0	10,0	14,0	20,0	29,0	40,0	57,0	81,0
	$3{,}5 < m \leqslant 6$	1,6	2,2	3,1	4,4	6,0	9,0	12,0	18,0	25,0	35,0	50,0	70,0	99,0
	$6 < m \leqslant 10$	1,9	2,7	3,8	5,5	7,5	11,0	15,0	22,0	31,0	43,0	61,0	87,0	123,0
$50 < d \leqslant 125$	$0{,}5 \leqslant m \leqslant 2$	1,0	1,5	2,1	2,9	4,1	6,0	8,5	12,0	17,0	23,0	33,0	47,0	66,0
	$2 < m \leqslant 3{,}5$	1,4	2,0	2,8	3,9	5,5	8,0	11,0	16,0	22,0	31,0	44,0	63,0	89,0
	$3{,}5 < m \leqslant 6$	1,7	2,4	3,4	4,8	6,5	9,5	13,0	19,0	27,0	38,0	54,0	76,0	108,0
	$6 < m \leqslant 10$	2,0	2,9	4,1	6,0	8,0	12,0	16,0	23,0	33,0	46,0	65,0	92,0	131,0
	$10 < m \leqslant 16$	2,5	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0	112,0	159,0
	$16 < m \leqslant 25$	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0	96,0	136,0	192,0
$125 < d \leqslant 280$	$0{,}5 \leqslant m \leqslant 2$	1,2	1,7	2,4	3,5	4,9	7,0	10,0	14,0	20,0	28,0	39,0	55,0	78,0
	$2 < m \leqslant 3{,}5$	1,6	2,2	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	50,0	71,0	101,0
	$3{,}5 < m \leqslant 6$	1,9	2,6	3,7	5,5	7,5	11,0	15,0	21,0	30,0	42,0	60,0	84,0	119,0
	$6 < m \leqslant 10$	2,2	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	50,0	71,0	101,0	143,0
	$10 < m \leqslant 16$	2,7	3,8	5,5	7,5	11,0	15,0	21,0	30,0	43,0	60,0	85,0	121,0	171,0
	$16 < m \leqslant 25$	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	51,0	72,0	102,0	144,0	204,0
	$25 < m \leqslant 40$	3,8	5,5	7,5	11,0	15,0	22,0	31,0	43,0	61,0	87,0	123,0	174,0	246,0
$280 < d \leqslant 560$	$0{,}5 \leqslant m \leqslant 2$	1,5	2,1	2,9	4,1	6,0	8,5	12,0	17,0	23,0	33,0	47,0	66,0	94,0
	$2 < m \leqslant 3{,}5$	1,8	2,6	3,6	5,0	7,5	10,0	15,0	21,0	29,0	41,0	58,0	82,0	116,0
	$3{,}5 < m \leqslant 6$	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	67,0	95,0	135,0
	$6 < m \leqslant 10$	2,5	3,5	4,9	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0	112,0	158,0
	$10 < m \leqslant 16$	2,9	4,1	6,0	8,0	12,0	16,0	23,0	33,0	47,0	66,0	93,0	132,0	186,0
	$16 < m \leqslant 25$	3,4	4,8	7,0	9,5	14,0	19,0	27,0	39,0	55,0	78,0	110,0	155,0	219,0
	$25 < m \leqslant 40$	4,1	6,0	8,0	12,0	16,0	23,0	33,0	46,0	65,0	92,0	131,0	185,0	261,0
	$40 < m \leqslant 70$	5,0	7,0	10,0	14,0	20,0	28,0	40,0	57,0	80,0	113,0	160,0	227,0	321,0
$560 < d \leqslant 1\,000$	$0{,}5 \leqslant m \leqslant 2$	1,8	2,5	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0	112,0
	$2 < m \leqslant 3{,}5$	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	67,0	95,0	135,0

Table 4 — Total helix deviation, F_β

Reference diameter d mm	Facewidth b mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		F_β µm												
$5 \leqslant d \leqslant 20$	$4 \leqslant b \leqslant 10$	1,1	1,5	2,2	3,1	4,3	6,0	8,5	12,0	17,0	24,0	35,0	49,0	69,0
	$10 \leqslant b \leqslant 20$	1,2	1,7	2,4	3,4	4,9	7,0	9,5	14,0	19,0	28,0	39,0	55,0	78,0
	$20 \leqslant b \leqslant 40$	1,4	2,0	2,8	3,9	5,5	8,0	11,0	16,0	22,0	31,0	45,0	63,0	89,0
	$40 \leqslant b \leqslant 80$	1,6	2,3	3,3	4,6	6,5	9,5	13,0	19,0	26,0	37,0	52,0	74,0	105,0
$20 < d \leqslant 50$	$4 \leqslant b \leqslant 10$	1,1	1,6	2,2	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	51,0	72,0
	$10 < b \leqslant 205$	1,3	1,8	2,5	3,6	5,0	7,0	10,0	14,0	20,0	29,0	40,0	57,0	81,0
	$20 < b \leqslant 40$	1,4	2,0	2,9	4,1	5,5	8,0	11,0	16,0	23,0	32,0	46,0	65,0	92,0
	$40 < b \leqslant 80$	1,7	2,4	3,4	4,8	6,5	9,5	13,0	19,0	27,0	38,0	54,0	76,0	107,0
	$80 < b \leqslant 160$	2,0	2,9	4,1	5,5	8,0	11,0	16,0	23,0	32,0	46,0	65,0	92,0	130,0
$50 < d \leqslant 125$	$4 \leqslant b \leqslant 10$	1,2	1,7	2,4	3,3	4,7	6,5	9,5	13,0	19,0	27,0	38,0	53,0	76,0
	$10 < b \leqslant 20$	1,3	1,9	2,6	3,7	5,5	7,5	11,0	15,0	21,0	30,0	42,0	60,0	84,0
	$20 < b \leqslant 40$	1,5	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0	95,0
	$40 < b \leqslant 80$	1,7	2,5	3,5	4,9	7,0	10,0	14,0	20,0	28,0	39,0	56,0	79,0	111,0
	$80 < b \leqslant 160$	2,1	2,9	4,2	6,0	8,5	12,0	17,0	24,0	33,0	47,0	67,0	94,0	133,0
	$160 < b \leqslant 250$	2,5	3,5	4,9	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0	112,0	158,0
	$250 < b \leqslant 400$	2,9	4,1	6,0	8,0	12,0	16,0	23,0	33,0	46,0	65,0	92,0	130,0	184,0
$125 < d \leqslant 280$	$4 \leqslant b \leqslant 10$	1,3	1,8	2,5	3,6	5,0	7,0	10,0	14,0	20,0	29,0	40,0	57,0	81,0
	$10 < b \leqslant 20$	1,4	2,0	2,8	4,0	5,5	8,0	11,0	16,0	22,0	32,0	45,0	63,0	90,0
	$20 < b \leqslant 40$	1,6	2,2	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	50,0	71,0	101,0
	$40 < b \leqslant 80$	1,8	2,6	3,6	5,0	7,5	10,0	15,0	21,0	29,0	41,0	58,0	82,0	117,0
	$80 < b \leqslant 160$	2,2	3,1	4,3	6,0	8,5	12,0	17,0	25,0	35,0	49,0	69,0	98,0	139,0
	$160 < b \leqslant 250$	2,6	3,6	5,0	7,0	10,0	14,0	20,0	29,0	41,0	58,0	82,0	116,0	164,0
	$250 < b \leqslant 400$	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	47,0	67,0	95,0	134,0	190,0
	$400 < b \leqslant 650$	3,5	4,9	7,0	10,0	14,0	20,0	28,0	40,0	56,0	79,0	112,0	158,0	224,0
$280 < d \leqslant 560$	$10 \leqslant b \leqslant 20$	1,5	2,1	3,0	4,3	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0	97,0
	$20 < b \leqslant 40$	1,7	2,4	3,4	4,8	6,5	9,5	13,0	19,0	27,0	38,0	54,0	76,0	108,0
	$40 < b \leqslant 80$	1,9	2,7	3,9	5,5	7,5	11,0	15,0	22,0	31,0	44,0	62,0	87,0	124,0

Table B.1 — Profile form deviation, $f_{f\alpha}$

Reference diameter d mm	Module m mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		$f_{f\alpha}$ µm												
$5 \leqslant d \leqslant 20$	$0{,}5 \leqslant m \leqslant 2$	0,6	0,9	1,3	1,8	2,5	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0
	$2 < m \leqslant 3{,}5$	0,9	1,3	1,8	2,6	3,6	5,0	7,0	10,0	14,0	20,0	29,0	41,0	58,0
$20 < d \leqslant 50$	$0{,}5 \leqslant m \leqslant 2$	0,7	1,0	1,4	2,0	2,8	4,0	5,5	8,0	11,0	16,0	22,0	32,0	45,0
	$2 < m \leqslant 3{,}5$	1,0	1,4	2,0	2,8	3,9	5,5	8,0	11,0	16,0	22,0	31,0	44,0	62,0
	$3{,}5 < m \leqslant 6$	1,2	1,7	2,4	3,4	4,8	7,0	9,5	14,0	19,0	27,0	39,0	54,0	77,0
	$6 < m \leqslant 10$	1,5	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	48,0	67,0	95,0
$50 < d \leqslant 125$	$0{,}5 \leqslant m \leqslant 2$	0,8	1,1	1,6	2,3	3,2	4,5	6,5	9,0	13,0	18,0	26,0	36,0	51,0
	$2 < m \leqslant 3{,}5$	1,1	1,5	2,1	3,0	4,3	6,0	8,5	12,0	17,0	24,0	34,0	49,0	69,0
	$3{,}5 < m \leqslant 6$	1,3	1,8	2,6	3,7	5,0	7,5	10,0	15,0	21,0	29,0	42,0	59,0	83,0
	$6 < m \leqslant 10$	1,6	2,2	3,2	4,5	6,5	9,0	13,0	18,0	25,0	36,0	51,0	72,0	101,0

Table B.2 — Profile slope deviation, $\pm f_{H\alpha}$

Reference diameter d mm	Module m mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		$\pm f_{H\alpha}$ µm												
$5 \leqslant d \leqslant 20$	$0{,}5 \leqslant m \leqslant 2$	0,5	0,7	1,0	1,5	2,1	2,9	4,2	6,0	8,5	12,0	17,0	24,0	33,0
	$2 < m \leqslant 3{,}5$	0,7	1,0	1,5	2,1	3,0	4,2	6,0	8,5	12,0	17,0	24,0	34,0	47,0
$20 < d \leqslant 50$	$0{,}5 \leqslant m \leqslant 2$	0,6	0,8	1,2	1,6	2,3	3,3	4,6	6,5	9,5	13,0	19,0	26,0	37,0
	$2 < m \leqslant 3{,}5$	0,8	1,1	1,6	2,3	3,2	4,5	6,5	9,0	13,0	18,0	26,0	36,0	51,0
	$3{,}5 < m \leqslant 6$	1,0	1,4	2,0	2,8	3,9	5,5	8,0	11,0	16,0	22,0	32,0	45,0	63,0
	$6 < m \leqslant 10$	1,2	1,7	2,4	3,4	4,8	7,0	9,5	14,0	19,0	27,0	39,0	55,0	78,0
$50 < d \leqslant 125$	$0{,}5 \leqslant m \leqslant 2$	0,7	0,9	1,3	1,9	2,6	3,7	5,5	7,5	11,0	15,0	21,0	30,0	42,0
	$2 < m \leqslant 3{,}5$	0,9	1,2	1,8	2,5	3,5	5,0	7,0	10,0	14,0	20,0	28,0	40,0	57,0
	$3{,}5 < m \leqslant 6$	1,1	1,5	2,1	3,0	4,3	6,0	8,5	12,0	17,0	24,0	34,0	48,0	68,0
	$6 < m \leqslant 10$	1,3	1,8	2,6	3,7	5,0	7,5	10,0	15,0	21,0	29,0	41,0	58,0	83,0

Table B.1 - Runout tolerance, F_r

Reference diameter d mm	Normal module m_n mm	Accuracy grade												
		0	1	2	3	4	5	6	7	8	9	10	11	12
		F_r µm												
$5 \le d \le 20$	$0,5 \le m_n \le 2,0$	1,5	2,5	3,0	4,5	6,5	9,0	13	18	25	36	51	72	102
	$2,0 < m_n \le 3,5$	1,5	2,5	3,5	4,5	6,5	9,5	13	19	27	38	53	75	106
$20 < d \le 50$	$0,5 \le m_n \le 2,0$	2,0	3,0	4,0	5,5	8,0	11	16	23	32	46	65	92	130
	$2,0 < m_n \le 3,5$	2,0	3,0	4,0	6,0	8,5	12	17	24	34	47	67	95	134
	$3,5 < m_n \le 6,0$	2,0	3,0	4,5	6,0	8,5	12	17	25	35	49	70	99	139
	$6,0 < m_n \le 10$	2,5	3,5	4,5	6,5	9,5	13	19	26	37	52	74	105	148
$50 < d \le 125$	$0,5 \le m_n \le 2,0$	2,5	3,5	5,0	7,5	10	15	21	29	42	59	83	118	167
	$2,0 < m_n \le 3,5$	2,5	4,0	5,5	7,5	11	15	21	30	43	61	86	121	171
	$3,5 < m_n \le 6,0$	3,0	4,0	5,5	8,0	11	16	22	31	44	62	88	125	176
	$6,0 < m_n \le 10$	3,0	4,0	6,0	8,0	12	16	23	33	46	65	92	131	185
	$10 < m_n \le 16$	3,0	4,5	6,0	9,0	12	18	25	35	50	70	99	140	198
	$16 < m_n \le 25$	3,5	5,0	7,0	9,5	14	19	27	39	55	77	109	154	218
$125 < d \le 280$	$0,5 \le m_n \le 2,0$	3,5	5,0	7,0	10	14	20	28	39	55	78	110	156	221
	$2,0 < m_n \le 3,5$	3,5	5,0	7,0	10	14	20	28	40	56	80	113	159	225
	$3,5 < m_n \le 6,0$	3,5	5,0	7,0	10	14	20	29	41	58	82	115	163	231
	$6,0 < m_n \le 10$	3,5	5,5	7,5	11	15	21	30	42	60	85	120	169	239
	$10 < m_n \le 16$	4,0	5,5	8,0	11	16	22	32	45	63	89	126	179	252
	$16 < m_n \le 25$	4,5	6,0	8,5	12	17	24	34	48	68	96	136	193	272
	$25 < m_n \le 40$	4,5	6,5	9,5	13	19	27	38	54	76	107	152	215	304