

## 6.3 Parallelism of axes for Spur and Helical gears

Extract from JGMA1102 (2000) is as follows.

**0. Preface:** This standard stipulates Allowable value of parallel accuracy for Spur and Helical gears. Basically, these standards are consistent with recommended values from ISO/TR10064-3 (1996).

### 1. Application range

This standard stipulates the parallel accuracy for steel-made Involute spur and helical gears. Therefore gears covered by this standard are simply called Gear.

- (1) Normal module: 0.5 to 70.0 (mm)
- (2) Reference diameter: 5.0 to 10,000.0 (mm)
- (3) Facewidth: From 4.0 to 1,000.0 (mm)

Remark 1. Double helical gear axis is also covered.

Remark 2. The above mentioned Standard is quoted from:

ISO/TR 10064-3 (1996) Cylindrical gears- Code of inspection practice- Part 3

JIS B 0102 (1999) International gear notation - Symbols for geometrical data

JIS B 1702-1 (1998) Cylindrical gears- ISO System of accuracy Classification-Article 1:

Definition and allowable values of deviations relevant to corresponding flanks of the gear teeth.

ISO/TR 10064-3 (1996) Cylindrical gears- Code of Inspection Practice- Part 3

### 2. Definition of terms

Definition for this standard is from JIS B 0102 (1999) (Terms of Tooth Flank-Geometric Definition) and following details.

- (1) **Parallel accuracy of axis:** Composes of accuracy of parallel deviation and Non-parallel and Non-intersection deviations.
- (2) **Parallel deviation of axis:** Distance between C and O<sup>(1)</sup> (Refer to Fig. 1) where both ends of measurement distance L on the a-axis on one side of the gear are points A and B; and Flat face H is surface to include one of the points A and one of shaft centre b (b-axis); and flat face V is surface through point A and parallel to b and perpendicular to flat face H, and orthogonal projection of point B to H is C.

Note(1): Point O is base of tolerance among perpendicular flat face S, V, H and B.

- (3) Refer to Fig.1, **deviation for Non-parallel and Non-intersecting axes:** Distance between points O and D where D is orthogonal projection of point B to V, referring to above (2).

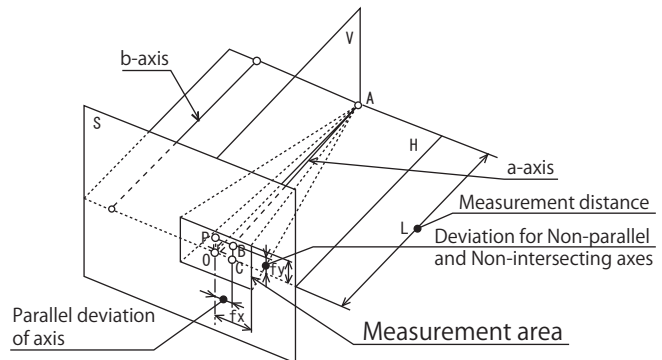


Fig. 1 Deviations for Parallel axis, Non-parallel and Non-intersecting axes.

### 3. Allowable value

Allowable value for parallel accuracy of gear axis is met with System of accuracy N10 to N12 in JIS B1702-1 (1998) as follows,

- (1) Allowable value of parallel deviation for axis  $f_x$

Calculating  $f_x$  for measuring span  $L$  of gear axis is as follows,

$$f_x = \frac{L}{b} f_x'$$

Hereby,  $L$  : Measuring span (mm)

$b$  : Facewidth (mm), choose smaller dimension of Facewidth (mm) between pinion and gear.

$f_x'$  : Refer to Table 1 ( $\mu\text{m}$ )

(2) Allowable value of deviation for Axes of Non-parallel and Non-intersecting  $f_y$ .

Calculation  $f_y$  for measuring span L of gear axis is as follows,

$$f_y = \frac{L}{b} f_y'$$

Hereby,  $L$  : Measuring span (mm)

$b$  : Facewidth (mm), choose smaller dimension of Facewidth (mm) between pinion and gear.

$f_y'$  : Refer to Table 2 ( $\mu\text{m}$ )

Remark

Depending on purpose of usage and System of accuracy class, which is different from the gear, Allowable value of deviation of parallelism accuracy of axis can be used.

**Table 2. Allowable values of parallel deviations  $f_x'$  for axis per Facewidth**

Unit:  $\mu\text{m}$

Reference diameter d (mm)	Facewidth b (mm)	System of Accuracy												
		N0	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
$5 \leq d \leq 20$	$4 \leq b \leq 10$	1.1	1.5	2.2	3.1	4.3	6.0	8.5	12	17	24	35	49	69
	$10 < b \leq 20$	1.2	1.7	2.4	3.4	4.9	7.0	9.5	14	19	28	39	55	78
	$20 < b \leq 40$	1.4	2.0	2.8	3.9	5.5	8.0	11	16	22	31	45	63	89
$20 < d \leq 50$	$4 \leq b \leq 10$	1.1	1.6	2.2	3.2	4.5	6.5	9.0	13	18	25	36	51	72
	$10 < b \leq 20$	1.3	1.8	2.5	3.6	5.0	7.0	10	14	20	29	40	57	81
	$20 < b \leq 40$	1.4	2.0	2.9	4.1	5.5	8.0	11	16	23	32	46	65	92
$50 < d \leq 125$	$4 \leq b \leq 10$	1.2	1.7	2.4	3.3	4.7	6.5	9.5	13	19	27	38	53	76
	$10 < b \leq 20$	1.3	1.9	2.6	3.7	5.5	7.5	11	15	21	30	42	60	84
	$20 < b \leq 40$	1.5	2.1	3.0	4.2	6.0	8.5	12	17	24	34	48	68	95
	$40 < b \leq 80$	1.7	2.5	3.5	4.9	7.0	10	14	20	28	39	56	79	111
$125 < d \leq 280$	$4 \leq b \leq 10$	1.3	1.8	2.5	3.6	5.0	7.0	10	14	20	29	40	57	81
	$10 < b \leq 20$	1.4	2.0	2.8	4.0	5.5	8.0	11	16	22	32	45	63	90
	$20 < b \leq 40$	1.6	2.2	3.2	4.5	6.5	9.0	13	18	25	36	50	71	101
	$40 < b \leq 80$	1.8	2.6	3.6	5.0	7.5	10	15	21	29	41	58	82	117
$280 < d \leq 560$	$10 < b \leq 20$	1.5	2.1	3.0	4.3	6.0	8.5	12	17	24	34	48	68	97
	$20 < b \leq 40$	1.7	2.4	3.4	4.8	6.5	9.5	13	19	27	38	54	76	108
	$40 < b \leq 80$	1.9	2.7	3.9	5.5	7.5	11	15	22	31	44	62	87	124
	$80 < b \leq 160$	2.3	3.2	4.6	6.5	9.0	13	18	26	36	52	73	103	146

**Table 3. Allowable values of Non-parallel and Non-intersecting deviations  $f_y'$  for axis per Facewidth**

Unit:  $\mu\text{m}$

Reference diameter d (mm)	Facewidth b (mm)	System of Accuracy												
		N0	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
$5 \leq d \leq 20$	$4 \leq b \leq 10$	0.5	0.8	1.1	1.5	2.2	3.1	4.3	6.0	8.5	12	17	24	35
	$10 < b \leq 20$	0.6	0.9	1.2	1.7	2.4	3.4	4.9	7.0	9.5	14	19	28	39
	$20 < b \leq 40$	0.7	1.0	1.4	2.0	2.8	3.9	5.5	8.0	11	16	22	31	45
$20 < d \leq 50$	$4 \leq b \leq 10$	0.6	0.8	1.1	1.6	2.2	3.2	4.5	6.5	9.0	13	18	25	36
	$10 < b \leq 20$	0.6	0.9	1.3	1.8	2.5	3.6	5.0	7.0	10	14	20	29	40
	$20 < b \leq 40$	0.7	1.0	1.4	2.0	2.9	4.1	5.5	8.0	11	16	23	32	46
$50 < d \leq 125$	$4 \leq b \leq 10$	0.6	0.8	1.2	1.7	2.4	3.3	4.7	6.5	9.5	13	19	27	38
	$10 < b \leq 20$	0.7	0.9	1.3	1.9	2.6	3.7	5.5	7.5	11	15	21	30	42
	$20 < b \leq 40$	0.7	1.1	1.5	2.1	3.0	4.2	6.0	8.5	12	17	24	34	48
	$40 < b \leq 80$	0.9	1.2	1.7	2.5	3.5	4.9	7.0	10	14	20	28	39	56
$125 < d \leq 280$	$4 \leq b \leq 10$	0.6	0.9	1.3	1.8	2.5	3.5	5.0	7.0	10	14	20	29	40
	$10 < b \leq 20$	0.7	1.0	1.4	2.0	2.8	4.0	5.5	8.0	11	16	22	32	45
	$20 < b \leq 40$	0.8	1.1	1.6	2.2	3.2	4.5	6.5	9.0	13	18	25	36	50
	$40 < b \leq 80$	0.9	1.3	1.8	2.6	3.6	5.0	7.5	10	15	21	29	41	58
$280 < d \leq 560$	$10 < b \leq 20$	0.8	1.1	1.5	2.1	3.0	4.3	6.0	8.5	12	17	24	34	48
	$20 < b \leq 40$	0.8	1.2	1.7	2.4	3.4	4.8	6.5	9.5	13	19	27	38	54
	$40 < b \leq 80$	1.0	1.4	1.9	2.7	3.9	5.5	7.5	11	15	22	31	44	62