

## 5.7 Precision of Spur and Helical gears

### 1. Introduction

In order to make **JIS Standard** consistent with **ISO Standard**, **JIS B 1702 (old)** : 1995 (Accuracy for the Spur and Helical gears) which had been used for a long time has been abolished and it was enacted as two regulations: **JIS B 1702-1**: 1998(Cylindrical gears- System of accuracy and Classification Article 1: Definition of Deviation and Allowable value of deviation relevant to corresponding Tooth flanks) and **JIS B 1702-2**: 1998 (Cylindrical gears - System of accuracy and Classification Article 2: Definition and Allowable values of deviation relevant to Radial composite deviation and Runout).

When comparing **JIS B 1702 (old)** with the **JIS B 1702-1 or 2**, classifications of module and Reference diameter (called Pitch diameter of **old JIS B1702**) are different. For example, **class 4 in JIS B 1702 (old)** may not be able to correspond to **JIS B1702-1 or 2**. The rough outline of **System of accuracy in JIS B1702-1 or 2** = System of accuracy in **JIS B 1702 (old)** class plus 4. However certain range of small or large Number of teeth are unable to correspond to above rough outline classification.

In due time, many standards established of **JIS** and **JGMA** based on the **JIS B 1702 (old)**. It will be revised to a new edition based on **JIS B 1702-1 or 2**. However, there are certain areas that cannot be resolved immediately.

Therefore, this new edition of **KG catalogue** indicates System of accuracy with comparison table between the **JIS B1702-1** and **JIS B1702 (old)**. Please refer to following System of accuracy. Firstly find gear accuracy from **JIS B1702-1** and compared with **JIS B 1702 (old)**. Secondly, use these correspondances to compare to other **JIS** and **JGMA** standards to obtain the total of each Reference or Allowable tolerance.

To search for accuracy of gears outside the range of **KG-catalogue**, please verify with **JIS B 1702-1**: 1998 and **JIS B 1702-2**:1998 (old and new) standard, as **KG-catalogue** does not cover all accuracy.

### 2. Types of Deviations for Allowable value compared between old and new JIS.

Extracted **JIS B 1702-1**: 1998 and **JIS B1702-2** :1998 (Refer to Table 1 to 11)

- (1) Single pitch deviation
- (2) Total cumulative pitch deviations
- (3) Total profile deviation
- (4) Runout
- (5) Total radial composite deviation  
(ISO 1328-2: Total radial composite tolerance)
- (6) Tooth-to-tooth radial composite deviation

Refer to the following pages for comparison tables of the above 6 types of deviations. New and old **JIS** standards are classified by module.

It is recommended that the System of accuracy for new **JIS** prefixed with a figure **N** at the beginning to avoid confusion of new and old **JIS**.

### 3. Precaution when comparing Helical gear

**New JIS** uses Normal module to set the Allowable value for each deviations. However **old JIS** uses Transverse module instead. When comparing accuracy between new and old **JIS** standards for Helical gear of Normal module, calculation of Transverse module  $m_t$  is by the following formula from Normal module  $m_n$  and Reference cylinder helix angle  $\beta$ .

$$m_t = m_n / \cos \beta$$

### 4. Total helix deviation (old JIS: Lead error)

Refer to Table 12 to find Total helix deviation as extracted from **JIS B 1702-1**: 1998.

### 5. Material accuracy of Cylindrical gear.

Refer to Table 13 to 19 for material accuracy of Cylindrical gear.

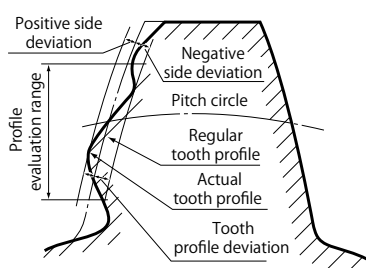


Fig. 17 Tooth profile deviations

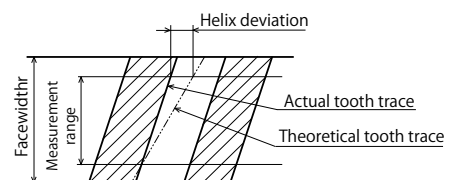


Fig. 18 Helix deviation

Table 1. The Allowable value of each deviation for module 0.5

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	10 - 40	3.3	4.7	6.5	9.5	13	19	26	7 - 12	2	3	5	7	9	13	19
	41 - 100	3.5	5	7	10	14	20	28	13 - 24	3	4	5	7	10	14	20
	101 - 250	3.8	5.5	7.5	11	15	21	30	25 - 50	3	4	6	8	11	16	22
									51 - 100	3	4	6	9	13	18	25
									101 - 200	4	5	7	10	14	20	29
Total cumulative pitch deviations	10 - 40	8	11	16	23	32	45	64	7 - 12	9	13	19	26	37	52	75
	41 - 100	10	14	20	29	41	57	81	13 - 24	10	14	20	29	41	57	81
	101 - 250	13	18	26	37	52	74	104	25 - 50	11	16	22	32	45	63	90
									51 - 100	13	18	25	36	50	71	100
									101 - 200	14	20	29	40	57	80	115
Total profile deviation	10 - 40	3.2	4.6	6.5	9	13	18	26	All range	2	3	5	7	10	14	20
	41 - 100	3.6	5	7.5	10	15	21	29								
	101 - 250	4.1	6	8.5	12	17	23	33								
Runout	10 - 40	6.5	9	13	18	25	36	51	7 - 12	7	9	13	19	26	37	52
	41 - 100	8	11	16	23	32	46	65	13 - 24	7	10	14	20	29	41	57
	101 - 250	10	15	21	29	42	59	83	25 - 50	8	11	16	22	32	45	63
									51 - 100	9	13	18	25	36	50	71
									101 - 200	10	14	20	29	40	57	80
Radial composite deviation Total contact	10 - 40	7.5	11	15	21	30	42	60	7 - 12	9	12	17	24	34	48	68
	41 - 100	9.5	13	19	26	37	52	74	13 - 24	9	13	18	26	37	52	73
	101 - 250	12	16	23	33	46	66	93	25 - 50	10	14	20	28	40	56	79
									51 - 100	11	15	22	31	44	62	87
									101 - 200	12	17	24	34	48	68	96
Tooth-to-tooth radial composite deviation	All range	1	2	2.5	3.5	5	7	10	All range	4	6	8	11	16	22	32

Table 2. The Allowable values of each deviation for module 0.75

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviation	7 - 26	3.3	4.7	6.5	9.5	13	19	26	8 - 16	3	4	5	8	11	15	21
	27 - 66	3.5	5	7	10	14	20	28	17 - 33	3	4	6	8	12	17	24
	67 - 166	3.8	5.5	7.5	11	15	21	30	34 - 66	3	5	7	9	13	19	26
									67 - 133	4	5	7	10	15	21	30
Total cumulative pitch deviations	7 - 26	8	11	16	23	32	45	64	8 - 16	11	15	21	30	43	60	86
	27 - 66	10	14	20	29	41	57	81	17 - 33	12	17	24	33	47	66	94
	67 - 166	13	18	26	37	52	74	104	34 - 66	13	19	26	37	53	74	105
									67 - 133	15	21	30	42	60	83	120
Total profile deviation	7 - 26	3.3	4.6	6.5	9	13	18	26	All range	3	4	6	8	11	16	22
	27 - 66	3.5	5	7.5	10	15	21	29								
	67 - 166	3.8	6	8.5	12	17	23	33								
Runout	7 - 26	6.5	9	13	18	25	36	51	8 - 16	8	11	15	21	30	43	60
	27 - 66	8	11	16	23	32	46	65	17 - 33	8	12	17	24	33	47	66
	67 - 166	10	15	21	29	42	59	83	34 - 66	9	13	19	26	37	53	74
									67 - 133	10	15	21	30	42	60	83
Radial composite deviation Total contact	7 - 26	8	12	16	23	33	46	66	8 - 16	10	14	20	28	39	55	78
	27 - 66	10	14	20	28	40	56	80	17 - 33	11	15	21	30	42	60	84
	67 - 166	12	17	25	35	49	70	98	34 - 66	12	16	23	33	46	65	92
									67 - 133	13	18	25	36	51	72	100
Tooth-to-tooth radial composite deviation	7 - 66	2	2.5	4	5.5	7.5	11	15	All range	4	6	9	13	18	25	36
	67 - 166	2	3	4	5.5	8	11	16								

Table 3. The Allowable value of each deviation for module 0.8

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	7 - 25	3.3	4.7	6.5	9.5	13	19	26	8 - 15	3	4	5	8	11	15	21
	26 - 62	3.5	5	7	10	14	20	28	16 - 31	3	4	6	8	12	17	24
	63 - 156	3.8	5.5	7.5	11	15	21	30	32 - 62	3	5	7	9	13	19	26
									63 - 125	4	5	7	10	15	21	30
Total cumulative pitch deviations	7 - 25	8	11	16	23	32	45	64	8 - 15	11	15	21	30	43	60	86
	26 - 62	10	14	20	29	41	57	81	16 - 31	12	17	24	33	47	66	94
	63 - 156	13	18	26	37	52	74	104	32 - 62	13	19	26	37	53	74	105
									63 - 125	15	21	30	42	60	83	120
Total profile deviation	- 20	3.2	4.6	6.5	9	13	18	26	All range	3	4	6	8	11	16	22
	21 - 50	3.6	5	7.5	10	15	21	29								
	51 - 125	4.1	6	8.5	12	17	23	33								
Runout	7 - 25	6.5	9	13	18	25	36	51	8 - 15	8	11	15	21	30	43	60
	26 - 62	8	11	16	23	32	46	65	16 - 31	8	12	17	24	33	47	66
	63 - 156	10	15	21	29	42	59	83	32 - 62	9	13	19	26	37	53	74
									63 - 125	10	15	21	30	42	60	83
Radial composite deviation Total contact	7 - 25	8	12	16	23	33	46	66	8 - 15	10	14	20	28	39	55	78
	26 - 62	10	14	20	28	40	56	80	16 - 31	11	15	21	30	42	60	84
	63 - 156	12	17	25	35	49	70	98	32 - 62	12	16	23	33	46	65	92
									63 - 125	13	18	25	36	51	72	100
Tooth-to-tooth radial composite deviation	7 - 62	2	2.5	4	5.5	7.5	11	15	All range	4	6	9	13	18	25	36
	63 - 156	2	3	4	5.5	8	11	16								

Table 4. The Allowable value of each deviation for module 1.0

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 20	3.3	4.7	6.5	9.5	13	19	26	7 - 12	3	4	5	8	11	15	21
	21 - 50	3.5	5	7	10	14	20	28	13 - 25	3	4	6	8	12	17	24
	51 - 125	3.8	5.5	7.5	11	15	21	30	26 - 50	3	5	7	9	13	19	26
									51 - 100	4	5	7	10	15	21	30
									101 - 200	4	6	9	12	17	24	34
Total cumulative pitch deviations	- 20	8	11	16	23	32	45	64	7 - 12	11	15	21	30	43	60	86
	21 - 50	10	14	20	29	41	57	81	13 - 25	12	17	24	33	47	66	94
	51 - 125	13	18	26	37	52	74	104	26 - 50	13	19	26	37	53	74	105
									51 - 100	15	21	30	42	60	83	120
									101 - 200	17	24	34	48	68	95	135
Total profile deviation	- 20	3.2	4.6	6.5	9	13	18	26	All range	3	4	6	8	11	16	22
	21 - 50	3.6	5	7.5	10	15	21	29								
	51 - 125	4.1	6	8.5	12	17	23	33								
Runout	- 20	6.5	9	13	18	25	36	51	7 - 12	8	11	15	21	30	43	60
	21 - 50	8	11	16	23	32	46	65	13 - 25	8	12	17	24	33	47	66
	51 - 125	10	15	21	29	42	59	83	26 - 50	9	13	19	26	37	53	74
									51 - 100	10	15	21	30	42	60	83
									101 - 200	12	17	24	34	48	68	95
Radial composite deviation Total contact	- 20	9	12	18	25	35	50	70	7 - 12	10	14	20	28	39	55	78
	21 - 50	11	15	21	30	42	60	85	13 - 25	11	15	21	30	42	60	84
	51 - 125	13	18	26	36	52	73	103	26 - 50	12	16	23	33	46	65	92
									51 - 100	13	18	25	36	51	72	100
									101 - 200	14	20	28	40	57	81	115
Tooth-to-tooth radial composite deviation	All range	2.5	3.5	5	7	10	14	20	All range	4	6	9	13	18	25	36

Table 5. The Allowable value of each deviation for module 1.25

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 16	3.3	4.7	6.5	9.5	13	19	26	- 9	3	4	6	8	11	16	23
	17 - 40	3.5	5	7	10	14	20	28	10 - 20	3	4	6	9	12	18	25
	41 - 100	3.8	5.5	7.5	11	15	21	30	21 - 40	3	5	7	10	14	19	28
	101 - 224	4.2	6	8.5	12	17	24	34	41 - 80	4	6	8	11	16	22	31
Total cumulative pitch deviations									81 - 160	4	6	9	12	18	25	35
	- 16	8	11	16	23	32	45	64	- 9	11	16	23	32	45	64	91
	17 - 40	10	14	20	29	41	57	81	10 - 20	12	18	25	35	50	70	100
	41 - 100	13	18	26	37	52	74	104	21 - 40	14	19	28	39	55	77	110
	101 - 224	17	24	35	49	69	98	138	41 - 80	16	22	31	44	62	87	125
Total profile deviation									81 - 160	18	25	35	50	71	99	140
	- 16	3.2	4.6	6.5	9	13	18	26	All range	3	4	6	9	13	18	25
	17 - 40	3.6	5	7.5	10	15	21	29								
	41 - 100	4.1	6	8.5	12	17	23	33								
	101 - 224	4.9	7	10	14	20	28	39								
Runout	- 16	6.5	9	13	18	25	36	51	- 9	8	11	16	23	32	45	64
	17 - 40	8	11	16	23	32	46	65	10 - 20	9	12	18	25	35	50	70
	41 - 100	10	15	21	29	42	59	83	21 - 40	10	14	19	28	39	55	77
	101 - 224	14	20	28	39	55	78	110	41 - 80	11	16	22	31	44	62	87
									81 - 160	12	18	25	35	50	71	99
Radial composite deviation Total contact	- 16	10	14	19	27	38	54	76	- 9	10	15	21	30	42	59	84
	17 - 40	11	16	23	32	45	64	91	10 - 20	11	16	23	32	45	64	90
	41 - 100	14	19	27	39	55	77	109	21 - 40	12	17	25	35	49	69	98
	101 - 224	17	24	34	48	68	97	137	41 - 80	13	19	27	38	54	76	105
									81 - 160	15	21	30	42	60	85	120
Tooth-to-tooth radial composite deviation	- 40	3.0	4.5	6.5	9.0	13	18	25	All range	5	7	10	14	20	28	40
	41 - 224	3.0	4.5	6.5	9.0	13	18	26								

Table 6. The Allowable value of each deviation for module 1.5

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 13	3.3	4.7	6.5	9.5	13	19	26	- 8	3	4	6	8	11	16	23
	14 - 33	3.5	5	7	10	14	20	28	9 - 16	3	4	6	9	12	18	25
	34 - 83	3.8	5.5	7.5	11	15	21	30	17 - 33	3	5	7	10	14	19	28
	84 - 186	4.2	6	8.5	12	17	24	34	34 - 66	4	6	8	11	16	22	31
									67 - 133	4	6	9	12	18	25	35
Total cumulative pitch deviations	- 13	8	11	16	23	32	45	64	- 8	11	16	23	32	45	64	91
	14 - 33	10	14	20	29	41	57	81	9 - 16	12	18	25	35	50	70	100
	34 - 83	13	18	26	37	52	74	104	17 - 33	14	19	28	39	55	77	110
	84 - 186	17	24	35	49	69	98	138	34 - 66	16	22	31	44	62	87	125
									67 - 133	18	25	35	50	71	99	140
Total profile deviation	- 13	3.2	4.6	6.5	9	13	18	26	All range	3	4	6	9	13	18	25
	14 - 33	3.6	5	7.5	10	15	21	29								
	34 - 83	4.1	6	8.5	12	17	23	33								
	84 - 186	4.9	7	10	14	20	28	39								
Runout	- 13	6.5	9	13	18	25	36	51	- 8	8	11	16	23	32	45	64
	14 - 33	8	11	16	23	32	46	65	9 - 16	9	12	18	25	35	50	70
	34 - 83	10	15	21	29	42	59	83	17 - 33	10	14	19	28	39	55	77
	84 - 186	14	20	28	39	55	78	110	34 - 66	11	16	22	31	44	62	87
									67 - 133	12	18	25	35	50	71	99
Radial composite deviation Total contact	- 13	10	14	19	27	38	54	76	- 8	10	15	21	30	42	59	84
	14 - 33	11	16	23	32	45	64	91	9 - 16	11	16	23	32	45	64	90
	34 - 83	14	19	27	39	55	77	109	17 - 33	12	17	25	35	49	69	98
	84 - 186	17	24	34	48	68	97	137	34 - 66	13	19	27	38	54	76	105
									67 - 133	15	21	30	42	60	85	120
Tooth-to-tooth radial composite deviation	- 33	3	4.5	6.5	9	13	18	25	All range	5	7	10	14	20	28	40
	34 - 186	3	4.5	6.5	9	13	18	26								

Table 7. The Allowable value of each deviation for module 2.0

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 10	3.3	4.7	6.5	9.5	13	19	26	7 - 12	3	5	7	9	13	19	27
	11 - 25	3.5	5	7	10	14	20	28	13 - 25	4	5	7	10	15	21	30
	26 - 62	3.8	5.5	7.5	11	15	21	30	26 - 50	4	6	8	12	16	23	33
	63 - 140	4.2	6	8.5	12	17	24	34	51 - 100	5	7	9	13	19	26	37
Total cumulative pitch deviations	- 10	8	11	16	23	32	45	64	7 - 12	13	19	27	38	53	75	105
	11 - 25	10	14	20	29	41	57	81	13 - 25	15	21	30	42	59	83	120
	26 - 62	13	18	26	37	52	74	104	26 - 50	16	23	33	46	66	92	130
	63 - 140	17	24	35	49	69	98	138	51 - 100	19	26	37	52	74	105	150
Total profile deviation	- 10	3.2	4.6	6.5	9	13	18	26	All range	4	5	7	10	15	21	29
	11 - 25	3.6	5	7.5	10	15	21	29								
	26 - 62	4.1	6	8.5	12	17	23	33								
	63 - 140	4.9	7	10	14	20	28	39								
Runout	- 10	6.5	9	13	18	25	36	51	7 - 2	9	13	19	27	38	53	75
	11 - 25	8	11	16	23	32	46	65	13 - 25	10	15	21	30	42	59	83
	26 - 62	10	15	21	29	42	59	83	26 - 50	12	16	23	33	46	66	92
	63 - 140	14	20	28	39	55	78	110	51 - 100	13	19	26	37	52	74	105
Radial composite deviation Total contact	- 10	11	16	22	32	45	63	89	7 - 12	12	17	25	35	49	70	98
	11 - 25	13	18	26	37	52	73	103	13 - 25	13	19	27	38	53	75	105
	26 - 62	15	22	31	43	61	86	122	26 - 50	15	21	29	41	58	82	115
	63 - 140	19	26	37	53	75	106	149	51 - 100	16	23	32	45	64	91	130
Tooth-to-tooth radial composite deviation	- 62	4.5	6.5	9.5	13	19	26	37	All range	6	8	12	16	23	33	47
	63 - 140	4.5	6.5	9.5	13	19	27	38								

Table 8. The Allowable value of each deviation for module 2.5

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 8	3.7	5	7.5	10	15	21	29	- 10	3	5	7	9	13	19	27
	9 - 20	3.9	5.5	7.5	11	15	22	31	11 - 20	4	5	7	10	15	21	30
	21 - 50	4.1	6	8.5	12	17	23	33	21 - 40	4	6	8	12	16	23	33
	51 ~ 112	4.6	6.5	9	13	18	26	36	41 ~ 80	5	7	9	13	19	26	37
Total cumulative pitch deviations	~ 8	8.5	12	17	23	33	47	66	~ 10	13	19	27	38	53	75	105
	9 ~ 20	10	15	21	30	42	59	84	11 ~ 20	15	21	30	42	59	83	120
	21 ~ 50	13	19	27	38	53	76	107	21 ~ 40	16	23	33	46	66	92	130
	51 ~ 112	18	25	35	50	70	100	141	41 ~ 80	19	26	37	52	74	105	150
Total profile deviation	~ 8	4.7	6.5	9.5	13	19	26	37	All range	4	5	7	10	15	21	29
	9 ~ 20	5	7	10	14	20	29	40								
	21 ~ 50	5.5	8	11	16	22	31	44								
	51 ~ 112	6.5	9	13	18	25	36	50								
Runout	~ 8	6.5	9.5	13	19	27	38	53	~ 10	9	13	19	27	38	53	75
	9 ~ 20	8.5	12	17	24	34	47	67	11 ~ 20	10	15	21	30	42	59	83
	21 ~ 50	11	15	21	30	43	61	86	21 ~ 40	12	16	23	33	46	66	92
	51 ~ 112	14	20	28	40	56	80	113	41 ~ 80	13	19	26	37	52	74	105
Radial composite deviation Total contact	~ 8								~ 10	12	17	25	35	49	70	98
	9 ~ 20	13	18	26	37	52	73	103	11 ~ 20	13	19	27	38	53	75	105
	21 ~ 50	15	22	31	43	61	86	122	21 ~ 40	15	21	29	41	58	82	115
	51 ~ 112	19	26	37	53	75	106	149	41 ~ 80	16	23	32	45	64	91	130
Tooth-to-tooth radial composite deviation	~ 50	4.5	6.5	9.5	13	19	26	37	All range	6	8	12	16	23	33	47
	51 ~ 112	4.5	6.5	9.5	13	19	27	38								

Table 9. The Allowable value of each deviation for module 3.0

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	7 - 16	3.9	5.5	7.5	11	15	22	31	8	This is beyond the standard, applied Allowable value of No. of teeth of 9.						
	17 - 41	4.1	6	8.5	12	17	23	33	9 - 16	4	6	8	11	16	23	33
	42 - 93	4.6	6.5	9	13	18	26	36	17 - 33	4	6	9	13	18	25	36
									34 - 66	5	7	10	14	20	28	40
Total cumulative pitch deviations	7 - 16	10	15	21	30	42	59	84	8	This is beyond the standard, applied Allowable value of No. of teeth of 9.						
	17 - 41	13	19	27	38	53	76	107	9 - 16	16	23	33	46	65	91	130
	42 - 93	18	25	35	50	70	100	141	17 - 33	18	25	36	51	72	100	145
									34 - 66	20	28	40	57	81	115	160
Total profile deviation	7 - 16	5	7	10	14	20	29	40	All range	4	6	9	13	18	25	36
	17 - 41	5.5	8	11	16	22	31	44								
	42 - 93	6.5	9	13	18	25	36	50								
Runout	7 - 16	8.5	12	17	24	34	47	67	8	This is beyond the standard, applied Allowable value of No. of teeth of 9.						
	17 - 41	11	15	21	30	43	61	86	9 - 16	11	16	23	33	46	65	91
	42 - 93	14	20	28	40	56	80	113	17 - 33	13	18	25	36	51	72	100
									34 - 66	14	20	28	40	57	81	115
Radial composite deviation Total contact	7 - 16	16	22	31	44	63	89	126	8	This is beyond the standard, applied Allowable value of No. of teeth of 9.						
	17 - 41	18	25	36	51	72	102	144	9 - 16	15	21	30	43	60	85	120
	42 - 93	21	30	43	61	86	121	172	17 - 33	16	23	32	46	65	92	130
									34 - 66	18	25	35	50	71	100	140
Tooth-to-tooth radial composite deviation	- 93	7.5	10	15	21	29	41	58	All range	7	10	13	20	29	40	57

Table 10. The Allowable value of each deviation for module 4.0

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 12	4.3	6	8.5	12	17	24	34	- 124		6	8	11	16	23	33
	13 - 31	4.6	6.5	9	13	18	26	36	13 - 25	4	6	9	13	18	25	36
	32 - 70	5	7	10	14	20	28	40	26 - 50	5	7	10	14	20	28	40
Total cumulative pitch deviations	- 12	11	15	22	31	44	62	87	- 12	16	23	33	46	65	91	130
	13 - 31	14	19	28	39	55	78	110	13 - 25	18	25	36	51	72	100	145
	32 - 70	18	25	36	51	72	102	144	26 - 50	20	28	40	57	81	115	160
Total profile deviation	- 12	6	9	12	18	25	35	50	All range	4	6	9	13	18	25	36
	13 - 31	6.5	9.5	13	19	27	38	54								
	32 - 70	7.5	11	15	21	30	42	60								
Runout	- 12	8.5	12	17	25	35	49	70	- 12	11	16	23	33	46	65	91
	13 - 31	11	16	22	31	44	62	88	13 - 25	13	18	25	36	51	72	100
	32 - 70	14	20	29	41	58	82	115	26 - 50	14	20	28	40	57	81	115
Radial composite deviation Total contact	- 12	16	22	31	44	63	89	126	- 12	15	21	30	43	60	85	120
	13 - 31	18	25	36	51	72	102	144	13 - 25	16	23	32	46	65	92	130
	32 - 70	21	30	43	61	86	121	172	26 - 50	18	25	35	50	71	100	140
Tooth-to-tooth radial composite deviation	- 70	7.5	10	15	21	29	41	58	All range	7	10	13	20	29	40	57

Table 11. The Allowable value of each deviation for module 5.0

Unit:  $\mu\text{m}$ 

Deviations	System of accuracy for JIS B 1702-1 and 2: 1998								System of accuracy for JIS B 1702 and JGMA 116-01							
	No. of teeth	N4	N5	N6	N7	N8	N9	N10	No. of teeth	0	1	2	3	4	5	6
Single pitch deviations	- 10	4.3	6	8.5	12	17	24	34	- 10	5	7	9	13	19	26	37
	11 - 25	4.6	6.5	9	13	18	26	36	11 - 20	5	7	10	14	20	28	40
	26 - 56	5	7	10	14	20	28	40	21 - 40	6	8	11	16	22	32	45
Total cumulative pitch deviations	- 10	11	15	22	31	44	62	87	- 10	19	26	37	52	74	105	150
	11 - 25	14	19	28	39	55	78	110	11 - 20	20	28	40	57	81	115	160
	26 - 56	18	25	36	51	72	102	144	21 - 40	22	32	45	63	90	125	180
Total profile deviation	- 10	6	9	12	18	25	35	50	All range	6	8	11	16	23	32	45
	11 - 25	6.5	9.5	13	19	27	38	54								
	26 - 56	7.5	11	15	21	30	42	60								
Runout	- 10	8.5	12	17	25	35	49	70	- 10	13	19	26	37	52	74	105
	11 - 25	11	16	22	31	44	62	88	11 - 20	14	20	28	40	57	81	115
	26 - 56	14	20	29	41	58	82	115	21 - 40	15	22	32	45	63	90	125
Radial composite deviation Total contact	- 10	20	28	39	56	79	111	157	- 10	18	25	35	50	70	100	140
	11 - 25	22	31	44	62	88	124	176	11 - 20	19	27	38	53	75	105	150
	26 - 56	25	36	51	72	102	144	203	21 - 40	20	29	41	58	81	115	160
Tooth-to-tooth radial composite deviation	- 56	11	15	22	31	44	62	87	All range	9	13	18	26	36	51	73

Table 12. Total helix deviation

Reference diameter d mm	Facewidth b mm	Reference diameter						
		N4	N5	N6	N7	N8	N9	N10
		$\mu\text{m}$						
$5 \leq d \leq 20$	$4 \leq b \leq 10$	4.3	6	8.5	12	17	24	35
	$10 < b \leq 20$	4.9	7	9.5	14	19	28	39
	$20 < b \leq 40$	5.5	8	11	16	22	31	45
$20 < d \leq 50$	$4 \leq b \leq 10$	4.5	6.5	9	13	18	25	36
	$10 < b \leq 20$	5	7	10	14	20	29	40
	$20 < b \leq 40$	5.5	8	11	16	23	32	46
$50 < d \leq 125$	$4 \leq b \leq 10$	4.7	6.5	9.5	13	19	27	38
	$10 < b \leq 20$	5.5	7.5	11	15	21	30	42
	$20 < b \leq 40$	6	8.5	12	17	24	34	48
	$40 < b \leq 80$	7	10	14	20	28	39	56
$125 < d \leq 280$	$4 \leq b \leq 10$	5	7	10	14	20	29	40
	$10 < b \leq 20$	5.5	8	11	16	22	32	45
	$20 < b \leq 40$	6.5	9	13	18	25	36	50
	$40 < b \leq 80$	7.5	10	15	21	29	41	58
$280 < d \leq 560$	$10 < b \leq 20$	6	8.5	12	17	24	34	48
	$20 < b \leq 40$	6.5	9.5	13	19	27	38	54
	$40 < b \leq 80$	7.5	11	15	22	31	44	62
	$80 < b \leq 160$	9	13	18	26	36	52	73

Table 13. Allowable value of Runout for material of Outside diameter (JIS B 1702 old)

Unit:  $\mu\text{m}$ 

da = Outside diameter (mm)	1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
Class 0	3	4	4	4	5	5	6	6	7	9	10
Class 1	5	5	5	6	6	7	8	9	10	12	14
Class 2	7	7	8	8	9	10	11	13	15	17	20
Class 3	10	10	11	12	13	14	16	18	20	24	28
Class 4	14	14	15	17	18	20	22	25	29	34	40
Class 5	19	20	22	23	26	28	31	36	41	47	56
Class 6	28	29	31	33	36	40	45	51	58	60	80
Class 7	55	58	62	67	73	80	90	100	115	135	160
Class 8	110	115	125	135	145	160	180	200	230	270	320

Table 14. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 0 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)	1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	2	2	3	4	5	8	-	-	-	-
	3 < b ≤ 6	2	2	3	3	5	8	13	-	-	-
	6 < b ≤ 12	2	2	3	3	5	7	12	23	-	-
	12 < b ≤ 25	2	2	3	3	4	7	11	20	38	-
	25 < b ≤ 50	-	2	3	3	4	6	9	16	30	59
	50 < b ≤ 100	-	-	2	3	3	5	7	12	22	42
	100 < b ≤ 200	-	-	-	3	3	4	5	8	15	27
	200 < b ≤ 400	-	-	-	-	3	3	4	6	9	17
	400 < b ≤ 800	-	-	-	-	-	3	3	4	6	10

Table 15. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 1 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)	1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	3	3	4	5	7	11	-	-	-	-
	3 < b ≤ 6	3	3	4	5	7	11	19	-	-	-
	6 < b ≤ 12	3	3	4	5	7	10	18	32	-	-
	12 < b ≤ 25	3	3	4	5	6	9	16	28	53	-
	25 < b ≤ 50	-	3	4	4	5	8	13	23	43	83
	50 < b ≤ 100	-	-	3	4	5	7	10	17	31	59
	100 < b ≤ 200	-	-	-	4	4	5	7	12	21	38
	200 < b ≤ 400	-	-	-	-	4	4	6	8	13	23
	400 < b ≤ 800	-	-	-	-	-	4	4	6	9	14



Table 16. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 2 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)		1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	5	5	6	7	10	16	-	-	-	-	-
	3 < b ≤ 6	5	5	6	7	10	15	26	-	-	-	-
	6 < b ≤ 12	5	5	5	7	9	14	25	45	-	-	-
	12 < b ≤ 25	4	5	5	6	9	13	22	40	75	-	-
	25 < b ≤ 50	-	5	5	6	8	11	18	32	60	115	-
	50 < b ≤ 100	-	-	5	5	7	9	14	24	44	83	160
	100 < b ≤ 200	-	-	-	5	6	7	10	17	29	54	105
	200 < b ≤ 400	-	-	-	-	5	6	8	11	18	33	61
	400 < b ≤ 800	-	-	-	-	-	5	6	8	12	20	35

Table 17. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 3 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)		1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	6	7	8	10	14	22	-	-	-	-	-
	3 < b ≤ 6	6	7	8	10	14	22	37	-	-	-	-
	6 < b ≤ 12	6	7	8	10	13	21	35	64	-	-	-
	12 < b ≤ 25	6	7	8	9	12	19	31	56	105	-	-
	25 < b ≤ 50	-	7	7	8	11	16	26	46	86	165	-
	50 < b ≤ 100	-	-	7	8	10	13	20	34	62	120	230
	100 < b ≤ 200	-	-	-	7	8	10	15	24	41	77	150
	200 < b ≤ 400	-	-	-	-	7	9	11	16	26	47	88
	400 < b ≤ 800	-	-	-	-	-	7	9	12	17	28	50

Table 18. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 4 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)		1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	9	10	11	14	20	31	-	-	-	-	-
	3 < b ≤ 6	9	10	11	14	19	30	52	-	-	-	-
	6 < b ≤ 12	9	10	11	13	19	29	49	90	-	-	-
	12 < b ≤ 25	9	9	11	13	17	26	44	79	150	-	-
	25 < b ≤ 50	-	9	10	12	15	22	36	64	120	230	-
	50 < b ≤ 100	-	-	10	11	13	18	28	48	87	165	320
	100 < b ≤ 200	-	-	-	10	12	15	21	33	58	110	210
	200 < b ≤ 400	-	-	-	-	10	12	16	23	37	66	125
	400 < b ≤ 800	-	-	-	-	-	10	12	16	24	39	70

Table 19. Allowable value of Runout for material of side flank (JIS B 1702 old) for class 5 gear.

Unit:  $\mu\text{m}$ 

d = Reference diameter (mm)		1.5 < da ≤ 3.0	3 < da ≤ 6	6 < da ≤ 12	12 < da ≤ 25	25 < da ≤ 50	50 < da ≤ 100	100 < da ≤ 200	200 < da ≤ 400	400 < da ≤ 800	800 < da ≤ 1,600	1,600 < da ≤ 3,200
b = Facewidth (mm)	b < 3.0	13	14	16	20	28	45	-	-	-	-	-
	3 < b ≤ 6	13	14	16	20	28	43	75	-	-	-	-
	6 < b ≤ 12	13	14	15	19	27	41	70	130	-	-	-
	12 < b ≤ 25	13	14	15	18	25	37	62	115	210	-	-
	25 < b ≤ 50	-	13	14	17	22	32	52	92	170	330	-
	50 < b ≤ 100	-	-	14	15	19	26	40	68	125	240	469
	100 < b ≤ 200	-	-	-	14	16	21	30	47	83	155	300
	200 < b ≤ 400	-	-	-	-	15	17	22	32	53	94	175
	400 < b ≤ 800	-	-	-	-	-	15	18	23	34	56	190

## Accuracy for Bevel gear JIS B 1704 (Extracts)

1. **Applicable Range** covers accuracy of Bevel gear with Outer transverse module 0.4 to 25.0 and Outer pitch diameter 3.0 mm to 1,600.00 mm

**Remark:** Above applicable range can be used for Hypoid gear.

2. **The meanings of gear terms.** Standard terms are used as follow.

**(1) Single pitch deviation.**

Amount of actual pitch on Pitch circle at Mean cone distance of adjacent teeth subtracted by its correct pitch.

**(2) Pitch variation deviation.**

The Absolute amount of difference between adjacent two pitches on Pitch circle at Mean cone distance.

**(3) Total cumulative pitch deviations.**

The value from amount of correct pitch subtracted by sum of actual pitch with any adjacent two pitches at Mean cone distance.

**(4) Runout.**

Maximum difference at location of radius direction when contact piece such as Over balls or Rollers are put to Tooth space near Pitch circle.

3. **System of accuracy** for gears is classified into 9 classes. Can select to combine from different classes with different deviation or choose only necessary items in accordance to the usage purpose.

There are the classes 0, 1, 2, 3, 4, 5, 6, 7, 8.

4. **Allowable value** For classification of System of accuracy, refer to following pages for Allowable values of Single pitch deviation, Pitch variation deviation, Total cumulative pitch deviation and Runout.

Table 20.

Allowable tolerances for Transverse module 0.4 to 0.6.

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)					
		3.0 < d ≤ 6.0	6.0 < d ≤ 12.0	12.0 < d ≤ 25.0	25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0
0	Single pitch deviation (±)	3	4	4	4	4	5
	Pitch variation deviation	4	5	5	5	6	6
	Total cumulative pitch deviations (±)	14	14	15	16	18	19
	Runout	5	7	10	14	20	28
1	Single pitch deviation (±)	6	6	7	7	8	8
	Pitch variation deviation	8	8	9	9	10	11
	Total cumulative pitch deviations (±)	25	26	27	29	31	34
	Runout	7	10	15	21	30	43
2	Single pitch deviation (±)	11	12	12	13	14	15
	Pitch variation deviation	15	15	16	17	18	20
	Total cumulative pitch deviations (±)	46	47	50	52	56	60
	Runout	11	15	22	31	45	63
3	Runout	16	24	33	48	67	95
4	Runout	25	35	50	71	100	145
5	Runout	37	52	75	105	150	210
6	Runout	56	79	110	160	230	320

Table 21. Allowable tolerances for Transverse module above 0.6 to 1.0

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)					
		3.0 < d ≤ 6.0	6.0 < d ≤ 12.0	12.0 < d ≤ 25.0	25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0
0	Single pitch deviation (±)	4	4	4	4	5	5
	Pitch variation deviation	5	5	5	5	6	6
	Total cumulative pitch deviations (±)	14	15	16	17	18	20
	Runout	5	7	10	14	20	28
1	Single pitch deviation (±)	6	7	7	7	8	9
	Pitch variation deviation	8	9	9	10	10	11
	Total cumulative pitch deviations (±)	25	26	28	30	32	34
	Runout	7	10	15	21	30	43
2	Single pitch deviation (±)	12	12	13	13	14	15
	Pitch variation deviation	15	16	16	17	18	20
	Total cumulative pitch deviations (±)	46	48	50	53	57	61
	Runout	11	15	22	31	45	63
3	Runout	16	24	33	48	67	95
4	Runout	25	35	50	71	100	145
5	Runout	37	52	75	105	150	210
6	Runout	56	79	110	160	230	320

Table 22. Allowable tolerances for Transverse module above 1.0 to 1.6.

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)					
		3.0 < d ≤ 6.0	6.0 < d ≤ 12.0	12.0 < d ≤ 25.0	25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0
0	Single pitch deviation (±)	4	4	4	5	5	6
	Pitch variation deviation	5	5	6	6	7	7
	Total cumulative pitch deviations (±)	15	16	17	19	20	22
	Runout	7	10	14	20	28	40
1	Single pitch deviation (±)	7	7	8	8	9	10
	Pitch variation deviation	9	9	10	11	11	13
	Total cumulative pitch deviations (±)	27	29	30	32	35	39
	Runout	10	15	21	30	43	60
2	Single pitch deviation (±)	12	13	14	14	16	17
	Pitch variation deviation	16	17	18	19	20	22
	Total cumulative pitch deviations (±)	49	52	54	58	62	68
	Runout	15	22	31	45	63	89
3	Single pitch deviation (±)	23	23	25	26	28	30
	Pitch variation deviation	29	30	32	34	36	39
	Total cumulative pitch deviations (±)	90	94	98	105	110	120
	Runout	24	33	48	67	95	135
4	Single pitch deviation (±)	41	42	44	46	49	52
	Pitch variation deviation	53	55	57	60	63	68
	Total cumulative pitch deviations (±)	165	170	175	185	195	210
	Runout	35	50	71	100	145	200
5	Runout	52	75	105	150	210	300
6	Runout	79	110	160	230	320	450

Table 23. Allowable tolerances for Transverse module above 1.6 to 2.5.

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)					
		3.0 < d ≤ 6.0	6.0 < d ≤ 12.0	12.0 < d ≤ 25.0	25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0
0	Single pitch deviation (±)	4	4	5	5	6	6
	Pitch variation deviation	5	6	6	7	8	9
	Total cumulative pitch deviations (±)	17	18	19	21	23	26
	Runout	10	14	20	28	40	56
1	Single pitch deviation (±)	7	8	8	9	10	11
	Pitch variation deviation	10	10	11	12	13	14
	Total cumulative pitch deviations (±)	30	32	34	36	40	44
	Runout	15	21	30	43	60	86
2	Single pitch deviation (±)	13	14	15	16	17	19
	Pitch variation deviation	17	18	19	21	23	25
	Total cumulative pitch deviations (±)	54	56	60	64	69	76
	Runout	22	31	45	63	89	125
3	Single pitch deviation (±)	24	25	27	28	31	33
	Pitch variation deviation	31	33	35	37	40	43
	Total cumulative pitch deviations (±)	97	100	105	115	120	135
	Runout	33	48	67	95	135	190
4	Single pitch deviation (±)	43	45	47	50	55	57
	Pitch variation deviation	56	58	61	65	69	75
	Total cumulative pitch deviations (±)	170	180	190	200	210	239
	Runout	50	71	100	145	200	290
5	Pitch variation deviation	110	115	120	125	132	150
	Runout	75	105	150	210	300	430
6	Pitch variation deviation	210	220	240	250	270	290
	Runout	110	160	230	320	450	640

Table 24. Allowable tolerances for Transverse module above 2.5 to 4.0.

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)						
		12.0 < d ≤ 25.0	25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0	200.0 < d ≤ 400.0	400.0 < d ≤ 800.0	800.0 < d ≤ 1,600.0
0	Single pitch deviation (±)	5	5	5	6	6	7	8
	Pitch variation deviation	6	6	7	7	8	9	10
	Total cumulative pitch deviations (±)	18	19	21	22	24	27	31
	Runout	10	14	20	28	40	56	79
1	Single pitch deviation (±)	8	8	9	10	10	12	13
	Pitch variation deviation	10	11	12	12	14	15	17
	Total cumulative pitch deviations (±)	32	33	36	38	42	46	51
	Runout	15	21	30	43	60	86	120
2	Single pitch deviation (±)	14	15	16	17	18	20	22
	Pitch variation deviation	18	19	20	22	24	26	29
	Total cumulative pitch deviations (±)	57	59	63	67	72	79	88
	Runout	22	31	45	63	89	125	180
3	Single pitch deviation (±)	25	27	28	30	32	35	38
	Pitch variation deviation	33	34	36	39	41	45	49
	Total cumulative pitch deviations (±)	100	105	110	120	130	140	150
	Runout	33	48	67	95	135	190	270
4	Single pitch deviation (±)	45	47	50	52	55	59	65
	Pitch variation deviation	59	61	65	67	72	77	84
	Total cumulative pitch deviations (±)	180	185	200	210	220	240	260
	Runout	50	71	100	145	200	290	400
5	Pitch variation deviation	115	120	125	130	135	155	170
	Runout	75	105	150	210	300	430	600
6	Pitch variation deviation	220	240	250	260	280	290	310
	Runout	110	160	230	320	450	640	900
7	Runout	250	360	500	720	1000	1450	2000

Table 25. Allowable tolerances for Transverse module above 4.0 to 6.0

Unit:  $\mu\text{m}$ 

System of accuracy	Deviations	d = Pitch diameter (mm)					
		25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0	200.0 < d ≤ 400.0	400.0 < d ≤ 800.0	800.0 < d ≤ 1,600.0
0	Single pitch deviation (±)	5	6	6	7	7	8
	Pitch variation deviation	7	7	8	9	9	11
	Total cumulative pitch deviations (±)	21	22	24	26	29	32
	Runout	14	20	28	40	56	79
1	Single pitch deviation (±)	9	10	10	11	12	14
	Pitch variation deviation	12	12	13	14	16	18
	Total cumulative pitch deviations (±)	36	38	41	45	49	54
	Runout	21	30	43	60	86	120
2	Single pitch deviation (±)	16	17	18	19	21	23
	Pitch variation deviation	21	22	23	25	27	30
	Total cumulative pitch deviations (±)	64	67	72	77	84	92
	Runout	31	45	63	89	125	180
3	Single pitch deviation (±)	28	30	31	34	36	40
	Pitch variation deviation	37	39	41	44	47	52
	Total cumulative pitch deviations (±)	115	120	125	135	145	160
	Runout	48	67	95	135	190	270
4	Single pitch deviation (±)	50	52	54	58	62	68
	Pitch variation deviation	65	67	71	75	81	88
	Total cumulative pitch deviations (±)	200	210	220	230	250	270
	Runout	71	100	145	200	290	400
5	Pitch variation deviation	125	130	135	150	165	175
	Runout	105	150	210	300	430	600
6	Pitch variation deviation	250	260	270	290	300	330
	Runout	160	230	320	450	640	900
7	Runout	360	500	720	1000	1450	2000

Table 26. Allowable tolerances for Transverse module above 6.0 to 10.0

Unit:  $\mu\text{m}$ 

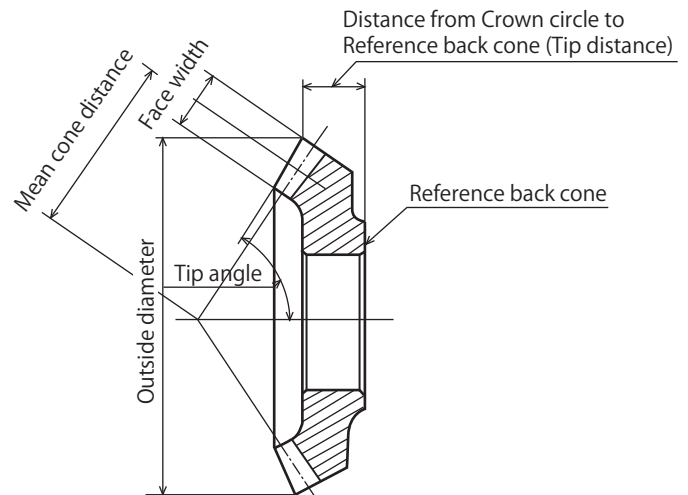
System of accuracy	Deviations	d = Pitch diameter (mm)					
		25.0 < d ≤ 50.0	50.0 < d ≤ 100.0	100.0 < d ≤ 200.0	200.0 < d ≤ 400.0	400.0 < d ≤ 800.0	800.0 < d ≤ 1,600.0
0	Single pitch deviation (±)	6	6	7	7	8	9
	Pitch variation deviation	8	8	9	9	10	11
	Total cumulative pitch deviations (±)	24	25	27	29	32	35
	Runout	14	20	28	40	56	79
1	Single pitch deviation (±)	10	11	11	12	13	15
	Pitch variation deviation	13	14	15	16	17	19
	Total cumulative pitch deviations (±)	41	43	46	49	54	59
	Runout	21	30	43	60	86	120
2	Single pitch deviation (±)	18	19	20	21	23	25
	Pitch variation deviation	23	24	26	27	30	32
	Total cumulative pitch deviations (±)	71	75	79	84	91	100
	Runout	31	45	63	89	125	180
3	Single pitch deviation (±)	31	33	34	37	39	43
	Pitch variation deviation	41	42	45	48	51	56
	Total cumulative pitch deviations (±)	125	130	140	145	155	170
	Runout	48	67	95	135	190	270
4	Single pitch deviation (±)	54	56	59	62	67	72
	Pitch variation deviation	71	73	77	81	87	100
	Total cumulative pitch deviations (±)	220	230	240	250	270	290
	Runout	71	100	145	220	290	400
5	Pitch variation deviation	135	140	155	165	175	185
	Runout	105	150	210	300	430	600
6	Pitch variation deviation	270	280	290	310	320	340
	Runout	160	230	320	450	640	900
7	Runout	360	500	720	1000	1450	2000

**Table 27. Allowable tolerance for Tip angle of material**

Unit: Minutes

System of accuracy	b = Facewidth (mm)			
	b < 1.6	1.6 < b ≤ 6	6.0 < b ≤ 25.0	b > 25.0
1, 2	0 +60	0 +20	0 +10	0 +8
3, 4	0 +100	0 +30	0 +20	0 +15
5, 6	0 +120	0 +40	0 +25	0 +20
7, 8	0 +150	0 +60	0 +30	0 +25

Details for Allowable distance from Outside diameter of material or Crown circle to Reference back cone ... omitted.



**Fig. 19 Terms for Bevel gear**

- 1. Allowable value of Runout for material's Cone surface.** When using Reference surface for gear cutting or measurement with material's Tip cone surface. Allowable Runout for material's Tip cone surface is indicated in Table below. While material's Back cone and Front cone surface is used for Reference surface, values below may also be used.
- Note (1): Runout for material's cone surface is difference between maximum and minimum readings of an indicator when turning the material with the indicator placed firmly near the heel of cone perpendicular to cone surface.

**Table 28. Allowable value of Runout for material's Cone surface**

Unit:  $\mu\text{m}$

System of accuracy	d = Pitch diameter (mm)								
	$3.0 < d \leq 6.0$	$6.0 < d \leq 12.0$	$12.0 < d \leq 25.0$	$25.0 < d \leq 50.0$	$50.0 < d \leq 100.0$	$100.0 < d \leq 200.0$	$200.0 < d \leq 400.0$	$400.0 < d \leq 800.0$	$800.0 < d \leq 1,600.0$
1,2	14	15	17	18	20	22	25	30	34
3,4	33	35	38	41	45	51	57	66	76
5,6	73	77	83	91	100	110	125	145	170
7,8	-	-	185	200	220	250	280	330	380

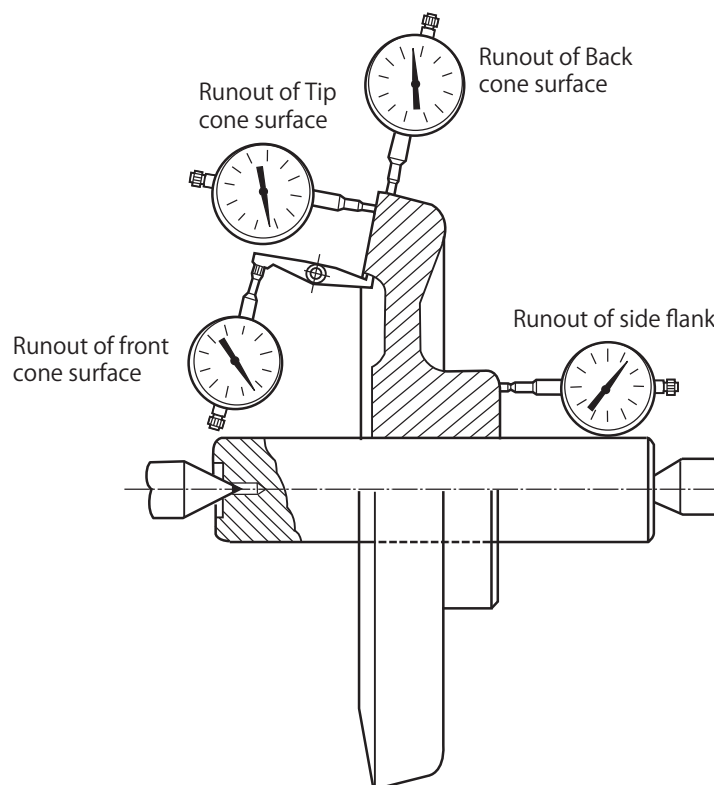
- 2. Allowable value of Runout for side flank of material.** For the material of Bevel gear with shaft or bore, refer to Table 29, shows Allowable value of Runout for side flank of material when using the Reference surface as flat face perpendicular to axis for gear cutting.

Note (1): Runout for material's side flank is difference between maximum and minimum readings of an indicator when turning the material with the indicator placed firmly near the heel of Reference side face.

**Table 29. Allowable value of Runout for material's side flank**

Unit:  $\mu\text{m}$

System of accuracy	d = Pitch diameter (mm)								
	$3.0 < d \leq 6.0$	$6.0 < d \leq 12.0$	$12.0 < d \leq 25.0$	$25.0 < d \leq 50.0$	$50.0 < d \leq 100.0$	$100.0 < d \leq 200.0$	$200.0 < d \leq 400.0$	$400.0 < d \leq 800.0$	$800.0 < d \leq 1,600.0$
1,2	6	6	7	7	8	9	10	12	14
3,4	16	17	19	20	22	25	28	33	38
5,6	46	49	53	57	63	71	80	92	105
7,8	-	-	150	165	180	200	230	260	310



**Fig. 20 Runout of Bevel gear with bore**