

JIS

JAPANESE INDUSTRIAL STANDARD

Tolerance System for
Metric Screw Threads

JIS B 0215 —1982

Translated and Published

by

Japanese Standards Association

Printed in Japan

Translation without guarantee
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standard in Japanese is to be evidence

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Tolerance System for Metric Screw Threads

B 0215-1982

1. Scope

This Japanese Industrial Standard specifies the tolerance system for metric coarse screw threads ⁽¹⁾ and metric fine screw threads specified respectively in JIS B 0205 and JIS B 0207, hereinafter referred to as the "metric screw threads", in combination of metric coarse screw threads and metric fine screw threads, mainly to be used for fastening. However, this standard does not apply to the metric screw threads of Grade 1, Grade 2 and Grade 3 specified in JIS B 0209 and JIS B 0211.

Note ⁽¹⁾ The screw threads of M 1.7, M 2.3 and M 2.6 are excluded.

Remark: This standard is in accordance with ISO general purpose metric screw thread tolerance system specified in ISO 965/1 (ISO general purpose metric screw threads-Tolerances-Part 1: Principles and basic data) and ISO 965/3 (ISO general purpose metric screw threads-Tolerances-Part 3: Deviations for constructional threads).

Applicable Standards:

JIS B 0123-Designation of Screw Threads

JIS B 0205-Metric Coarse Screw Threads

JIS B 0207-Metric Fine Screw Threads

JIS B 0209-Limits of Sizes and Tolerances for Metric Coarse Screw Threads

JIS B 0211-Limits of Sizes and Tolerances for Metric Fine Screw Threads

JIS B 1051-Mechanical Properties of Bolts and Screws

Reference Standards:

ISO 965/1-1980 ISO general purpose metric screw threads-Tolerances-Part 1: Principles and basic data

ISO 965/3-1980 ISO general purpose metric screw threads-Tolerances-Part 3: Deviations for constructional threads

2. Structure of the Tolerance System

The tolerance system for metric screw threads consists of the following tolerance grades, tolerance positions and a selection of grades and positions:

- (1) The tolerance grade (refer to 4.) provides for the size of tolerance for major diameter of external thread, minor diameter of internal thread, pitch diameter of external thread and that of internal thread.
- (2) The tolerance position (refer to 5.) applies where the surface treatment is carried out or easy screwing is required.
- (3) The tolerance class consists of a combination of tolerance grade and tolerance position (refer to 6.) and shall be selected with an order of preference according to length of thread engagement (refer to 8.) and tolerance quality (refer to 12.) (refer to 13.).

Remark: The tolerance grade, tolerance position, tolerance class, length of thread engagement and tolerance quality correspond to those specified in ISO 965/1 respectively.

3. Symbols and Definitions

For the purpose of this standard symbols and the definitions shall be in accordance with the following:

D , D_1 and D_2 : basic major diameter, basic minor diameter and basic pitch diameter of internal thread

d , d_1 and d_2 : basic major diameter, basic minor diameter and basic pitch diameter of external thread

P : pitch

H : height of fundamental triangle

R : root radius of external thread

S : symbol for short length of thread engagement

N : symbol for normal length of thread engagement

L : symbol for long length of thread engagement

G, H : symbol for tolerance position of internal thread

e, f, g, h : symbol for tolerance position of external thread

T_{D_1}, T_{D_2}, T_d and T_{d_2} : tolerances respectively on D_1, D_2, d and d_2

ES_{D_2} and ES_{D_1} : upper deviations respectively for D_2 and D_1

EI_{D_2} and EI_{D_1} : lower deviations respectively for D_2 and D_1

es_d and es_{d_2} : upper deviations respectively for d and d_2

ei_d and ei_{d_2} : lower deviations respectively for d and d_2

EI : fundamental deviations for D_1 and D_2

es : fundamental deviations for d and d_2

4. Tolerance Grades

The tolerance grades to be applied to minor diameter of internal thread, major diameter of external thread, pitch diameter of internal thread and pitch diameter of external thread, respectively shall be in accordance with Table 1.

Table 1. Tolerance Grades

Applicable portion	Tolerance grades
Minor diameter of internal thread (D_1)	4, 5, 6, 7, 8
Major diameter of external thread (d)	4, 6, 8
Pitch diameter of internal thread (D_2)	4, 5, 6, 7, 8
Pitch diameter of external thread (d_2)	3, 4, 5, 6, 7, 8, 9

5. Tolerance Positions

The tolerance positions shall be H and G for internal thread, and h, g, f and e for external thread, provided that the tolerance positions f and e are applicable to screw threads having pitch P of not less than 0.35 mm and of not less than 0.5 mm respectively.

The relationships of basic profile, basic size, dimensional deviation and tolerance relating to each tolerance position are shown in Fig. 1 and Fig. 2.

The fundamental deviations EI and es relating to each tolerance position shall be in accordance with Table 2.

Fig. 1. Relationship Figure for Basic Profile, Basic Size, Dimensional Deviation and Tolerances of Internal Thread

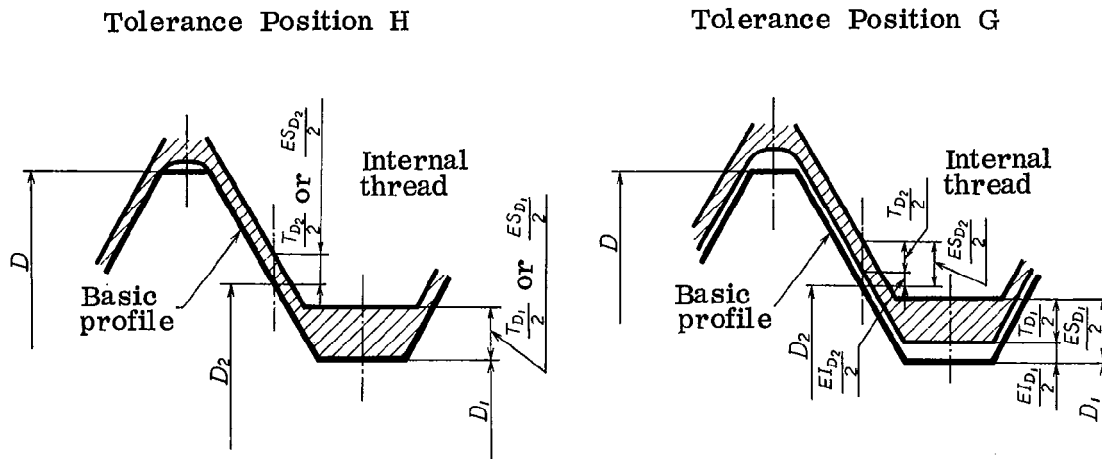
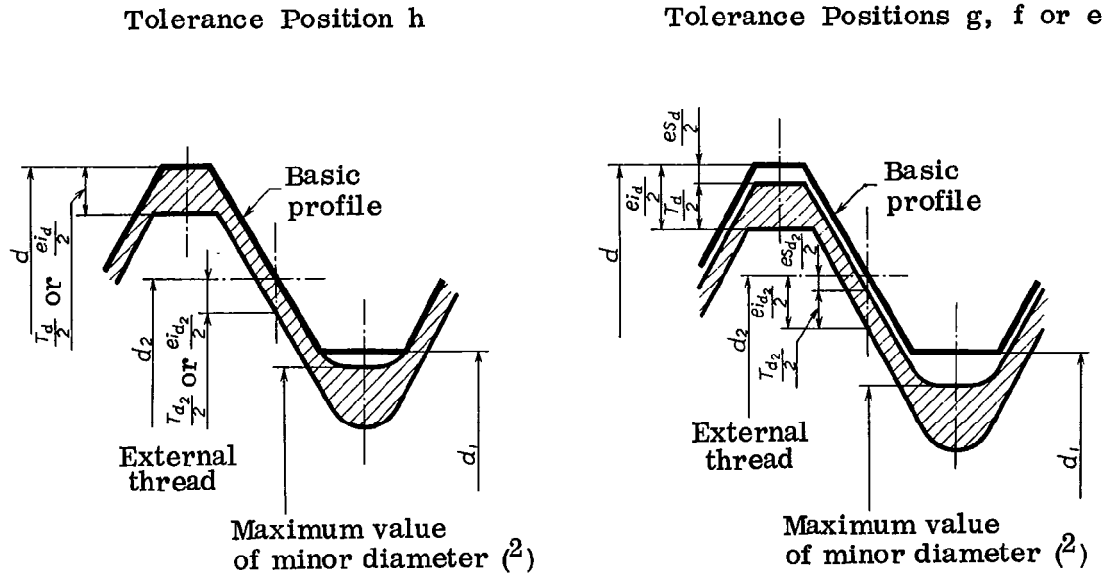


Fig. 2. Relationship Figure for Basic Profile, Basic Size, Dimensional Deviation and Tolerances of External Thread



Note ⁽²⁾ Refer to 11.

Table 2. Fundamental Dimensional Deviation

Unit: μm

Pitch P (mm)	Internal thread		External thread			
	EI		es			
	H	G	h	g	f	e
0.2	0	+ 17	0	-17	—	—
0.25	0	+ 18	0	-18	—	—
0.3	0	+ 18	0	-18	—	—
0.35	0	+ 19	0	-19	-34	—
0.4	0	+ 19	0	-19	-34	—
0.45	0	+ 20	0	-20	-35	—
0.5	0	+ 20	0	-20	-36	- 50
0.6	0	+ 21	0	-21	-36	- 53
0.7	0	+ 22	0	-22	-38	- 56
0.75	0	+ 22	0	-22	-38	- 56
0.8	0	+ 24	0	-24	-38	- 60
1	0	+ 26	0	-26	-40	- 60
1.25	0	+ 28	0	-28	-42	- 63
1.5	0	+ 32	0	-32	-45	- 67
1.75	0	+ 34	0	-34	-48	- 71
2	0	+ 38	0	-38	-52	- 71
2.5	0	+ 42	0	-42	-58	- 80
3	0	+ 48	0	-48	-63	- 85
3.5	0	+ 53	0	-53	-70	- 90
4	0	+ 60	0	-60	-75	- 95
4.5	0	+ 63	0	-63	-80	-100
5	0	+ 71	0	-71	-85	-106
5.5	0	+ 75	0	-75	-90	-112
6	0	+ 80	0	-80	-95	-118

6. Tolerance Classes

6.1 The tolerance class consists of a combination of tolerance grade and tolerance position, and is indicated by a digit indicating the tolerance grade followed by a letter indicating tolerance position (refer to Example: 1).

Example: 1 $\overbrace{6 \text{ H}}^{\text{digit indicating tolerance grade}}$
 $\underbrace{\hspace{1.5cm}}_{\text{letter indicating tolerance position}}$

6.2 The tolerance class of internal thread or external thread is indicated by tolerance class for pitch diameter followed by the tolerance class for minor diameter or major diameter (refer to Example: 2). However, if the both tolerance classes are same, the tolerance class is not repeated (refer to Example: 3).

Examples 2 $\overbrace{5 \text{ g} \quad 6 \text{ g}}^{\text{tolerance class for pitch diameter}}$
 $\underbrace{\hspace{1.5cm}}_{\text{tolerance class for major diameter}}$

3 $\overbrace{6 \text{ H}}^{\text{where the tolerance classes for pitch diameter and for minor diameter are same}}$

$\overbrace{6 \text{ g}}^{\text{where the tolerance classes for pitch diameter and for major diameter are same}}$

6.3 A fit between internal thread and external thread is indicated by the tolerance class for internal thread followed by that of external thread separated by a stroke (refer to Example: 4).

Example: 4 $6 \text{ H}/6 \text{ g}$
 $6 \text{ H}/5 \text{ g} \quad 6 \text{ g}$

6.4 The designation of screw thread including tolerance class shall be in accordance with JIS B 0123.

Example: 5 $M \ 6 \ - \ 6 \ H$ $M \ 6 \ x \ 0.75 \ - \ 6 \ H$
 $M \ 6 \ - \ 5 \ g \ 6 \ g$ $M \ 6 \ x \ 0.75 \ - \ 5 \ g \ 6 \ g$
 $M \ 6 \ - \ 6 \ H/6 \ g$ $M \ 6 \ x \ 0.75 \ - \ 6 \ H/6 \ g$

7. Surface Treatment

The tolerance class for a screw thread to be surface-treated applies, as a rule, to one prior to surface treatment. The size posterior to surface treatment⁽³⁾ shall not exceed the minimum limit of size at tolerance position H (refer to Fig. 1) or maximum limit of size at tolerance position h (refer to Fig. 2).

Note ⁽³⁾ Except hot dipping.

8. Lengths of Thread Engagement

The lengths of thread engagement are classified into three groups, S, N or L, and the classification shall be in accordance with Table 3.

Table 3. Classification of Lengths of Thread Engagement

Unit: mm

Classification of nominal diameter		Pitch <i>P</i>	S	N		L
Over	Up to and incl.		Up to and incl.	Over	Up to and incl.	Over
0.99	1.4	0.2	0.5	0.5	1.4	1.4
		0.25	0.6	0.6	1.7	1.7
		0.3	0.7	0.7	2	2
1.4	2.8	0.2	0.5	0.5	1.5	1.5
		0.25	0.6	0.6	1.9	1.9
		0.35	0.8	0.8	2.6	2.6
		0.4	1	1	3	3
		0.45	1.3	1.3	3.8	3.8
2.8	5.6	0.35	1	1	3	3
		0.5	1.5	1.5	4.5	4.5
		0.6	1.7	1.7	5	5
		0.7	2	2	6	6
		0.75	2.2	2.2	6.7	6.7
		0.8	2.5	2.5	7.5	7.5
5.6	11.2	0.75	2.4	2.4	7.1	7.1
		1	3	3	9	9
		1.25	4	4	12	12
		1.5	5	5	15	15

Table 3 (Continued)

Classification of nominal diameter		Pitch <i>P</i>	S	N		L
Over	Up to and incl.		Up to and incl.	Over	Up to and incl.	Over
11.2	22.4	1	3.8	3.8	11	11
		1.25	4.5	4.5	13	13
		1.5	5.6	5.6	16	16
		1.75	6	6	18	18
		2	8	8	24	24
		2.5	10	10	30	30
22.4	45	1	4	4	12	12
		1.5	6.3	6.3	19	19
		2	8.5	8.5	25	25
		3	12	12	36	36
		3.5	15	15	45	45
		4	18	18	53	53
		4.5	21	21	63	63
45	90	1.5	7.5	7.5	22	22
		2	9.5	9.5	28	28
		3	15	15	45	45
		4	19	19	56	56
		5	24	24	71	71
		5.5	28	28	85	85
		6	32	32	95	95
90	180	2	12	12	36	36
		3	18	18	53	53
		4	24	24	71	71
		6	36	36	106	106
180	355	3	20	20	60	60
		4	26	26	80	80
		6	40	40	118	118

9. Tolerances of Minor Diameter and Major Diameter

The minor diameter tolerances of internal thread T_{D_1} relating to tolerance grades 4, 5, 6, 7 and 8 shall be in accordance with Table 4, and the major diameter tolerances of external thread T_d relating to tolerance grades 4, 6 and 8, be in accordance with Table 5.

Table 4. Minor Diameter Tolerances of
Internal Thread T_{D_1}

Unit: μm

Pitch P (mm)	Tolerance grade				
	4	5	6	7	8
0.2	38	—	—	—	—
0.25	45	56	—	—	—
0.3	53	67	85	—	—
0.35	63	80	100	—	—
0.4	71	90	112	—	—
0.45	80	100	125	—	—
0.5	90	112	140	180	—
0.6	100	125	160	200	—
0.7	112	140	180	224	—
0.75	118	150	190	236	—
0.8	125	160	200	250	315
1	150	190	236	300	375
1.25	170	212	265	335	425
1.5	190	236	300	375	475
1.75	212	265	335	425	530
2	236	300	375	475	600
2.5	280	355	450	560	710
3	315	400	500	630	800
3.5	355	450	560	710	900
4	375	475	600	750	950
4.5	425	530	670	850	1060
5	450	560	710	900	1120
5.5	475	600	750	950	1180
6	500	630	800	1000	1250

Table 5. Major Diameter Tolerances of
External Thread T_d Unit: μm

Pitch P (mm)	Tolerance grade		
	4	6	8
0.2	36	56	—
0.25	42	67	—
0.3	48	75	—
0.35	53	85	—
0.4	60	95	—
0.45	63	100	—
0.5	67	106	—
0.6	80	125	—
0.7	90	140	—
0.75	90	140	—
0.8	95	150	236
1	112	180	280
1.25	132	212	335
1.5	150	236	375
1.75	170	265	425
2	180	280	450
2.5	212	335	530
3	236	375	600
3.5	265	425	670
4	300	475	750
4.5	315	500	800
5	335	530	850
5.5	355	560	900
6	375	600	950

10. Pitch Diameter Tolerances

The pitch diameter tolerances of internal thread T_{D_2} relating to tolerance grades 4, 5, 6, 7 and 8 shall be in accordance with Table 6, and the pitch diameter tolerances of external thread T_{d_2} relating to tolerance grades 3, 4, 5, 6, 7, 8 and 9, be in accordance with Table 7.

Table 6. Pitch Diameter Tolerances of
Internal Thread T_{D_2} Unit: μm

Classification of nominal diameter (mm)		Pitch P (mm)	Tolerance grade				
Over	Up to and incl.		4	5	6	7	8
0.99	1.4	0.2	40	—	—	—	—
		0.25	45	56	—	—	—
		0.3	48	60	75	—	—
1.4	2.8	0.2	42	—	—	—	—
		0.25	48	60	—	—	—
		0.35	53	67	85	—	—
		0.4	56	71	90	—	—
		0.45	60	75	95	—	—
2.8	5.6	0.35	56	71	90	—	—
		0.5	63	80	100	125	—
		0.6	71	90	112	140	—
		0.7	75	95	118	150	—
		0.75	75	95	118	150	—
		0.8	80	100	125	160	200
5.6	11.2	0.75	85	106	132	170	—
		1	95	118	150	190	236
		1.25	100	125	160	200	250
		1.5	112	140	180	224	280
11.2	22.4	1	100	125	160	200	250
		1.25	112	140	180	224	280
		1.5	118	150	190	236	300
		1.75	125	160	200	250	315
		2	132	170	212	265	335
		2.5	140	180	224	280	355
22.4	45	1	106	132	170	212	—
		1.5	125	160	200	250	315
		2	140	180	224	280	355
		3	170	212	265	335	425
		3.5	180	224	280	355	450
		4	190	236	300	375	475
45	90	4.5	200	250	315	400	500
		1.5	132	170	212	265	335
		2	150	190	236	300	375
		3	180	224	280	355	450
		4	200	250	315	400	500
		5	212	265	335	425	530
90	180	5.5	224	280	355	450	560
		6	236	300	375	475	600
		2	160	200	250	315	400
		3	190	236	300	375	475
180	355	4	212	265	335	425	530
		6	250	315	400	500	630
		3	212	265	335	425	530
		4	236	300	375	475	600
180	355	6	265	335	425	530	670