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JAPANESE INDUSTRIAL STANDARD

Hexagon Socket Head Cap Screws

Ⓔ JIS B 1176—1988

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the original Standard in Japanese is to be final authority.



JAPANESE INDUSTRIAL STANDARD

J I S

Hexagon Socket Head Cap Screws

B 1176-1988

1. Scope

This Japanese Industrial Standard specifies hexagon socket head cap screws for general use manufactured of steel, hereinafter referred to as the "steel bolts" and stainless steel, hereinafter referred to as the "stainless steel bolts".

Remarks 1. This Standard is in accordance with ISO 4762-1977 and ISO 4762-1977/Amendment 1-1984 except the parts enclosed in double rectangles (□).

2. Where naming steel bolts and stainless steel bolts generically, they are referred to as bolts simply.

2. Grade

2.1 Part Grade The part grade of bolt shall be in accordance with part Grade A of threaded fastener for general use specified in JIS B 1021.

2.2 Grade According to Mechanical Properties The steel bolts of M 39 and under in nominal designation of screw thread shall be divided into three classes of 8.8, 10.9 and 12.9 according to the strength division of mechanical properties.

Furthermore, the grade according to the mechanical properties are not specified for steel bolts and stainless bolts of M 42 and over in nominal designation.

3. Mechanical Properties

3.1 Mechanical Properties of Steel Bolt The mechanical properties of steel bolt shall be as follows:

(1) The mechanical properties of the steel bolt of M 39 and under in nominal designation of screw thread shall be in accordance with 8.8, 10.9 and 12.9 in strength division of the mechanical properties specified in the body of JIS B 1051.

(2) The mechanical properties of the steel bolts of M 42 and over in nominal designation of screw thread shall be subjected to the agreement between the interested parties.

3.2 Mechanical Properties of Stainless Steel Bolt The mechanical properties of stainless steel bolt shall be as follows:

- (1) The mechanical properties of stainless steel bolts of M 20 and under in nominal designation of screw thread shall be in accordance with the property division A 2-70 of the mechanical properties specified in JIS B 1054.
- (2) The mechanical properties of stainless steel bolts of M 22 to M 39 in nominal designation shall be in accordance with the property division A 2-50 of JIS B 1054.

(3) The mechanical properties of the stainless steel bolt of M 42 and over in nominal designation of screw thread shall be subjected to the agreement between the purchaser and the supplier.

4. Shape and Dimensions

The shape and dimensions of bolts shall be in accordance with Attached Table.

5. Screw Thread

The screw thread of bolt shall be in accordance with Table 1.

Table 1

Division	Strength division or properties division	Screw thread	
		Class	Grade
Steel bolt	8.8, 10.9	Metric coarse screw thread of the body of JIS B 0205	6 g ⁽¹⁾ of the body of JIS B 0209
	12.9		5 g, 6 g ⁽²⁾ based on JIS B 0215
Stainless bolt	A 2-70, A 2-50	Same as the above-mention	6 g of the body of JIS B 0209

Notes ⁽¹⁾ For the present, the Grade 2 of Appendix of JIS B 0209 may be used.

⁽²⁾ 6 g or Grade 2 of JIS B 0209 can be subjected to the agreement between the purchaser and the supplier. Provided that those conducted with half-tone dot meshing shall be 6 g or Grade 2 of JIS B 0209 unless especially specified by the orderer.

Furthermore, the limits of size and tolerance of Grade 5 g and 6 g are given for Reference.

Remark: The maximum limit of size when conducting electroplating for screw threads of 5 g 6 g, 6 g and Grade 2 shall be the maximum limit of size of Grade 4 h or Grade 1 which have been specified in JIS B 0209.

6. Geometrical Tolerance

The geometrical tolerance of bolt is included in the part Grade A of JIS B 1021 but the items of the geometrical tolerance to be applied shall be in accordance with Table 2.

Table 2

Items of geometrical tolerance	Number of Figure in Attached Table 1 of JIS B 1021
Coaxiality of head toward the shank	Fig. 1.2
Coaxiality of hexagon socket toward the shank	Fig. 1.4
Perpendicularity of the head bearing surface toward the shank	Fig. 1.24
Straightness of the shank	Fig. 1.35

7. Appearance

The surface of bolts shall be smooth and be free from defects such as quench cracks, flaws, burrs, flush detrimental to the use, and the like.

Furthermore, it is preferable that the standard of allowable limit of the surface defects is in accordance with Reference of JIS B 0101 unless especially specified.

8. Materials

8.1 Material of Steel Bolts The material of steel bolts shall be as follows:

- (1) The material of steel bolt of M 39 and under in nominal designation of screw thread shall be 3. of the body of JIS B 1051.

- (2) The material of steel bolt of M 42 and over in nominal designation shall be in accordance with Table 3 as a rule.

Table 3

Division	Materials
Case of carbon steel	SWCH 38 K to SWCH 48 K of JIS G 3539 or S 38 C to S 48 C of JIS G 4051
Case of alloy steel	SNCM 240 of JIS G 4103 or SCM 435 or SCM 440 of JIS G 4105

8.2 Materials of Stainless Bolt The materials of stainless bolt shall be as follows:

- (1) The material of stainless bolt of M 39 and under in nominal designation of screw thread shall be in accordance with 5. of JIS B 1054.

- (2) The material of stainless bolt of M 42 and over in nominal designation of screw thread shall be subjected to the agreement between the purchaser and the supplier.

9. Surface Treatment

The surface treatment of steel bolt shall be black oxidized coating. Provided that where the surface treatment is not required and the plating and other surface treatment is required, the orderer shall specify it.

Furthermore, the stainless steel cap screws shall be undisguised generally and free from special surface treatment and where the steel cap screw conducted with electric plating shall be treated to remove brittleness.

Provided that the brittleness removal treatment for the cap screw of 8.8 and 10.9 in strength division shall be conducted as required.

10. Inspection

10.1 Mechanical Properties Inspection

10.1.1 Mechanical Properties Inspection of Steel Cup Screw The mechanical properties inspection of steel cup screws shall be as follows:

- (1) The mechanical properties inspection for steel cup screws of M 39 and under in nominal designation of screw thread shall be conducted in accordance with Table 4 and the mechanical properties of 3.1 (1) shall be satisfied.
- (2) The mechanical properties inspection for steel cup screws of M 42 and over in nominal designation of screw thread shall be subjected to the agreement between the supplier and the manufacturer.

Table 4

Group No.	Division of steel cap screws to be inspected	Mechanical properties to be inspected	Test method
①	Steel cap screw of 4 mm and under in nominal diameter (d) of screw thread or less than $3d$ in nominal length	Centre part hardness (min., max.) ⁽³⁾	To be in accordance with 4.2.5 (1) of the body of JIS B 1051.
		Surface hardness	To be in accordance with 4.2.5 (2) of the body of JIS B 1051.
		Wedge tensile strength	To be in accordance with 4.2.3 of the body of JIS B 1051.
		Head impact strength ⁽⁴⁾	To be in accordance with 4.2.6 of the body of JIS B 1051.
		Decarburization of thread part	To be in accordance with 4.2.8 of the body of JIS B 1051.
		Change in hardness due to retempering	To be in accordance with 4.3 of the body of JIS B 1051.
②	Steel cap screw of over 4 mm in nominal diameter (d) of screw thread and $3d$ and over in nominal length	Tensile strength ⁽⁵⁾	To be in accordance with 4.2.2 of the body of JIS B 1051.
		Strength of centre part (max.) ⁽³⁾	To be in accordance with 4.2.5 (1) of the body of JIS B 1051.
		Surface hardness	To be in accordance with 4.2.5 (2) of the body of JIS B 1051.
		Proof load stress	To be in accordance with 4.2.4 of the body of JIS B 1051.
		Wedge tensile strength ⁽⁶⁾	To be in accordance with 4.2.3 of the body of JIS B 1051.
		Decarburization of thread part	To be in accordance with 4.2.8 (1) of the body of JIS B 1051.
		Change in hardness due to retempering	To be in accordance with 4.3 of the body of JIS B 1051.

Notes ⁽³⁾ The hardness of centre part shall be in accordance with any one of Vickers hardness or Rockwell hardness. However, the acceptance or rejection shall be determined by Vickers hardness in case of doubt.

⁽⁴⁾ The inspection of the strength of head blow apply to cap screws of M 16 and under, which are too short to inspect the wedge tensile strength. This inspection can be omitted where the wedge tensile strength test has been conducted.

⁽⁵⁾ In order to simplify the inspection, the minimum hardness of the centre part may be inspected in place of the tensile strength inspection. Provided that the last judgement of acceptance or rejection shall be subjected to the inspection of tensile strength.

⁽⁶⁾ The tensile strength of the cap screws, of which the wedge tensile strength inspection has ended, may be omitted.

Remarks 1. The inspection of Table 4 shall be in accordance with the inspection program B of the body of JIS B 1051 but the inspection may be conducted in accordance with the inspection program A in place of B. Provided that the inspection items of the inspection program A for the strength division and its mechanical properties shall be in accordance with the specifications of the body of JIS B 1051.

Furthermore, where the tensile test is impracticable because of being short in normal length of bolt or being small in capacity of the testing machine and the like, the items practicable of being tested out of among the mechanical properties of each group given in Table 4 in addition to the hardness (minimum and maximum) of centre part shall be tested.

2. A part of the inspection of the mechanical properties at the time of delivery can be omitted by a method or the like to confirm the test result table according to the agreement between the parties concerned.

10.1.2 Inspection of Mechanical Properties of Stainless Cap Screws

The inspection of mechanical properties of stainless cap screws shall be as follows:

- (1) The inspection of mechanical properties of stainless cap screws of nominal designation M 39 and under shall be conducted in accordance with Table 5 and shall meet the mechanical properties of 3.2 (1) or 3.2 (2).
- (2) The inspection of mechanical properties of stainless cap screw of nominal designation of cup screw M 42 and over shall be subjected to the agreement between the manufacturer and the supplier.

Table 5

Division of nominal diameter of bolt to be inspected	Mechanical properties ⁽⁷⁾ to be inspected	Test method
1.6 mm to 5 mm incl.	Tensile strength or twisting strength ⁽⁸⁾	To be in accordance with 6.2.1 (1) or 6.2.2 of JIS B 1054
	Proof stress ⁽⁹⁾	To be in accordance with 6.2.1 (2) of JIS B 1054.
	Elongation ⁽⁹⁾	To be in accordance with 6.2.1 (3) of JIS B 1054.
Over 5 mm to 39 mm incl. ⁽¹⁰⁾	Tensile strength	To be in accordance with 6.2.1 (1) of JIS B 1054.
	Proof strength	To be in accordance with 6.2.1 (2) of JIS B 1054.
	Elongation	To be in accordance with 6.2.1 (3) of JIS B 1054.

Notes ⁽⁷⁾ This mechanical properties shall be used for the screw bolts of 8 d and under in nominal length and the inspection of the mechanical properties of screw bolt of 8 d and over in nominal length shall be subjected to the agreement between the supplier and the purchaser.

where, d : nominal diameter of screw thread

- ⁽⁸⁾ Any one of tensile strength or twisting strength should be inspected.
- ⁽⁹⁾ The proof strength and elongation of screw thread of 5 mm and under in nominal diameter shall be taken as the criterion for the quality and may be omitted from usual inspection.
- ⁽¹⁰⁾ The range of this nominal diameter shall be divided into those of 20 mm and under and of those of over 20 mm, and the former shall take a cap screw of A 2-70 and the latter shall take a cap screw of A 2-50 as the object of inspection respectively.

10.2 Shape • Dimensions Inspection The shape and dimensions of cap screws shall be inspected by the measuring method for the dimensions of each part of JIS B 1071 or an alternative method and shall comply with the requirements of the specifications of 4.

10.3 Screw Thread Inspection The screw threads of cap screw shall be inspected in accordance with the method of verification for size and geometry of external thread of JIS B 1071 or an alternative method and shall comply with the requirements of the specifications of 5.

Furthermore, for the go-screw thread ring gauge of the screw thread conducted with electroplating, the ring gauge for 4 h (for grade 1 for screw thread Grade 2) shall be used.

10.4 Inspection for Geometrical Tolerance The geometrical tolerance of cap screw shall be inspected in accordance with the measuring method of geometrical deviation of JIS B 1071 or an alternative method and comply with the requirements of the specifications of 6.

10.5 Visual Inspection The cap screw shall be inspected by visual observation and comply with the requirements of the specifications of 7.

10.6 Delivery Inspection The sampling inspection plan for the lots at the time of delivery shall be subjected to the agreement between the purchaser and the supplier.

11. Designation

The designation of cap screw shall be in accordance with standard number or title of standard, grade of parts, nominal designation of screw thread (d) $\times$ nominal length (l), strength division of mechanical properties (property division in case of stainless cap screw), materials and specified matters (¹¹). Provided that the materials shall be excluded for the cap screw to which the strength division of JIS B 1051 and the properties division of JIS B 1054 have been applied, and for the other cap screws, the strength division shall be excluded.

Furthermore, where applying Grade 2 to the grade of screw thread and where applying 6 g to the strength division 12.9, that grade shall be shown behind $d \times l$ as a rule (or where the length of thread part has been given, behind the length).

Note (¹¹) The length of thread part, omit of knurling tool, class of surface treatment and the like shall be shown for the specified matters as required. Provided that the length of thread part shall be shown by appending a parenthesis to the rear of $d \times l$.

Example: JIS B 1176 M 6 $\times$ 30 (18) - 6 g - 12.9 - A

Hexagon socket head cap screw	M 42 $\times$ 100		- 2 grade		SCM 440	- A	no knurling
(No. of standard or title of standard)	($d \times l$)	(Length of thread)	(Grade of screw thread)	(Strength division)	(Materials)	(Grade of parts)	(Specified matters)

12. Marking

12.1 Marking of Products The marking of products for steel cap screw and stainless steel cap screw, which are M 39 and under in nominal designation of screw thread, shall be in accordance with 6. of the body of JIS B 1051 or 8. of JIS B 1054.

12.2 Marking of Package Each package of cap screw shall be marked with the following information:

- (1) Name
- (2) Nominal designation of screw thread $\times$ nominal length [the grade of screw thread is given behind this as required (behind that where the length of thread part has been given), (see Example of 11.)]

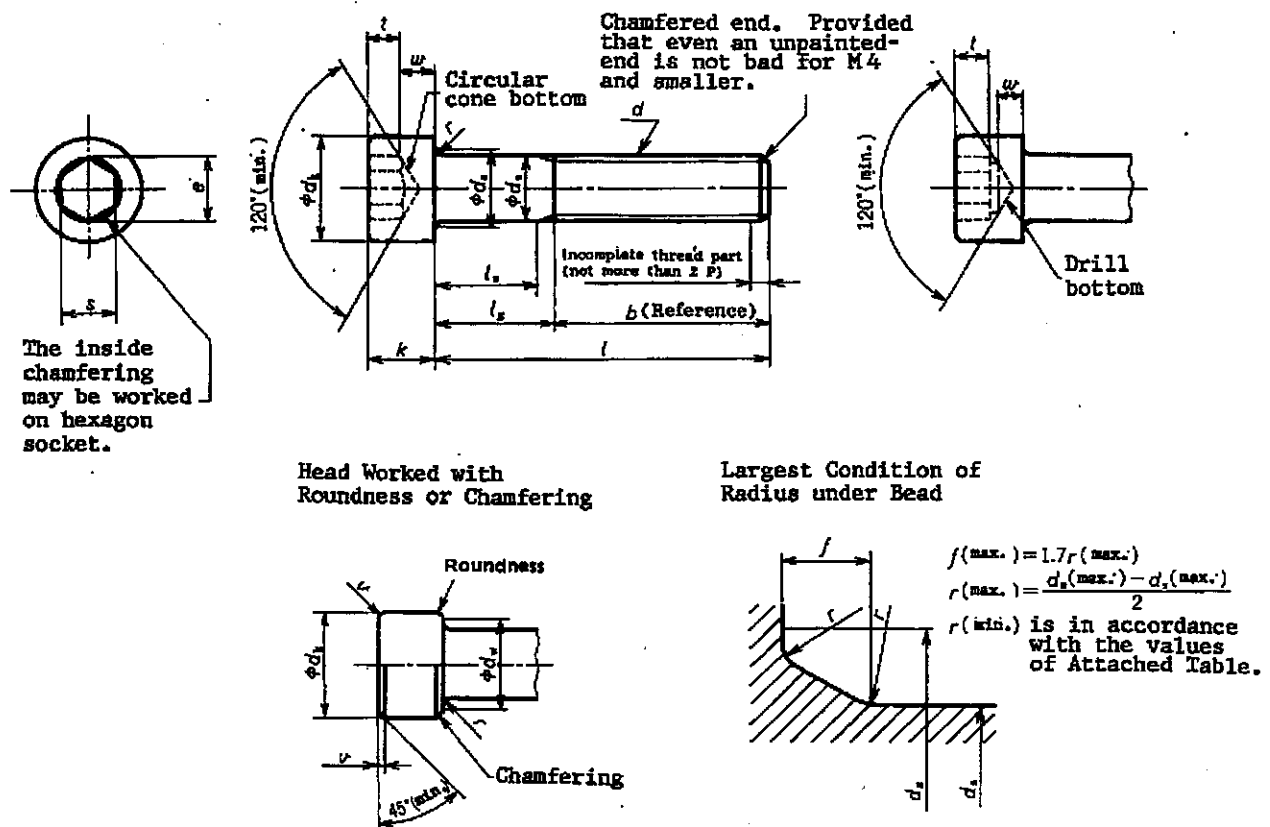
- (3) Strength division or properties division (that, to which JIS B 1051 and JIS B 1054 are not applied, is excluded.)
- (4) Material ⁽¹²⁾
- (5) Grade of part
- (6) Quantity
- (7) Specified matters [where the length of thread part has been specified, show it by appending parentheses to the rear of "nominal designation of screw thread × nominal length" (see Example of 11.)]
- (8) Manufacturer's name or its abbreviation ⁽¹³⁾

Notes ⁽¹²⁾ The marking of materials is conducted for the materials to which the strength division and properties division are not applied. The marking of materials, to which these two divisions have been applied, is omitted as a rule.

Furthermore, the marking of material may be in accordance with its general name.

- ⁽¹³⁾ It is better to use a trade mark as far as possible for an abbreviated symbol.

Attached Table. Shape - Dimension of Hexagon Socket Head Cap Screws



- Remarks 1. Any of cone bottom or gimlet bottom will do for the shape of hexagon socket head.
2. The roundness or chamfer may be worked on the top face side and the bearing surface side. The manufacturer may take either of them at their option. Provided that the roundness or chamfering at the bearing surface side shall be worked between ϕd_k and ϕd_w and that part shall be free from flash, burr and the like.

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Attached Table (Cont'd)

Unit: mm

Nominal designation of screw thread (d)		M 1.6	M 2	M 2.5	M 3	M 4	M 5	M 6	M 8
Pitch of screw thread (P)		0.35	0.4	0.45	0.5	0.7	0.8	1	1.25
b	Reference	15	16	17	18	20	22	24	28
d _k	Max. (Basic size)*	3	3.8	4.5	5.5	7	8.5	10	13
	Max. **	3.14	3.98	4.68	5.68	7.22	8.72	10.22	13.27
	Min.	2.86	3.62	4.32	5.32	6.78	8.28	9.78	12.73
d _a	Max.	2	2.6	3.1	3.6	4.7	5.7	6.8	9.2
d _r	Max. (Basic size)	1.6	2	2.5	3	4	5	6	8
	Min.	1.46	1.86	2.36	2.86	3.82	4.82	5.82	7.78
e	Min.	1.73	1.73	2.30	2.87	3.44	4.58	5.72	6.86
f	Max.	0.34	0.51	0.51	0.51	0.60	0.60	0.68	1.02
k	Max. (Basic size)	1.6	2	2.5	3	4	5	6	8
	Min.	1.46	1.86	2.36	2.86	3.82	4.82	5.70	7.64
r	Min.	0.1	0.1	0.1	0.1	0.2	0.2	0.25	0.4
s	Nominal designation (Basic size)	1.5	1.5	2	2.5	3	4	5	6
	Min.	1.52	1.52	2.02	2.52	3.02	4.02	5.02	6.02
	Max. (14)	1 Column	1.560	1.560	2.060	2.580	3.080	4.095	5.140
t	2 Column	1.545	1.545	2.045	2.560	3.080	4.095	5.095	6.095
	Min.	0.7	1	1.1	1.3	2	2.5	3	4
v	Max.	0.16	0.2	0.25	0.3	0.4	0.5	0.6	0.8
d _w	Min.	2.72	3.40	4.18	5.07	6.53	8.03	9.38	12.33
w	Min.	0.55	0.55	0.85	1.15	1.4	1.9	2.3	3.3

l			l _s and l _g															
Nominal length	Min.	Max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.	l _s min.	l _s max.
2.5	2.30	2.70																
3	2.80	3.20																
4	3.76	4.24																
5	4.76	5.24																
6	5.76	6.24																
8	7.71	8.29																
10	9.71	10.29																
12	11.65	12.35																
16	15.65	16.35																
20	19.58	20.42			2	4												
25	24.58	25.42					5.75	8	4.5	7								
30	29.58	30.42							9.5	12	6.5	10	4	8				
35	34.5	35.5									11.5	15	9	13	6	11		
40	39.5	40.5									16.5	20	14	18	11	16	5.75	12
45	44.5	45.5											19	23	16	21	10.75	17
50	49.5	50.5											24	28	21	26	15.75	22
55	54.4	55.6													26	31	20.75	27
60	59.4	60.6													31	36	25.75	32
65	64.4	65.6															30.75	37
70	69.4	70.6															35.75	42
80	79.4	80.6															45.75	52

Attached Table (Cont'd)

Unit: mm

Nominal designation of screw thread (d)(¹³)		M 10	M 12	(M 14)	M 16	(M 18)	M 20	(M 22)	M 24
Pitch of screw thread (P)		1.5	1.75	2	2	2.5	2.5	2.5	3
b	Reference	32	36	40	44	48	52	56	60
d _k	Max. (Basic size) *	16	18	21	24	27	30	33	36
	Max. **	16.27	18.27	21.33	24.33	27.33	30.33	33.33	36.39
	Min.	15.73	17.73	20.67	23.67	26.67	29.67	32.67	35.61
d _a	Max.	11.2	13.7	15.7	17.7	20.2	22.4	24.4	26.4
d _s	Max. (Basic size)	10	12	14	16	18	20	22	24
	Min.	9.78	11.73	13.73	15.73	17.73	19.67	21.67	23.67
e	Min.	9.15	11.43	13.72	16.00	18.00	19.44	21.44	21.73
f	Max.	1.02	1.45	1.45	1.45	1.57	2.04	2.04	2.04
k	Max. (Basic size)	10	12	14	16	18	20	22	24
	Min.	9.64	11.57	13.57	15.57	17.57	19.48	21.48	23.48
r	Min.	0.4	0.6	0.6	0.6	0.8	0.8	0.8	0.8
s	Nominal designation (Basic size)		8	10	12	14	17	17	19
	Min.		8.025	10.025	12.032	14.032	17.050	17.050	19.065
	Max. (¹⁴)	1 Column	8.175	10.175	12.212	14.212	17.230	17.230	19.275
		2 Column	8.115	10.115	12.142	14.142	17.142	17.142	19.142
t	Min.	5	6	7	8	9	10	11	12
v	Max.	1	1.2	1.4	1.6	1.8	2	2.2	2.4
d _w	Min.	15.33	17.23	20.17	23.17	25.87	28.87	31.61	34.81
w	Min.	4	4.8	5.8	6.8	7.7	8.6	9.5	10.4

l			l ₂ and l _g															
Nominal length	Min.	Max.	l ₂ min.	l ₂ max.	l _g min.	l _g max.	l ₂ min.	l ₂ max.	l _g min.	l _g max.	l ₂ min.	l ₂ max.	l _g min.	l _g max.	l ₂ min.	l ₂ max.	l _g min.	l _g max.
16	15.65	16.35																
20	19.58	20.42																
25	24.58	25.42																
30	29.58	30.42																
35	34.5	35.5																
40	39.5	40.5																
45	44.5	45.5	5.5	13														
50	49.5	50.5	10.5	18	5.25	14												
55	54.4	55.6	15.5	23	10.25	19												
60	59.4	60.6	20.5	28	15.25	24	10	20	6	16								
65	64.4	65.6	25.5	33	20.25	29	15	25	11	21	4.5	17						
70	69.4	70.6	30.5	38	25.25	34	20	30	16	26	9.5	21	5.5	18				
80	79.4	80.6	40.5	48	35.25	44	30	40	26	36	15.5	28	15.5	28	11.5	24		
90	89.3	90.7	50.5	58	45.25	54	40	50	36	46	25.5	38	25.5	38	21.5	34	15	30
100	99.3	100.7	60.5	68	55.25	64	50	60	46	56	35.5	48	35.5	48	31.5	44	25	40
110	109.3	110.7			65.25	74	60	70	56	66	45.5	58	45.5	58	41.5	54	35	50
120	119.3	120.7			75.25	84	70	80	66	76	55.5	68	55.5	68	51.5	64	45	60
130	129.2	130.8					80	90	76	86	65.5	78	65.5	78	61.5	74	55	70
140	139.2	140.8					90	100	86	96	75.5	88	75.5	88	71.5	84	65	80
150	149.2	150.8							96	106	85.5	98	85.5	98	81.5	94	75	90
160	159.2	160.8							106	116	95.5	108	95.5	108	91.5	104	85	100
180	179.2	180.8									115.5	128	115.5	128	111.5	124	105	120
200	199.05	200.95									135.5	148	135.5	148	131.5	144	125	140

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Attached Table (Cont'd)

Unit: mm

Nominal designation of screw thread (d) ⁽¹⁾		M 27	M 30	M 33	M 36	M 39	M 42	M 45	M 48	M 52
Pitch of screw thread (P)		3	3.5	3.5	4	4	4.5	4.5	5	5
b	Reference	84	72	78	84	90	96	102	108	116
d_k	Max. (Basic size)	40	45	50	54	58	63	68	72	78
	Max. **	40.39	45.39	50.39	54.46	58.46	63.46	68.46	72.46	78.46
	Min.	39.61	44.61	49.61	53.54	57.54	62.54	67.54	71.54	77.54
d_a	Max.	39.4	33.4	36.4	39.4	42.4	45.4	48.4	52.4	55.6
d_s	Max. (Basic size)	27	30	33	36	39	42	45	48	52
	Min.	26.61	29.67	32.61	35.61	38.61	41.61	44.61	47.61	51.54
e	Min.	21.75	25.15	27.43	30.85	33.55	36.97	39.57	41.15	41.12
f	Max.	2.89	2.89	2.89	2.89	2.89	3.06	3.06	3.06	3.91
k	Max. (Basic size)	27	30	33	36	39	42	45	48	52
	Min.	26.48	29.48	32.38	35.38	38.38	41.38	44.38	47.38	51.38
r	Min.	1	1	1	1	1	1.2	1.2	1.6	1.6
s	Nominal designation (Basic size)	19	22	24	27	27	32	32	36	38
	Min.	19.065	22.065	24.065	27.065	27.065	32.080	32.080	36.080	36.080
	Max.	19.275	22.275	24.275	27.275	27.275	32.390	32.390	36.390	36.390
t	Min.	13.5	15.5	16.5	19	20	21	23	24	26
v	Max.	2.7	3	3.3	3.6	3.9	4.2	4.5	4.8	5.2
d_w	Min.	38.61	43.61	48.61	52.54	56.34	61.34	66.34	70.34	75.34
w	Min.	12.1	13.1	15.0	15.3	17.2	19.2	20.0	21.6	23.5

l			l_s and l_g																	
Nominal designation of screw thread	Min.	Max.	l_s		l_g		l_s		l_g		l_s		l_g		l_s		l_g		l_s	
			min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
45	44.5	45.5																		
50	49.5	50.5																		
55	54.4	55.6																		
60	59.4	60.6																		
65	64.4	65.6																		
70	69.4	70.6																		
80	79.4	80.6																		
90	89.3	90.7	9	24																
100	99.3	100.7	19	34	10.5	28	4.5	22												
110	109.3	110.7	29	44	20.5	38	14.5	32												
120	119.3	120.7	39	54	30.5	48	24.5	42	16	36	10	30	1.5	24						
130	129.2	130.8	49	64	40.5	58	34.5	52	26	46	20	40	11.5	34	5.5	28				
140	139.2	140.8	59	74	50.5	68	44.5	62	36	56	30	50	21.5	44	15.5	38	7	32		
150	149.2	150.8	69	84	60.5	78	54.5	72	46	66	40	60	31.5	54	25.5	42	17	42	4	34
160	159.2	160.8	79	94	70.5	88	64.5	82	56	76	50	70	41.5	64	35.5	46	27	52	10	44
180	179.2	180.8	99	114	90.5	108	84.5	102	76	96	70	90	61.5	84	55.5	58	47	72	28	54
200	199.05	200.95	119	134	110.5	128	104.5	122	96	116	90	110	81.5	104	75.5	68	57	90	55	54
220	219.05	220.95	139	154	130.5	148	124.5	142	116	136	110	130	101.5	124	95.5	116	87	112	75	104
240	239.05	240.95	159	174	150.5	168	144.5	162	136	156	130	150	121.5	144	115.5	136	107	132	90	124
260	259.95	261.05	179	194	170.5	188	164.5	182	156	176	150	170	141.5	164	135.5	156	127	152	118	144
280	279.95	281.05	199	214	190.5	208	184.5	202	176	196	170	190	161.5	184	155.5	176	147	172	138	164
300	299.95	301.05	219	234	210.5	228	204.5	222	196	216	190	210	181.5	204	175.5	196	167	192	158	184

Notes (14) The column 1 of s (max.) shall apply to cap screws of 8.8 and 10.9 in strength division and those of A 2-50 and A 2-70 in property division. The column 2 shall apply to cap screws of 12.9 in strength division. Provided that the column 1 can apply to those of 12.9 in strength division in accordance with the agreement between the purchaser and the manufacturer.

Furthermore, the s (max.) of M 20 and over in nominal designation of screw thread shall apply to all of cap screws strength division and property division.

(15) Cap screws having a nominal designation appended with parentheses shall not be used as far as possible.

Remarks 1. The flank of head part shall be appended with a knurl (see JIS B 0951) of parallel or crossed. In this case of dk (max.) shall be the value of $**$ given in this Table.

Furthermore, where the cap screws without knurl are required, the orderer shall specify it. Provided that dk (max.) shall be the value of $*$ given in this Table.

2. The nominal length (l) recommendable to the nominal designation of screw thread shall be within the frame of thick lines.

Furthermore, the cap screws shorter than the position of dotted line in nominal length l shall be whole threads and the length of the incomplete thread at the underhead part shall be about $3P$.

3. The l_r (max.) and l_r (min.) for the cap screw, of which the nominal length (l) is longer than the position of dotted line, shall be in accordance with the following formula:

$$l_r (\text{max.}) = \text{nominal } (l) - b,$$

$$l_r (\text{min.}) = l_r (\text{max.}) - 5P$$

Furthermore, the thread length (b) is taken as reference but $b + \frac{1}{2}P$ can be used in place of l_r and l_r in accordance with the agreement between the purchaser and the supplier. In this case, b of 125 mm and under in b may be taken as $2d + 6$.

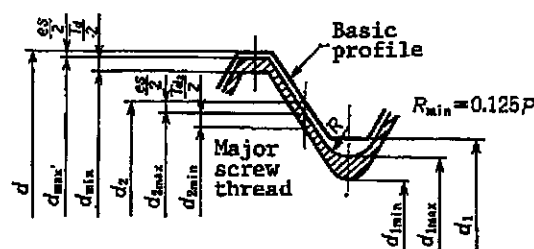
4. Where the r and s besides this Table are required, the orderer shall specify. Provided that the tolerance shall be in accordance with part grade A or JIS B 1021 as a rule.

Reference Limits of Size and Tolerance of Grade 5 g 6 g

1. Relation of Basic Profile, Basic Size, Limits of Size, Tolerance and Dimensional Deviation Forming the Basis

The following Reference Figure shall give the relation of basic profile, basic size, limits of size, tolerance and dimensional deviation forming the basis.

Reference Figure



The meaning of the symbols in the Reference Figure shall be as follows:

- $d, d_{\max}, d_{\min}, T_d$ and es : Basic size of major diameter of external thread, maximum allowable dimensions, minimum allowable dimensions, tolerance and dimensional deviation forming the basis
- $d_2, d_{2\max}, d_{2\min}, T_{d2}$ and es : Basic size of pitch diameter of external thread, maximum allowable dimensions, minimum allowable dimensions, tolerance and dimensional deviation forming the basis
- $d_1, d_{1\max}, d_{1\min}$ and R : Basic size of minor diameter of external thread, maximum allowable dimensions, minimum allowable dimensions and root radius

Furthermore, the thick line shows basic profile and the oblique lines gives the tolerance zone of external thread.

The numeral values of d, d_2 and d_1 are specified in Attached Table of JIS B 0205.

2. Limit of Size and Tolerance

The limits of size and tolerance of 5 g 6 g shall be as given in the following Reference Table.

Reference Table

Unit: mm

Nominal designation of screw thread	Pitch P	Dimensional deviation forming the basis e_s	Major diameter			Pitch diameter			Minimum root radius $R_{\min}$
			$d_{\max}$	$d_{\min}$	T_1	$d_{2\max}$	$d_{2\min}$	T_{d2}	
M 1.6	0.35	-0.019	1.581	1.496	0.085	1.354	1.304	0.050	0.044
M 2	0.4	-0.019	1.981	1.866	0.095	1.721	1.668	0.053	0.050
M 2.5	0.45	-0.020	2.480	2.380	0.100	2.188	2.132	0.056	0.056
M 3	0.5	-0.020	2.980	2.874	0.106	2.655	2.595	0.060	0.063
M 4	0.7	-0.022	3.978	3.838	0.140	3.523	3.452	0.071	0.088
M 5	0.8	-0.024	4.976	4.826	0.150	4.456	4.381	0.075	0.100
M 6	1	-0.026	5.974	5.794	0.180	5.324	5.234	0.090	0.125
M 8	1.25	-0.028	7.972	7.760	0.212	7.160	7.065	0.095	0.156
M 10	1.5	-0.032	9.968	9.732	0.236	8.994	8.888	0.106	0.188
M 12	1.75	-0.034	11.966	11.701	0.265	10.829	10.711	0.118	0.219
M 14	2	-0.038	13.962	13.682	0.280	12.663	12.538	0.125	0.250
M 16	2	-0.038	15.962	15.682	0.280	14.663	14.538	0.125	0.250
M 18	2.5	-0.042	17.958	17.623	0.335	16.334	16.202	0.132	0.313
M 20	2.5	-0.042	19.958	19.623	0.335	18.334	18.202	0.132	0.313
M 22	2.5	-0.042	21.958	21.623	0.335	20.334	20.202	0.132	0.313
M 24	3	-0.048	23.952	23.577	0.375	22.003	21.843	0.160	0.375
M 27	3	-0.048	26.952	26.577	0.375	25.003	24.843	0.160	0.375
M 30	3.5	-0.053	29.947	29.522	0.425	27.674	27.504	0.170	0.438
M 33	3.5	-0.053	32.947	32.522	0.425	30.674	30.504	0.170	0.438
M 36	4	-0.060	35.940	35.465	0.475	33.342	33.162	0.180	0.500
M 39	4	-0.060	38.940	38.465	0.475	36.342	36.162	0.180	0.500
M 42	4.5	-0.063	41.937	41.437	0.500	39.014	38.824	0.190	0.563
M 45	4.5	-0.063	44.937	44.437	0.500	42.014	41.824	0.190	0.563
M 48	5	-0.071	47.929	47.399	0.530	44.681	44.481	0.200	0.625
M 52	5	-0.071	51.929	51.399	0.530	48.681	48.481	0.200	0.625

- Remarks 1. The corner of the crest of external thread shall not be appended with roundness as a rule, but it may be appended with roundness in the range not exceeding 0.1P for the convenience of manufacture.
2. The minor diameter of external thread is not specified, but shall not be interfered with minor diameter of internal thread.
3. The values of this Table are in accordance with JIS B 0215 and these values apply to the cap screws before plating and the dimensions after plating shall not exceed the maximum limits of size of tolerance position h (see Fig. 2 of JIS B 0215).

Applicable Standards:

JIS B 0101-Glossary of Terms Relating to Fasteners
JIS B 0205-Metric Coarse Screw Threads
JIS B 0209-Limits of Sizes and Tolerances for Metric Coarse Screw
Threads
JIS B 0215-Tolerance System for Metric Screw Threads
JIS B 0951-Knurling
JIS B 1021-Tolerance System for Threaded Fasteners.
JIS B 1051-Mechanical Properties of Steel Bolts and Screws
JIS B 1054-Specification for Corrosion-resistant Stainless Steel Fasteners
JIS B 1071-Method of Verification for Size and Geometry of Threaded
Fasteners
JIS G 3539-Carbon Steel Wires for Cold Heading and Cold Forging
JIS G 4051-Carbon Steels for Machine Structural Use
JIS G 4103-Nickel Chromium Molybdenum Steels
JIS G 4105-Chromium Molybdenum Steels

Corresponding International Standards:

ISO 4762-1977 Hexagon socket head cap screws-Product grade A
ISO 4762-1977/Amendment 1-1984

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