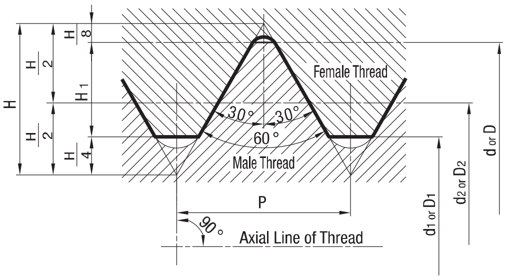
Metric Coarse Screw Threads

Excerpts from JIS B0205 (2001)



$H = 0.866025P$　　$D = d$

$H_1 = 0.541266P$　　$D_2 = d_2$

$D_1 = d_1$

$d_2 = d - 0.649519P$

$d_1 = d - 1.082532P$

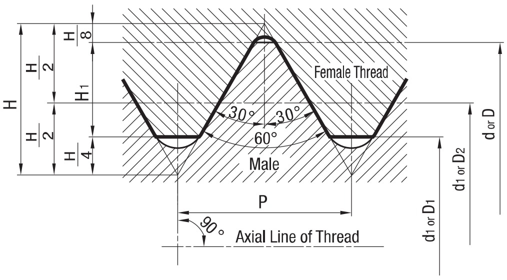
Unit:mm

Nominal of Thread(1)*			Pitch P	Height of Engagement H_1	Female Thread		
					Minor Dia. D	Effective Dia. D_2	Inner Dia. D_1
					Male Thread		
Column 1	Column 2	Column 3			Outer Dia. d	Effective Dia. d_2	Inner Dia. d_1
M 1			0.25	0.135	1.000	0.838	0.729
	M 1.1		0.25	0.135	1.100	0.938	0.829
M 1.2			0.25	0.135	1.200	1.038	0.929
	M 1.4		0.3	0.162	1.400	1.205	1.075
M 1.6			0.35	0.189	1.600	1.373	1.221
	M 1.8		0.35	0.189	1.800	1.573	1.421
M 2			0.4	0.217	2.000	1.740	1.567
	M 2.2		0.45	0.244	2.200	1.908	1.713
M 2.5			0.45	0.244	2.500	2.208	2.013
M 3			0.5	0.271	3.000	2.675	2.459
	M 3.5		0.6	0.325	3.500	3.110	2.850
M 4			0.7	0.379	4.000	3.545	3.242
	M 4.5		0.75	0.406	4.500	4.013	3.688
M 5			0.8	0.433	5.000	4.480	4.134
M 6			1	0.541	6.000	5.350	4.917
		M 7	1	0.541	7.000	6.350	5.917
M 8			1.25	0.677	8.000	7.188	6.647
		M 9	1.25	0.677	9.000	8.188	7.647
M10			1.5	0.812	10.000	9.026	8.376
		M11	1.5	0.812	11.000	10.026	9.376
M12			1.75	0.947	12.000	10.863	10.106
	M14		2	1.083	14.000	12.701	11.835
M16			2	1.083	16.000	14.701	13.835
	M18		2.5	1.353	18.000	16.376	15.294
M20			2.5	1.353	20.000	18.376	17.294
	M22		2.5	1.353	22.000	20.376	19.294
M24			3	1.624	24.000	22.051	20.752
	M27		3	1.624	27.000	25.051	23.752
M30			3.5	1.894	30.000	27.727	26.211
	M33		3.5	1.894	33.000	30.727	29.211
M36			4	2.165	36.000	33.402	31.670
	M39		4	2.165	39.000	36.402	34.670
M42			4.5	2.436	42.000	39.077	37.129
	M45		4.5	2.436	45.000	42.077	40.129
M48			5	2.706	48.000	44.752	42.587
	M52		5	2.706	52.000	48.752	46.587
M56			5.5	2.977	56.000	52.428	50.046
	M60		5.5	2.977	60.000	56.428	54.046
M64			6	3.248	64.000	60.103	57.505
	M68		6	3.248	68.000	64.103	61.505

*Priority should be given to Column 1. If required, select items in Column 2 and 3, in that order.

[Technical Data]
Metric Fine Screw Threads

Excerpts from JIS B 0207 (1999)



$H = 0.866025P$ $D = d$

$H_1 = 0.541266P$ $D_2 = d_2$

$D_1 = d_1$

$d_2 = d - 0.649519P$

$d_1 = d - 1.082532P$

Unit: mm

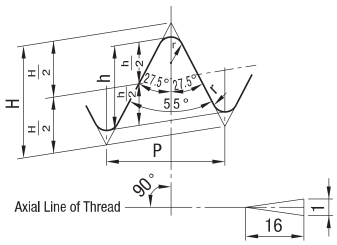
Nominal of Thread	Pitch P	Height of Engagement H_1	Female Thread: Minor Dia. D / Male Thread: Outer Dia. d	Female Thread: Effective Ø D_2 / Male Thread: Effective Ø d_2	Female Thread: Inner Dia. D_1 / Male Thread: Inner Dia. d_1
M 1 ×0.2	0.2	0.108	1.000	0.870	0.783
M 1.1×0.2	0.2	0.108	1.100	0.970	0.883
M 1.2×0.2	0.2	0.108	1.200	1.070	0.983
M 1.4×0.2	0.2	0.108	1.400	1.270	1.183
M 1.6×0.2	0.2	0.108	1.600	1.470	1.383
M 1.8×0.2	0.2	0.108	1.800	1.670	1.583
M 2 ×0.25	0.25	0.135	2.000	1.838	1.729
M 2.2×0.25	0.25	0.135	2.200	2.038	1.929
M 2.5×0.35	0.35	0.189	2.500	2.273	2.121
M 3 ×0.35	0.35	0.189	3.000	2.773	2.621
M 3.5×0.35	0.35	0.189	3.500	3.273	3.121
M 4 ×0.5	0.5	0.271	4.000	3.675	3.459
M 4.5×0.5	0.5	0.271	4.500	4.175	3.959
M 5 ×0.5	0.5	0.271	5.000	4.675	4.459
M 5.5×0.5	0.5	0.271	5.500	5.175	4.959
M 6 ×0.75	0.75	0.406	6.000	5.513	5.188
M 7 ×0.75	0.75	0.406	7.000	6.513	6.188
M 8 ×1	1	0.541	8.000	7.350	6.917
M 8 ×0.75	0.75	0.406	8.000	7.513	7.188
M 9 ×1	1	0.541	9.000	8.350	7.917
M 9 ×0.75	0.75	0.406	9.000	8.513	8.188
M 10 ×1.25	1.25	0.677	10.000	9.188	8.647
M 10 ×1	1	0.541	10.000	9.350	8.917
M 10 ×0.75	0.75	0.406	10.000	9.513	9.188
M 11 ×1	1	0.541	11.000	10.350	9.917
M 11 ×0.75	0.75	0.406	11.000	10.513	10.188
M 12 ×1.5	1.5	0.812	12.000	11.026	10.376
M 12 ×1.25	1.25	0.677	12.000	11.188	10.647
M 12 ×1	1	0.541	12.000	11.350	10.917
M 14 ×1.5	1.5	0.812	14.000	13.026	12.376
M 14 ×1.25	1.25	0.677	14.000	13.188	12.647
M 14 ×1	1	0.541	14.000	13.350	12.917
M 15 ×1.5	1.5	0.812	15.000	14.026	13.376
M 15 ×1	1	0.541	15.000	14.350	13.917
M 16 ×1.5	1.5	0.812	16.000	15.026	14.376
M 16 ×1	1	0.541	16.000	15.350	14.917
M 17 ×1.5	1.5	0.812	17.000	16.026	15.376
M 17 ×1	1	0.541	17.000	16.350	15.917
M 18 ×2	2	1.083	18.000	16.701	15.835
M 18 ×1.5	1.5	0.812	18.000	17.026	16.376
M 18 ×1	1	0.541	18.000	17.350	16.917
M 20 ×2	2	1.083	20.000	18.701	17.835
M 20 ×1.5	1.5	0.812	20.000	19.026	18.376
M 20 ×1	1	0.541	20.000	19.350	18.917
M 22 ×2	2	1.083	22.000	20.701	19.835
M 22 ×1.5	1.5	0.812	22.000	21.026	20.376
M 22 ×1	1	0.541	22.000	21.350	20.917
M 24 ×2	2	1.083	24.000	22.701	21.835
M 24 ×1.5	1.5	0.812	24.000	23.026	22.376
M 24 ×1	1	0.541	24.000	23.350	22.917

Nominal of Thread	Pitch P	Height of Engagement H_1	Female Thread: Minor Dia. D / Male Thread: Outer Dia. d	Female Thread: Effective Ø D_2 / Male Thread: Effective Ø d_2	Female Thread: Inner Dia. D_1 / Male Thread: Inner Dia. d_1
M25×2	2	1.083	25.000	23.701	22.835
M25×1.5	1.5	0.812	25.000	24.026	23.376
M25×1	1	0.541	25.000	24.350	23.917
M26×1.5	1.5	0.812	26.000	25.026	24.376
M27×2	2	1.083	27.000	25.701	24.835
M27×1.5	1.5	0.812	27.000	26.026	25.376
M27×1	1	0.541	27.000	26.350	25.917
M28×2	2	1.083	28.000	26.701	25.835
M28×1.5	1.5	0.812	28.000	27.026	26.376
M28×1	1	0.541	28.000	27.350	26.917
M30×3	3	1.624	30.000	28.051	26.752
M30×2	2	1.083	30.000	28.701	27.835
M30×1.5	1.5	0.812	30.000	29.026	28.376
M30×1	1	0.541	30.000	29.350	28.917
M32×2	2	1.082	32.000	30.701	29.835
M32×1.5	1.5	0.812	32.000	31.026	30.376
M33×3	3	1.624	33.000	31.051	29.752
M33×2	2	1.083	33.000	31.701	30.835
M33×1.5	1.5	0.812	33.000	32.026	31.376
M35×1.5	1.5	0.812	35.000	34.026	33.376
M36×3	3	1.624	36.000	34.051	32.752
M36×2	2	1.083	36.000	34.701	33.835
M36×1.5	1.5	0.812	36.000	35.026	34.376
M38×1.5	1.5	0.812	38.000	37.026	36.376
M39×3	3	1.624	39.000	37.051	35.752
M39×2	2	1.083	39.000	37.701	36.835
M39×1.5	1.5	0.812	39.000	38.026	37.376
M40×3	3	1.624	40.000	38.051	36.752
M40×2	2	1.083	40.000	38.701	37.835
M40×1.5	1.5	0.812	40.000	39.026	38.376
M42×4	4	2.165	42.000	39.402	37.670
M42×3	3	1.624	42.000	40.051	38.752
M42×2	2	1.083	42.000	40.701	39.835
M42×1.5	1.5	0.812	42.000	41.026	40.376
M45×4	4	2.165	45.000	42.402	40.670
M45×3	3	1.624	45.000	43.051	41.752
M45×2	2	1.083	45.000	43.701	42.835
M45×1.5	1.5	0.812	45.000	44.026	43.376
M48×4	4	2.165	48.000	45.402	43.670
M48×3	3	1.624	48.000	46.051	44.752
M48×2	2	1.083	48.000	46.701	45.835
M48×1.5	1.5	0.812	48.000	47.026	46.376
M50×3	3	1.624	50.000	48.051	46.752
M50×2	2	1.083	50.000	48.701	47.835
M50×1.5	1.5	0.812	50.000	49.026	48.376
M52×4	4	2.165	52.000	49.402	47.670
M52×3	3	1.624	52.000	50.051	48.752
M52×2	2	1.083	52.000	50.701	49.835
M52×1.5	1.5	0.812	52.000	51.026	50.376
M55×4	4	2.165	55.000	52.402	50.670
M55×3	3	1.624	55.000	53.051	51.752
M55×2	2	1.083	55.000	53.701	52.835
M55×1.5	1.5	0.812	55.000	54.026	53.376

Taper Pipe Threads Excerpts from JIS B 0203 (1999)

Reference Thread Shape and Reference Dimension

Reference Thread Shape and Basic Dimension for a Tapered Male/Female Thread



Thick Solid Lines: Reference Thread Shape

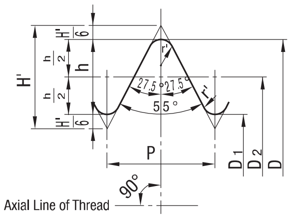
$P=\frac{25.4}{n}$

H=0.960237P

h=0.640327P

r =0.137278P

Reference Thread Shape for a Parallel Female Thread



Thick Solid Lines: Reference Thread Shape

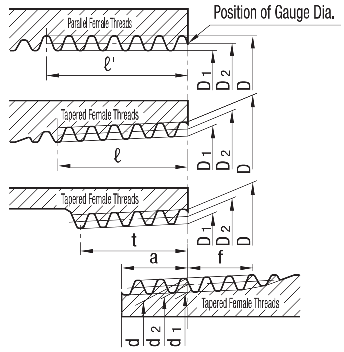
$P = \frac{25.4}{n}$

H'=0.960491P

h =0.640327P

r' =0.137329P

Fitting together a tapered female thread or parallel female thread and a tapered male thread.



Unit: mm

Nominal of Thread (1)	Thread: Number of Threads in 25.4 mm n	Thread: Pitch P (Reference)	Thread: Thread Height h	Thread: Roundness r or r	Gauge Dia. Male Thread: Outer Dia. d / Female Thread: Minor Dia. D	Gauge Dia. Male Thread: Effective Dia. d2 / Female Thread: Effective Dia. D2	Gauge Dia. Male Thread: Minor Dia. d1 / Female Thread: Inner Dia. D1	Position of Gauge Dia. Male Thread, From Pipe End: Reference Length a	Position of Gauge Dia. Male Thread, From Pipe End: Axial Tolerance b	Position of Gauge Dia. Female Thread, Pipe End: Axial Tolerance c	D, D2 and D1 Tolerances of Parallel Female Threads	Length of Effective Thread (Min.), Male Thread: From Position of Gauge Dia. Spot to Major Dia. Spot f	Length of Effective Thread (Min.), Female Thread, With Incomplete Threaded Portion: Tapered Female Threads, From Position of Gauge Dia. Spot to Minor Dia. Spot ℓ	Length of Effective Thread (Min.), Female Thread, With Incomplete Threaded Portion: Parallel Female Threads, From pipe end or pipe fitting end ℓ' (Reference)	Length of Effective Thread (Min.), Female Thread, Without Incomplete Threaded Portion: Tapered Female Threads, Parallel Female Threads t(2)	Carbon Steel for Piping Size of Steel Pipe (Reference): Outer Diameter	Carbon Steel for Piping Size of Steel Pipe (Reference): Thickness
R1/16	28	0.9071	0.581	0.12	7.723	7.142	6.561	3.97	±0.91	±1.13	±0.071	2.5	6.2	7.4	4.4	–	–
R1/8	28	0.9071	0.581	0.12	9.728	9.147	8.566	3.97	±0.91	±1.13	±0.071	2.5	6.2	7.4	4.4	10.5	2.0
R1/4	19	1.3368	0.856	0.18	13.157	12.301	11.445	6.01	±1.34	±1.67	±0.104	3.7	9.4	11.0	6.7	13.8	2.3
R3/8	19	1.3368	0.856	0.18	16.662	15.806	14.950	6.35	±1.34	±1.67	±0.104	3.7	9.7	11.4	7.0	17.3	2.3
R1/2	14	1.8143	1.162	0.25	20.955	19.793	18.631	8.16	±1.81	±2.27	±0.142	5.0	12.7	15.0	9.1	21.7	2.8
R3/4	14	1.8143	1.162	0.25	26.441	25.279	24.117	9.53	±1.81	±2.27	±0.142	5.0	14.1	16.3	10.2	27.2	2.8
R1	11	2.3091	1.479	0.32	33.249	31.770	30.291	10.39	±2.31	±2.89	±0.181	6.4	16.2	19.1	11.6	34	3.2
R1 1/4	11	2.3091	1.479	0.32	41.910	40.431	38.952	12.70	±2.31	±2.89	±0.181	6.4	18.5	21.4	13.4	42.7	3.5
R1 1/2	11	2.3091	1.479	0.32	47.803	46.324	44.845	12.70	±2.31	±2.89	±0.181	6.4	18.5	21.4	13.4	48.6	3.5
R2	11	2.3091	1.479	0.32	59.614	58.135	56.656	15.88	±2.31	±2.89	±0.181	7.5	22.8	25.7	16.9	60.5	3.8
R2 1/2	11	2.3091	1.479	0.32	75.184	73.705	72.226	17.46	±3.46	±3.46	±0.216	9.2	26.7	30.1	18.6	76.3	4.2
R3	11	2.3091	1.479	0.32	87.884	86.405	84.926	20.64	±3.46	±3.46	±0.216	9.2	29.8	33.3	21.1	89.1	4.2
R4	11	2.3091	1.479	0.32	113.030	111.551	110.072	25.40	±3.46	±3.46	±0.216	10.4	35.8	39.3	25.9	114.3	4.5
R5	11	2.3091	1.479	0.32	138.430	136.951	135.472	28.58	±3.46	±3.46	±0.216	11.5	40.1	43.5	29.3	139.8	4.5
R6	11	2.3091	1.479	0.32	163.830	162.351	160.872	28.58	±3.46	±3.46	±0.216	11.5	40.1	43.5	29.3	165.2	5.0

Note(1): The nominal of a tapered male thread is given here. For a taper female thread or parallel female thread, R should be replaced with Rc or Rp. (Refer to*)

(2): Tapered thread: length from position of gauge dia. spot to a minor dia. spot. /Parallel female thread: length from a pipe end or pipe fitting end.

Reference
1. The threads should be at right angles to the central axial line, and the pitch should be measured along the central axial line.
2. The length of the effective thread means the length over which threads are fully provided. A pipe or a pipe fitting may be left in place on the crests of the last few threads. A chamfered end, if any, of a pipe or a pipe fitting should be included in the length of the effective thread.
3. When the value of a, f and t does not meet the requirements, the criteria of other standard is provided.

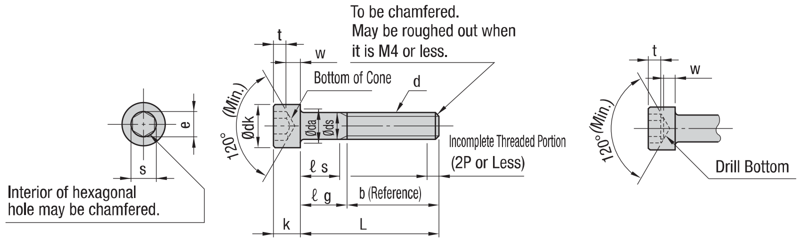
(*) Tapered threads type for a pipe are specified as taper male thread for a pipe, taper female thread and parallel female thread for a pipe.
The parallel female thread for a pipe should be mated with a tapered male thread for a pipe, and differs in dimension tolerances from the parallel female thread specified by JIS B 0202.

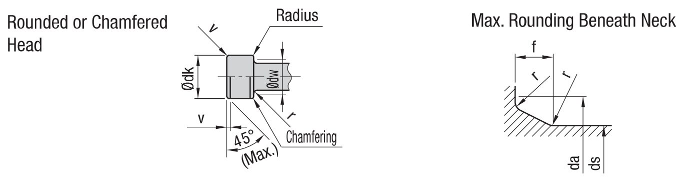
[Technical Data]

Hexagon Socket Head Cap Screws

Excerpts from JIS B 1176 (1999, 2000)

1. Dimensions of Sections





f(Max.)=1.7r(Max.)

$$r(\text{Max.}) = \frac{da(\text{Max.}) - ds(\text{Max.})}{2}$$

r(Min.)= Value in the Attached Table

Unit: mm

Nominal of Thread(d)(2)		M2	M2.5	M3	M4	M5	M6	M8	M10	M12	(M14)	M16	(M18)	M20	(M22)	M24	(M27)	M30
Pitch of Thread(P)		0.4	0.45	0.5	0.7	0.8	1	1.25	1.5	1.75	2	2	2.5	2.5	2.5	3	3	3.5
b	Reference	16	17	18	20	22	24	28	32	36	40	44	48	52	56	60	66	72
dk	Max.(Basis)*	3.8	4.5	5.5	7	8.5	10	13	16	18	21	24	27	30	33	36	40	45
	Max.**	3.98	4.68	5.68	7.22	8.72	10.22	13.27	16.27	18.27	21.33	24.33	27.33	30.33	33.39	36.39	40.39	45.39
	Min.	3.62	4.32	5.32	6.78	8.28	9.78	12.73	15.73	17.73	20.67	23.67	26.67	29.67	32.61	35.61	39.61	44.61
da	Max.	2.6	3.1	3.6	4.7	5.7	6.8	9.2	11.2	13.7	15.7	17.7	20.2	22.4	24.4	26.4	30.4	33.4
ds	Max.(Basis)	2	2.5	3	4	5	6	8	10	12	14	16	18	20	22	24	27	30
	Min.	1.86	2.36	2.86	3.82	4.82	5.82	7.78	9.78	11.73	13.73	15.73	17.73	19.67	21.67	23.67	26.67	29.67
e	Min.	1.73	2.30	2.87	3.44	4.58	5.72	6.86	9.15	11.43	13.72	16.00	16.00	19.44	19.44	21.73	21.73	25.15
f	Max.	0.51	0.51	0.51	0.60	0.60	0.68	1.02	1.02	1.45	1.45	1.45	1.87	2.04	2.04	2.04	2.89	2.89
k	Max.(Basis)	2	2.5	3	4	5	6	8	10	12	14	16	18	20	22	24	27	30
	Min.	1.86	2.36	2.86	3.82	4.82	5.70	7.64	9.64	11.57	13.57	15.57	17.57	19.48	21.48	23.48	26.48	29.48
r	Min.	0.1	0.1	0.1	0.2	0.2	0.25	0.4	0.4	0.6	0.6	0.6	0.6	0.8	0.8	0.8	1	1
s	Nominal(Basis)	1.5	2	2.5	3	4	5	6	8	10	12	14	14	17	17	19	19	22
	Min.	1.52	2.02	2.52	3.02	4.02	5.02	6.02	8.025	10.025	12.032	14.032	14.032	17.05	17.050	19.065	19.065	22.065
	Max. (1) Column 1	1.560	2.060	2.580	3.080	4.095	5.140	6.140	8.175	10.175	12.212	14.212	14.212	17.230	17.230	19.275	19.275	22.275
	Max. (1) Column 2	1.545	2.045	2.560	3.080	4.095	5.095	6.095	8.115	10.115	12.142	14.142	14.142					
t	Min.	1	1.1	1.3	2	2.5	3	4	5	6	7	8	9	10	11	12	13.5	15.5
v	Max.	0.2	0.25	0.3	0.4	0.5	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.7	3
dw	Min.	3.40	4.18	5.07	6.53	8.03	9.38	12.33	15.33	17.23	20.17	23.17	25.87	28.87	31.81	34.81	38.61	43.61
w	Min.	0.55	0.85	1.15	1.4	1.9	2.3	3.3	4	4.8	5.8	6.8	7.7	8.6	9.5	10.4	12.1	13.1

Note (1): Column 1 for s (max.) is applicable to strength class 8.8, 10.9, A 2-50 and A 2-70; Column 2 should be applied to strength class 12.9.
Column 1 may be applicable to strength class 12.9 in accordance with an agreement made between the delivering and receiving sides.
When the nominal of thread is M20 or larger, s (max.) should be applied to all strength classes.

Note (2): Nominal of thread in brackets should not be used unless it is absolutely necessary.

Reference
1. A side of the head should be knurled into a straight line or crisscross pattern [refer to JIS B 0951 (knurling pattern)]. dk(max.) should be the value marked with**.
   If no knurled pattern is needed, purchasers can indicate that. However, dk(max.) should be the value marked with*.
2. Recommended nominal lengths (L) for individual nominal of thread are shown within the bold lines.
   If L is shorter than the dotted line, the thread should be fully threaded, and the incompletely threaded part length beneath the neck should be approximately 3P.
3. ℓg (max.) and ℓg (min.) for a screw, whose length (L) exceeds the dotted line, are obtained by the equations below:
   ℓg(Max)=Nominal Length(L)-b
   ℓs(Min)=ℓg(Max)-5P

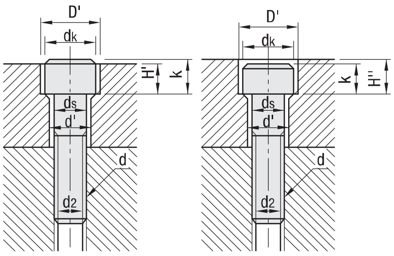
2. L, s and g of Hexagon Socket Head Cap Screws

Unit: mm

Nominal of Thread (d)			M2		M2.5		M3		M4		M5		M6		M8		M10		M12		M14		M16		(M18)		M20		(M22)		M24		(M27)		M30	
L			ℓs min and ℓg max																																	
Nominal Length	min	max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max	ℓs min	ℓg max
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	5.5	13																		
50	49.5	50.5									24	28	21	26	15.75	22	10.5	18																		
55	54.4	55.6											26	31	20.75	27	15.5	23	10.25	19																
60	59.4	60.6											31	36	25.75	32	20.5	28	15.25	24	10	20														
65	64.4	65.6													30.75	37	25.5	33	20.25	29	15	25	11	21	4.5	17										
70	69.4	70.6													35.75	42	30.5	38	25.25	34	20	30	16	26	9.5	22										
80	79.4	80.6													45.75	52	40.5	48	35.25	44	30	40	26	36	19.5	32	15.5	28	11.5	24						
90	89.3	90.7															50.5	58	45.25	54	40	50	36	46	29.5	42	25.5	38	21.5	34	15	30	9	24		
100	99.3	100.7															60.5	68	55.25	64	50	60	46	56	39.5	52	35.5	48	31.5	44	25	40	19	34		
110	109.3	110.7																	66.25	74	60	70	56	66	49.5	62	45.5	58	41.5	54	35	50	29	44	20.5	38
120	119.3	120.7																	75.25	84	70	80	66	76	59.5	72	55.5	68	51.5	64	45	60	39	54	30.5	48
130	129.2	130.8																			80	90	76	86	69.5	82	65.5	78	61.5	74	55	70	49	64	40.5	58
140	139.2	140.8																			90	100	86	96	79.5	92	75.5	88	71.5	84	65	80	59	74	50.5	68
150	149.2	150.8																					96	106	89.5	102	85.5	98	81.5	94	75	90	69	84	60.5	78
160	159.2	160.8																					106	116	99.5	112	95.5	108	91.5	104	85	100	79	94	70.5	88
180	179.2	180.8																							119.5	132	115.5	128	111.5	124	105	120	99	114	90.5	108
200	199.05	200.95																									135.5	148	131.5	144	125	140	119	134	110.5	128
220	219.05	220.95																															139	154	130.5	148
240	239.05	240.95																															159	174	150.5	168
260	258.95	261.05																															179	194	170.5	188
280	278.95	281.05																															199	214	190.5	208
300	298.95	301.05																															219	234	210.5	228

Reference: Dimensions of Counterboring and Bolt Hole for the Hexagon Socket Head Cap Screws

Unit: mm



Nominal of Thread (d)	M3	M4	M5	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
d_s	3	4	5	6	8	10	12	14	16	18	20	22	24	27	30
d	3.4	4.5	5.5	6.6	9	11	14	16	18	20	22	24	26	30	33
d_k	5.5	7	8.5	10	13	16	18	21	24	27	30	33	36	40	45
D'	6.5	8	9.5	11	14	17.5	20	23	26	29	32	35	39	43	48
k	3	4	5	6	8	10	12	14	16	18	20	22	24	27	30
H'	2.7	3.6	4.6	5.5	7.4	9.2	11	12.8	14.5	16.5	18.5	20.5	22.5	25	28
H''	3.3	4.4	5.4	6.5	8.6	10.8	13	15.2	17.5	19.5	21.5	23.5	25.5	29	32
d_2	2.6	3.4	4.3	5.1	6.9	8.6	10.4	12.2	14.2	15.7	17.7	19.7	21.2	24.2	26.7

[Technical Data]
Proper Bolt Axial Tightening Force and Proper Tightening Torque

■Axial Tightening Force for Bolt and Fatigue Limit

· The proper axial tightening force for a bolt should be calculated within an elasticity range up to 70% of the rated yield strength when the torque method is used.
· The fatigue strength of bolt under repeated load should not exceed the specified tolerance.
· Do not let the seat of a bolt or nut dent the contact area.
· Do not break the tightened piece by tightening.

A bolt is tightened by torque, torque inclination, rotating angle, stretch measurement and other methods. The torque method is widely used due to its simplicity and convenience.

■Calculation of Axial Tightening Force and Tightening Torque

The relation between the axial tightening force and Ff is represented by Equation(1)below:

$Ff=0.7\times\sigma y\times As$……(1)

Tightening torque TfA can be obtained by using the following formula(2).

$T_{fA}=0.35k(1+1/Q)\sigma y \cdot As \cdot d$……(2)

k : Torque Coefficient
d : Nominal Diameter of Bolt[cm]
Q : Tightening Coefficient
σy : Tensile strength(When the strength class is 12.9, it is 112kgf/mm^2)
As : Effective Sectional Area of the Bolt[mm^2]

■Calculation Example

Proper torque and axial force for Mild steel pieces tightened together by means of a hexagon socket head cap screw, M6(strength class 12.9), with the pieces lubricated with oil can be calculated.

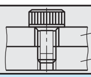
· Proper Torque, by using Equation(2)

$T_{fA}=0.35k\ (1+1/Q)\ \sigma y \cdot As \cdot d$
$=0.35 \cdot 0.17\ (1+1/1.4)\ 1098 \cdot 20.1 \cdot 0.6$
$=1351$[N · cm] {138[kgf · cm]}

· Axial Force Ff, by using Equation(1)

$Ff=0.7\times\sigma y\times As$
$=0.7\times1098\times20.1$
$=15449$[N] {1576[kgf]}

■Surface Treatment for Bolt and Torque Coefficient Dependent on the Combination of Material for Area to be Fastened and Material of Female Thread

Bolt Surface Treatment Lubrication	Torque Coefficient k	Combination of material for area to be fastened and material for female thread (a) (b) 
Steel Bolt Black Oxided Film Oil Lubrication	0.145	SCM–FC FC–FC SUS–FC
	0.155	1.0301–FC SCM–1.0301 SCM–SCM FC–1.0301 FC–SCM
	0.165	SCM–SUS FC–SUS AL–FC SUS–1.0301 SUS–SCM SUS–SUS
	0.175	1.0301–1.0301 1.0301–SCM 1.0301–SUS AL–1.0301 AL–SCM
	0.185	SCM–AL FC–AL AL–SUS
	0.195	1.0301–AL SUS–AL
	0.215	AL–AL
Steel Bolt Black Oxided Film Unlubricated	0.25	1.0301–FC SCM–FC FC–FC
	0.35	1.0301–SCM SCM–SCM FC–1.0301 FC–SCM AL–FC
	0.45	1.0301–1.0301 SCM–1.0301 AL–1.0301 AL–SCM
	0.55	SCM–AL FC–AL AL–AL

1.0301:Mild steel not thermally refined SCM:Thermally Refined Steel(35HRC) FC:Cast Iron(FC200)AL:Aluminum SUS:Stainless Steel

■Standard Value of Tightening Coefficient Q

Tightening Coefficient Q	Tightening Method	Surface Condition: Bolts	Surface Condition: Nuts	Lubrication
1.25	Torque Wrench	Manganese Phosphate	Not treated or Treated with Phosphate.	Lubricated with oil or MoS2 paste
1.4	Torque Wrench	Not treated or Treated with Phosphate.		
	Limited-Torque Wrench			
1.6	Impact Wrench			
1.8	Torque Wrench	Not treated or Treated with Phosphate.	No Treatment	Unlubricated
	Limited-Torque Wrench			

Strength Class
Ex. 12.9
Tensile Strength(Yield Stress):90% of the minimum value of tensile strength
The minimum value of tensile strength is 1220N/mm^2 { 124kgf/mm^2 }
10.9
Tensile Strength(Yield Stress):90% of the minimum value of tensile strength
The minimum value of tensile strength is 1040N/mm^2 { 106kgf/mm^2 }

■Initial Tightening Force and Tightening Torque

Nominal of Thread	Effective Sectional Area As mm^2	12.9 Yield Load N {kgf}	12.9 Initial Tightening Force N {kgf}	12.9 Tightening Torque N · cm {kgf · cm}	10.9 Yield Load N {kgf}	10.9 Initial Tightening Force N {kgf}	10.9 Tightening Torque N · cm {kgf · cm}	8.8 Yield Load N {kgf}	8.8 Initial Tightening Force N {kgf}	8.8 Tightening Torque N · cm {kgf · cm}
M 3×0.5	5.03	5517{ 563}	3861{ 394}	167{ 17}	4724{ 482}	3312{ 338}	147{ 15}	3214{ 328}	2254{ 230}	98{ 10}
M 4×0.7	8.78	9633{ 983}	6742{ 688}	392{ 40}	8252{ 842}	5772{ 589}	333{ 34}	5615{ 573}	3930{ 401}	225{ 23}
M 5×0.8	14.2	15582{ 1590}	10907{ 1113}	794{ 81}	13348{ 1362}	9339{ 953}	676{ 69}	9085{ 927}	6360{ 649}	461{ 47}
M 6×1	20.1	22060{ 2251}	15445{ 1576}	1352{ 138}	18894{ 1928}	13220{ 1349}	1156{ 118}	12867{ 1313}	9006{ 919}	784{ 80}
M 8×1.25	36.6	40170{ 4099}	28116{ 2869}	3273{ 334}	34398{ 3510}	24079{ 2457}	2803{ 286}	23422{ 2390}	16395{ 1673}	1911{ 195}
M10×1.5	58	63661{ 6496}	44561{ 4547}	6497{ 663}	54508{ 5562}	38161{ 3894}	5557{ 567}	37113{ 3787}	25980{ 2651}	3783{ 386}
M12×1.75	84.3	92532{ 9442}	64768{ 6609}	11368{ 1160}	79223{ 8084}	55458{ 5659}	9702{ 990}	53949{ 5505}	37759{ 3853}	6605{ 674}
M14×2	115	126224{ 12880}	88357{ 9016}	18032{ 1840}	108084{ 11029}	75656{ 7720}	15484{ 1580}	73598{ 7510}	51519{ 5257}	10486{ 1070}
M16×2	157	172323{ 17584}	117982{ 12039}	28126{ 2870}	147549{ 15056}	103282{ 10539}	24108{ 2460}	100470{ 10252}	70325{ 7176}	16366{ 1670}
M18×2.5	192	210739{ 21504}	147519{ 15053}	38710{ 3950}	180447{ 18413}	126312{ 12889}	33124{ 3380}	126636{ 12922}	88641{ 9045}	23226{ 2370}
M20×2.5	245	268912{ 27440}	188238{ 19208}	54880{ 5600}	230261{ 23496}	161181{ 16447}	46942{ 4790}	161592{ 16489}	113112{ 11542}	32928{ 3360}
M22×2.5	303	332573{ 33936}	232799{ 23755}	74676{ 7620}	284768{ 29058}	199332{ 20340}	63896{ 6520}	199842{ 20392}	139885{ 14274}	44884{ 4580}
M24×3	353	387453{ 39536}	271215{ 27675}	94864{ 9680}	331759{ 33853}	232231{ 23697}	81242{ 8290}	232819{ 23757}	162974{ 16630}	57036{ 5820}

(Note) · Tightening Conditions:Use of a torque wrench(Lubricated with Oil, Torque Coefficient k=0.17, Tightening Coefficient Q=1.4)
· The torque coefficient varies with the conditions of use. Values in this table should be used as rough referential values.
· The table is an excerpt from a catalog of Kyokuto Seisakusho Co., Ltd.

Strength of Bolts, Screw Plugs and Dowel Pins

Strength of Bolt

1)Tensile Load Bolt

$P=\sigma t \times As$ ·······(1)

$=\pi d^2 \sigma t/4$ ·····(2)

Pt : Tensile Load in the Axial Direction [N]
σb : Yield Stress of the Bolt [N/mm^2]
σt : Allowable Stress of the Bolt [N/mm^2]
($\sigma t=\sigma b$/Safety Factorα)
As : Effective Sectional Area of the Bolt [mm^2]
$As=\pi d^2/4$
d : Effective Dia. of the Bolt (Core Dia.) [mm]

Safety Factorα of Unwin Based on Tensile Strength

Materials	Static Load	Repeated Load		Impact Load
		Pulsating	Reversed	
Steel	3	5	8	12
Cast Iron	4	6	10	15
Copper, Soft Metal	5	5	9	15

Allowable Stress = $\frac{\text{Reference Strength}}{\text{Safety Factor}\alpha}$ Reference Strength:Yield Stress for Ductile Material
Fracture Stress for Fragile Material

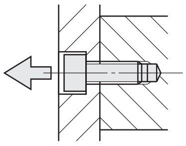
(Ex.)The proper size of a hexagon socket head cap screws, which is to bear a repeated tensile load(pulsating) at P=1960N {200 kgf} , should be determined.(The hexagon socket head cap screws are 1.7220, 38 to 43 HRC, strength class 12.9)

(1)Using Equation

$As=Pt/\sigma t$

$=1960/219.6$

$=8.9$ [mm^2]



∴By finding a value greater than the result of the equation in the Effective Sectional Area column in the table on the right, M5, 14.2[mm^2], should be selected.
M6, allowable load of 2087N {213 kgf} , should be selected from the column for strength class 12.9, with the fatigue strength taken into account.

The yield stress, strength class 12.9, isσb=1098[N/mm^2] {112[kgf/mm^2]}.
Allowable Stress σ t= σ b/Safety Factor(from the above table Safety Factor 5)
=1098/5
=219.6[N/mm^2] {22.4[kgf/mm^2]}

2) If the bolt, like a stripper bolt, is to bear a tensile impact load, the right size should be selected from the fatigue strength column.(Under a load of 1960N {200kgf}, stripper bolt made of 1.7220, 33 to 38 HRC, strength class 10.9)

By finding a value greater than the allowable load of 1960N {200 kgf} in the Strength Class 10.9 column in the table on right, M8, 3116[N] {318[kgf]} , should be selected. Hence, MSB10 with the M8 threaded portion and an axial diameter of 10 mm should be selected.

If it is to bear a shearing load, a dowel pin should also be used.

Fatigue Strength of Bolt(Thread:Fatigue Strength is 2 million times)

Nominal of Thread	Effective Sectional Area As mm²	Strength Class 12.9		Strength Class 10.9	
		Fatigue Strength† N/mm²{kgf/mm²}	Allowable Load N {kgf}	Fatigue Strength† N/mm²{kgf/mm²}	Allowable Load N {kgf}
M 4	8.78	128{ 13.1}	1117{ 114}	89{ 9.1}	774{ 79}
M 5	14.2	111{ 11.3}	1568{ 160}	76{ 7.8}	1088{ 111}
M 6	20.1	104{ 10.6}	2087{ 213}	73{ 7.4}	1460{ 149}
M 8	36.6	87{ 8.9}	3195{ 326}	85{ 8.7}	3116{ 318}
M10	58	73{ 7.4}	4204{ 429}	72{ 7.3}	4145{ 423}
M12	84.3	66{ 6.7}	5537{ 565}	64{ 6.5}	5370{ 548}
M14	115	60{ 6.1}	6880{ 702}	59{ 6}	6762{ 690}
M16	157	57{ 5.8}	8928{ 911}	56{ 5.7}	8771{ 895}
M20	245	51{ 5.2}	12485{ 1274}	50{ 5.1}	12250{ 1250}
M24	353	46{ 4.7}	16258{ 1659}	46{ 4.7}	16258{ 1659}

Fatigue strength* is a revision of an excerpt from "Estimated Fatigue Limits of Small Screws, Bolts and Metric Screws for Nuts" (Yamamoto).

Strength of Screw Plug

When screw plug MSW30 is to bear an impact load, allowable load P should be determined.
(The materials of MSW30 are 1.1191, 34 to 43 HRC, tensile strength σt 637N/mm^2 {65kgf/mm^2.})

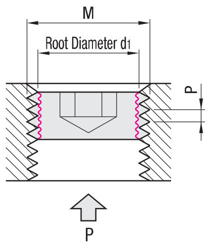
If M S W is shorn at a spot within the root diameter section and is broken, allowable load P can be calculated as shown below.
Allowable Load $P=\tau t \times A$

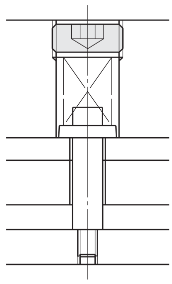
$=3.9\times 107.4$

$=40812$[N] {4164[kgf]}

Find the allowable shearing force base on the core diameter of female thread if a tap is made of soft material.

Area A=Root Diameter $d_1 \times \pi \times L$
(Root Diameter $d_1 \approx M-P$)
$A=(M-P)\pi L=(30-1.5)\pi \times 12$
$=1074$ [mm^2]
Yield Stress≈0.9×Tensile Strength $\sigma b=0.9\times 637=573$[N/mm^2]
Shearing Stress≈0.8×Yield Stress
=459 [N/mm^2]
Allowable Shearing Stress τt=Shearing Stress/Safety Factor12
=459/12=38 [N/mm^2] {3.9 [kgf/mm^2]}





Strength of Dowel Pins

The proper size of a dowel pin under repeated shearing load of 7840N {800 kgf} (Pulsating) should be determined.(The material of Dowel Pins is SUJ2. Hardness 58HRC~)

$P=A\times\tau$

$=\pi D^2\tau/4$

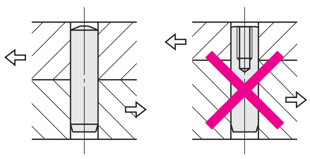
$D=\sqrt{(4P)/(\pi\tau)}$

$=\sqrt{(4\times 7840)/(3.14\times 188)}$

≈ 7.3

Yield Stress for SUJ2 σb=1176 [N/mm^2] {120 [kgf/mm^2]}
Allowable Shearing Strength $\tau=\sigma b\times 0.8$/Safety Factor α
$=1176\times 0.8/5$
$=188$ [N/mm^2] {19.2 [kgf/mm^2]}

∴D8 or a larger size should be selected for MS.
If the dowel pins are of a roughly uniform size, the number of the necessary tools and extra pins can be reduced.

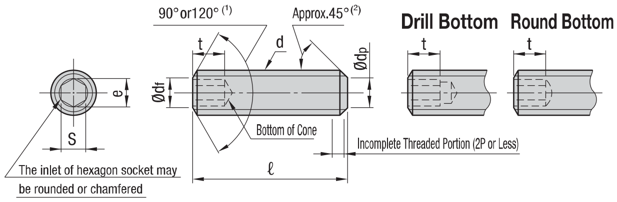


The dowel pin must not be loaded.

Typical strength calculations are presented here. In practice, further conditions including hole-to-hole pitch precision, hole perpendicularity, surface roughness, circularity, plate material, parallelism, quenching or non-quenching, precision of the press, product output, wear of tools should be considered. Hence the values in these examples are typical but not guaranteed values.

[Technical Data]
Hexagon Socket Set Screws Flat Type

1. Shape and Dimension of Hexagon Socket Set Screws and Its Flat End (JIS B 1177-1997).



Note (1): Should be chamfered to 120° if l falls short of the dotted line, which forms stairs, in the table.
(2): 45° Slanted portion below the trough diameter line of the male thread.

Nominal of Thread(d)			M2	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24
Pitch(P)			0.4	0.5	0.7	0.8	1.0	1.25	1.5	1.75	2.0	2.5	3.0
d_p	Max.(Reference Dimension)		1.0	2.0	2.5	3.5	4.0	5.5	7.0	8.5	12.0	15.0	18.0
	Min.		0.75	1.75	2.25	3.2	3.7	5.2	6.64	8.14	11.57	14.57	17.57
d_f	Approx.		Thread Bottom Diameter of Male Thread										
e	Min.(3)		1.003	1.73	2.30	2.87	3.44	4.58	5.72	6.86	9.15	11.43	13.72
s	Nominal(Reference Dimension)		0.9	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0
	Max.		0.902	1.545	2.045	2.560	3.080	4.095	5.095	6.095	8.115	10.115	12.142
	Min.		0.889	1.520	2.020	2.520	3.020	4.020	5.020	6.020	8.025	10.025	12.032
t	Min.(4)	Column 1	0.8	1.2	1.5	2.0	2.0	3.0	4.0	4.8	6.4	8.0	10.0
		Column 2	1.7	2.0	2.5	3.0	3.5	5.0	6.0	8.0	10.0	12.0	15.0
ℓ(5)			Approx. Mass Per 1000 Units								Unit:kg (Density:7.85kg/dm^3)		
Nominal Length(Reference Dimension)	Min.	Max.											
2	1.8	2.2	0.029	0.059									
2.5	2.3	2.7	0.037	0.08	0.099								
3	2.8	3.2	0.044	0.1	0.14	0.2							
4	3.7	4.3	0.059	0.14	0.22	0.32	0.41						
5	4.7	5.3	0.074	0.18	0.3	0.44	0.585	0.945					
6	5.7	6.3	0.089	0.22	0.38	0.56	0.76	1.26	1.77				
8	7.7	8.3	0.119	0.3	0.54	0.8	1.11	1.89	2.78	4			
10	9.7	10.3	0.148	0.38	0.7	1.04	1.46	2.52	3.78	5.4	8.5		
12	11.6	12.4		0.46	0.86	1.28	1.81	3.15	4.78	6.8	11.1	15.8	
16	15.6	16.4		0.62	1.18	1.76	2.51	4.41	6.78	9.6	16.3	24.1	30
20	19.6	20.4			1.49	2.24	3.21	5.67	8.76	12.4	21.5	32.3	42
25	24.6	25.4				2.84	4.09	7.25	11.2	15.9	28	42.6	57
30	29.6	30.4					4.97	8.82	13.7	19.4	34.6	52.9	72
35	34.5	35.5						10.4	16.2	22.9	41.1	63.2	87
40	39.5	40.5						12	18.7	26.4	47.7	73.5	102
45	44.5	45.5							21.2	29.9	54.2	83.8	117
50	49.5	50.5							23.7	33.4	60.7	94.1	132
55	54.4	55.6								36.8	67.3	104	147
60	59.4	60.6								40.3	73.7	115	162

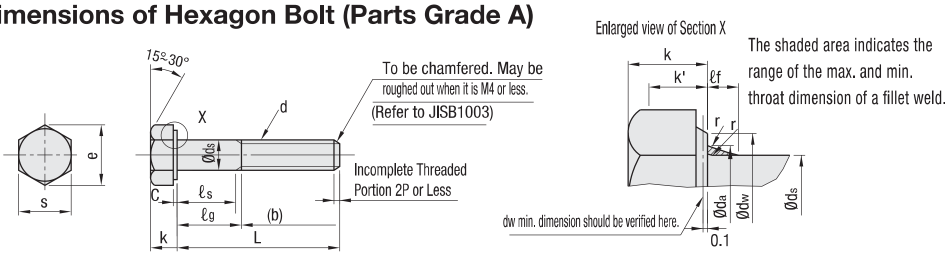
Note (3): when **e** min.=1.14×s(min.) Excluding nominal of thread M25 or less for screws.
(4): The values in Column 1 for **t** min. are applicable to the nominal lengths (ℓ) falling short of the dotted border, and the values in Column 2 to the nominal lengths beyond the border.
(5): Min.rand max. are based on JIS B 1021. They are rounded to the first digit below zero.

Reference 1. Recommended nominal lengths (ℓ) for individual nominal of thread are enclosed by thick lines.
If the required ℓ-value is not given in the table, it should be specified by the ordering side.
2. The shape and dimensions of the flat end of the screw are based on JIS B 1003 (shape and dimensions of the end of the screw).
3. The shape of the hexagon socket bottom may be a conical, drill or round bottom.

The shape and dimensions indicated in the reference table are based on ISO 4026-1977.

Hexagon Bolts
Excerpts from JIS B 1180 (1999)

1. Shape and Dimensions of Hexagon Bolt (Parts Grade A)



Unit: mm

Nominal of Thread d	Coarse Thread Column I	M2	M3	M4	M5	M6	M8	M10	M12	–	M16	M20	M24
	Coarse Thread Column II	–	–	–	–	–	–	–	–	M14	–	–	–
	Coarse Thread Pitch P	0.4	0.5	0.7	0.8	1	1.25	1.5	1.75	2	2	2.5	3
	Fine Thread Column I	–	–	–	–	–	M8×1	M10×1	M12×1.5	–	M16×1.5	M20×1.5	M24×2
	Fine Thread Column II	–	–	–	–	–	–	M10×1.25	M12×1.25	M14×1.5	–	M20×2	–
b (Reference)	L≤125mm	10	12	14	16	18	22	26	30	34	38	46	54
	125<L≤150mm	–	–	–	–	–	–	–	–	40	44	52	60
c	Min.	0.1	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.2	0.2	0.2
	Max.	0.25	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.8	0.8	0.8
da	Max.	2.6	3.6	4.7	5.7	6.8	9.2	11.2	13.7	15.7	17.7	22.4	26.4
ds	Reference Dimension=Max.	2	3	4	5	6	8	10	12	14	16	20	24
	Min.	1.86	2.86	3.82	4.82	5.82	7.78	9.78	11.73	13.73	15.73	19.67	23.67
dw	Min.	3.07	4.57	5.88	6.88	8.88	11.63	14.63	16.63	*19.64	22.49	28.19	33.61
e	Min.	4.32	6.01	7.66	8.79	11.05	14.38	17.77	20.03	23.36	26.75	33.53	39.98
ℓf	Max.	0.8	1	1.2	1.2	1.4	2	2	3	3	3	4	4
k	Reference Dimension=Nominal	1.4	2	2.8	3.5	4	5.3	6.4	7.5	8.8	10	12.5	15
	Min.	1.275	1.875	2.675	3.35	3.85	5.15	6.22	7.32	8.62	9.82	12.285	14.785
	Max.	1.525	2.125	2.925	3.65	4.15	5.45	6.58	7.68	8.98	10.18	12.715	15.215
k	Min.	0.89	1.31	1.87	2.35	2.7	3.61	4.35	5.12	6.03	6.87	8.6	10.35
r	Min.	0.1	0.1	0.2	0.2	0.25	0.4	0.4	0.6	0.6	0.6	0.8	0.8
s	Reference Dimension=Max.	4	5.5	7	8	10	13	16	18	21	24	30	36
	Min.	3.82	5.32	6.78	7.78	9.78	12.73	15.73	17.73	20.67	23.67	29.67	35.38

Length of Bolt L			ℓs and ℓg																							
Nominal Length (Reference Dimension)	Min.	Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.	ℓs Min.	ℓg Max.
16	15.65	16.35	4	6																						
20	19.58	20.42	8	10	5.5	8																				
25	24.58	25.42			10.5	13	7.5	11	5	9																
30	29.58	30.42			15.5	18	12.5	16	10	14	7	12														
35	34.5	35.5					17.5	21	15	19	12	17														
40	39.5	40.5					22.5	26	20	24	17	22	11.75	18												
45	44.5	45.5							25	29	22	27	16.75	23	11.5	19										
50	49.5	50.5							30	34	27	32	21.75	28	16.5	24	11.25	20								
55	54.4	55.6									32	37	26.75	33	21.5	29	16.25	25								
60	59.4	60.6									37	42	31.75	38	26.5	34	21.25	30	16	26						
65	64.4	65.6											36.75	43	31.5	39	26.25	35	21	31	17	27				
70	69.4	70.6											41.75	48	36.5	44	31.25	40	26	36	22	32				
80	79.4	80.6											51.75	58	46.5	54	41.25	50	36	46	32	42	21.5	34		
90	89.3	90.7													56.5	64	51.25	60	46	56	42	52	31.5	44	21	36
100	99.3	100.7													66.5	74	61.25	70	56	66	52	62	41.5	54	31	46
110	109.3	110.7															71.25	80	66	76	62	72	51.5	64	41	56
120	119.3	120.7															81.25	90	76	86	72	82	61.5	74	51	66
130	129.2	130.8																	80	90	76	86	65.5	78	55	70
140	139.2	140.8																	90	100	86	96	75.5	88	65	80
150	149.2	150.8																			96	106	85.5	98	75	90

Reference
1. Priority should be given to the nominal of thread in Column I. The screw size codes are based on JIS B 0123.
2. Recommended nominal lengths(L)for individual nominal of thread are enclosed by thick lines.
3. When the thread part length (b) of a bolt exceeds the max. nominal value given within the thick lines, the tolerance of the thread part length should be agreed upon by the delivering and receiving sides, corresponding to JIS B 1021.
4. Max. value ℓg and Min. value ℓs as follows: ℓg max Nominal Length(L)-b, ℓs min.=ℓg max-5P(P=Coarse Thread Pitch)
5. da and r in this table are based on JIS B 1005.
6. "Chamfered" and "Unpointed", the shape of the end screw should be decided according to JIS B 1003.
7. The asterisked figures in the table are values after correction with the relevant international standard.

*With some of the hexagon bolts and hexagon nuts for M10 and M12 distributed at present, the opposite side S is based on JIS prior to the revision.