Technical Data [ข้อมูลทางเทคนิค] [อ้างอิงจาก JIS B 1186 - 1995]

F10T Hex Head Bolt : High Strength Bolts

1. Classes and Grades

Table 1. Class of Bolt Set

Classes of Sets		Grades according to mechanical properties		
Class according to mechanical properties	Class according to torque coefficient values	Bolt	Nut	Washer
Class 1	A	F8T	F10 (F8)	F35
	B			
Class 2	A	F10T	F10	F35
	B			
Class 3	A	F11T	F10	F35
	B			

2. Materials

Table 2. F10T Hex Head Set

F10T Hex Head Set	Bolt [F10T]	Nut [F10]	Washer [F35]
Material	SCM435	S45C	S45C

3. Mechanical Properties

3.1 Machined Test Pieces

Table 3. Bolt Test Pieces

Grade of Bolt	Yeild Strength, min. [MPa]	Tensile Strength, min. [MPa]	Elongation, min [%]	Reduction of area, min [%]
F10T	900	1000 ~ 1200	14	40

3.2 Full Size Bolts

Table 4. Full Size Bolts

Grade of Bolt	Tensile Load (minimum) [MPa]							Hardness [HRC]
	Nominal size of threads							
	M12	M16	M20	M22	M24	M27	M30	
F10T	85	157	245	303	353	459	561	27 ~ 38

3.3 Nuts & Washers

Table 5. Hardness of Nuts

Grade of Nut	Hardness [minimum]	Hardness [maximum]	Proof Load
F10	95 HRB	35 HRC	The same as the tensile load (minimum) of the bolt of Table 4.

Table 6. Hardness of Washers

Grade of Nut	Hardness [HRC]
F35	35 ~ 45

4. Shape and Dimensions

4.1 Hexagon Bolts

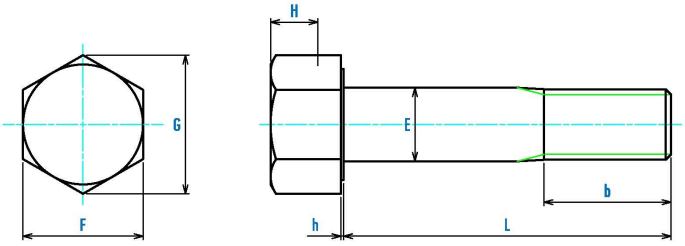


Table 7. Dimension of Bolt

Size	E		F		G	H		b	
	Basic	Tolerance	Basic	Tolerance	<Approx.>	Basic	Tolerance	Basic	Tolerance
M12	12	+0.7 ~ -0.2	22	+0 ~ -0.8	25.4	8	±0.8	25	+5 ~ -0
M16	16	+0.7 ~ -0.2	27	+0 ~ -0.8	31.2	10	±0.8	30	+5 ~ -0
M20	20	+0.8 ~ -0.4	32	+0 ~ -1.0	37.0	13	±0.9	35	+6 ~ -0
M22	22	+0.8 ~ -0.4	36	+0 ~ -1.0	41.6	14	±0.9	40	+6 ~ -0
M24	24	+0.8 ~ -0.4	41	+0 ~ -1.0	47.3	15	±0.9	45	+6 ~ -0
M27	27	+0.8 ~ -0.4	46	+0 ~ -1.0	53.1	17	±0.9	50	+6 ~ -0
M30	30	+0.8 ~ -0.4	50	+0 ~ -1.0	57.7	19	±1.0	55	+6 ~ -0

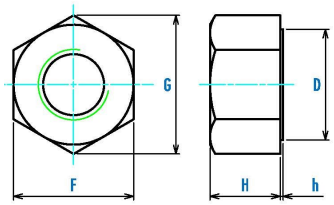
Length of Bolt [L]	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
Tolerance	±1.0				±1.4											

Length of Bolt [L]	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180
Tolerance	±1.4			±1.8											

4.2 Hexagon Nuts

Table 8. Dimension of Nut

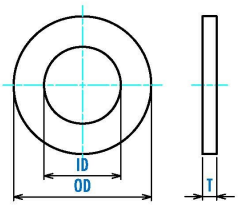
Size	F		G	H		D	h
	Basic	Tolerance	<Approx.>	Basic	Tolerance	<min.>	<Approx.
M12	22.0	+0 ~ -0.8	25.4	12.0	±0.35	20.0	0.4 ~ 0.8
M16	27.0	+0 ~ -0.8	31.2	16.0	±0.35	25.0	0.4 ~ 0.8
M20	32.0	+0 ~ -1.0	37.0	20.0	±0.40	30.0	0.4 ~ 0.8
M22	36.0	+0 ~ -1.0	41.6	22.0	±0.40	33.0	0.4 ~ 0.8
M24	41.0	+0 ~ -1.0	47.3	24.0	±0.40	38.0	0.4 ~ 0.8
M27	46.0	+0 ~ -1.0	53.1	27.0	±0.40	43.0	0.4 ~ 0.8
M30	50.0	+0 ~ -1.0	57.7	30.0	±0.40	47.0	0.4 ~ 0.8



4.3 Plain Washers

Table 9. Dimension of Washer

Size	ID		OD		T	
	Basic	Tolerance	Basic	Tolerance	Basic	Tolerance
M12	13.0	+0.7 ~ -0	26.0	+0 ~ -0.8	3.2	±0.40
M16	17.0	+0.7 ~ -0	32.0	+0 ~ -1.0	4.5	±0.50
M20	21.0	+0.8 ~ -0	40.0	+0 ~ -1.0	4.5	±0.50
M22	23.0	+0.8 ~ -0	44.0	+0 ~ -1.0	6.0	±0.70
M24	25.0	+0.8 ~ -0	48.0	+0 ~ -1.0	6.0	±0.70
M27	28.0	+0.8 ~ -0	56.0	+0 ~ -1.0	6.0	±0.70
M30	31.0	+1.0 ~ -0	60.0	+0 ~ -1.2	8.0	±0.70



5. Torque Coefficient of Set

Table 10. Torque Coefficient

Division	Class of Set According to Torque Coefficient	
	A	B
Average value of torque coefficient of one manufacturing lot	0.110 ~ 0.150	0.150 ~ 0.190
Standard deviation of torque coefficient of one manufacturing lot	0.010 max	0.013 max

6. Weights of F10T Set [1 Set ; 1 Bolt + 1 Nut + 2 Washer]

Table 11. Weights of Set (1 set includes 1 Bolt, 1 Nut, 2 Washers)

Length [mm]	Diameter						
	M12	M16	M20	M22	M24	M27	M30
35	0.103						
40	0.107	0.202	0.336				
45	0.112	0.210	0.348				
50	0.116	0.217	0.361	0.496			
55		0.225	0.373	0.510	0.666		
60		0.233	0.385	0.525	0.683		
65		0.241	0.398	0.540	0.701		
70		0.249	0.410	0.555	0.719		
75		0.257	0.422	0.570	0.737		
80		0.265	0.435	0.585	0.754	1.045	1.375
85		0.273	0.447	0.600	0.772	1.068	1.403
90		0.281	0.450	0.615	0.790	1.091	1.431
95		0.289	0.472	0.630	0.808	1.114	1.459
100		0.296	0.484	0.645	0.825	1.137	1.487
105		0.304	0.496	0.659	0.843	1.160	1.515
110		0.312	0.509	0.674	0.861	1.183	1.543
115		0.320	0.521	0.689	0.879	1.206	1.571
120		0.328	0.533	0.704	0.896	1.229	1.599
125		0.336	0.545	0.719	0.914	1.252	1.627
130		0.344	0.558	0.734	0.932	1.275	1.655
135		0.352	0.570	0.749	0.950	1.298	1.683
140		0.360	0.583	0.764	0.967	1.321	1.711
145			0.595	0.779	0.985	1.344	1.739
150			0.607	0.794	1.003	1.367	1.767
155			0.620	0.809	1.021	1.390	1.795
160			0.632	0.824	1.038	1.413	1.823
170				0.854	1.074	1.459	1.879
180				0.884	1.109	1.505	1.935
190				0.913	1.145	1.551	1.991
200				0.943	1.179	1.597	2.047