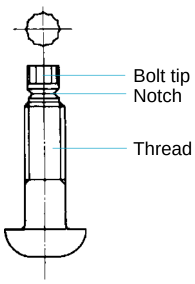
Features of High Strength T.C. (Tension Control) Bolts

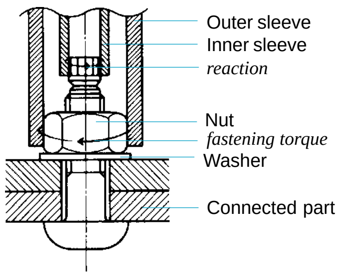
T.C. bolts, improved type of heavy hexagonal structural bolts, were developed for more simplified bolt fastening and more accurate performance and offer such excellent characteristics as shown below because no fastening technique of high level is required :

1. Controlled clamping force can be ensured.
2. Completion of bolt fastening can be comfirmed by the shear-off of the notched end of the bolt.
3. Fastening can easily be done by electric wrench.
4. Noiseless installation and no need of wrench adjustment.
5. The bolt does not rotate when fastening.
6. No apprehension of bolts being left unfastened.

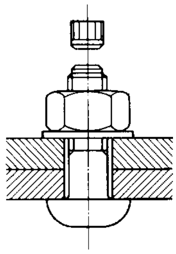
Before clamping



During clamping

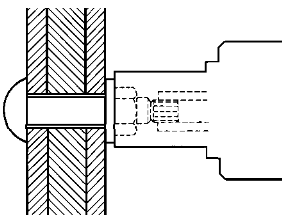


After clamping

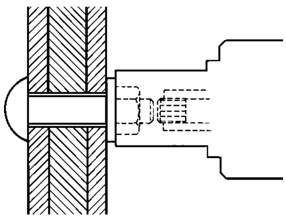


The bolt reacts to the fastening torque and the notched end of the bolt shears off.
The required clamping force is thus given.

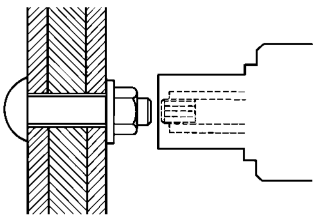
Installation Procedure



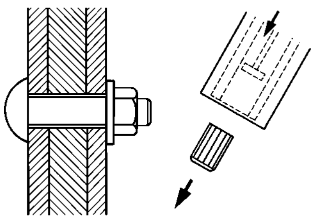
1 Fit the inner sleeve firmly over the bolt tip and engage the outer sleeve over the nut by slightly pushing the wrench.



2 Turn on the switch.
The outer sleeve then rotates thereby tightening the bolt until the torque-controlled notched end of the bolt shears off.



3 Turn off the switch when the notched end of the bolt shears off. Pull the wrench back to remove the outer sleeve from the nut.



4 Pull the tip lever to discharge the severed bolt tip left inside the inner sleeve.

High Strength T.C. Bolts (JSS II 09)

Classes and Grades

Classes of sets	Combination of grade according to mechanical properties of component parts		
Class according to mechanical properties	Bolt	Nut	Washer
Class 2	S 10 T	F 10	F 35

Mechanical Properties

Machined Test Pieces

Grade of bolt according to mechanical properties	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Reduction of area (%)
S 10 T	900 min.	1000 ~ 1200 min.	14 min.	40 min.

Full Size Bolts

Grade of bolt according to mechanical properties	Tensile load (min.) (KN)						Hardness
	Nominal size of threads						
	M16	M20	M22	M24	M27	M30	
S 10 T	157	245	303	353	459	561	H_RC 27 ~ 38

Nuts

Grade of nut according to mechanical properties	Hardness		Proof load
	Min.	Max.	
F 10	H_RB 95	H_RC 35	Same as tensile load (min.) of bolt

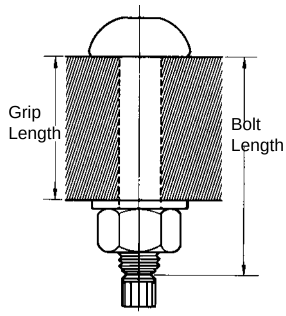
Hardness of Washers

Grade of washer according to mechanical properties	Hardness
F 35	H_RC 35 ~ 45

Determination of Bolt Length

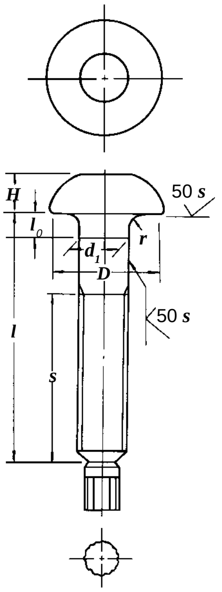
Nominal size of threads	To determine required bolt length add to grip
M16	25
M20	30
M22	35
M24	40
M27	45
M30	50

Unit: mm



Shape and Dimensions

High Strength Tension Control Bolts



Nominal size of threads (d)	d_1 Basic dimension	d_1 Tolerance	H Basic dimension	H Tolerance	D Min.	r	s Basic dimension	s Tolerance
M16	16	+0.7 ~ -0.2	10	± 0.8	26	1.2 ~ 2.0	30	+5 ~ 0
M20	20	+0.8 ~ -0.4	13	± 0.9	33		35	+6 ~ 0
M22	22		14		37		40	
M24	24		15		41	1.6 ~ 2.4	45	
M27	27		17		47		50	
M30	30		19	± 1.0	53	2.0 ~ 2.8	55	

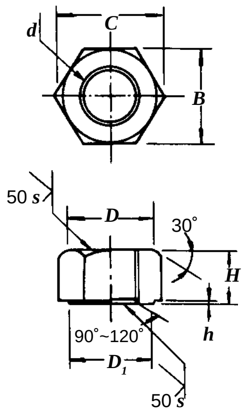
Unit: mm

Nominal bolt length (*l*)	Tolerance
30 up to 50	± 1.0
55 up to 120	± 1.4
125 up to 180	± 1.8

Note: The measuring point for d_1 should be $l_0 = d_1/4$

Unit: mm

Heavy Hexagon Nuts



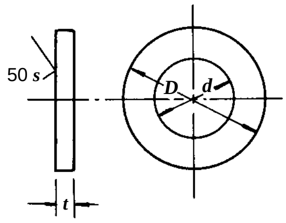
Nominal size of threads (d)	Outside diameter external thread	H Basic dimension	H Tolerance	B Basic dimension	B Tolerance	C Approx.	D Approx.	D_1 Min.	h
M16	16	16	± 0.35	27	0 ~ -0.8	31.2	25	25	0.4 ~ 0.8
M20	20	20	± 0.4	32	0 ~ -1	37.0	30	29	
M22	22	22		36		41.6	34	33	
M24	24	24		41		47.3	39	38	
M27	27	27		46		53.1	44	43	
M30	30	30		50		57.7	48	47	

Unit: mm

Plain Washers

Nominal size of washers	d		D		t	
	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance
M16	17	+0.7 ~ 0	32	0 ~ -1	4.5	± 0.5
M20	21	+0.8 ~ 0	40			
M22	23		44		6	± 0.7
M24	25		48			
M27	28		56			
M30	31	+1.0 ~ 0	60	0 ~ -1.2	8	

Unit: mm



Fastener Tension

Nominal size of threads	Minimum fastener tension
	S 10 T
M16	106
M20	165
M22	205
M24	238
M27	310
M30	379

Unit: KN

Weights of JSS II 09 Grade S10T High Strength T.C. Bolts, Hexagon Nuts and Plain Washers (w.e.f. 1st April 2002)

Approximate weight per set (1 set includes 1 Bolt, 1 Nut and 1 Washer)

Diameter / Length mm	M 16		M 20		M 22		M 24		M 27		M 30	
	kg	sets per carton	kg	sets per carton	kg	sets per carton	kg	sets per carton	kg	sets per carton	kg	sets per carton
35	0.185	160										
40	0.191	160	0.318	95								
45	0.199	150	0.328	95								
50	0.207	140	0.341	90	0.463	65						
55	0.215	130	0.354	85	0.478	65	0.631	45				
60	0.223	130	0.367	80	0.493	60	0.649	45				
65	0.231	120	0.380	75	0.508	55	0.667	40				
70	0.239	120	0.393	75	0.523	55	0.685	40				
75	0.247	110	0.406	70	0.538	50	0.703	40				
80	0.255	110	0.419	65	0.553	50	0.721	40	0.971	25	1.269	20
85	0.263	105	0.432	60	0.568	45	0.739	35	0.994	25	1.297	20
90	0.271	105	0.445	60	0.583	45	0.757	35	1.016	25	1.325	20
95	0.279	105	0.458	60	0.598	45	0.775	35	1.039	25	1.353	20
100	0.287	90	0.471	55	0.613	40	0.793	35	1.061	25	1.380	20
105	0.295	90	0.484	50	0.628	40	0.811	30	1.084	25	1.408	20
110	0.303	90	0.497	50	0.643	40	0.829	30	1.106	25	1.436	20
115	0.311	90	0.510	50	0.658	35	0.847	30	1.129	25	1.464	20
120	0.319	90	0.523	50	0.673	35	0.865	25	1.151	25	1.491	20
125	0.327	90	0.536	50	0.688	35	0.883	25	1.174	20	1.519	18
130	0.335	90	0.549	45	0.703	30	0.901	25	1.196	20	1.547	18
135			0.562	40	0.718	30	0.919	25	1.219	20	1.575	18
140			0.575	40	0.733	30	0.937	25	1.241	20	1.602	18
145			0.588	40	0.748	30	0.955	25	1.264	18	1.630	16
150					0.763	25	0.973	25	1.286	18	1.658	16
155					0.778	25	0.991	20	1.309	18	1.686	16
160					0.793	25	1.009	20	1.331	16	1.713	16
170					0.823	25	1.045	20	1.376	16	1.768	16
180					0.853	25	1.081	20	1.421	16	1.824	15
190					0.883	25	1.117	20	1.446	16	1.879	15
200					0.913	20	1.152	20	1.511	16	1.935	15
210					0.943	20	1.189	20			1.990	10
220					0.973	20	1.225	20			2.046	10

Remark: Weight for Anti rust treated TC Bolt, nut & washer (1 set) is the same as of plain finish (above)