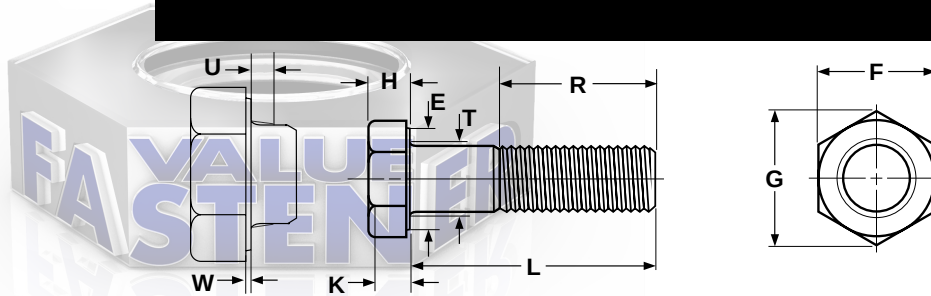


Cap Screws & Bolts

METRIC

Hex Bolts Grade-A & B



METRIC - HEX HEAD BOLTS, PRODUCT GRADE A

ISO 4014

Nominal Size	Thread Pitch	R		W		T	U	E	H		F		G	K
		Threaded Length		Washer Face Thickness		Fillet Transition Diameter	Under-head Fillet	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		L ≤ 125 mm	L > 125 mm ≤ 200 mm	Max	Min	Max	Max	Min	Max	Min	Max	Min	Min	Min
M1.6	0.35	9	-	0.25	0.1	2	0.6	2.27	1.225	0.975	3.2	3.02	3.41	0.68
M2	0.4	10	-	0.25	0.1	2.6	0.8	3.07	1.525	1.275	4	3.82	4.32	0.89
M2.5	0.45	11	-	0.25	0.1	3.1	1	4.07	1.825	1.575	5	4.82	5.45	1.1
M3	0.5	12	-	0.4	0.15	3.6	1	4.57	2.125	1.875	5.5	5.32	6.01	1.31
M4	0.7	14	-	0.4	0.15	4.7	1.2	5.88	2.925	2.675	7	6.78	7.66	1.87
M5	0.8	16	-	0.5	0.15	5.7	1.2	6.88	3.65	3.35	8	7.78	8.79	2.35
M6	1	18	-	0.5	0.15	6.8	1.4	8.88	4.15	3.85	10	9.78	11.05	2.7
M8	1.25	22	-	0.6	0.15	9.2	2	11.63	5.45	5.15	13	12.73	14.38	3.61
M10	1.5	26	-	0.6	0.15	11.2	2	14.63	6.58	6.22	16**	15.73	17.77	4.35
M12	1.75	30	-	0.6	0.15	13.7	3	16.63	7.68	7.32	18**	17.73	20.03	5.12
M14	2	34	40	0.6	0.15	15.7	3	19.37	8.98	8.62	21**	20.67	23.36	6.03
M16	2	38	44	0.8	0.2	17.7	3	22.49	10.18	9.82	24	23.67	26.75	6.87
M20	2.5	46	52	0.8	0.2	22.4	4	28.19	12.715	12.285	30	29.67	33.53	8.6
M24	3	54	60 73*	0.8	0.2	26.4	4	33.61	15.215	14.785	36	35.38	39.98	10.35
Tolerance on Length		12-16mm: ±0.35		20-30mm: ±0.42		35-50mm: ±0.5		55-80mm: ±0.6		90-120: ±0.7		130-150mm: ±0.8		

*For nominal lengths over 200mm.

**DIN 931 spec for maximum width across flats on these three diameters are 17, 19 & 22 mm, respectively.

METRIC - HEX HEAD BOLTS, PRODUCT GRADE B

ISO 4014

Nominal Size	Thread Pitch	R		W		T	U	E	H		F		G	K
		Threaded Length		Washer Face Thickness		Fillet Transition Diameter	Under-head Fillet	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		L > 125 mm ≤ 200 mm	L > 200 mm	Max	Min	Max	Max	Min	Max	Min	Max	Min	Min	Min
M16	2	44	-	0.8	0.2	17.7	3	22	10.29	9.71	24	23.16	26.17	6.8
M20	2.5	52	-	0.8	0.2	22.4	4	27.7	12.85	12.15	30	29.16	32.95	8.51
M24	3	60	73	0.8	0.2	26.4	4	33.25	15.35	14.65	36	35	39.55	10.26
M30	3.5	72	85	0.8	0.2	33.4	6	42.75	19.12	18.28	46	45	50.85	12.8
M36	4	84	97	0.8	0.2	39.4	6	51.11	22.92	22.08	55	53.8	60.79	15.46
M42	4.5	96	109	1	0.3	45.6	8	59.95	26.42	25.58	65	63.1	71.3	17.91
M48	5	108	121	1	0.3	52.6	10	69.45	30.42	29.58	75	73.1	82.6	20.71
M56	5.5	-	137	1	0.3	63	12	78.66	35.5	34.5	85	82.8	93.56	24.15
M64	6	-	153	1	0.3	71	13	88.16	40.5	39.5	95	92.8	104.86	27.65
Tolerance on Length		110-120mm: ±1.75		130-180mm: ±2.0		200-240mm: ±2.3		260-300mm: ±2.6		320-400mm: ±2.85		420-500mm: ±3.15		

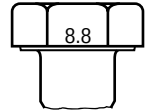
Hex Bolts Class 8.8 & 10.9

METRIC

Bolts & Cap Screws



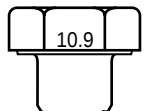
CLASS 8.8 BOLTS



Description	A hex bolt with metric thread pitch made from medium carbon steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/Advantages	Has greater tensile strength than Class 4.6, 4.8 and 5.8 bolts.
Material	Class 8.8 bolts can be made from a carbon steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- <i>Carbon</i> : 0.15-0.40%; <i>Phosphorus</i> : 0.035% maximum; <i>Sulfur</i> : 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content of less than 0.25% (ladle analysis), the minimum <i>Manganese</i> content shall be 0.6%
	Class 8.8 bolts can be made from a carbon steel which conforms to the following chemical composition-- <i>Carbon</i> : 0.25-0.55%; <i>Phosphorus</i> : 0.035% maximum; <i>Sulfur</i> : 0.035% maximum.
Heat Treatment	Class 8.8 bolts shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	For diameters less than or equal to 16mm: Rockwell C22 - 32 (Vickers HV 250 - 320) For diameters greater than 16mm: Rockwell C23 - 34 (Vickers HV 255 - 335)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	For diameters less than or equal to 16mm: 640 N/mm ² minimum For diameters greater than 16mm: 660 N/mm ² minimum
Tensile Strength	For diameters less than or equal to 16mm: 800 N/mm ² minimum For diameters greater than 16mm: 830 N/mm ² minimum
Elongation	12% minimum
Plating	See Appendix-A for plating information



CLASS 10.9 BOLTS



Description	A bolt with metric thread pitch made from medium carbon alloy steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/Advantages	Has greater tensile strength than Class 8.8 bolts; is most comparable but not exactly equivalent to U.S. Grade 8 cap screws.
Material	Class 10.9 bolts can be made from a carbon steel which conforms to the following chemical composition-- <i>Carbon</i> : 0.25-0.55%; <i>Phosphorus</i> : 0.035% maximum; <i>Sulfur</i> : 0.035% maximum.
	Class 10.9 bolts can be made from a low carbon martensite steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- <i>Carbon</i> : 0.20-0.55%; <i>Phosphorus</i> : 0.035% maximum; <i>Sulfur</i> : 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content of less than 0.25% (ladle analysis), the minimum <i>Manganese</i> content shall be 0.7%
	Class 10.9 bolts can be made from an alloy steel which conforms to the following chemical composition-- <i>Carbon</i> : 0.20-0.55%; <i>Phosphorus</i> : 0.035% maximum; <i>Sulfur</i> : 0.035% maximum; and shall contain one or more of the following elements: <i>Chromium</i> , <i>Nickel</i> , <i>Molybdenum</i> or <i>Vanadium</i>
Heat Treatment	Class 10.9 bolts shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	Rockwell C32 - 39 (Vickers HV 320 - 380)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	940 N/mm ² minimum
Tensile Strength	1040 N/mm ² minimum
Elongation	9% minimum
Plating	See Appendix-A for plating information