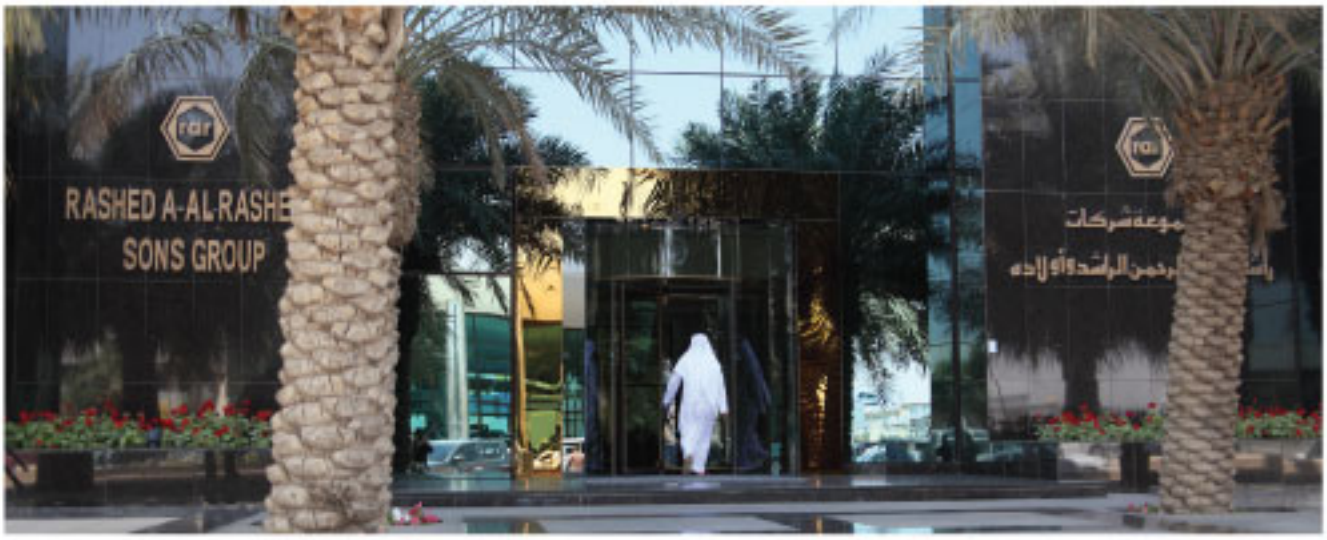
AL RASHED FASTENERS

"QUALITY & COMMITMENT SINCE 1978"

TECHNICAL CATALOGUE



AL RASHED GROUP

Founded in 1950. Al-Rashed Group has helped the national economy grow to its present strength. Operating through a network of Commercial & industrial divisions, the group has evolved a special role for itself in virtualy every sector of the saudi Economy. Besides the wholly owned subsidiaries, Al-Rashed has partnerships with both the saudi & foreign entrepreneurs, & Over the years, the conglomerate has assumed vital stakes in the fastest growing private Sector.

AL RASHED FASTENERS

Manufacturing & Marketing a whole range of quality Fasteners to international standards and hold Kingdom's giant industrial & structural infrastructure in place. By reaching for the Gulf & Middle Eastern markets, it is helping diversify the Economy - an explicit national goal. Major local clients of the concern include Saudi Aramco, Sceco, Sabic and the private sector.

AL-RASHED FASTENERS DIVISION

Our products include hot & cold forged bolts & Nuts, and Automotive fasteners besides the Stud & Anchor bolts. Quality standards are ensured through Hi-Tech facilities like heat treatment, Hot-dip galvanizing and electro galvanizing. These techniques satisfy specialized demands for high-tensile usages.

State of the art latest machinery are being used for the manufacturing like cold bolt formers, flat and circular thread rollers equipped with process monitoring devices, all intended to improve product quality and aim at zero defect. In process areas like heat treatment, electroplating and hot dip galvanizing computerized controls are used to maintain process parameters and thereby ensure consistent quality of the products.

Processes are compatible to handle high tensile fasteners to maintain product characteristics as mentioned in various international standards. Proper handling and packing methods are adopted to ensure product quality.

WHY PREFER AL RASHED FASTENERS?

HIGHER VALUE FOR YOUR MONEY

Equipped with dimensional accuracy and higher strength levels, **AL-Rashed Fasteners** offer's you substantial cost-saving in the joint preparation & assembly stages thereby raising the value of your money.

THE FOLLOWING RULES ESTABLISH THIS VALUE APPRECIATION.

1.Cost of fasteners is disproportionate with their utility. Consequently, the reliability of 95% cost of the project rests on 5% cost of the fasteners giving them high value responsibility in industry.

2.Fasteners cost is a minor percentage (5%) of that of the whole fastening system i.e In Place Cost of the System (IPC), itself.

3.The IPC cost, for a given joint, can be reduced by using lesser bolts or smaller diameter bolts. This can only done through smaller fasteners with highest tensile strength. Obvious advantage would be a lighter and smaller assembly.

4.In which event costs would be cut under all the heads of IPC making the assembly economical.

To reduce the in-place cost, it is, therefore, obvious that in a given joint, either the number of bolts used should be reduced, or diameters of the bolts used should be reduced. This is possible by selecting smaller size fasteners with higher tensil strengths. The added advantage will be a lighter and smaller assembly.

Equipped with dimensional accuracy and higher strength levels, AL-RASHED FASTENERS offer you substantial cost-saving in the joint preparation & assembly. Value of your money is raised after heeding to the following rules.

WHY INSIST ON RF HIGH TENSILE HEXAGON HEAD BOLTS. SCREWS AND NUTS

High Tensile Hex Bolts and Nuts by AL-RASHED are used in a wide range of applications including automotive, structures, machine building and electrical industries. Their special design and properties offers several benefits.

Rolled Threads

Bolt

ROLLED THREADS

Threads are rolled, not cut or ground. Rolled threads are more uniform and have closer tolerances. Countour following flow lines eliminate planes of weakness and improve fatigue strength.

DIMENSIONAL TOLERANCE

They are held to precision grade to give maximum cross-section area and ensure smooth assembly.

HEAT TREATMENT

Heat treated in a controlled atmosphere to achieve maximum strength and toughness.

FORGED HEADS

In contrast to conventionally machined bolts, which cut metal fibers, break fiber flow lines and create planes of weakness at stress points, controlled forging gives uniform grain flow with unbroken fiber lines; makes heads stronger ; besides preventing fatigue failure in the vital area.

SPECIAL UNDER-HEAD FILLET DESIGN

Provides smooth transition in the area from head to shank; reduces stress concentrations; improves fatigue life.

WHY INSIST ON RF HIGH TENSILE HEXAGON HEAD BOLTS, SCREWS AND NUTS

ADVANTAGES OF HIGH TENSILE FASTENERS: MAXIMUM STRENGTH WITH MINIMUM OF FASTENERS.

High Tensile Fasteners are forged to precision grade dimensions to ensure smooth assembly. In addition, heat treatment is done to suit the chemistry of every part of steel. This imparts optimum mechanical properties to ensure that correct tightening torques can be applied to fullfill design requirements.

ADVANTAGES

1. Reduced Number of Bolts
2. Reduced Bolt Size
3. Less Numbers of Holes
4. Reduced size of holes
5. Reduced assembly cost
6. Reduced Maintenance Cost

TABLE BELOW COMPARE STRENGTHS OF HIGH TENSILE AND ORDINARY MILD STEEL BOLTS

STRENGTH GRADE	TENSILE GRADE	YIELD GRADE	YIELD INDEX (4.6 = 100)
4.6	400 MPa	240 MPa	100
5.8	500 MPa	400 MPa	166
6.8	600 MPa	480 MPa	200
8.8*	800 MPa	640 MPa	266
10.9*	1000 MPa	900 MPa	375
12.9*	1200 MPa	1080 MPa	450

It is obvious from the above table that High tensile Bolt of Property Class 8.8 is approximately four times stronger than ordinary Mild Steel Bolt of Property Class 4.6. This extra strength of High Tensile Bolt can be used to upgrade an assembled joint from a low tensile one to a high tensile one to gain all the advantages described above.

QUALITY SYSTEM ISO 9001

AL-RASHED'S MANUFACTURING THEME

"DO IT RIGHT THE FIRST TIME AND EVERY TIME"

Ensures constant awareness from vendor selection to manufacturing, and from warehousing to shipping. Quality importance is felt and applied at all stages. All raw materials and products are thoroughly inspected for their conformity to the standard requirements with a computer database for future reference. Any non-conformity is immediately reported to the supplier and remedial action taken. Our Quality System is based on ISO 9001 Modern techniques of Quality Assurance are applied and supported by written procedures including
statistical Quality Control, Failure Mode and Effect analysis, Chemical, Metallurgical and Mechanical Laboratory facilities are provided at plant site and all tests are carried out systematically on a day-to-day basis. All the gauges, measuring instruments and testing equipments are calibrated as per the periodicity set forth by the company for their effective utilization and documented for future verification.

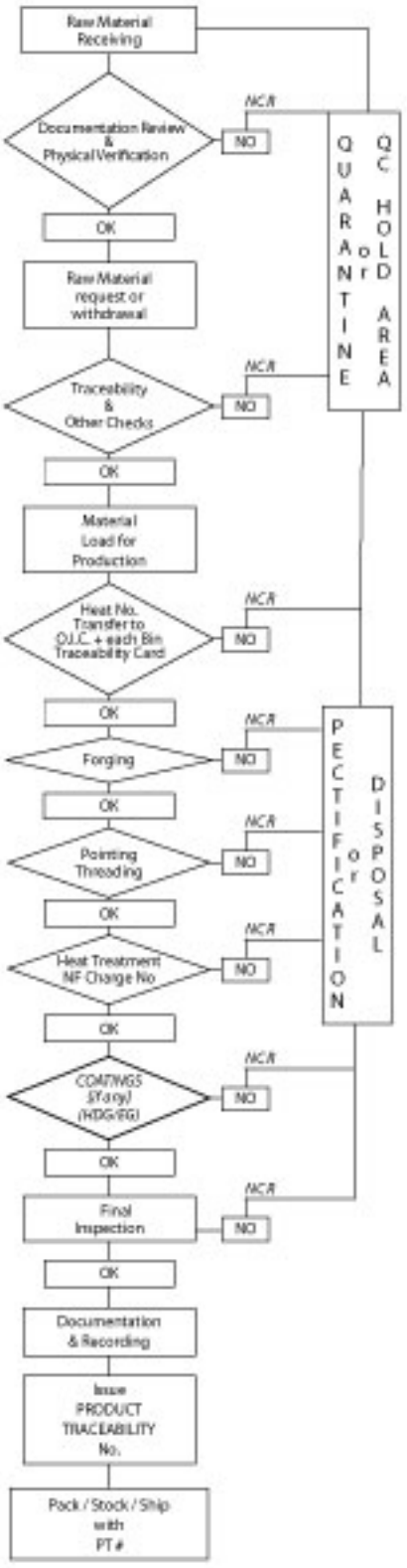
PRODUCT TRACEABILITY SYSTEM:

Each production batch is thoroughly inspected and tested for its conformity to the standard's requirements. Upon satisfactory report, a Product Traceability Number (PT#) is issued and recorded in computer detailing Mill Heat #, Heat Treatment Charge#, Chemical Composition and Mechanical Properties of the raw material used for production. This PT# is recorded in all documents and also on each carton, thus enabling QC to issue Test Certificates and to trace back the histroy of any product, for future verification, if required.

TEST CERTIFICATE THROUGH DATA BANK:

All data relating to any product is fed into computers data base, as explained above and, therefore, the preparation for Test Certificates has become more reliable and accurate with an added advantage of better cutomer service, thus enabling us to improve successfully quality measures like increased customer confidence, improved productivity, greater efficiency and a more committed work force.

PRODUCT TRACEABILITY SYSTEM



AL RASHED FASTENERS

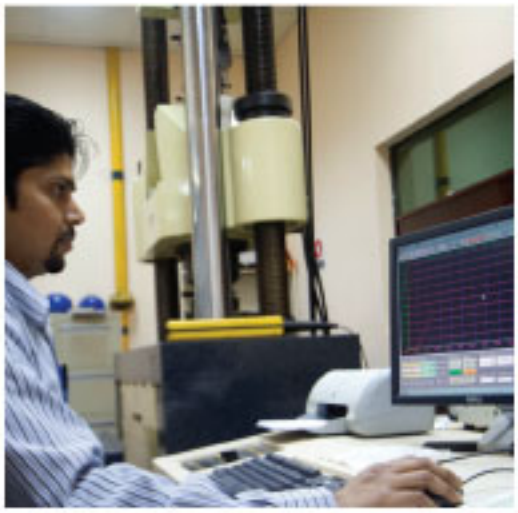
QUALITY ASSURANCE AND CONTROL

Our Quality Management System is based on ISO - 9001 - Modern techniques are employed and supported by written procedures including Statistical Control Failure Mode and Effect Analysis. Chemical Laboratory Tests are also done as required to ensure the different stages of work-in-process. All mechanical tests are carried out systematically on regular basis and a Product Traceability Number is allocated for each product, after satisfying the requirements of the relevant standards.

Alloy Analyzer (USA)
(Positive material identification)

Gauges Calibration
(Floating Carriage Micrometer)

(Portable Hardness Testing Machine - USA)



Universal Tensile Testing Machine (UTS)
(1000 KN Computerised)

Destructive Testing

Mechanical properties Like (Hardness Compression test, Proof Load, Tensile, Yield, % elongation, Reduction of area, Bend Test, Shear Test, Micro structure, Torque, & Impact testing.

Non-Destructive Testing

Eddy Current (Method), MPI Crack Detection
Positive Material Identification (ALLOY ANALYZER)

Surface Treatment

(Electro-galvanizing / Hot dip galvanizing) Heat Treatment, Phosphating.

Grade/Glass/Strength Category/Designation							NOMINAL PRODUCT RANGE	MATERIALS (STEEL) & TREATMENT	Shear Strength (min)	Yeild Strength (min)	Tensile (min)	Tensile (max)	Red'n Area (min)	Elogation (min)	HARDNESS (MIN)	HARDNESS (MAX)	IMPACT STRENGTH (MIN)
GERMAN	U.K	ITALY	INTERNATIONAL	JAPAN	U.S.A	U.S.A											
DIN	BS	UNI	ISO	JIS	ASTM	SAE			MPa (ksi)	MPa (ksi)	MPa (ksi)	MPa (ksi)	%	%	ROCKWELL (HR)		TEST TEMP (J/CM2)
267-3 Class 4.6	4190/ 3692 Class 4.6	3740-1 Class 4.6	898-1 Class 4.6	B 1051 Class 4.6	F 568 Class 4.6	J 1199 Class 4.6	M5 to M36	LOW or MEDIUM CARBON	248 (36)	240 (35)	400 (58)	-	(35)	(22)	B 67	B 95.5	
					A 307 Gr A		1/4 to 4		257 (37)	- -	414 (60)	- 690 (100)	- -	18	B 69	B 100 B 95	
					A 307 Gr B												
267-3 Class 4.8	4190/ 3692 Class 4.8	3740-1 Class 4.8	898-1 Class 4.8	B 1051 Class 4.8	F 568 Class 4.8		M1.6 to M16	LOW or MEDIUM CARBON	260 (38)	340 (49)	420 (58)	-	35	14	B 71	B 100	
267-3 Class 5.8	4190/ 3692 Class 5.8	3740-1 Class 4.8	898-1 Class 5.8	B 1051 Class 5.8	F 568 Class 5.8		Upto M36	Low or Medium Carbon	322 (46)	420 (61)	520 (75)	-	35	10	B 82	B 100	
					A 394 Type 0		1/2 to 1"		322 (46)	420 (61)	520 (75)	-	-	-	B 80	B 100	
							1/4 to 3/4		316 (46)	393 (57)	510 (75)	-	35	18	B 80	B 100	
						J 429 Gr. 2	> 3/4 to 1 1/2		180 (26)	172 (25)	290 (42)	-			B 70		
267-3 Class 8.8	4190/ 3692 Class 8.8	3740-1 Class 8.8	898-1 Class 8.8	B 1051 Class 8.8	F 568 Class 8.8	J 1199 Class 8.8	M6 to M30	Low Carbon Martensite Quenched & Tempered or Medium Carbon Quenched & Tempered	515 (75)	660 (96)	830 (120)	-	35	12	C 23	C 34	
					A 325 Type 1	J 429 Gr.5	1/2 to 1"			635 (92)	827 (120)				C 25	C 34	
					A 449 Type 1/2												
					A 394 Type 1				513 (74.4)			-	-	-			
267-3 Class 10.9	4190/ 3692 Class 10.9	3740-1 Class 10.9	898-1 Class 10.9	B 1051 Class 10.9	F 568 Class 10.9	J 199 Class 10.9	Upto M36	Medium Carbon Alloy * Quenched & Tempered	645 (93)	940 (136)	1040 (152)	-	35	9		C 39	
					A 354 Gr. BD	J 429 Gr.8	1/4 to 2 1/2		641 (93)	896 (130)	1034 (150)	- 1193 (173)	40	14	C 33	C 36 C 38	
					A 490 Type 1		1/2" to 2 1/2										
					A 193 Gr. B7		Upto 2 1/2"	AISI 414/4142/4145 (Cr. Mo Alloy Steel) + Quenched & Tempered	533 (77) 490 (71)	896 (105) 655 (95)	1034 (125) 795 (115)		50	16		C 35 MAX	
							>2-to 1/2"4"		533 (77)	725 (105)	860 (125)		50	16		C 35 MAX	@-101 C (20 J)
					A 320 Gr. L7		Upto 2 1/2"										

Shear Strength is based on 62% of min. Tensile Strength.

This is only a Guide for product selection. No claim shall be entertained in this regard.

Figure in BOLD-FACE are the requirements as per the applicable code (s)/ standard (s) /specifications(s).

Figure are rounded off to match the nearst applicable code(s)/ standard (s).

NUTS COMPATABILITY GUIDE

BOLT	DIAMETER RANGE	FINISH	RECOMMENDED NUT	DESIGN
ASTM A307 Gr. A	1/4" to 1-1/2"	B/EG/HDG	ASTM A563 Gr. A/B/C/D/DH/DH3 ASTM A563 Gr. A	Hex OR Heavy Hex
	1 - 1/2" to 4"	B/EG/HDG		
ASTM A307 Gr. B	1/2" to 1 - 1/2"	B/EG/HDG	ASTM A563 Gr. A/B/C/D/DH/Dh3	Heavy Hex
ASTM A325 Type 1 or 2	1/2" to 1 - 1/2"	Black	ASTM A563 Gr. C3/D/DH/DH3 ASTM A 194 Gr. 2/2H	Heavy Hex
		EG/HDG		
ASTM A354 Gr. BD	1/4" to 4"	Black	ASTM A563 Gr. DH ASTM A 194 Gr. 2H	Heavy Hex
ASTM A394 Type 0	1/2" to 1"	EG/HDG	ASTM A563 Gr. DH/A/B/C ASTM A194 Gr. 2H	Hex
ASTM A394 Type 1	1/2" to 1"	EG/HDG	ASTM A563 Gr. DH ASTM A194 Gr. 2H	Heavy Hex
ASTM A449 Type 1	1/4" to 1 - 1/2"	Black	ASTM A563 Gr. B ASTM A563 Gr. DH ASTM A194 Gr. 2H	Hex
	1/4" to 3"	EG/HDG		Heavy Hex
ASTM A490 Type 1	1/2" to 1 - 1/2"	Black	ASTM A563 Gr. DH ASTM A194 Gr. 2H	Heavy Hex
ASTM A193 Gr. B5/B6		B/EG/HDG	ASTM A194 Gr. Any	Hex or Heavy Hex
B7		Black	Gr. 2H. 4. 7 or 8	Heavy Hex
B7M		Black	Gr. 2HM, 4, 7M or 8M	Heavy Hex
ASTM A320 Gr. L7		Black	ASTM A194 Gr. Any	Heavy Hex
Gr. L7M		Black	Gr. 7M	Heavy Hex
SAE J429 Gr. 1 or 2		B/EG/HDG	SAE J 995 Gr. 2	Hex
Gr. 4		B/EG/HDG	Gr. 5	Hex
Gr. 5		B/EG/HDG	Gr. 5 or 8	
Gr. 8		Black	Gr. 8	
METRIC FASTENERS				
CLASS 4.6	M5 TO M6	B/EG/HDG	ASTM A 563M CL.5	Hex (Style-1)
CLASS 4.8	M1.6 TO M16	B/EG/HDG	ASTM A 563M CL.5	Hex (Style-1)
CLASS 5.8	M 5 TO M24	B/EG/HDG	ASTM A 563M CL.5	Hex (Style-1)
CLASS 8.8	M16 TO M36	Black	ASTM A 563M CL.9	Hex (Style-2)
		EG/HDG	ASTM A 563M CL.12	Hex (Style-2)
CLASS 9.8	M16 TO M36	Black	ASTM A 563M CL.9	Hex (Style-2)
		BG/HDG	ASTM A 563M CL.12	Hex (Style-2)
CLASS 10.9	M5 TO M36	Black	ASTM A 563M CL.10	
	M42 TO M100	Black	ASTM A 563M CL.12	Heavy Hex
ASTM A 325M Type 1	M16 TO M36	Black	ASTM A 563M CL.8 S	Heavy Hex
		EG/HDG	ASTM A 563M CL.10 S	Heavy Hex
ASTM A 490M Type 1	M16 TO M36	Black	ASTM A 563M CL.10 S	Hex (Style-1)
ASTM A 394M Grade A	M12 TO M24	EG/HDG	ASTM A 563M CL.5	Hex (Style-1)
ASTM A 394M Grade B	M12 TO M24	EG/HDG	ASTM A 563M CL.12	Hex (Style-2)

B - Natural Finish EG - Electro-Galv. HDG - Hot - Dip - Galv.

SURFACE COATING OF FASTENERS

As a protective measure, Fasteners are coated against corrosion at production stage. Different types of coating can be applied as required by the standards, by the customer or the environment. Al-Rashed Fasteners can offer the following surface coating facilities to complement existing production range:

1. ZINC ELECTRO GALVANIZING

This is done in accordance with ASTM B 633 or DN 267 Part 9 with Colour chromation as detailed below:

a. Yellow chromating (Yellow passivation)

b. Blue chromating (Blue passivation)

2. ZINC HOT DIP GALVANIZING

Hot Dip Galvanizing (HDG) is a process to provide a protective Zinc layer deposited onto the surface of metal articles by immersing these parts in Molten Zinc. The coating thickness measuring points shall be either on top of head or on flats of Hex or on the end faces of threads. In order to ensure that Bolt/Nut assembly continues to function properly after HDG without impairing the threads, Bolts with standards class of fit (2A or 6g) are HDG and only the Nuts are tapped oversize (by about 0.3 mm larger) after HDG. This Bolt/Nut combination do not meet the usual thread fit and hence, these are supplied as a set only. HDG is generally carried out in accordance with ASTM A 153 Class C or BS EN ISO1461. HDG itself does not cause Hydrogen embrittlement. Pretreatments like pickling are processed with adequate and-professional care to avoid hydrogen embrittlement. The colour of the Zinc coating may vary from bright to greyish, depending on different circumstances. The colour however, is not an indication of the quality of protection against corrosion and can not be a base for rejection.

3. PTFE (FLOUROPOLYMER) COATING:

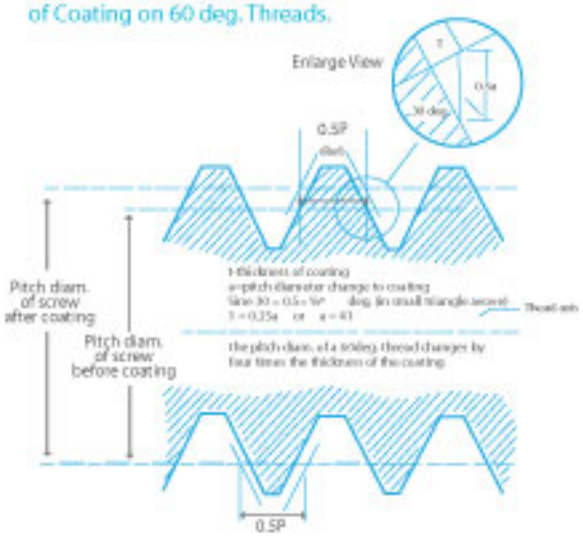
This is a special purpose coating with some unique performance enhancing features, which greatly increases service life in corrosive atmospheres, lowers frictional coeffcient, resists wear and abrasion and provides protection at temperatures ranging between -217°C to + 260°C. This process is however more expensive compared to conventional Electroplating, Hot Dip Galvanizing and Phosphate coating processes. This coating can be furnished as per customer's requirement.

GENERAL:

One more important aspect to be noted, while coating fasteners, its dimensional changes. When a rod or bar is coated, the increase in diameter is twice the coating thickness but when a Screw thread is coated, the pitch diameter will be increased by four times the coating thickness, e.g. A coating thickness of 8µm increases the pitch diameter by 32µm.

See Illustration.

Ratio of Pitch Diameter Change to Thickness of Coating on 60 deg. Threads.

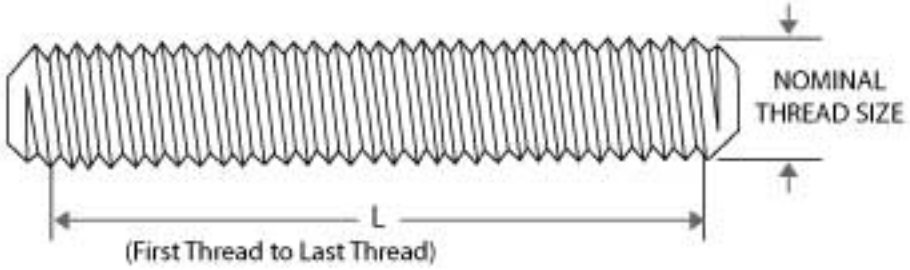


STUD BOLTS-ASTM A 193 GR. B7 & B16

INCH SERIES: UNC/UN - DIMENSIONS

NOTES:

1. The stud bolt will generally conform to ASTM A 193. Gr: B7 & B16
2. Threads will conform to class 2A of unified coarse thread and per ANSI B1.1
3. Material: Medium Carbon Chromium Molybdenum Alloy Steal (Cr-Mo Alloy Steel) for B7 and chromium molybdenum, & vanadium (Cr-Mo-Va) for B16.
4. Heat Treatment as per A 193, Gr: B7 & Gr:B16.
5. All dimensions are in inches.



Nominal Thread Size -'D'	TPI		Length Range 'L' Meter	Nominal thread Size	TPI	Length Range 'L' Meter
	UNC	UN				
1/2"	13	-	Up to 6	1-7/8"	8	Up to 6
5/8"	11	-	Up to 6	2"	8	Up to 6
3/4"	10	-	Up to 6	2-1/4"	8	Up to 6
7/8"	9	-	Up to 6	2-1/2"	8	Up to 6
1"	8	-	Up to 6	2-3/4"	8	Up to 6
1-1/8"	-	8	Up to 6	3"	8	Up to 6
1-1/4"	-	8	Up to 6	3-1/4"	8	Up to 6
1-3/8"	-	8	Up to 6	3-1/2"	8	Up to 6
1-1/2"	-	8	Up to 6	3-3/4"	8	Up to 6
1-5/8"	-	8	Up to 6	4"	8	Up to 6
1-3/4"	-	8	Up to 6			

STUD BOLTS-ASTM A 193 GR. B7 & B16

INCH SERIES: UNC/UN - PHYSICAL PROPERTIES

Physical Properties		Diameter Range	Grade 'B7'	Grade 'B16'
Tensile Strength (Min.)	Psi (N/mm^2)	2-1/2" and under	125,000 (860)	125,000 (860)
		Over 2-1/2" to 4"	115,000 (795)	110,000 (758)
Yield Strength (Min.)	Psi (N/mm^2)	2-1/2" and under	105,000 (720)	105,000 (720)
		2-1/2" to 4"	95,000 (655)	95,000 (655)
Elongation on GL=4D (Min.)	[%]	2-1/2" and under	16%	18%
		Over 2-1/2" to 4"	16%	17%
Reduction of Area (Min.)	[%]	2-1/2" and under	50%	50%
		Over 2-1/2" to 4"	50%	45%
Hardness	[HRC]	ALL SIZES	C35(Max.)	C35(Max.)

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

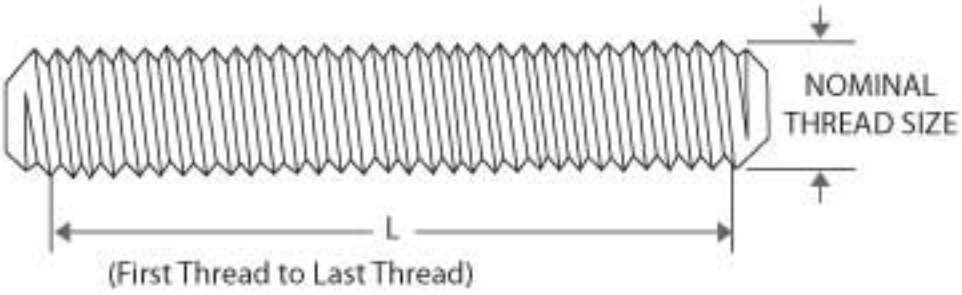
Nominal Thread Size		Stress Area	GRADE 'B7 & B16'		Nominal Thread size	Stress Area	GRADE 'B7 & B16'	
			Unlubricated Finish	Induced Load			Unlubricated Finish	Induced Load
UNC	8UN	in^2	Ft-1b	K-1bf	8UN	in^2	Ft-1b	K-1bf
1/2"-13UNC		0.142	86.98	10.437	1-7/8"	2.410	5,535.47	177.135
5/8"-11UNC		0.226	173.03	16.611	2"	2.770	6,786.50	203.595
3/4"-10UNC		0.334	306.86	24.549	2-1/4"	3.560	9,812.225	261.660
7/8"-9UNC		0.462	495.21	33.957	2-1/2"	4.440	13,597.50	326.340
1"-8UNC		0.606	742.35	44.541	2-3/4"	5.430	16,550.19	361.095
	1-1/8"	0.790	1,088.72	58.065	3"	6.510	21,645.75	432.915
	1-1/4"	1.000	1,531.25	73.500	3-1/4"	7.690	27,700.02	511.385
	1-3/8"	1.233	2,076.82	90.625	3-1/2"	8.960	34,757.33	595.840
	1-1/2"	1.492	2,741.55	109.662	3-3/4"	10.340	42,975.63	687.610
	1-5/8"	1.780	3,543.31	130.830	4"	11.810	52,357.67	785.365
	1-3/4"	2.080	4,459.00	152.880				

STUD BOLTS-ASTM A 193 GR. B7M

INCH SERIES: UNC/UN - DIMENSIONS

NOTES:

1. The stud bolt will generally conform to ASTM A 193. Gr. B7M.
2. Threads will conform to class 2 A of unified coarse thread as per ANSI B1.1
3. Material: Medium Carbon Chromium Molybdenum Alloy Steel (Cr-Mo Alloy Steel)
4. Heat Treatment as per A193 GR. B7M.
5. All dimensions are in inches.



Nominal Thread Size -'D'	TPI		Length Range 'L' meter	Nominal thread Size	TPI	Length Range 'L' meter
	UNC	UN				
1/2"	13	-	Up to 6	1-7/8"	8	Up to 6
5/8"	11	-	Up to 6	2"	8	Up to 6
3/4"	10	-	Up to 6	2-1/4"	8	Up to 6
7/8"	9	-	Up to 6	2-1/2"	8	Up to 6
1"	8	-	Up to 6	2-3/4"	8	Up to 6
1-1/8"	-	8	Up to 6	3"	8	Up to 6
1-1/4"	-	8	Up to 6	3-1/4"	8	Up to 6
1-3/8"	-	8	Up to 6	3-1/2"	8	Up to 6
1-1/2"	-	8	Up to 6	3-3/4"	8	Up to 6
1-5/8"	-	8	Up to 6	4"	8	Up to 6
1-3/4"	-	8	Up to 6			

STUD BOLTS - ASTM A 193 GR. B7M

INCH SERIES. UNC/UN

PHYSICAL PROPERTIES

Physical Properties		Diameter Range	Grade ' B7M '
Tensile Strength (Min.)	Psi (N/mm2)	7" and under	100,000 690
		4" and under	80,000 (550)
Yield Strength (Min.)	Psi (N/mm2)	Over 4" to 7"	75,000 (518)
Elongation on GL=4D (Min.)	{%}	7" and under	18%
Reduction of Area (Min.)	{%}	7" and under	50%
Hardness	{HRC}	ALL SIZES	B93 - B99

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread Size		Stress Area	GRADE 'B7M '		Nominal Thread size	Stress Area	GRADE 'B7M'	
			Unlubricated Finish	Induced Load			Unlubricated Finish	Induced Load
UNC	8UN	in^2	Ft-1b	K-1bf	8UN	in^2	Ft-1b	K-1bf
1/2"-13 UNC		0.142	66.27	7.952	1-7/8"	2.410	4,217.50	134.960
5/8"-11 UNC		0.226	131.83	12.656	2"	2.770	5,170.66	155.120
3/4"-10 UNC		0.334	233.80	18.704	2-1/4"	3.560	7,476.00	199.360
7/8"- 9 UNC		0.462	377.30	25.872	2-1/2"	4.440	10,360.00	248.640
1"- 8 UNC		0.606	565.160	33.936	2-3/4"	5.430	13,937.00	304.080
	1-1/8"	0.790	829.50	44.240	3"	6.510	18,228.00	364.560
	1-1/4"	1.000	1,166.66	56.000	3-1/4"	7.690	23,326.00	430.640
	1-3/8"	1.233	1,582.35	69.048	3-1/2"	8.960	29,269.33	501.760
	1-1/2"	1.492	2,088.80	83.552	3-3/4"	10.340	36,190.00	579.040
	1-5/8"	1.780	2,699.66	99.680	4"	11.810	44,090.67	661.360
	1-3/4"	2.080	3,397.33	116.480				

NOTE:

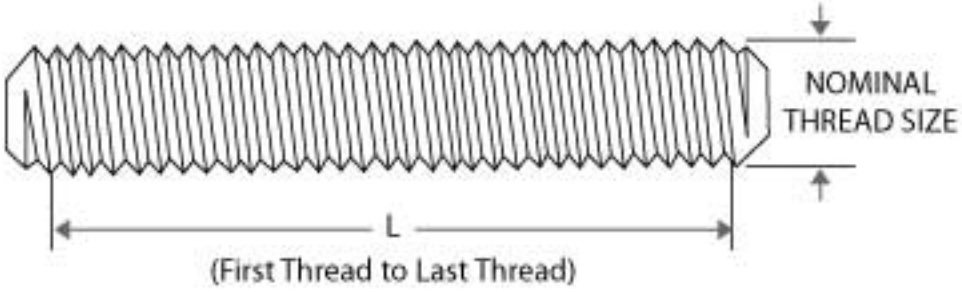
- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening torques of lubricated finished is 75% of the values stated Unlubricated

STUD BOLTS-ASTM A 320 GR.L7

INCH SERIES: UNC/UN - DIMENSIONS

NOTES:

1. The stud bolt will generally conform to ASTM A 320. Gr. L7
2. Threads will conform to class 2 A of unified coarse thread as per ANSI B1.1
3. Material: Medium Carbon Chromium Molybdenum Alloy Steel (Cr-Mo Alloy Steel)
4. Heat Treatment as per Grade L7.
5. All dimensions are in inches.



Nominal Thread Size -'D'	TPI		Length Range 'L' Meter	Nominal thread Size	TPI	Length Range 'L' Meter
	UNC	UN			UN	
1/2"	13	-	Up to 6	1-7/8"	8	Up to 6
5/8"	11	-	Up to 6	2"	8	Up to 6
3/4"	10	-	Up to 6	2-1/4"	8	Up to 6
7/8"	9	-	Up to 6	2-1/2"	8	Up to 6
1"	8	-	Up to 6	2-3/4"	8	Up to 6
1-1/8"	-	8	Up to 6	3"	8	Up to 6
1-1/4"	-	8	Up to 6	3-1/4"	8	Up to 6
1-3/8"	-	8	Up to 6	3-1/2"	8	Up to 6
1-1/2"	-	8	Up to 6	3-3/4"	8	Up to 6
1-5/8"	-	8	Up to 6	4"	8	Up to 6
1-3/4"	-	8	Up to 6			

STUD BOLTS - ASTM A 320, GR.L7

INCH SERIES. UNC/UN | PHYSICAL PROPERTIES

Physical Properties		Diameter ange	Grade ' L7 '
Tensile Strength (Min.)	Psi (N/mm^2)	2 - 1/2" and under	125,000 (860)
Yield Strength (Min.)	Psi (N/mm^2)	2 - 1/2" and under	105,000 (720)
Elongation on GL = 4D (Min.)	{%}	2 - 1/2" and under	16%
Reduction of Area (Min.)	{%}	2 - 1/2" and under	50%
Hardness Max	HRC	2 - 1/2" and under	C35

IMPACT ENERGY ABSORPTION REQUIREMENTS @ - 101°C

Size of Specimen (mm)	Minimum impact value required for average of each set of three specimen		Minimum impact value permitted of one specimen	
10 By 10	20 (ft-Lbf)	27 (J)	15 (ft-lbf)	20 (J)
10 By 7.50	16 (ft-ibf)	22 (J)	12 (ft-lbf)	16 (J)

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread Size	Stress Area	GRADE 'L7'		Nominal Thread size	Stress Area	GRADE 'L7'	
		Unduplicated Finish	Induced Load			Unduplicated Finish	Induced Load
UNC/UN	in^2	Ft-1b	K-1bf	8UN	in^2	Ft-1b	K-1bf
1/2"-13UNC	0.142	86.98	10.437	1-7/8"	2.410	5,535.47	177.135
5/8"-11UNC	0.226	173.03	16.611	2"	2.770	6,786.50	203.595
3/4"-10UNC	0.334	306.86	24.549	2-1/4"	3.560	9,812.25	261.660
7/8"-9UNC	0.462	495.21	33.957	2-1/2"	4.440	13,597.50	326.340
1"-8UNC	0.606	742.35	44.541	2-3/4"	5.430	18.292.31	399.105
1-1/8"-8UN	0.790	1,088.72	58.065	3"	6.510	23,924.25	478.485
1-1/4-8UN	1.000	1,531.25	73.500	3-1/4"	7.690	30,615.81	565.215
1-3/8"-8UN	1.233	2,076.82	90.625	3-1/2"	8.960	35,100.21	658.560
1-1/2"-8UN	1.492	2,741.55	109.662	3-3/4"	10.340	47,499.38	759.990
1-5/8"-8UN	1.780	3,543.31	130.830	4"	11.810	57,869.00	868.035
1-3/4"-8UN	2,080	4,459.00	152.880				

NOTE:

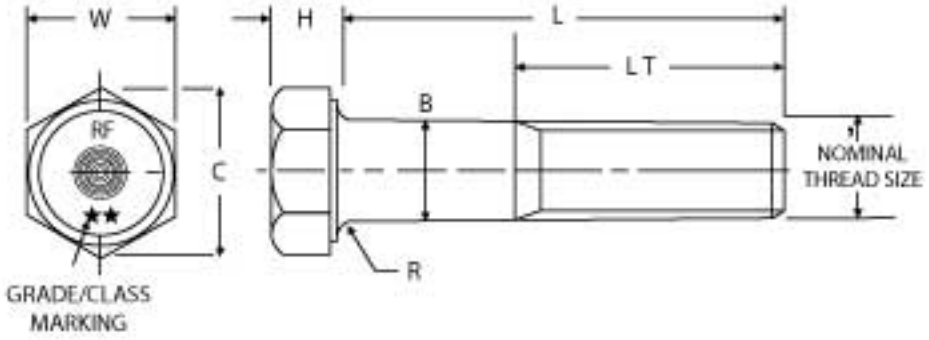
- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening torques of lubricated finished is 75% of the values stated Unlubricated

HEX. BOLTS / SCREWS - ASTM A 307,GR. A

INCH SERIES: UNC/UN - DIMENSIONS

NOTES:

1. The Bolt will generally conform to ANSI/ASME B 18.2.1 Hex. Bolts
2. Threads will conform to class 2A of ANSI B 1.1 Coarse Series
3. Material: Low Carbon Steel
4. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded (ie. screw)
5. All dimensions are in inches



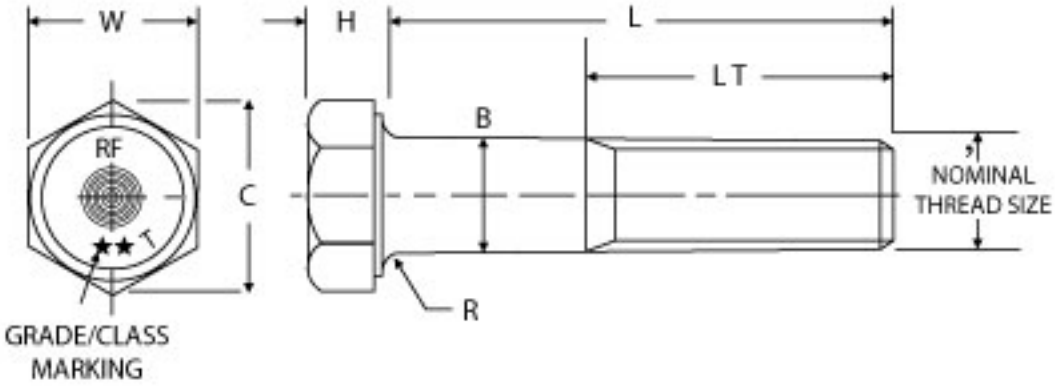
DIMENSIONS:

Nominal Thread Size	TPI	W Max.	C Max.	B Max.	H Nom.	R Min	Length of Thread LT		L.F.T	Length Range
	UNC						L≤6"	L>6"		
3/8"	16	0.562	0.650	0.388	1/4"	0.01	1.00	1.25	1.250	1/2"-4"
1/2"	13	0.750	0.866	0.515	11/32"	0.01	1.25	1.50	1.500	3/4"-8"
5/8"	11	0.938	1.083	0.642	27/64"	0.02	1.50	1.75	1.750	1"-8
3/4"	10	1.125	1.299	0.768	1/2"	0.02	1.75	2.00	2.000	1-1/2"-8"
7/8"	9	3.312	1.516	0.895	37/64"	0.02	2.00	2.25	2.250	1-1/2"-8"
1"	8	1.500	1.732	1.022	43/64"	0.03	2.25	2.50	2.500	1-1/2"-8"
1-1/8"	8UN	1.688	1.949	1.149	3/4"	0.03	2.50	2.75	2.750	2"-8"
1-1/4"	8UN	1.875	2.165	1.277	27/32"	0.03	2.75	3.00	3.000	2"-8"
1-3/8"	8UN	2.062	2.380	1.404	29/92"	0.03	3.00	3.25	3.250	2-1/2"-8"
1-1/2"	8UN	2.250	2.598	1.531	1"	0.03	3.25	350	3.500	2-1/2"-8"

HEAVY HEX BOLTS/SCREWS-ASTM A 307, GR. B

NOTES:

1. The Bolt will generally conform to ANSI/ASME B 18.2.1 Heavy Hex. Series
2. Threads will conform to class 2A of ANSI B 1.1 Coarse Series
3. Material: Low Carbon Steel
4. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded (ie. screw)
5. All dimensions are in inches



DIMENSIONS:

Nominal Thread Size	TPI	W Max.	C Max.	B Max.	H Nom.	R Min	Length of Thread LT		L.F.T	Length Range
	UNC						L≤6"	L>6"		
1/2"	13	0.875	1.010	0.515	11/32"	0.01	1.25	1.50	1.500	3/4"-8"
5/8"	11	0.062	1.227	0.642	27/64"	0.02	1.50	1.75	1.750	1"-8"
3/4"	10	1.250	1.443	0.768	1/2"	0.02	1.75	2.00	2.000	1-1/2"-8"
7/8"	9	1.438	1.660	0.895	37/64"	0.02	2.00	2.25	2.250	1-1/2"-8"
1"	8	1.625	1.876	1.022	43/64"	0.03	2.25	2.50	2.500	1-1/2"-8"
1-1.8"	8UN	1.812	2.093	1.149	3/4"	0.03	2.50	2.75	2.750	2"-8"
1-1/4"	8UN	2.000	2.309	1.277	27/32"	0.03	2.75	3.00	3.000	2"-8"
1-3/8"	8UN	2.188	2.526	1.404	29/92"	0.03	3.00	3.25	3.250	2-1/2"-8"
1-1/2"	8UN	2.375	2.742	1.531	1"	0.03	3.25	350	3.500	2-1/2"-8"

HEXAGON HEAD BOLTS / SCREW - ASTMA A 307

INCH SERIES.

PHYSICAL PROPERTIES

Physical Properties		GR.A	GR.B
Tensile Strength (Min.)	Psi (N/mm^2)	60,000 (415)	60,000/100,000 (415/690) (Min) (Max)
Elongation (Min.)	{%}	18.00	18.00
Hardness	{HRB.}	B69-B100	B69 - B95

TIGHTENING TORQUES :

Nominal Thread Size	Stress Area	GR. A		GR. B	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
	in^2	Ft-1b	K-1bf	Ft-1b	K-1bf
3/8"-16UNC	0.0775	12.21	1.95	-	-
1/2"-13UNC	0.142	29.82	3.58	29.82	3.58
5/8"-11UNC	0.226	59.33	5.70	59.33	5.70
3/4"-10UNC	0.334	105.21	8.42	105.21	8.42
7/8"-9UNC	0.462	169.79	11.64	169.79	11.64
1"-8UNC	0.606	254-52	15.27	254.52	15.27
1-1/8"-8UN	0.790	373.28	19.91	373.28	19.91
1-1/4"-8UN	1.000	525.00	25.20	525.00	25.20
1-3/8"-8UN	1.233	712.06	31.07	712.06	31.07
1-1/2"-8UN	1.492	939.96	37.60	939.96	37.60

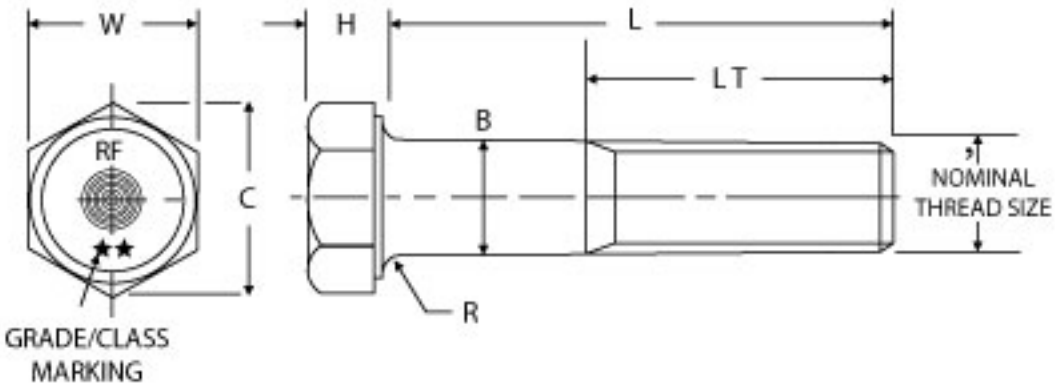
NOTE:

- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress and Yield Sress is assumed as equivalent to 60% of tensile strength.
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEAVY HEX STRUCTURAL BOLTS - ASTM A 325

NOTES:

1. The Bolts will generally conform to ANSI/ASME B 18.2.6 Heavy Hex. Structural Bolts.
2. Threads will conform to Class 2A of ANSI B 1.1 Coarse Series
3. Material: MEDIUM CARBON/ALLOY STEEL
4. Heat Treatment Type 1 as per ASTM A 325
5. All dimensions are in inches



DIMENSIONS:

Nominal Thread Size	TPI	W Max.	C Max.	B Max.	H Min	R Min	Length of Thread	Length Range
	UNC						LT	
1/2"	13	0.875"	1.010"	0.515"	5/16"	0.009"	1.00"	1-1/2"-200mm"
5/8"	11	1.062"	1.227"	0.642"	25/64"	0.021"	1.25"	1-1/2"-300mm"
3/4"	10	1.250"	1.443"	0.768"	15/32"	0.021"	1.38"	1-1/2"-500mm"
7/8"	9	1.438"	1.660"	0.895"	35/64"	0.031"	1.50"	1-1/2"-500mm"
1"	8	1.625"	1.876"	1.022"	39/64"	0.062"	1.75"	1-1/2"-500mm"
1-1/8"	8UN	1.813"	2.093"	1.149"	11/16"	0.062"	2.00"	2"-900mm"
1-1/4"	8UN	2.000"	2.310"	1.276"	25/32"	0.062"	2.00"	2"-900mm"
1-3/8"	8UN	2.187"	2.525"	1.404"	27/32"	0.062"	2.25"	2-1/2"-900mm"
1-1/2"	8UN	2.375"	2.740"	1.522"	15/16"	0.062"	2.25"	2-1/2"-900mm"

HEAVY HEX STRUCTURAL BOLTS - ASTM A 325

INCH SERIES.

PHYSICAL PROPERTIES

Physical Properties		Type '1'	Type '1'
Bolt Size		1/2" to 1"	1-1/8" to 1-1/2"
Tensile Strength (Min.)	Psi (N/mm^2)	120,000 (827)	105,000 (724)
Proof Load Stress (Min.)	Psi (N/mm^2)	85,000 (586)	74,000 (510)
Yield Strength (Min.)	Psi (N/mm^2)	92,000 (635)	81,000 (560)
Hardness	{HR.}	Bolt length <2D C25-C34	Bolt length <3D C19-C30
		Bolt length 2D and over C34 (Max)	Bolt length 3D and over C30 (Max)
Elongation in 4D (Min.)	{%}	14	14
Reduction of Area (Min.)	{%}	35	35

ROTATIONAL CAPACITY TEST FOR ZINC COATED BOLTS	
Bolt length in	Naminal Nut rotation degree (Turn)
<4D	240° (2/3)
4D<8D	360° (1)
8D<12D	420° (1-1/8)
12D<OVER	TEST NOT APPLICABLE

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS.

Thread Size	Stress Area	Torque in		Induced Load
		Unlubricated Finish	Unlubricated Finish	
UNC/UN	in^2	Ft-1b	Ft-1b	K-1bf
1/2" - 13UNC	0.142	76.20	57.15	9.145
5/8" - 11UNC	0.226	151.61	113.70	14.554
3/4" - 10UNC	0.334	268.86	201.64	21.51
7/8" - 9UNC	0.462	433.89	325.41	29.750
1" - 8UNC	0.606	650.44	487.83	39.026
1-1/8" - 8UN	0.790	839.87	629.90	44.793
1-1/4" - 8UN	1.000	1,181.25	885.93	56.700
1-3/8" - 8UN	1.233	1,602.13	1201.59	69.911
1-1/2" - 8UN	1.492	2,114.91	1586.18	84.60

NOTE:

- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEAVY HEX STRUCTURAL BOLTS - ASTM A 325M METRIC SERIES

DIMENSION

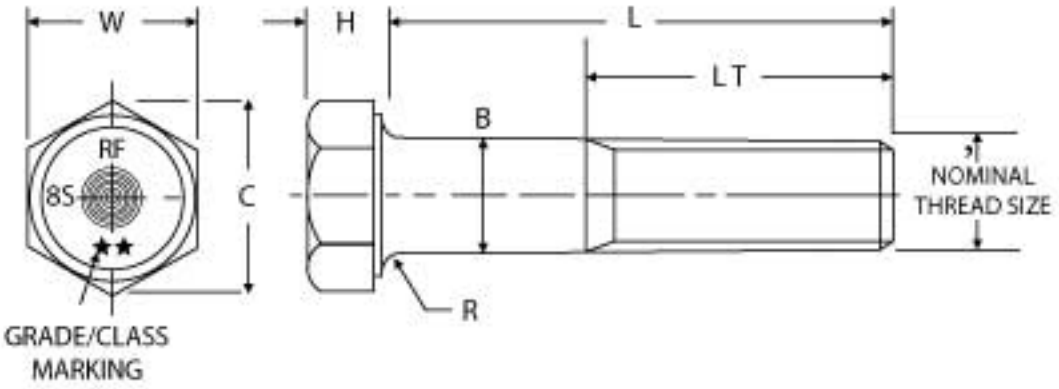
NOTES:

1. The Bolts will generally conform to ANSI/ASME B 18.2.3.7M Metric Heavy Hex Structural Bolts.
2. Threads will conform to Class 6g of ANSI B1.13M Coarse Series
3. Material: High Grade Carbon/alloy steel.
4. Heat Treatment as per ASTM A 325M or ASTM F 568M Class 8.8.
5. Thread length LT

LT 1 for ≤100

LT 2 for L>100

All dimensions are in millimeter



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Max.	R Max.	Length of Thread		Length Range mm
							LT 1	LT 2	
M12	1.75	22.00	25.40	12.70	8.0	0.6	25	-	30-200
M16	2.00	27.00	31.18	16.70	10.0	0.6	31	38	50-500
M20	2.50	34.00	39.26	20.84	12.5	0.8	36	43	50-500
M22	2.50	36.00	41.57	22.84	14.0	0.8	38	45	70-700
M24	3.00	41.00	47.34	24.84	15.0	1.0	41	48	70-900
M27	3.00	46.00	53.12	27.84	17.0	1.2	44	51	80-900
M30	3.50	50.00	57.74	30.84	18.7	1.2	49	56	100-900
M36	4.00	60.00	69.28	37.00	22.5	1.5	56	63	100-900

HEAVY HEX STRUCTURAL BOLTS - ASTM A 325M METRIC SERIES

PHYSICAL PROPERTIES

Physical Properties		Type '1'	Type '1'
Nominal Thread Size		M12 to M24	M25 to M36
Tensile Strength (Min.)	(N/mm^2)	830	830
Yield Strength (Min.)	(N/mm^2)	660	660
Proof Load Stress (Min.)	(N/mm^2)	600	600
On GL =2" Elongation (min.)	{%}	12	12
Reduction of Area (Min.)	{%}	35	35
Hardness	{HR.}	Bolt length <2D C25-C34	Bolt length <3D C19-C30
		Bolt length 2D and over C34 (Max.)	Bolt length 3D and over C30 (Max.)

ROTATIONAL CAPACITY TEST FOR ZINC COATED BOLTS	
Bolt length in	Nominal Nut rotation degree (Turn)
2D AND SHORTER	180°(1/2)
OVER 2D TO 3D Incl.	240° (2/3)
OVER 3D to 4D Incl.	300° (7/8)
OVER 4D TO 8D Incl	360° (1)
OVER 8D	420° (1-1/8)

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS.

Thread Size & Pitch	Stress Area	Un-lubricated Finish	Induced Load
	mm^2	Nm	KN
M12-1.75	84.30	93.47	38.95
M16-2.00	157	232.11	72.534
M20-2.50	245	452.76	113.19
M22-2.50	303	615.94	139.99
M24-3.00	353	782.81	163.09
M27-3.00	459	1,145.11	212.06
M30-3.50	561	1,555.10	259.18
M36-4.00	817	2,717.67	377.45

NOTE:

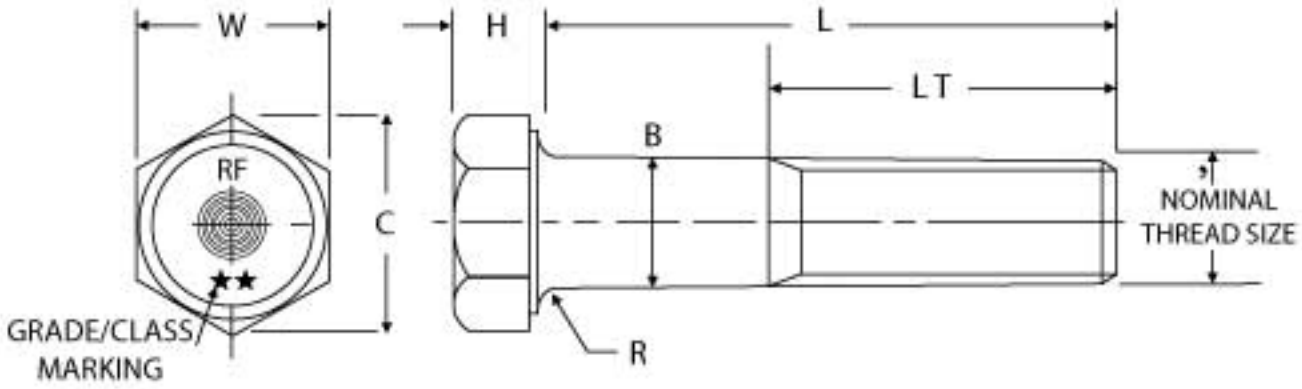
- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening of lubricated finished is 75% of the values stated unlubricated finish.

HEXBOLTS - ASTM A 394

METRIC SERIES DIMENSION

v1. The bolts will generally conform to ASTM A 394 (Bolts made will also generally conform to American standard ANSI 18.2.1)

2. Threads will conform to Clase 2A of Unified threads (Coarse) as per ANSI B1.1
3. Material Low Carbon Steel for Type - o/ Medium carbon Steel for Type - 1 bolts.
4. Heat Treatment as per A394-T1
5. All dimensions are in inches.



Nominal Thread Size	TPI	W Max.	C Max.	B Max.	H Min.	R Min.	Length Range L	Thread Length LT (L>2")
1/2"	13	0.7500"	0.866"	0.515"	0.344"	0.010"	1-3/4-8"	1-3/32"
5/8"	11	0.9375"	1.083"	0.642"	0.422"	0.020"	2"-8"	1-1/4"
3/4"	10	1.1250"	1.300"	0.768"	0.500"	0.020"	2-1/4"-8"	1-3/8"
7/8"	9	1.3125"	1.515"	0.895"	0.578"	0.020"	2-1/4"-8"	1-1/2"
1"	8	1.5000"	1.732"	1.022"	0.672"	0.030"	2-1/2"-8"	1-5/8"

NOTE:

- The full-body length listed in Table 5 of ASTM A 394 shall be the basis of manufacture and inspection.
- For the thread length of bolts below 2" length Refer to ASTM A 394

HEX BOLTS - ASTM A 394

INCH SERIES - PHYSICAL PROPERTIES

Physical Properties			Type '0'	Type '1'
Tensile Strength (min.)		psi (N/mm2)	74,000 (510)	120,000 (827)
Single Shear Strength	Through Threads (min.)	psi (N/mm2)	55,200 (380)	74,400 (513)
	Through Body (min.)	psi (N/mm2)	45,880 (316)	74,400 (513)
Hardness		{HR.}	B80-B100	C25-C34

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Naminal thread size	Stress Area	Type '0'		Type '1'	
		Unlubricated finish	Induced load	Unlubricated finish	Induced load
UNC	in^2	Ft-lb	K-Lbf	Ft-1b	K-lbf
1/2"	0.1422	36.78	4.413	59.64	7.157
5/8"	0.226	73.17	7.024	118.65	11.390
3/4"	0.334	129.76	10.381	210.42	16.834
7/8"	0.462	209.40	14.359	339.57	23.285
1"	0.606	313.91	18.834	509.04	30.542

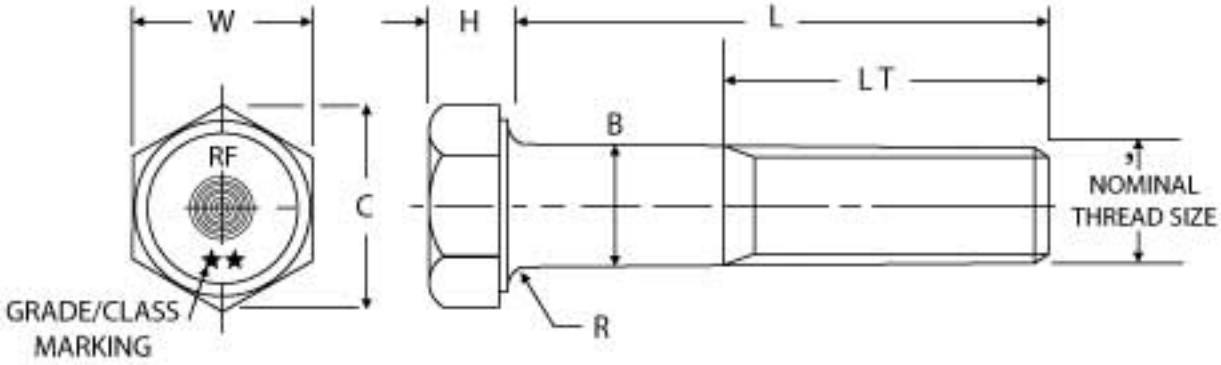
NOTE:

- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress and Yield Stress is assurned as equivalent to 60% of Tensile Strength.
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEAVY HEX STRUCTURAL BOLTS - ASTM A 490 (INCH SERIES)

NOTE:

1. The Bolts will generally conform to ANSI / ASME B 18.2.1 Heavy Hex.Structural Bolts.
2. Threads will conform to Class 2A of ANSI B 1.1 Coarse Series
3. Material: Alloy Steel
4. Heat Treatment: As per ASTM A 490 Type-1
5. All dimensions are in inches.



Nominal Thread Size	TPI UNC	W Max.	C Max.	B Max.	H Min.	R Min.	Length of Thread LT	Length Range
1/2"	13	0.875"	1.010"	0.515"	5/16"	0.009"	1.00"	1-1/2"-4"
5/8"	11	1.062"	1.227"	0.642"	25/64"	0.021"	1.25"	1-1/2"-8"
3/4"	10	1.250"	1.443"	0.768"	15/32"	0.021"	1.38"	1-1/2"-8"
7/8"	9	1.438"	1.660"	0.895"	35/64"	0.031"	1.50"	1-1/2"-8"
1"	8	1.625"	1.876"	1.022"	39/64"	0.062"	1.75"	1-1/2"-8"
1-1/8"	8UN	1.813"	2.093"	1.149"	11/16"	0.062"	2.00"	2"-8"
1-1/4"	8UN	2.000"	2.310"	1.276"	25/32"	0.062"	2.00"	2"-8"
1-3/8"	8UN	2.188"	2.525"	1.404"	27/32"	0.062"	2.25"	2-1/2"-8"
1-1/2"	8UN	2.375"	2.740"	1.522"	15/16"	0.062"	2.25"	2-1/2"-8"

HEAVY HEX STRUCTURAL BOLTS - ASTM A 490 (INCH SERIES)

INCH SERIES - PHYSICAL PROPERTIES

Physical Properties		Type '1'	Type '1'
Bolt Size		1/2" to 1"	1-1/8" to 1-1/2"
Tensile Strength (Min.)	Psi (N/mm²)	150,000(1034) 173,000(1193)	150,000(1034) 173,000(1193)
Proof Load Stress (Min.)	Psi (N/mm²)	120,000(827)	120,000(827)
Yield Strength (Min.)	Psi (N/mm²)	130,000(896)	130,000(896)
Hardness	(HR.)	Bolt length <2D C33-39	Bolt length <3D C33-C39
		Bolt length 2D and over C39 (Max)	Bolt length 3D and over C39 (Max)
Elongation in 4D (Min.)	(%)	14	14
Reduction of Area (Min.)	(%)	40	40

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Thread Size	Stress Area	Torque in		Induced Load
		Un-lubricated Finish	Lubricated Finish	
UNC/UN	in²	Ft-1b	Ft-1b	K-1bf
1/2"-13UNC	0.142	107.68	80.76	12.92
5/8"-11UNC	0.226	214.23	160.67	20.57
3/4"-10UNC	0.334	379.93	284.94	30.39
7/8"-9UNC	0.462	613.11	459.83	42.04
1"-8UNC	0.606	919.10	689.32	55.15
1-1/8"-8UN	0.790	1347.94	1010.95	71.89
1-1/4"-8UN	1.000	1895.83	1421.87	91.00
1-3/8"-8UN	1.233	2571.32	1928.49	112.20
1-1/2"-8UN	1.492	3394.30	2545.73	135.77

NOTE:

- The tightening toques are calculated to induce stress equal to approximstely 70% of Yield Stress.
- The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated.

HEAVY HEX STRUCTURAL BOLTS ASTM A 490M (METRIC SERIES)

DIMENSION

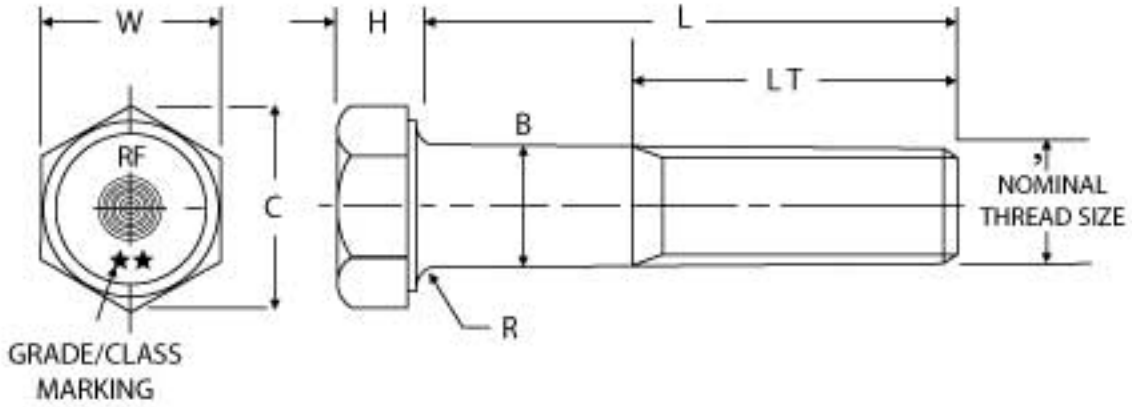
NOTE:

1. The Bolts will generally conform to ANSI/ASME B18.2.3.7M Metric Heavy Hex Structural Bolts.
2. Threads will conform to Class 6g of ANSI B 1.13M Coarse Series.
3. Material: High Grade Carbon/alloy steel.
4. Heat Treatment as per ASTM A 490M Type 1
5. Thread length LT

LT 1 for ⩽ 100

LT 2 for L > 100

All dimensions are in millimeter



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Min	R Min	Length of Thread		Length Range mm
							LT 1	LT 2	
M12	1.75	22.00	25.40	12.70	8.0	0.6	25	-	30-200
M16	2.00	27.00	31.18	16.70	10.0	0.6	31	38	50-500
M20	2.50	34.00	39.26	20.84	12.5	0.8	36	43	50-500
M22	2.50	36.00	41.57	22.84	14.0	0.8	38	45	70-700
M24	3.00	41.00	47.34	24.84	15.0	1.0	41	48	70-900
M27	3.00	46.00	53.12	27.84	17.0	1.2	44	51	80-900
M30	3.50	50.00	57.74	30.84	18.7	1.2	49	56	100-900
M36	4.00	60.00	69.28	37.00	22.5	1.5	59	63	100-900

HIGH STRENGTH STRUCTURAL BOLTS - ASTM A 490M

METRIC SERIES - PHYSICAL PROPERTIES

Physical Properties		
Nominal Thread Size		**M16 to M36**
Tensile Strength	(N/mm^2)	1040/1210
Yield Strength (Min.)	(N/mm^2)	940
Proof Load Stress (Min.)	(N/mm^2)	830
On GL = 2" Elongation (Min.)	{%}	14
Reduction of Area (Min.)	{%}	40
Hardness	{HR}	C33-C39

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Thread Size & Pitch	Stress Area	Un-lubricated Finish	Induced Load
	mm^2	Nm	KN
M 16-2.00	157	330.58	103.31
M 20-2.50	245	644.84	161.21
M 22-2.50	303	877.25	199.37
M 24-3.00	353	1114.92	232.27
M 27-3.00	459	1630.92	302.02
M 30.3.50	561	2214.83	369.14
M 36-4.00	817	3870.62	537.59

NOTE:

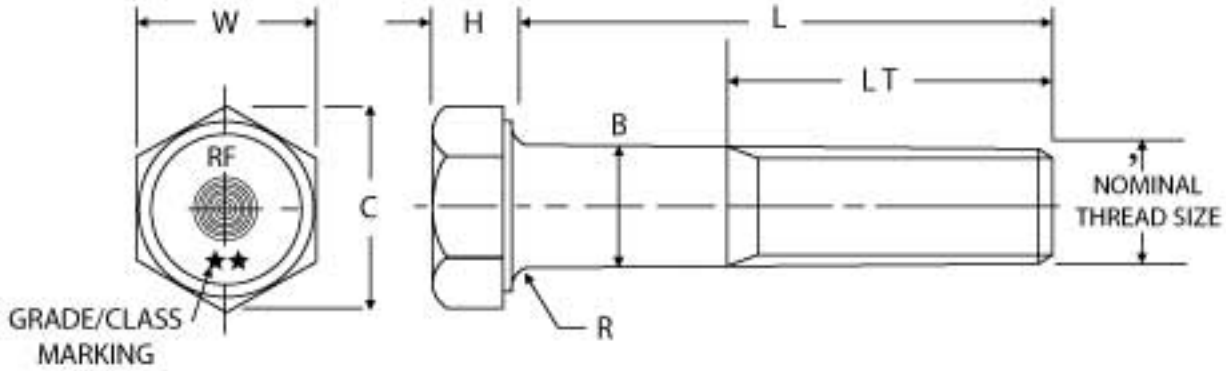
- The tightening toques are calculated to induce stress equal to approximstely 70% of Yield Stress.
- The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEX. BOLTS/SCREWS - SAE J 429

INCH SERIES DIMENSIONS

NOTE:

1. The Bolts/Screws generally conform to SAE J 429.
(Bolts/Screw made will also generally conform to American standard ANSI 18.2.1.
2. Threads will conform to Class 2A of Unified Threads (Coarse/fine) as per ANSI BI.1
3. Material Low/Medium/High Carbon Steel.
4. Heat Treatment: To achieve Mechanical properties of Grade 5 & 8.
5. Thread Length LT
LT 1 for L≤6"
LT 2 for L> 6"
6. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded. (ie. screw))
7. All dimensions are in millimeter



Nominal Thread Size	TPI	UNF	W Max.	C Max.	B Max.	H Min.	R Min.	Length of Thread LT		LFT	LENGTH RANGE
	UNC							L≤6"	L>6"		
1/4"	20	28	11.12	12.82	6.35	3.81	0.38	19.05	25.40	25.40	1/2"-2"
5/16"	18	24	12.70	14.65	7.93	4.95	0.38	22.22	28.57	28.57	1/2"-2"
3/8"	16	24	14.27	16.51	9.52	5.74	0.38	25.40	31.75	31.75	1"-2"
7/16"	14	20	15.87	18.33	11.11	6.91	0.38	28.57	34.92	34.92	1"-4"
1/2"	13	20	19.05	22.00	12.70	7.67	0.38	31.75	38.10	38.10	1"-8"
9/16"	12	18	20.62	23.82	14.28	8.84	0.51	34.92	41.27	41.27	1-8"
5/8"	11	18	23.83	27.51	15.87	9.60	0.51	38.10	44.45	44.45	1-1/2"-8"
3/4"	10	16	28.57	32.99	19.05	11.56	0.51	44.45	50.80	50.80	1-1/2"8"
7/8"	9	14	33.32	38.50	22.22	13.40	1.02	50.80	57.15	57.15	1-1/2"-8"
1"	8	12	38.10	43.99	25.40	15.01	1.52	57.15	63.50	63.50	1-1/2"-8"
1-1/8"	7	12	42.87	49.50	28.57	16.71	1.52	63.50	69.85	69.85	2"-8"
1-1/4"	7	12	47.62	54.99	31.75	19.05	1.52	69.85	76.20	76.20	2"-8"
1-3/8"	6	12	52.37	60.50	34.92	20.57	1.52	76.20	82.55	82.55	2"-8"
1-1/2"	6	12	57.15	65.98	38.10	22.19	1.52	82.55	88.90	88.90	2-1/2"8"

HEX. BOLTS/SCREWS - SAE J 429

INCH SERIES - PHYSICAL PROPERTIES

Physical Properties		Grade 2		Grade 5	Grade 8
Tensile Strength (Min.)	Psi (N/mm2)	1/4" - 3/4"	74000 (510)	120000	150000
		Over 3/4"-1-1/2"	60000 (415)	(827)	(1034)
Yield Strength (Min.)	Psi (N/mm2)	1/4"-3/4"	57000 (393)	92000	130000
		Over 3/4"-1-1/2"	36000 (250)	(635)	(896)
Elongation on GL=2"(Min.)	(%)	1/4"-1-1/2"	18%	14%	12%
Rockwell Hardness	(HR)		B80-B100	C25-C34	C33-C39
Reduction of Area (Min.)	(%)		35%	35%	35%

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS

Nominal Thread Size	Stress Area	GRADE 2		GRADE 5		GRADE 8	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
UNC	in2	Ft-1b	K-1bf	Ft-1b	Ft-1bf	Ft-1bf	K-1bf
1/4"-20UNC	0.0318	5.29	1.27	8.53	2.05	12.06	2.89
5/16"-18UNC	0.0524	10.89	2.09	17.58	3.37	24.84	4.77
3/8-16UNC	0.0775	19.33	3.09	31.19	4.99	44.08	7.05
7/16"-14UNC	0.1063	30.93	4.24	49.92	6.85	70.53	9.67
1/2"-13UNC	0.142	47.21	5.66	76.20	9.14	107.61	12.91
9/16"-12UNC	0.182	68.08	7.26	109.88	11.72	155.27	16.56
5/8"-11UNC	0.226	93.93	9.02	151.61	14.55	214.23	20.57
3/4"-10UNC	0.334	166.58	13.33	268.87	21.51	379.93	30.39
7/8"-9UNC	0.462	169.79	11.64	433.90	29.75	613.11	42.04
1"-8UNC	0.606	254.52	15.27	650.44	39.03	919.10	55.15

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS

Nominal Thread Size	Stress Area	GRADE 2		GRADE 5		GRADE 8	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
UNF	in2	Ft-1b	K-1bf	Ft-1b	K-1bf	Ft-1b	K-1bf
1/4"-28UNF	0.0364	6.05	1.45	9.77	2.34	13.80	3.31
5/16"-24UNF	0.0580	12.05	2.31	19.45	3.74	27.49	5.28
3/8"-24UNF	0.0878	21.90	3.50	35.34	5.65	49.94	7.99
7/16"-20UNF	0.1187	34.53	4.74	55.74	7.64	78.76	10.80
1/2"-20UNF	0.1599	53.17	6.38	85.81	10.30	121.26	14.55
9/16"-18UNF	0.203	75.93	8.10	112.56	13.07	173.18	18.47
5/8"-18UNF	0.256	106.40	10.21	171.73	16.49	242.67	23.30
3/4"-16UNF	0.373	186.03	14.88	300.27	24.02	424.29	33.94
7/8"-14UNF	0.509	187.06	12.83	478.04	32.78	675.49	46.32
1"-12UNF	0.663	278.46	16.71	711.62	42.70	1005.55	60.33

NOTE:

- The tightening toques are calculated to induce stress equal to approximstely 70% of Yield Stress.
- The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated.

HEX. BOLTS/SCREWS - DIN 931/933

METRIC SERIES DIMENSION

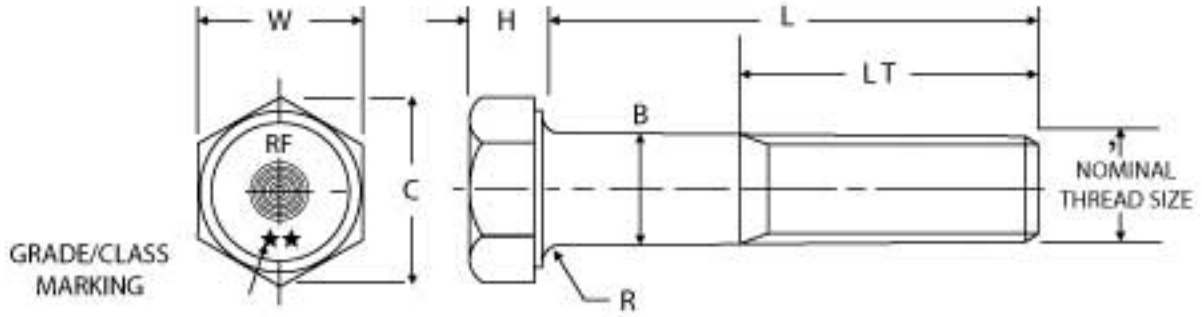
NOTE:

1. The Bolts/Screws will generally conform to DIN 931/933
2. Threads will conform to Class 6g of DIN 13-Coarse Series
3. Material: Carbon/alloy steel.
4. Heat Tratment: To achieve mechanical properties of Class 8.8 and 10.9
5. Thread Length LT

LT 1 for L < 125

LT 2 for L > 125 to 200, LT3 for L > 200

6. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded. (ie.screw)
7. All dimensions are in millimeters



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Min.	R Min.	Length of Thread				LENGTH RANGE mm
							LT1	LT2	LT3	L.F.T	
M6	1.00	10.0	11.05	6.0	4.0	0.25	18	-	-	25	15-100
M8	1.25	13.0	14.38	8.0	5.3	0.40	22	28	-	30	15-100
M10	1.50	17.0 16.0	18.90 17.80	10.0	6.4	0.40	26	32	45	35	15-100
M12	1.75	19.0 18.0	21.10 20.03	12.0	7.5	0.60	30	36	49	40	20-150
M14	2.00	22.0 21.0	24.49 23.35	14.0	8.8	0.60	34	40	53	45	25-150
M16	2.00	24.0	26.75	16.0	10.0	0.60	38	44	57	50	25-500
M18	2.50	27.0	30.14	18.0	11.5	0.60	42	48	61	60	35-500
M20	2.50	30.0	33.53	20.0	12.5	0.80	46	52	65	60	35-500
M22	2.50	32.0 34.0	35.72 37.72	22.0	14.0	0.80	50	56	69	65	40-500
M24	3.00	36.0	39.92	24.0	15.0	0.80	54	60	73	75	40-900
M27	3.00	41.00	45.20	27.0	17.0	1.00	60	66	79	85	70-900
M30	3.50	46.0	50.85	30.0	18.7	1.00	66	72	85	85	70-900
M33	3.50	50.0	55.37	33.0	21.0	1.00	72	78	91	95	75-900
M36	4.00	55.0	60.79	36.0	22.5	1.00	78	84	97	100	80-900
M39	4.00	60.0	66.44	39.0	25.0	1.00	84	90	103	110	90-900
M42	4.50	65.00	71.30	42.0	26.0	1.20	90	91	109	120	90-900

HEXAGON HEAD BOLTS/SCREWS DIN 931/ 933

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS		4.6	4.8	5.6
DIAMETER		All Diameter	All Diameter	All Diameter
Unit		N/mm^2	N/mm^2	N/mm^2
Tensile Strength (Min.)		400	420	500
Yield strength 0.2% offset (Min.)		240	340	300
Proof Load Stress		225	310	280
Impact Strength in Joules (Min.)		N/A	N/A	25
Hardness Rockwell	[HR.]	B67-B95	B71-B95	B79-B95
Elongation (Min.)	[%]	22	N/A	20
Reduction of Area (Min.)	[%]	N/A	N/A	N/A

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread size	Stress Area (mm^2)	4.6		4.8		5.6	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN
M6	20.1	4.05	3.38	5.74	4.78	5.07	4.22
M8	36.6	9.84	6.15	13.94	8.71	12.30	7.69
M10	58.0	19.49	9.74	27.61	13.80	24.36	12.18
M12	84.3	33.99	14.16	48.15	20.06	42.49	17.70
M14	115.0	54.09	19.32	76.64	27.37	67.62	24.15
M16	157.0	84.40	26.37	119.57	37.37	105.50	32.97
M18	192.0	116.12	32.25	164.51	45.70	145.15	40.32
M20	245.0	164.64	41.16	233.24	58.31	205.80	51.45
M22	303.0	223.98	50.90	317.30	72.11	279.97	63.63
M24	353.0	284.66	59.30	403.27	84.01	355.82	74.13
M27	459.0	416.40	77.11	589.91	109.24	520.51	96.39
M30	561.0	565.49	94.25	801.11	133.52	706.86	117.81
M33	694.0	769.51	116.59	1090.13	165.17	961.88	145.74
M36	817.0	988.24	137.26	1400.00	194.45	1235.30	171.57
M39	976.0	1278.95	163.97	1811.85	232.29	1598.69	204.96
M42	1120.0	1580.05	188.16	2239.10	266.56	1975.68	235.20

NOTE:

- The tightening torques are calculated to induce approximately stresses as detailed below:
- 168 N/mm2 for Property class 4.6
- 238 N/mm2 for Property class 4.8
- 210 N/mm2 for Property class 5.6
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEXAGON HEAD BOLTS/SCREWS DIN 931 / 933

METRIC SERIES PHYSICAL PROPERTIES

PROPERTY CLASS	5.8	6.8	8.8		10.9
Diameter	All Diameter	All Diameter	<M16	>M16	All Diameter
Unit	N/mm2	N/mm2	N/mm2	N/mm2	N/mm2
Tensile Strength (Min)	520	600	800	830	1040
Yield strength 0.2% offset (Min)	420	480	640	660	940
Proof Load Stress	380	440	580	600	830
Impact Strength in Joules (Min.)	N/A	N/A	30	30	20
Hardness Rockwell {HR.}	B82-B95	B89-B100	C22-C32	C23-C34	C32-C39
Elongation (Min.) {%}	N/A	N/A	12	12	9
Reduction of Area (Min.) {%}	N/A	N/A	52	52	48

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread Size	Stress Area (mm2)	5.8		6.8		8.8		10.9	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN	Nm	KN
M6	20.1	7.09	5.91	8.10	6.75	10.80	9.00	15.87	13.23
M8	36.6	17.22	10.76	19.68	12.30	26.23	16.40	38.53	24.08
M10	58.0	34.10	17.05	38.98	19.49	51.97	25.98	76.33	38.16
M12	84.3	59.48	24.78	67.98	28.32	90.64	37.77	133.13	55.47
M14	115.0	94.67	33.81	108.19	38.64	114.26	51.52	211.88	75.67
M16	157.0	147.71	46.16	168.81	52.75	225.08	70.34	330.58	103.31
M18	192.0	203.20	56.45	232.24	64.51	319.33	88.70	454.81	126.34
M20	245.0	288.12	72.03	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	391.96	89.08	447.95	101.81	615.94	140.00	877.25	199.37
M24	353.0	498.15	103.78	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	728.71	134.95	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	989.61	164.93	1130.97	188.50	1555.10	259.18	2214.83	369.14
M33	694.0	1346.64	204.04	1539.01	233.18	2116.14	320.63	3013.90	456.65
M36	817.0	1729.43	240.20	1976.49	274.51	2717.67	377.45	3870.62	537.59
M39	976.0	2238.16	286.94	2557.90	327.94	3517.11	450.91	5009.22	642.21
M42	1120.0	2765.95	329.28	3161.09	376.32	4346.50	517.44	6190.46	736.96

NOTE:

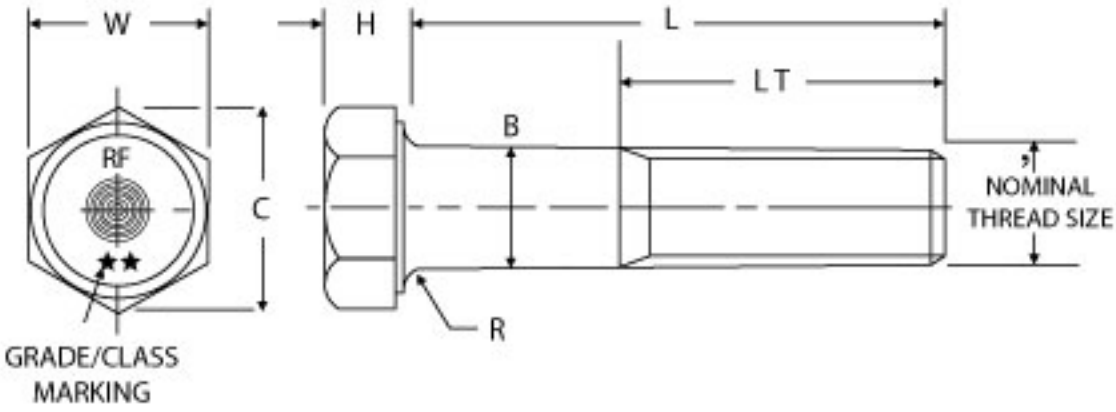
- The tightening torques are calculated to induce approximately stresses as detailed below:
  294 N/mm2 for Property class 5.8 | 336 N/mm2 for Property class 6.8
  448 N/mm2 for Property class ≤M 16 | 462 N/mm2 for Property class 8.8>M16
  658 N/mm2 for Property class 10.9
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HIGH STRENGTH HEAD HEX.BOLTS-DIN 6914

METRIC SERIES DIMENSION

NOTE:

1. The Bolts will generally conform to DIN 6914 High Strength Hex Head Bolts
2. Threads will conform to Class 6g of DIN 13 Coarse Series
3. Material: Carbon / Alloy Steel
4. Heat Treatment: To achieve Mechanical Properties of Class 8.8 and 10.9
5. All dimensions are in millimetres.



Nominal Thread Size	Pitch	W Max.	C Min	B Max.	H Nom	R Min	Length of Thread		Length Range
							LT 1	LT 2	L
M12	1.75	22.00	23.91	12.70	8.0	1.2	L<40 21.00	L>40 23.00	30-200
M16	2.00	27.00	29.56	16.70	10.0	1.2	L<70 26.00	L>70 28.00	50-200
M20	2.50	32.00	35.03	20.84	13.0	1.5	L<85 31.00	L>85 33.00	50-200
M22	2.50	36.00	39.55	22.84	14.0	1.5	L<85 32.00	L>85 34.00	70-200
M24	3.00	41.00	45.20	24.84	15.0	1.5	L<95 34.00	L>95 37.00	70-200
M27	3.00	46.00	50.85	27.84	17.0	2.0	L<95 37.00	L>95 39.00	80-200
M30	3.50	50.00	55.37	30.84	19.0	2.0	L<95 40.00	L>95 42.00	100-200
M36	4.00	60.00	66.44	37.00	23.0	2.0	L<100 48.00	L>100 50.00	100-200

HIGH STRENGTH HEX.BOLTS-DIN 6914

METRIC SERIES - PHYSICAL PROPERTIES

PROPERTY CLASS	10.9
Diameter	**All Diameter**
Unit	N/mm2
Tensile Strength (Min)	1040
Yield Strength 0.2% offset (Min)	940
Proof Load Stress	830
Impact Strength in joules (Min.) {j}	20
Hardness Rockwell {HRC.}	C32-C39
Elongation (Min.) {%}	9
Reduction of Area (Min.) {%}	48

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS

Nominal Thread Size	Stress Area mm^2	10.9	
		Un=lubricated Finish	Induced Load
		Nm	KN
M12	84.3	133.13	55.47
M14	115.00	211.90	75.70
M16	157.0	330.60	103.31
M18	192.0	454.81	126.34
M20	245.0	645.84	161.21
M22	303.0	877.25	199.37
M24	353.0	1114.90	232.27
M27	459.0	1630.92	302.02
M30	561.0	2214.40	369.14
M33	694.0	3013.90	456.65
M36	817.0	3870.62	537.59

NOTE:

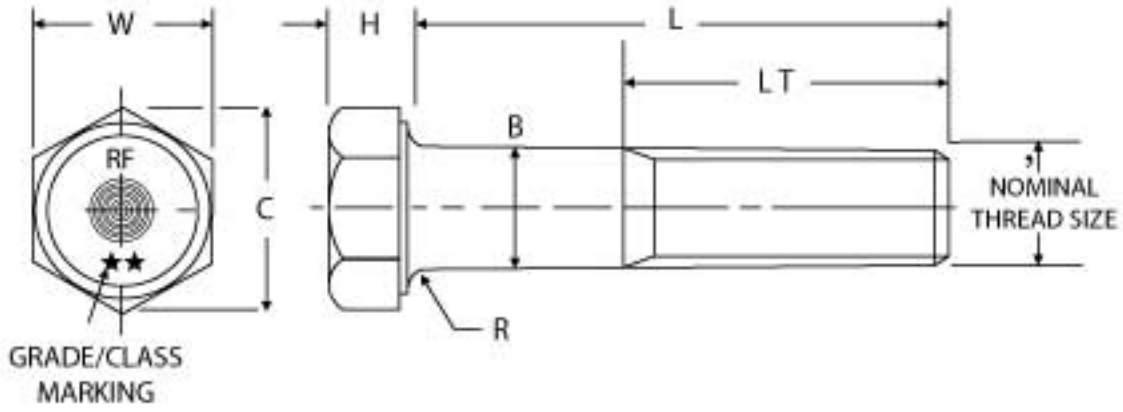
- The tightening torques are calculated to induce approximate stress 658 N/mm2 for property class 10.9.
- The tightening torques of lubricated finished is 75% of the values stated in unlubricated finish.

HEXAGON HEAD STRUCTURAL BOLTS - DIN 7990

METRIC SERIES DIMENSION

NOTE:

1. The Bolts will generally conform to DIN 7990
2. Threads will conform to Class 6g of DIN 13 Coarse Series
3. Material: Carbon / Alloy Steel
4. Heat Treatment: To achieve Mechanical Properties of Class 8.8 and 10.9
5. All dimensions are in millimetres.



Nominal Thread Size	Pitch	W Max.	C Min	B Max.	H Nom	R Min	Length of Thread	Length Range
							LT	L
M12	1.75	19.0	20.88	12.70	8.0	0.60	17.75	25-120
M16	2.00	24.0	26.17	16.70	10.0	0.60	21.00	30-150
M20	2.50	30.0	32.95	20.84	13.0	0.80	23.50	35-200
M22	2.50	32.0	35.03	22.84	14.0	0.80	25.50	45-200
M24	3.00	36.0	39.55	24.84	15.0	0.80	26.00	50-200
M27	3.00	41.0	45.20	27.84	17.0	1.00	29.00	70-200
M30	3.50	46.0	50.85	30.84	19.0	1.00	30.50	80-200

HEXAGON HEAD STRUCTURAL BOLTS - DIN 7990

METRIC SERIES - PHYSICAL PROPERTIES

Physical Properties		Class 4.6	Class 4.8	Class 5.6
Bolt Size		M12 to M30	M12 to M30	M12 to M30
Tensile Strength (Min)	(N/mm2)	400	420	500
Yield Stress (Min)	(N/mm2)	240	340	300
Proof Load Stress (Min.)	(N/mm2)	225	310	280
Elongation (Min.)	{%}	22	N/A	20
Impact Strength (Min.)	{j}	N/A	N/A	25
Hardness Rockwell	{HR-}	B67-B95	B71-B95	B79-B95

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS

Thread Size & Pitch	Stress Area	Property Class 4.6		Property Class 4.8		Property Class 5.6	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
	mm^2	Nm	KN	Nm	KN	Nm	KN
M12-1.75	84.3	33.99	14.162	48.15	20.06	42.49	17.70
M16-2.00	157	84.40	26.376	119.57	37.37	105.50	32.97
M20-2.50	245	164.64	41.160	233.24	58.31	205.80	51.45
M22-250	303	223.98	50.904	317.30	72.11	279.97	63.63
M24-3.00	353	284.66	59.304	403.27	84.01	355.82	74.13
M27-3.00	459	416.41	77.112	589.91	109.24	520.50	96.36
M30-3.50	561	565.49	94.248	801.11	133.52	706.86	117.81

NOTE:

- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening torques of lubricated finished is 75% of the values stated in Unlubricated.

HEXAGON HEAD STRUCTURAL BOLTS DIN 7990

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS	5.8	6.8	8.8		10.9
Diameter	All Diameter	All Diameter	≤M16	>M16	All Diameter
Unit	N/mm2	N/mm2	N/mm2		N/mm2
Tensile Strength (Min	520	600	800	830	1040
Yield Strength 0.2% offse (Min)	420	480	640	660	940
Proof Load Stress	380	440	580	600	830
Impact Strength (Min.) [J]	N/A	N/A	30	30	20
Hardness Roackwell [HR]	B82-B95	B89-B100	C22-C32	C23-C34	C32-C39
Elongation (Min.) [%]	N/A	N/A	12	12	9
Reduction of Area (Min.) [%]	N/A	N/A	52	52	48

RECOMMENDED TIGHTENING TORQUES AND INDUCED LAODS:

Nominal Thread size	Stress Area (mm^2)	5.8		6.8		8.8		10.9	
		Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN	Nm	KN
M12	84.3	59.48	24.78	67.98	28.32	90.64	37.77	133.13	55.47
M16	157.0	147.71	46.16	168.81	52.75	225.08	70.34	330.58	103.31
M20	245.0	288.12	72.03	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	391.96	89.08	447.95	101.81	615.94	140.00	877.25	199.37
M24	353.0	498.15	103.78	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	728.71	134.95	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	989.61	164.93	1130.97	188.50	1555.10	259.18	2214.83	369.14

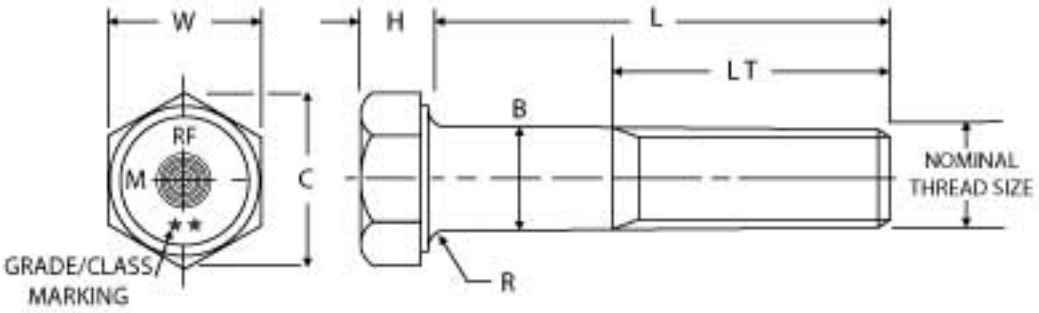
NOTE:

- The tightering torques are calculated to induce approximately stresses as detailed below:
- 294 N/mm2 for Property class 5.8
- 336 N/mm2 for property class 6.8
- 448 N/mm2 for Property class ≤M16
- 462 N/mm2 for Property class 8.8>M16
- 658 N/mm2 for Property class 10.9
- The tightening torques of lubricated finished is 75% of the values stated unlubricated.

HEX. BOLTS/SCREWS-BS 3692

NOTE:

1. The Bolts and Screws will generally conform to BS 3692
2. Threads will conform to Class 6g of BS 3643 - Coarse Series
3. Material: Carbon / alloy steel.
4. Heat Treatment: To achieve Mechanical Properties of class 8.8 and 10.9
5. Thread Length LT
   LT1 for L ≤125
   LT2 for L > 125 to 200
   LT3 for L> 200
6. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded. (ie. screw)
7. All dimensions are in millimeteres.



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Nom.	R Min.	Length of Thread				Length Range
							LT1	LT2	LT3	LFT	
M6	1.00	10.0	11.50	6.00	4.00	0.25	18	-	-	25	15-100
M8	1.25	13.0	15.00	8.00	5.50	0.40	22	28	-	30	15-100
M10	1.50	17.0	19.60	10.00	7.00	0.40	26	32	45	35	15-100
M12	1.75	19.0	21.90	12.00	8.00	0.60	30	36	49	40	20-150
M14	2.00	22.0	25.40	14.00	9.00	0.60	34	40	53	40	25-150
M16	2.00	24.0	27.70	16.00	10.00	0.60	38	44	57	50	25-200
M20	2.50	30.0	34.60	20.00	13.00	0.80	46	52	65	60	35-200
M22	2.50	32.0	36.90	22.00	14.00	0.80	50	56	69	65	40-200
M24	3.00	36.0	41.60	24.00	15.00	0.80	54	60	73	75	40-200
M27	3.00	41.0	47.30	27.00	17.00	1.00	60	66	79	85	70-200
M30	3.50	46.0	5310	30.00	19.00	1.00	66	72	85	85	70-300
M33	3.50	50.0	57.70	33.00	21.00	1.00	72	78	91	95	75-300
M36	4.00	55.0	63.50	36.00	23.00	1.00	78	84	97	100	80-300
M39	4.00	60.0	69.30	39.00	25.00	1.00	87	90	103	110	90-300
M42	4.50	65.0	75.10	42.00	26.00	1.20	90	96	109	120	90-300

HEXAGON HEAD BOLTS/SCREWS BS 3692

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS		4.6	4.8	5.6
DIAMETER		All Diameter	All Diameter	All Diameter
Unit		N/mm^2	N/mm^2	N/mm^2
Tensile Strength (Min.)		400	420	500
Yield strength 0.2% offset (Min.)		240	340	300
Proof Load Stress		225	310	280
Impact Strength in Joules (Min.)		N/A	N/A	25
Hardness Rockwell	[HR.]	B67-B95	B71-B95	B79-B95
Elongation (Min.)	[%]	22	N/A	20
Reduction of Area (Min.)	[%]	N/A	N/A	N/A

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread size	Stress Area (mm^2)	4.6		4.8		5.6	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN
M6	20.1	4.05	3.38	5.74	4.78	5.07	4.22
M8	36.6	9.84	6.15	13.94	8.71	12.30	7.69
M10	58.0	19.49	9.74	27.61	13.80	24.36	12.18
M12	84.3	33.99	14.16	48.15	20.06	42.49	17.70
M14	115.0	54.09	19.32	76.64	27.37	67.62	24.15
M16	157.0	84.40	26.37	119.57	37.37	105.50	32.97
M18	192.0	116.12	32.25	164.51	45.70	145.15	40.32
M20	245.0	164.64	41.16	233.24	58.31	205.80	51.45
M22	303.0	223.98	50.90	317.30	72.11	279.97	63.63
M24	353.0	284.66	59.30	403.27	84.01	355.82	74.13
M27	459.0	416.40	77.11	589.91	109.24	520.51	96.39
M30	561.0	565.49	94.25	801.11	133.52	706.86	117.81
M33	694.0	769.51	116.59	1090.13	165.17	961.88	145.74
M36	817.0	988.24	137.26	1400.00	194.45	1235.30	171.57
M39	976.0	1278.95	163.97	1811.85	232.29	1598.69	204.96
M42	1120.0	1580.05	188.16	2239.10	266.56	1975.68	235.20

NOTE:

- The tightening torques are calculated to induce approximately stresses as detailed below:
- 168 N/mm2 for Property class 4.6
- 238 N/mm2 for Property class 4.8
- 210 N/mm2 for Property class 5.6
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEXAGON HEAD BOLTS/SCREWS BS 3692

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS	5.8	6.8	8.8		10.9
Diameter	All Diameter	All Diameter	≤M16	>M16	All Diameter
Unit	N/mm2	N/mm2	N/mm2		N/mm2
Tensile Strength (Min	520	600	800	830	1040
Yield Strength 0.2% offset (Min)	420	480	640	660	940
Proof Load Stress	380	440	580	600	830
Impact Strength in joules (Min.)	N/A	N/A	30	30	20
Hardness Rockwell [HR]	B82-B95	B89-B100	C22-C32	C23-C34	C32-C39
Elongation (Min.) [%]	N/A	N/A	12	12	9
Reduction of Area (Min.) [%]	N/A	N/A	52	52	48

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread size	Stress Area (mm^2)	5.8		6.8		8.8		10.9	
		Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN	Nm	KN
M6	20.1	7.09	5.91	8.10	6.75	10.80	9.00	15.87	13.23
M8	36.6	17.22	10.76	19.68	12.30	26.23	16.4	38.53	24.08
M10	58.0	34.10	17.05	38.98	19.49	51.97	25.98	76.33	38.16
M12	84.3	59.48	24.78	67.98	28.32	90.64	37.77	133.13	55.47
M14	115.0	94.67	33.81	108.19	38.64	114.26	51.52	211.88	75.67
M16	157.0	147.71	46.16	168.81	52.75	225.08	70.34	330.58	103.31
M18	192.0	203.20	56.45	232.24	64.51	319.33	88.70	454.81	126.31
M20	245.0	288.12	72.03	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	391.96	89.08	447.95	101.81	615.94	140.00	877.25	199.37
M24	353.0	498.15	103.78	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	728.71	134.95	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	989.61	164.93	1130.97	188.50	1555.10	259.18	2214.83	369.14
M33	694.0	1346.64	204.04	1539.01	233.18	2116.14	320.63	3013.90	456.65
M36	817.0	1729.43	240.20	1976.49	274.51	2717.67	377.45	3870.62	537.59
M39	976.0	2238.16	286.94	2557.90	327.94	3517.11	450.91	5009.22	642.21
M42	1120.0	2765.95	329.28	3161.09	376.32	4346.50	571.44	6190.46	736.96

NOTE:

- The tightning torques are calculated to induce approximately stresses as detailed below:
- 294 N/ mm2 for Property calss 5.8
- 336 N/ mm2 for Property class 6.8
- 448 N/ mm2 for Proeperty calss 88 ≤M16
- 462 N/ mm2 for Property class 8.8>M16
- 658 N/ mm2 for Property class 10.9
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEX. BOLTS/SCREWS-BS 4190

METRIC SERIES - DIMENSIONS.

NOTE:

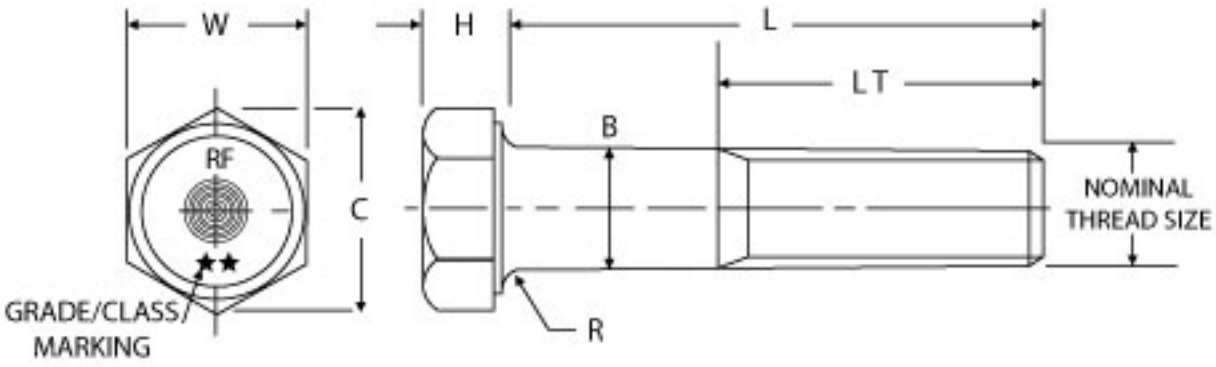
1. The Bolts and Screws will generally conform to BS 4190
2. Threads will conform to Class 6g of BS 3643 - Coarse Series
3. Material: Carbon / alloy steel.
4. Heat Treatment: To achieve Mechanical Properties of class 8.8 and 10.9
5. Thread Length LT

LT1 for L ≤125

LT2 for L > 125 to 200

LT3 for L> 200

6. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded. (ie. screw)
7. All dimensions are in millimeteres.



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Nom.	R Max.	Length of Thread				Length Range
							LT1	LT2	LT3	LFT	
M6	1.00	10.0	11.50	6.48	4.00	0.40	18	-	-	25	15-100
M8	1.25	13.0	15.00	8.58	5.50	0.80	22	28	-	30	15-100
M10	1.50	17.0	19.60	10.58	7.00	0.80	26	32	45	35	15-100
M12	1.75	19.0	21.90	12.70	8.00	1.25	30	36	49	40	20-150
M16	2.00	24.0	27.70	16.70	10.00	1.25	38	44	57	50	25-200
M20	2.50	30.0	34.60	20.84	13.00	1.78	46	52	65	60	35-200
M22	2.50	32.0	36.90	22.84	14.00	1.78	50	56	69	65	40-200
M24	3.00	36.0	41.60	24.84	15.00	1.78	54	60	73	75	40-200
M27	3.00	41.0	47.30	27.84	17.00	2.28	60	66	79	85	70-200
M30	3.50	46.0	53.10	30.84	19.00	2.28	66	72	85	85	70-300
M33	3.50	50.0	57.70	34.00	21.00	2.28	72	78	91	95	75-300
M36	4.00	55.0	63.50	37.00	23.00	2.70	78	84	97	100	80-300
M39	4.00	60.0	69.30	40.00	25.00	2.70	84	90	103	110	90-300
M42	4.50	65.0	75.10	43.00	26.00	2.80	90	96	109	120	90-300

HEXAGON HEAD BOLTS/SCREWS-BS 4190

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS	4.6	4.8
Diameter	**All Diameter**	**All Diameter**
Unit	N/mm^2	N/mm^2
Tensile Strength (Min)	400	420
Yield Strength 0.2% offset (Min)	240	340
Proof Load Stress	225	310
Impact Strength in Joules (Min)	N/A	N/A
Hardness Rockwell [HR]	B67-B95	B71-B95
Elongation (Min.) [%]	22	N/A
Reduction of Area (Min.) [%]	N/A	N/A

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread size	Stress Area (mm^2)	4.6		4.8	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
		Nm	KN	Nm	KN
M6	20.1	4.05	3.38	5.74	4.78
M8	36.6	9.84	6.15	13.94	8.71
M10	58.0	19.49	9.74	27.61	13.80
M12	84.3	33.99	14.16	48.15	20.06
M16	157.0	84.40	26.37	119.57	37.37
M20	245.0	164.64	41.16	233.24	58.31
M22	303.0	223.98	50.90	317.30	72.11
M24	353.0	284.66	59.30	403.27	84.01
M27	459.0	416.40	77.11	589.91	109.24
M30	561.0	565.49	94.25	801.11	133.52
M33	694.0	769.51	116.59	1090.13	165.17
M36	817.0	988.24	137.26	1400.00	194.45
M39	976.0	1278.95	163.97	1811.85	232.29
M42	1120.0	1580.05	188.16	2239.10	266.56

NOTE:

- The tightning torques are calculated to induce approximately stresses as detailed below:
- 168 N/ mm2 for Property calss 4.6
- 238 N/ mm2 for Property class 4.8
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEXAGON HEAD BOLTS/SCREWS - BS 4190

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS	6.8	8.8		10.9
Diameter	**All Diameter**	**≤M16**	**>M16**	**All Diameter**
Unit	N/mm²	N/mm²		N/mm²
Tensile Strength (Min.)	600	800	830	1040
Yield strength 0.2% offset (Min.)	480	640	660	940
Proof Load Stress	440	580	600	830
Impact Strength in Joules (Min.)	N/A	30	30	20
Hardness Rockwell {HR.}	B89-B100	C22-C32	C23-C34	C32-C39
Elocgation (Min.) {%}	N / A	12	12	9
Reduction of Area (Min.) {%}	N / A	52	52	48

RECOMMENDED TIGHTENING TORQUS AND INDUCED LOADS:

Nominal Thread Size	Stress Area (mm²)	6.8		8.8		10.9	
		Un lubricated Finish	Lnduced Load	Un lubricated Finish	Lnduced Load	Un lubricated Finish	Lnduced Load
		Nm	KN	Nm	KN	Nm	KN
M6	20.1	8.10	6.75	10.8	9.00	15.87	13.23
M8	36.6	19.68	12.30	26.23	16.4.	38.53	24.08
M10	58.0	38.98	19.49	51.97	25.98	76.33	38.16
M12	84.3	67.98	28.32	90.64	37.77	133.13	55.47
M16	157.0	168.81	52.75	225.08	70.34	330.58	103.31
M20	245.0	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	447.95	101.81	615.94	140.00	877.25	199.37
M24	353.0	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	1130.97	188.50	1555.101	259.18	2214.83	369.14
M33	694.0	1539.01	233.18	2116.14	320.63	3013.90	456.65
M36	817.0	1976.49	274.51	2717.64	377.45	3870.62	537.59
M39	976.0	2557.90	327.94	3517.11	450.91	5009.22	642.21
M42	1120.0	3161.09	376.32	4364.50	517.44	6190.46	736.96

NOTE:

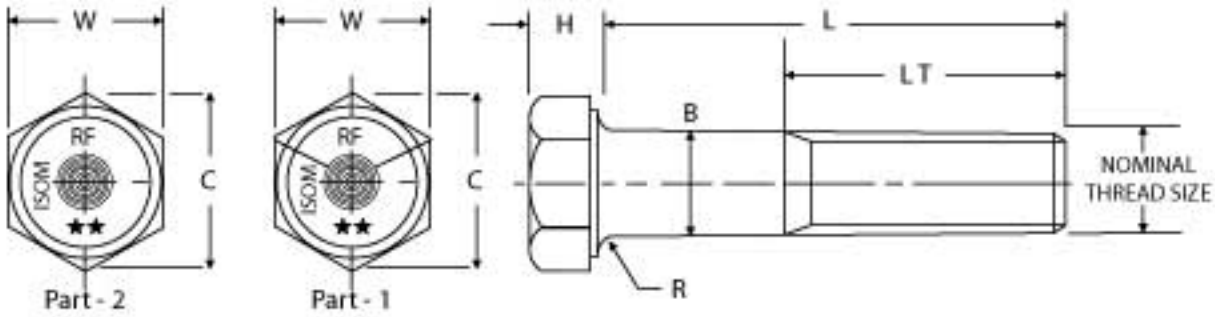
- The tightening torques are calculated to induce approximately stresses as detailed below:
- 336 N/mm2 for Property class 6.8
- 448 N/mm2 for Property class 8.8≤M16
- 462 N/mm2 for Property class 8.8>M16
- 658 N/mm2 for Property class 10.9
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish.

HIGH STRENGTH FRICTION GRIP BOLTS/SCREW-BS 4395

METRIC SERIES-DIMENSIONS

NOTE:

1. The Bolts will generally conform to BS 4395 High Strength Friction Bolts.
2. Threads will conform to Class 6g of BS 3643 Coarse Series.
3. Material: Carbon / alloy steel
4. Heat Treatment as per BS 4395 PART 1 & 2.
5. Thread Length LT
   L ≤ 125
   L > 125≤200
6. Bolt length equal to or shorter than those listed in LFT Column will be fully threaded (ie. screw)
7. All dimensions are in millimetres



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Nom	R Min	Length of Thread		LFT	Length Range L
							LT1	LT2		
M12	1.75	22.00	25.40	12.70	8.0	0.60	30	36	36	40-150
M16	2.00	27.00	31.20	16.70	10.0	0.60	38	44	44	50-200
M20	2.50	32.00	36.90	20.84	13.0	0.80	46	52	52	50-200
M22	2.50	36.00	41.60	22.84	14.00	0.80	50	56	56	70-200
M24	3.00	41.00	47.30	24.84	15.00	0.80	54	60	60	70-200
M27	3.00	46.00	53.10	27.84	17.00	1.00	60	66	66	80-200
M30	3.50	50.00	57.70	30.84	19.00	1.00	66	72	72	100-200
M36	4.00	60.00	69.30	37.00	23.00	1.00	78	84	84	100-200

HIGH SRENGTH FRICTION GRIP BOLTS/SCREW BS 4395/P1&2

METRIC SERIES

PHYSICAL PROPERTIES:

Phvsical Properties			BS 4395/PART 1	BS 4395/PART 2
Nominal Thread Size			M12-M36	M16-M33
Tensile Strength (Min.)	(N/mm^2)	M12-M24	827	981
		M27-M36	725	
Yield Stress (Min.)	(N/mm^2)	M12-M24	635	882
		M27-M36	558	
Proof Load Stress (Min.)	(N/mm^2)	M12-M24 M27-M36	587 512	776
OnGL=2"Elongation (Min.)	{%1}		12.00	9.00
Reduction of Area (Min.)	{%}		-	-
Hardness	{HRC.)	M12-M24 M27-M36	C25-C34 C19-C30	C27-C38

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Thread Size & Pitch		BS4395 PART-1		BS4395 PART-2	
	Stress Area	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
	mm^2	Nm	KN	Nm	KN
M12-1.75	84.30	89.93	37.47	-	-
M16-2.00	157	223.32	69.79	310.18	96.93
M20-2.50	245	435.61	108.90	605.05	151.26
M22-2.50	303	592.61	134.68	823.11	187.07
M24-300	353	753.16	156.91	1046.12	217.94
M27-300	459	968.14	179.29	1530.29	283.39
M30-3.50	561	1314.76	219.13	2078.17	346.36
M33-3.50	694	-	-	2827.94	428.47
M36-4.00	817	2297.66	319.12	-	-

NOTE:

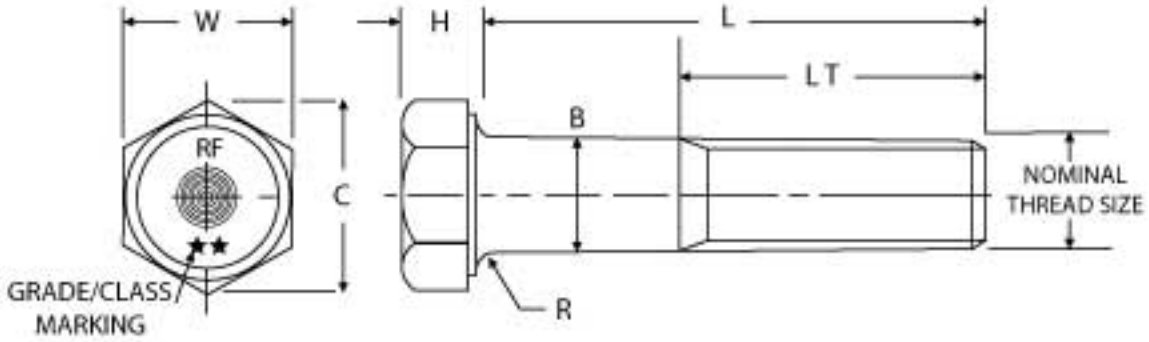
- The tightening torques are calculated to induce stress equal to approximately 70% of Yield Stress.
- The tightening toroues of lubricated finished is 75% of the values stated unlubricated finish.

HEX. BOLTS/SCREWS - ISO 4014 / 4016 / 4017

METRIC SERIES-DIMENSIONS

NOTE:

1. The Bolts/Screws will generally conform to ISO 4014, 4016, and 4017
2. Threads will conform to Class 6g of ISO 965/2 Coarse Series.
3. Material: Carbon/alloy steel.
4. Heat Treatment: To achieve mechanical properties of Class 8.8 and 10.9
5. Thread Length LT
   LT1 for <125, LT1 for L≤125
   LT2 for L>200, LT2 for L> 125 to 200, LT3 for L> 200
6. Bolt lengths equal to or shorter than those listed in LFT column will be fully threaded. (ie.screw)
7. All dimensions are in millimeters



Nominal Thread Size	Pitch	W. Max.		C Min.		B Max.	H Nom.	R Max.	Length of Thread				Length Range
									LT 1	LT 2	LT 3	LFT	
M6	1.00	10.0		11.04		6.0	4.0	0.25	18	-	-	25	15-100
M8	1.25	13.0		14.38		8.0	5.3	0.40	22	28	-	30	15-100
M10	1.50	17.0	16.0	18.90	17.80	10.0	6.4	0.40	26	32	45	35	15-100
M12	1.75	19.0	18.0	21.10	20.03	12.0	7.5	0.60	30	36	49	40	20-150
M14	2.00	22.0	21.0	24.49	23.35	14.0	8.8	0.60	34	40	53	45	25-150
M16	2.00	24.0		26.75		16.0	10.0	0.60	38	44	57	50	25-200
M18	2.50	27.0		30.14		18.0	11.5	0.60	42	48	61	60	35-200
M20	2.50	30.0		33.53		20.0	12.5	0.80	46	52	65	60	35-200
M22	2.50	32.0	34.0	35.72	37.72	22.0	14.0	0.80	50	56	69	65	40-200
M24	3.00	36.0		39.98		24.0	15.0	0.80	54	60	73	75	40-200
M27	3.00	41.00		45.20		27.0	17.0	1.00	60	66	79	85	70-200
M30	3.50	46.0		50.85		30.0	18.7	1.00	66	72	85	85	70-300
M33	3.50	50.0		55.37		33.0	21.0	1.00	72	78	91	95	75-300
M36	4.00	55.0		60.79		36.0	22.5	1.00	78	84	97	100	80-300
M39	4.00	60.0		66.44		39.0	25.0	1.00	84	90	103	110	90-300
M42	4.50	65.0		72.02		42.0	26.0	1.20	90	96	109	120	90-300

HEXAGON HEAD BOLTS/SCREWS ISO 4014 / 4016 / 4017

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS		4.6	4.8	5.6
Diameter		All Diameter	All Diameter	All Diameter
Unit		N/mm^2	N/mm^2	N/mm^2
Tensile Strength (Min.)		400	420	500
Yield strength 0.2% offset (Min.)		240	340	300
Proof Load Stress		225	310	280
Impact Strength (Min.)		N/A	N/A	25
Hardness Rockwell	(HR.)	B67-B95	B71-B95	B79 - B95
Elongation (Min.)	(%)	22	N/A	20
Reduction of Area (Min)	(%)	N/A	N/A	N/A

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS:

Nominal Thread Size	Stress Area (mm^2)	4.6		4.8		5.6	
		Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load	Unlubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN
M6	20.1	4.05	3.38	5.74	4.78	5.07	4.22
M8	36.6	9.84	6.15	13.94	8.71	12.30	7.69
M10	58.0	19.49	9.74	27.61	13.80	24.36	12.18
M12	84.3	33.99	14.16	48.15	20.06	42.49	17.70
M14	115.0	54.09	19.32	76.64	27.37	67.62	24.15
M16	157.0	84.40	26.37	119.57	37.37	105.50	32.97
M18	192.0	116.12	32.25	164.51	45.70	145.15	40.32
M20	245.0	164.64	41.16	233.24	58.31	205.80	51.45
M22	303.0	223.98	50.90	317.30	72.11	279.97	63.63
M24	353.0	284.66	59.30	403.27	84.01	355.82	74.13
M27	459.0	416.40	77.11	589.91	109.24	520.51	96.39
M30	561.0	565.49	94.25	801.11	133.52	706.86	117.81
M33	694.0	769.51	116.59	1090.13	165.17	961.88	145.74
M36	817.0	988.24	137.26	1400.00	194.45	1235.30	171.57
M39	976.0	1278.95	163.97	1811.85	232.29	1598.69	204.96
M42	1120.0	1580.05	188.16	2239.10	266.56	1975.68	235.20

NOTE:

- The tightening torques are calculated to induce approximately stresses as detailed below:
- 168 N/mm2 for Property class 4.6
- 238 N/mm2 for Property class 4.8
- 210 N/mm2 for property class 5.6

The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEXAGON HEAD BOLTS/SCREWS ISO 4014/4016/4017

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS		5.8	6.8	8.8		10.9
Diameter		All Diameter	All Diameter	≤M16	>M16	All Diameter
Unit		N/mm^2	N/mm^2	N/mm^2		N/mm^2
Tensile Strength (Min.)		520	600	800	830	1040
Yield strength 0.2% offset (Min.)		420	480	640	660	940
Proof Load Stress		380	440	580	600	830
Impact Strength (Min.)	(J)	N/A	N/A	30	30	20
Hardness Rockwell	(HR.)	B82-B95	B89-B100	C22-C32	C23-C34	C32-C39
Elongation (Min.)	(%)	N/A	N/A	12	12	9
Reduction of Area (Min.)	(%)	N/A	N/A	52	52	48

RECOMMENDED TIGHTENING TORQUESS AND INDUCED LOADS:

Nominal Thread Size	Stress Area (mm^2)	5.8		6.8		8.8		10.9	
		Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN	Nm	KN
M6	20.1	7.09	5.91	8.10	6.75	10.80	9.00	15.87	13.23
M8	36.6	17.22	10.76	19.68	12.30	26.23	16.4.	38.53	24.08
M10	58.0	34.10	17.05	38.98	19.49	51.97	25.98	76.33	38.16
M12	84.3	59.48	24.78	67.98	28.32	90.64	37.77	133.13	55.47
M14	115.0	94.67	33.81	108.19	38.64	114.26	51.52	211.88	75.67
M16	157.0	147.71	46.16	168.81	52.75	225.08	70.34	330.58	103.31
M18	192.0	203.20	56.45	232.24	64.51	319.33	88.70	454.51	126.34
M20	245.0	288.12	72.03	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	391.96	89.08	447.95	101.81	615.94	140.00	872.25	199.37
M24	353.0	498.15	103.78	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	728.71	134.95	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	989.61	164.93	1130.97	188.50	1555.10	259.18	2214.83	369.14
M33	694.0	1346.64	204.04	1539.01	233.18	2116.14	320.63	3013.40	456.65
M36	817.0	1729.43	240.20	1976.49	274.51	2717.67	377.45	3870.62	537.59
M39	976.0	2238.16	286.94	2557.90	327.94	3517.11	450.91	5009.22	642.21
M42	1120.0	2765.95	329.28	3161.09	376.32	4346.50	517.44	6190.46	736.96

NOTE:

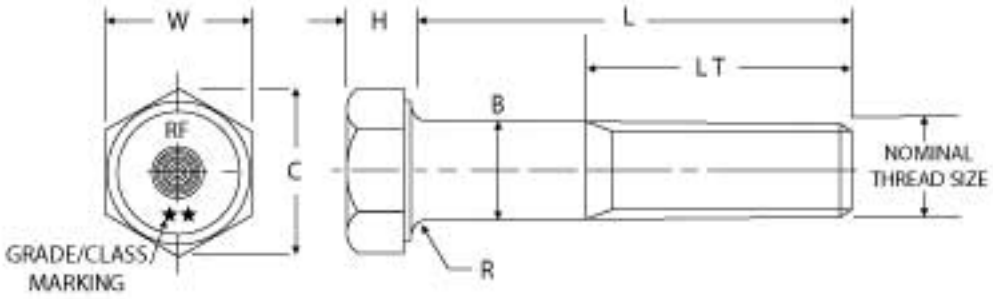
- The tightening torques are calculated to induce approximately stresses as detailed below:
- 294 N/mm2 for Property dass 5.8
- 336 N/mm2 for Property class 6.8
- 448 N/mm2 for Property class 8.8 ≤ M16
- 462 N/mm2 for Property class 8.8>M16
- 658 N/mm2 for Property class 10.9
- The tightening torques of lubricated finished is 75% of the values stated unlubricated finish

HEX BOLTS / SCREWS - JIS B 1180

METRIC SERIES - DIMENSIONS

NOTE:

1. The Bolts and Screws will generally conform to JIS B 1180
2. Threads will conform to class 6g of JIS B 0209 - coarse series
3. Material: Carbon/alloy steel.
4. Heat Treatment: To achieve Mechanical Properties of class 8.8 and 10.9
5. Thread Length LT
   LT 1 for < 125
   LT 2 for L>125 to 200
   LT3 for L>200
6. Bolt lengths equal to or shorter than those listed in LFT column will be fully thread.(ie.screw)
7. All dimensions are in millimeters



Nominal Thread Size	Pitch	W Max.	C Max.	B Max.	H Min	R Min	Length of Thread				LENGTH RANGE
							LT1	LT2	LT3	L.F.T	
M6	1.00	10.0	11.50	6.60	4.00	0.25	18	-	-	25	15-100
M8	1.25	13.0	15.00	8.70	5.50	0.40	22	28	-	30	15-100
M10	1.50	17.0	19.60	10.70	7.00	0.40	26	32	45	35	15-100
M12	1.75	19.0	21.00	12.90	8.00	0.60	30	36	49	40	20-150
M14	2.00	22.0	25.40	14.90	9.00	0.60	34	40	53	40	25-150
M16	2.00	24.0	27.70	16.90	10.00	0.60	38	44	57	50	25-200
M18	2.50	27.00	31.20	18.90	12.00	0.60	42	48	61	50	30-200
M20	2.50	30.0	34.60	20.95	13.00	0.80	46	52	65	60	35-200
M22	2.50	32.0	37.00	22.95	14.00	0.80	50	56	69	65	40-200
M24	3.00	36.0	41.60	24.95	15.00	0.80	54	60	73	75	40-200
M27	3.00	41.0	47.30	27.95	17.00	1.00	60	66	79	85	70-200
M30	3.50	46.0	53.10	30.95	19.00	1.00	66	72	85	85	70-300
M33	3.50	50.0	57.70	34.20	21.00	1.00	72	78	91	95	75-300
M36	4.00	55.0	63.50	37.20	23.00	1.00	78	84	97	100	80-300
M39	4.00	60.0	69.30	40.20	25.00	1.00	84	90	103	110	90-300
M42	4.50	65.0	75.0	43.20	26.00	1.20	90	96	109	120	90-300

HEXAGON HEAD BOLTS/SCREWS JIS B 1180

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS	4.6	4.8	5.6
Diameter	All Diameter	All Diameter	All Diameter
Unit	N/mm2	N/mm2	N/mm2
Tensile Strength (Min.)	400	420	500
Yield strength 0.2% offset (Min.)	240	340	300
Proof Load Stress	225	310	280
Impact Strength (Min.) {J}	N/A	N/A	25
Hardness Rockwell {HR.}	B67-B100	B71-B100	B79-B100
Elongation (Min.) {%}	22	14	20

RECOMMENDED TIGHTENING TORQUESS AND INDUCED LOADS:

Nominal Thread Size	Stress Area (mm^2)	4.6		4.8		5.6	
		Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN
M6	20.1	4.05	3.38	5.74	4.78	5.07	4.22
M8	36.6	9.84	6.15	13.94	8.71	12.30	7.69
M10	58.0	19.49	9.74	27.61	13.80	24.36	12.18
M12	84.3	33.99	14.16	48.15	20.06	42.49	17.70
M14	115.0	54.09	19.32	76.64	27.37	67.62	24.15
M16	157.0	84.40	26.37	119.57	37.37	105.50	32.97
M18	192.0	116.12	32.25	160.51	45.70	145.15	40.32
M20	245.0	164.64	41.16	233.24	58.31	205.80	51.45
M22	303.0	223.98	50.90	317.30	72.11	279.97	63.63
M24	353.0	284.66	59.30	403.27	84.01	355.82	74.13
M27	459.0	416.40	77.11	589.91	109.24	520.51	96.39
M30	561.0	565.49	94.25	801.11	133.52	706.86	117.81
M33	694.0	769.51	116.59	1090.13	165.17	961.88	145.74
M36	817.0	988.24	137.26	1400.00	194.45	1235.30	171.57
M39	976.0	1278.95	163.97	1811.85	232.29	1598.69	204.96
M42	1120.0	1580.05	188.16	2239.10	266.56	1975.68	235.20

NOTE:

- The tightening torques are calculated to induce approximately stresses as detailed below:
- 168 N/mm2 for Property class 4.6
- 238 N/mm2 for Property class 4.8
- 210 N/mm2 for property class 5.6
- 249 N/mm2 for property class 5.8
- 336 N/mm2 for property class 6.8
- 448 N/mm2 for property class 8.8≤M16
- 462 N/mm2 for property class 8.8>M16
- 658 N/mm2 for property class 10.9
- The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEXAGON HEAD BOLTS / SCREWS JIS B 1180

METRIC SERIES

PHYSICAL PROPERTIES:

PROPERTY CLASS		5.8	6.8	8.8		10.9
Diameter		All Diameter	All Diameter	≤M16	>M16	All Diameter
Unit		N/mm²	N/mm²	N/mm²		N/mm²
Tensile Strength (Min.)		520	600	800	830	1040
Yield strength 0.2% offset (Min.)		420	480	640	660	940
Proof Load Stress		380	440	580	600	830
Impact Strength (Min.)	(J)	N/A	N/A	30	30	20
Hardness Rockwell	(HR.)	B82-B95	B89-B100	C22-C32	C23-C34	C32-C39
Elongation (Min.)	(%)	10	8	12	12	9

RECOMMENDED TIGHTENING TORQUES AND INDUCED LOADS

Nominal Thread Size	Stress Area (mm²)	5.8		6.8		8.8		10.9	
		Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load	Un lubricated Finish	Induced Load
		Nm	KN	Nm	KN	Nm	KN	Nm	KN
M6	20.1	7.09	5.91	8.10	6.75	10.80	9.00	15.87	13.23
M8	36.6	17.22	10.76	19.68	12.30	26.23	16.4.	38.53	24.08
M10	58.0	34.10	17.05	38.98	19.49	51.97	25.98	76.33	38.16
M12	84.3	59.48	24.78	67.98	28.32	90.64	37.77	133.13	55.47
M14	115.0	94.67	33.81	108.19	38.64	114.26	51.52	211.88	75.67
M16	157.0	147.71	46.16	168.81	52.75	225.08	70.34	330.58	103.31
M18	192.0	203.20	56.45	232.24	64.51	319.33	88.70	454.81	126.34
M20	245.0	288.12	72.03	329.28	82.32	452.76	113.20	644.84	161.21
M22	303.0	391.96	89.08	447.95	101.81	615.94	140.00	877.25	199.37
M24	353.0	498.15	103.78	569.32	118.61	782.81	163.08	1114.91	232.27
M27	459.0	728.71	134.95	832.81	154.22	1145.11	212.06	1630.92	302.02
M30	561.0	989.61	164.93	1130.97	188.50	1555.10	259.18	2214.83	369.14
M33	694.0	1346.64	204.04	1539.01	233.18	2116.14	320.63	3013.90	456.65
M36	817.0	1729.43	240.20	1976.49	274.51	2717.67	377.45	3870.62	537.59
M39	976.0	2238.16	286.94	2557.90	327.94	3517.11	450.91	5009.22	642.21
M42	1120.0	2765.95	329.28	3161.09	376.32	4346.50	517.44	6190.46	736.96

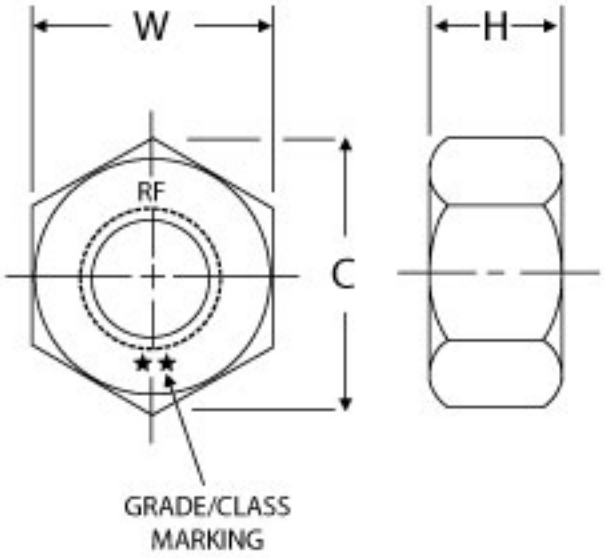
NOTE:

- The tightening torques are calculated to induce approximately stresses as detailed below:
- 168 N/mm2 for Property class 4.6
- 238 N/mm2 for Property class 4.8
- 210 N/mm2 for property class 5.6
- 249 N/mm2 for property class 5.8
- 336 N/mm2 for property class 6.8
- 448 N/mm2 for property class 8.8≤M16
- 462 N/mm2 for property class 8.8>M16
- 658 N/mm2 for property class 10.9
- The tiqhtening torques of lubricated finished is 75% of the values stated unlubricated finish.

HEAVY HEXAGON NUTS ASTM A 194 GR. 2H, 4&7

NOTE:

1. The nuts will generally conform ANSI/ASME B 18.2.2 Heavy Hex. Nuts.
2. Threads will conform to Class 2B of ANSI B1.1
3. Heat Treatment: To achieve the mechanical properties Gr. 2H, 4 and 7 which confirm the requirements of ASTM A 194.
4. In Bolt/Nut assembly, tightening should be done by rotation of nut. Torque values as recommended in table for bolts.
5. All dimensions are inches.



DIMENSIONS:

Thread Size	TPI UNC/UN	W Max.	C Max.	H Norm
1/2"	13	0.875"	1.010"	0.484"
5/8"	11	1.062"	1.227"	0.609"
3/4"	10	1.250"	1.443"	0.734"
7/8"	9	1.438"	1.660"	0.859"
1"	8	1.625	1.876"	0.984"
1-1/8"	8	1.812"	2.093"	1.109"
1-1/4"	8	2.000"	2.309"	1.219"
1-3/8"	8	2.188"	2.526"	1.344"
1-1/2"	8	2.375"	2.742"	1.469"
1-5/8"	8	2.562"	2.959"	1.594"
1-3/4"	8	2.750"	3.175"	1.719"
1-7/8"	8	2.938"	3.392"	1.844"
2"	8	3.125"	3.608"	1.969"
2-1/4"	8	3.500"	4.041"	2.203"
2-1/2"	8	3.875"	4.474"	2.453"
2-3/4"	8	4.250"	4.907	2.703"
3"	8	4.625"	5.340"	2.953"
3-1/4"	8	5.000"	5.774"	3.188"
3-1/2"	8	5.375"	6.207"	3.438"

PHYSICAL PROPERTIES

Property Class	Size	For use with Bolts. Stud Bolts of Grade	Proof Load Stress (psi)	Rockwell Hardness [HR]
GR.2H	Upto 1-1/2 incl.	ASTM A325T-1	175,000 N /A	C24 - C35
	Over 1-1/2	ASTMA 193B7 ASTM A307 B		C35 Max.
GR.4&7	All Sizes	ASTM A320 L7	175,000	C24 - C35
		ASTM GR. B16		

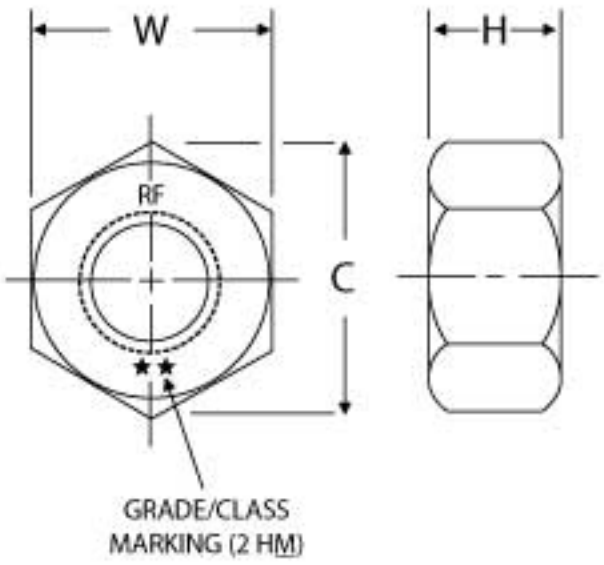
HEAVY HEXAGON NUTS ASTM A 194 GR. 2HM

NOTE:

1. The nuts will generally conform ANSI/ASME B 18.2.2 Heavy Hex. Nuts.
2. Threads will conform to Class 2B of ANSI B1.1
3. Heat Treatment: To achieve the mechanical properties of ASTM A 194 GR. 2HM
4. In Bolt/Nut assembly, tightening should be done by rotation of nut. Torque values as recommended in table for bolts.
5. All dimensions are inches.

DIMENSIONS:

Thread Size	TPI UNC/UN	W Max.	C Max.	H Nom
1/2"	13	0.875"	1.010"	0.484"
5/8"	11	1.062"	1.227"	0.609"
3/4"	10	1.250"	1.443"	0.734"
7/8"	9	1.438"	1.660"	0.859"
1"	8	1.625	1.876"	0.984"
1-1/8"	8	1.812"	2.093"	1.109"
1-1/4"	8	2.000"	2.309"	1.219"
1-3/8"	8	2.188"	2.526"	1.344"
1-1/2"	8	2.375"	2.742"	1.469"
1-5/8"	8	2.562"	2.959"	1.594"
1-3/4"	8	2.750"	3.175"	1.719"
1-7/8"	8	2.938"	3.392"	1.844"
2"	8	3.125"	3.608"	1.969"
2-1/4"	8	3.500"	4.041"	2.203"
2-1/2"	8	3.875"	4.474"	2.453"
2-3/4"	8	4.250"	4.907	2.703"
3"	8	4.625"	5.340"	2.953"
3-1/4"	8	5.000"	5.774"	3.188"
3-1/2"	8	5.375"	6.207"	3.438"



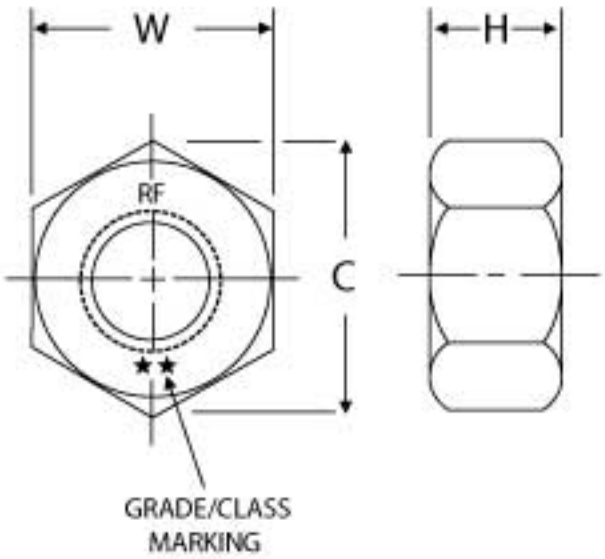
PHYSICAL PROPERTIES

Property Class	Size	For use with Bolts. Stud Bolts of Grade	Proof Load Stress (psi)	Rockwell Hardness [HR]
GR.2HM	All Sizes	ASTMA193 GR B7M	150,000	B84 - B99

HEXAGON NUTS ASTM A 563- GR. A

NOTE:

1. The Hex. nuts will generally conform ANSI / ASME B 18.2.2
2. Thread will conform to Class 2B of ANSI B1.1.
3. In Bolt/Nut assembly, tightening should be done by rotation of nut. Torques values as recommended in table for bolts.
4. All dimesnions are inches.



DIMENSIONS:

Thread Size	TPI		W Max.	C Max.	H Norm.
	UNC	UNF			
1/4"	20	28	0.4380"	0.505"	0.219"
5/16"	18	24	0.5000"	0.577"	0.266"
3/8"	16	24	0.5620"	0.650"	0.328"
7/16"	14	20	0.6880"	0.794"	0.375"
1/2"	13	20	0.7500"	0.866"	0.4375"
9/16"	12	18	0.8750"	1.010"	0.484"
5/8"	11	18	0.9380"	1.083"	0.547"
3/4"	10	16	1.1250"	1.300"	0.641"
7/8"	9	14	1.3120"	1.515"	0.750"
1"	8	12	1.5000"	1.732"	0.859"

PHYSICAL PROPERTIES

Grade	Size	For use with Bolts. Stud Bolts of Grade	Proof Load Stress (psi)	Rockwell hardness [HR]
GR.A	1/4" - 1/1/2"	ASMT A 36 ASTM A 307 A, B & C	90, 000	B68 - C32

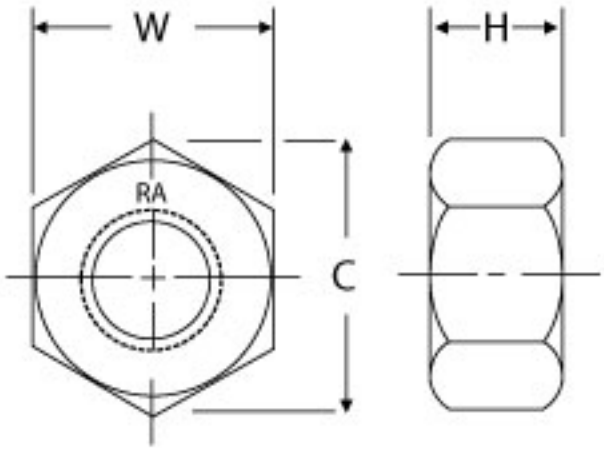
HEAVY HEXAGON NUTS ASTM A 563, GR. A

NOTE:

1. The nuts will generally conform ANSI/ASME B 18.2.2 Heavy Hex. Nuts.
2. Threads will conform to Class 2B of ANSI B1.1.
3. In Bolt/Nut assembly, tightening should be done by rotation of nut.
4. Torque values as recommended in table for bolts.
5. All dimensions are inches.

DIMENSIONS:

Thread Size	TPI UNC/UN	W Max.	C Max.	H Nom.
1/2"	13	0.875"	1.010"	0.484"
5/8"	11	1.062"	1.227"	0.609"
3/4"	10	1.250"	1.443"	0.734"
7/8"	9	1.438"	1.660"	0.859"
1"	8	1.625	1.876"	0.984"
1-1/8"	8	1.812"	2.093"	1.109"
1-1/4"	8	2.000"	2.309"	1.219"
1-3/8"	8	2.188"	2.526"	1.344"
1-1/2"	8	2.375"	2.742"	1.469"
1-5/8"	8	2.562"	2.959"	1.594"
1-3/4"	8	2.750"	3.175"	1.719"
1-7/8"	8	2.938"	3.392"	1.844"
2"	8	3.125"	3.608"	1.969"
2-1/4"	8	3.500"	4.041"	2.203"
2-1/2"	8	3.875"	4.474"	2.453"
2-3/4"	8	4.250"	4.907	2.703"
3"	8	4.625"	5.340"	2.953"
3-1/4"	8	5.000"	5.774"	3.188"
3-1/2"	8	5.375"	6.207"	3.438"



PHYSICAL PROPERTIES

Property Class	Size	For use with Bolts. Stud Bolts/Anchor Bolts of Grade	Proof Load Stress (psi)	Rockwell Hardness [HR]
GR.A	Upto 4" incl.	ASMT A 36 ASTMA 307 A, B & C	100,000	B68 - C32

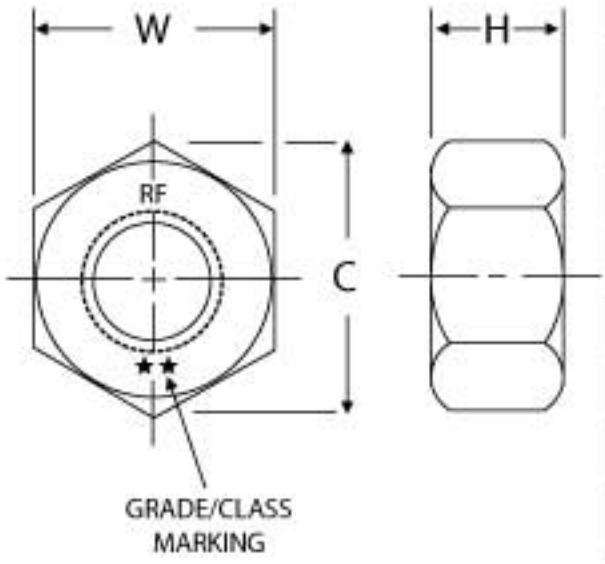
HEAVY HEXAGON NUTS ASTM A 563M

METRIC SERIES.

NOTE:

1. The nuts will generally conform ANSI B 18.2.4.6M. Metric Heavy Hexagonal Nuts.
2. Threads will conform to Class 6H of ANSI B 1.13M for Coarse Series.
3. Heat Treatment: To achieve mechanical properties of Property Class 8S or 10S of ASTM A 563M
4. Nuts of Property Class 8S are used with bolts of ASTM A325M Type 1 (Black).
5. Nuts of Property Class 10S are used with bolts to ASTM A325M Type 1 and ASTM A490 M
(In general nuts of a higher property class can replace nuts of a lower property class in a joint).
6. In Bolt/Nut assembly tightening should be done by rotation of nuts.
7. All dimensions are in millimeters.

Dimensions:



Thread Size	Pitch	W Max.	C Max.	H Nom.
M12	1.75	21.00	24.25	12.10
M14	2.00	24.00	27.71	13.95
M16	2.00	27.00	31.18	16.75
M20	2.50	34.00	39.26	20.05
M22	2.50	36.00	41.57	22.95
M24	3.00	41.00	47.34	23.55
M27	3.00	46.00	53.12	26.95
M30	3.50	50.00	57.74	29.90
M36	4.00	60.00	69.28	35.80

PHYSICAL PROPERTIES

Property Class	For use with type of bolts and finish	Proof Load Stress [N/mm2]	Rockwell Hardness [HR]
8S	ASTM A325 M Type 1 (non coated)	1075	B89 - C38
10S	ASTM A 325 M Type 1 and ASTM A 490 M	1245 (Normal Tapping) 1165 (Oversize Tapping)	C26 - C38

HEXAGON NUTS ISO 4032 & 4034

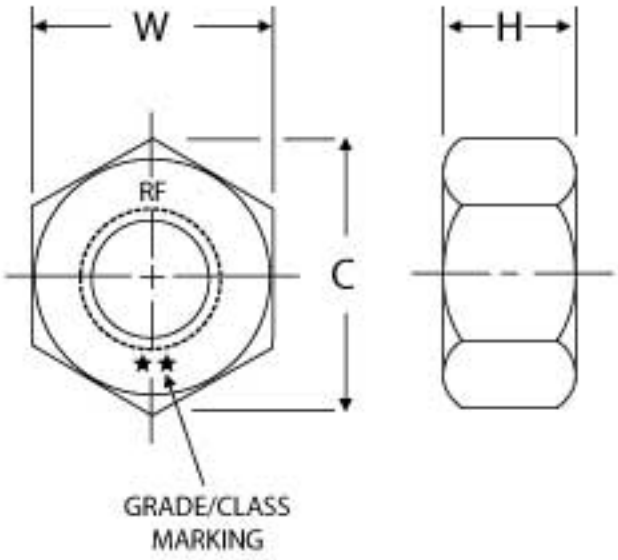
METRIC SERIES.

NOTE:

1. The nuts will generally conform to ISO 4032 & 4034.
2. Threads will conform to Class 6H of ISO 965/2 Coarse Series.
3. Heat Treatment to achieve mechanical properties of Property Class 8 &10.
4. Nuts of Property Class 8 are used with bolts of Property Class 8.8 (In general nuts of a higher property class can replace nuts of a lower property class in a joint).
5. In Bolt/Nut assembly tighening should be done by rotation of nuts.
6. All dimensions are in millimetres.

DIMENSIONS:

Thread Size	Pitch	W Max.	C Max.	H Max.
M12	1.75	19.0*	21.0	10.80
M14	2.0	22.0*	24.49	12.80
M16	2.0	24.0	26.75	14.80
M18	2.5	27.0	29.56	15.80
M20	2.5	30.0	32.95	18.00
M22	2.5	32.0*	35.03	19.40
M24	3.0	36.0	39.55	21.50
M27	3.0	41.0	45.20	23.80
M30	3.5	46.0	50.85	25.60
M33	3.5	50.0	55.37	28.70
M36	4.0	55.0	60.79	31.00
M39	4.0	60.0	66.44	33.40



PHYSICAL PROPERTIES

Nut Size	Property Class 5		Property Class 6		Property Class 8		Property Class 10		Property Class 12	
	Proof Load Stress	Hard-ness HR	Proof Load Stress	Hard-ness HR	Proof Load Stress	Hard-ness HR	Proof Load Stress	Hard-ness HR	Proof Load Stress	Hard-ness HR
	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]
M12-M16 Above M16-M39	610 630	B72-C30 B79-C30	700 720	B80-C30 B86-C30	880 920	B89-C30 B93-C30	1050 1080	C26-C36 C26-C36	1190 1200	C29-C36 C29-C36
For use with bolts of property Class	4.6, 4.8, 5.6, 5.8		4.6, 4.8, 5.6 5.8, 6.8		4.6, 4.8, 5.6, 5.8 6.8 and 8.8		8.8 and 10.9		10.9 and 12.9	

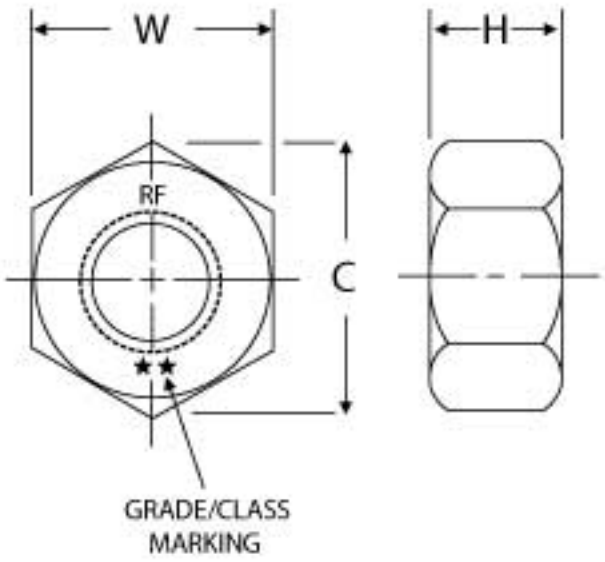
o For M12, M14 & M22, the Across flat sizes are per DIN 934, 1987 edition.

HEXAGON NUTS SAE J 995

INCH SERIES

NOTE:

1. The Hex nuts will generally conform ANSI / ASME B 18.2.2
2. Threads will conform to class 2B of ANSI B1.1.
3. Heart treatment to achieve mechanical properties of grade 5 & 8 of SAE J 995
4. SAE J 995 G.R.2 also conform the requirements of ASTM A 563, Grade A.
5. In Bolts assembly, tightening should be done by rotation of nut. Torque values as recommended in table for bolts.
6. All dimensions are inches.



DIMENSIONS:

Thread Size	TPI		W Max.	C Max.	H Max.
	UNC	UNF			
1/4"	20	28	0.4380	0.505	0.219
5/16"	18	24	0.5000	0.577	0.266
3/8"	16	24	0.5620	0.650	0.328
7/16"	14	20	0.6880	0.794	0.375
1/2"	13	20	0.7500	0.866	0.4375
9/16"	12	18	0.8750	1.010	0.484
5/8"	11	18	0.9380	1.083	0.547
3/4"	10	16	1.1250	1.300	0.641
7/8"	9	14	1.3120	1.515	0.750
1"	8	12	1.5000	1.732	0.859

PHYSICAL PROPERTIES

Grade	Size	For use With Bolts/Stud Bolts of Grade	Proof Load Stress [psi]	Rockwell hardness [HR]
2	1/4"-1/1/2"	SAE Gr.2 ASTM A 307 GrA & C	90,000	C32 (max.)
5	1/4"-1"	SAE Gr. 5	**120,000**	C32 (max.)
8	1/4"-5/8"	SAE Gr.8	150,000	C24-C32
	3/4" - 1"			C26-C34

HEXAGON NUTS DIN 934/DIN 555

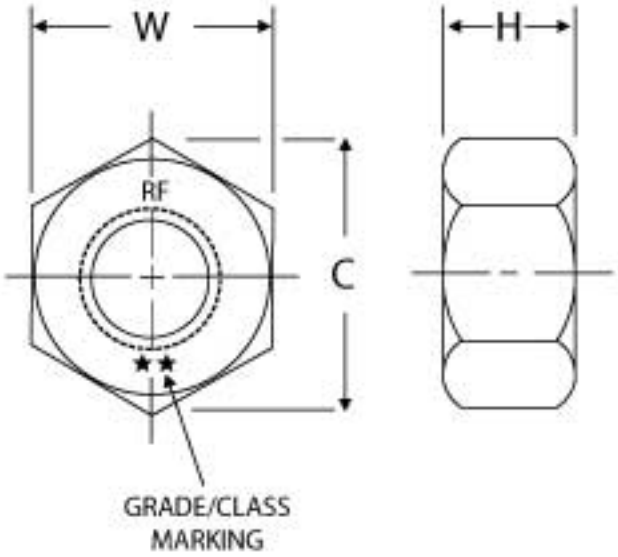
METRIC SERIES

NOTE:

1. The nuts will generally confurm to DIN 934 & DIN 555.
2. Threads will conforum to Class 6H of DIN - 13 Coarse Series.
3. Heart treatment to achieve mechanical properties of Property Class 8 or 10.
4. Nuts of property class 8 are used with Bolts of property Class 8.8 Nuts of property Class 10 are used with Bolts of property class 10.9 (in general nuts of a higher property class can be replace nut of lower property class in a joint).
5. In Bolt/Nut assembly tightening should be done by rotation of nuts.
6. All dimensions are in millimeters.

DIMENSIONS:

Thread Size	Pitch	W Max.	C Max.	H Nom.
M6	1.00	10.00	11.05	5.00
M8	1.25	13.00	14.38	6.50
M10	1.50	17.00	18.90	8.00
M12	1.75	19.00	21.0	10.00
M14	2.00	22.00	24.49	11.00
M16	2.00	24.00	26.75	13.00
M18	2.50	27.00	29.56	15.00
M20	2.50	30.00	32.95	16.00
M22	2.50	32.00	35.03	18.00
M24	3.00	36.00	39.55	19.00
M27	3.00	41.00	45.20	22.00
M30	3.50	46.00	50.85	24.00
M33	3.50	50.00	55.37	26.00
M36	4.00	55.00	60.79	29.00
M39	4.00	60.00	66.44	31.00
M42	4.50	65.00	71.30	34.00



PHYSICAL PROPERTIES

Nut Size	Property Class 5		Property Class 6		Property Class 8		Property Class 10		Property Class 12	
	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.
	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]
M6-M42	500	C30	600	C30	800	C30	1000	C36	1200	C36
For use with bolts of Property Class	4.6, 4.8, 5.6, 5.8		4.6, 4.8, 5.6 5.8, 6.8		4.6, 4.8, 5.6, 5.8 6.8 and 8.8		8.8 and 10.9		10.9 and 12.9	

NOTE:

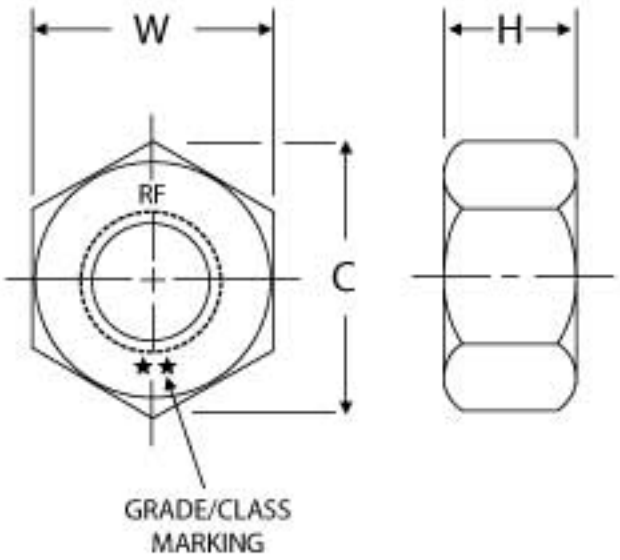
- For M10, M12, M14 & M22. The acrossflat dimensions are as per DIN 934, 1987 edition.

HIGH STRENGTH HEXAGON NUTS DIN 6915

METRIC SERIES

NOTE:

1. The nuts will generally conform DIN 6915
2. Threads will conform to Class 6H of DIN - 13 Coarse Series.
3. Heat Treatment: To achieve mechanical properties of Class 10.
4. Nuts of property class 10 are used with bolt of property class 10.9. In general nuts of a higher property class can replace nuts of a lower property class in a joint.
5. In Bolts/Nut assembly, Tightening should be done by rotation of nuts.
6. All dimensions are in millimeteres.



DIMENSIONS:

Thread Size	Pitch	W Max.	C Min.	H Max.
M12	1.75	22.00	23.91	10.00
M16	2.00	27.00	29.56	13.00
M20	2.50	32.00	35.03	16.00
M22	2.50	36.00	39.95	18.00
M24	3.00	41.00	45.20	19.00
M27	3.00	46.00	50.85	22.00
M30	3.50	50.00	56.37	24.00
M36	4.00	60.00	66.44	29.00

PHYSICAL PROPERTIES

Nut Size	Property Class 10	
	Proof Load Stress	Hardness Max.
	RF/mm^2	[HRC.]
M12-M36	1000	C36
For use with bolts of property class	Class 10.9	

HEXAGON NUTS BS 4190

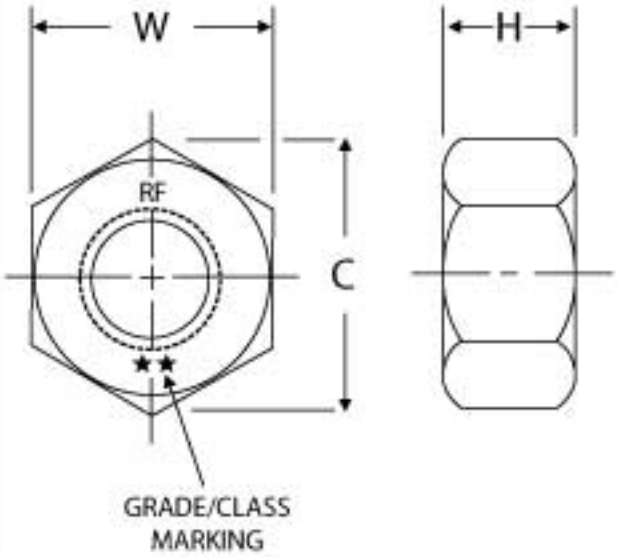
METRIC SERIES

NOTE:

1. The Hex. nuts will generally conform to BS 4190
2. Threads will conform to Class 6H of BS 3643 Coarse Series.
3. Heat Treatment: To achieve mechanical properties of Property Class 8 or 10.
4. Nuts of Property Class 8 are used with bolts of Property class 8.8 Nuts of Property Class 10 are used with bolts of Property Class 10.9. (In general nuts of a higher property class can replace nuts of a lower property class in a joint).
5. In Bolts/Nut assembly tightening should be done by rotation of nuts.
6. All dimensions are in millimeters.

DIMENSIONS:

Thread Size	Pitch	W Max.	C Max.	H Max.
M6	1.00	10.00	10.89	5.375
M8	1.25	13.00	14.20	6.875
M10	1.50	17.00	18.72	8.450
M12	1.75	19.00	20.88	10.450
M16	2.00	24.00	26.17	13.550
M20	2.50	30.00	32.95	16.500
M22	2.50	32.00	35.03	18.550
M24	3.00	36.00	39.55	19.650
M27	3.00	41.00	45.20	22.650
M30	3.50	46.00	50.85	24.650
M33	3.50	50.00	55.37	26.650
M36	4.00	55.00	60.79	29.650
M39	4.00	60.00	66.44	31.800
M42	4.50	65.00	72.09	34.800



PHYSICAL PROPERTIES

Nut Size	Property Class 5		Property Class 6		Property Class 8		Property Class 10		Property Class 12	
	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.
	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]
M6-M42	500	C30	600	C30	800	C30	1000	C36	1200	C36
For use with bolts of Property Class	4.6, 4.8		4.6, 4.8, 6.8		4.6, 4.8, 6.8 and 8.8		8.8 and 10.9		10.9 and 12.9	

HEXAGON NUTS BS 3692

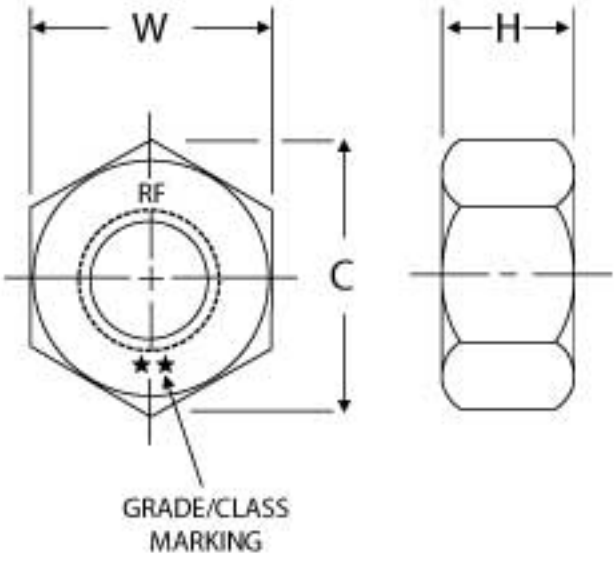
METRIC SERIES

NOTE:

1. The Hex. nuts will generally conform to BS 3692
2. Threads will conform to Class 6H of BS 3643 Coarse Series.
3. Heat Treatment: To achieve mechanical properties of Property Class 8 or 10.
4. Nuts of Property Class 8 are used with bolts of Property class 8.8, Nuts of Property Class 10 are used with bolts of Property Class 10.9.
5. (In general nuts of a higher property class can replace nuts of a lower property class in a joint).
6. In Bolts/Nut assembly tightening should be done by rotation of nuts.
7. All dimensions are in millimeters.

DIMENSIONS:

Thread Size	Pitch	W Max.	C Min.	H Max.
M6	1.00	10.00	11.05	5.00
M8	1.25	13.00	14.38	6.50
M10	1.50	17.00	18.90	8.00
M12	1.75	19.00	21.10	10.00
M14	2.00	22.00	24.49	11.00
M16	2.00	24.00	26.75	13.00
M18	2.50	27.00	30.14	15.00
M20	2.50	30.00	33.83	16.00
M22	2.50	32.00	35.72	18.00
M24	3.00	36.00	39.38	19.00
M27	3.00	41.00	45.63	22.00
M30	3.50	46.00	51.28	24.00
M33	3.50	50.00	55.80	26.00
M36	4.00	55.00	61.31	29.00
M39	4.00	60.00	66.96	31.00
M42	4.50	65.00	72.61	34.00



PHYSICAL PROPERTIES

Nut Size	Property Class 5		Property Class 6		Property Class 8		Property Class 10		Property Class 12	
	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.
	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]	N/mm^2	[HR.]
M6-M42	500	C30	600	C30	800	C30	1000	C36	1200	C39
For use with bolts of Property Class	4.6, 4.8, 5.6, 5.8		4.6, 4.8, 5.6 5.8, 6.8		4.6, 4.8, 5.6, 5.8, 6.8 and 8.8		8.8 and 10.9		10.9 and 12.9	

HIGH STRENGTH FRICTION GRIP NUTS BS 4395

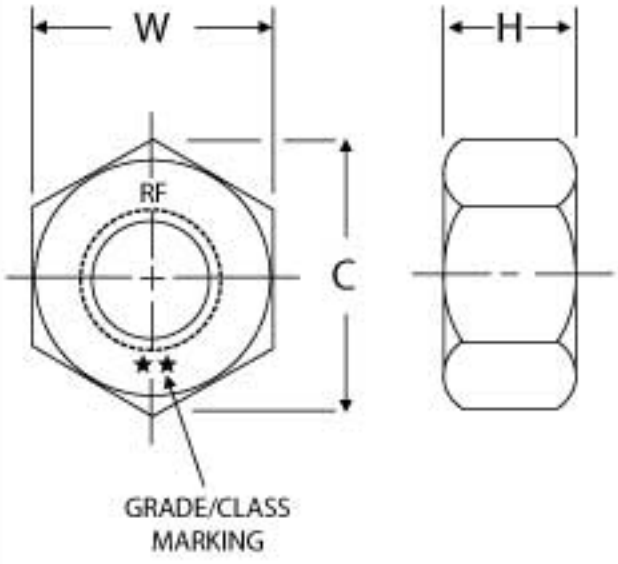
METRIC SERIES

NOTE:

1. The Nuts will generally conform to BS 4395 Metric H.S.F.G Nuts.
2. Threads will conform to Class 6H of BS 3643 Coarse Series.
3. Heat Treatment: To achieve mechanical properties of BS 4395 PART 1 & 2.
4. Nuts of Property PART 1 & 2 are used with bolts of BS 4395 PART 1 & 2.
   (In general nuts of a higher property class can replace nuts of a lower property class in a joint).
5. In Bolt/Nut assembly tightening should be done by rotation of nuts.
6. All dimenshions are in millimetres.

DIMENSIONS:

Thread Size	Pitch	W Max.	C Min.	H Nom.
M12	1.75	22.00	25.40	11.00
M16	2.00	27.00	31.20	15.00
M20	2.50	32.00	36.90	18.00
M22	2.50	36.00	41.60	19.00
M24	3.00	41.00	47.30	22.00
M27	3.00	46.00	5310	24.00
M30	3.50	50.00	57.70	26.00
M33	3.50	55.00	63.50	29.00
M36	4.00	60.00	69.30	31.00



PHYSICAL PROPERTIES

Property Class	For use with type of bolts and finish	Proof Load Stress N/mm²	Rockwell Hardness [HR]
PART 1	BS 4395 - PART 1	1000	B88 - C30
PART 2	BS 4395 - PART 2	1176	C24 - C36

NOTE:

- BS 4395/Part 1 dimensions starting from M12 to M36 and Part 2 starting from M16 to M3.

HEXAGON NUTS JIS B 1181

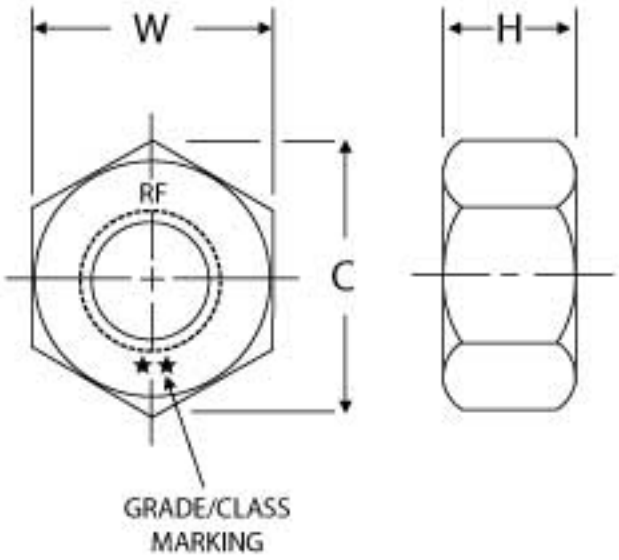
METRIC SERIES

NOTE:

1. The Nuts will generally conform to JIS B 1181
2. Threads will conform to Class 6H of JIS B 0209 Coarse Series.
3. Heat Treatment: To achieve mechanical properties of property Class 8 or 10.
4. Nuts of Property Class 8 are used with bolts of Property Class 8.8 Nuts of Property Class 10 are used with bolts of Property Class 10.9. (In general nuts of a higher property class can be replace nuts of a lower property class in a joint).
5. In Bolt/Nut assembly tightening should be done by rotation of nuts.
6. All dimenshions are in millimetres.

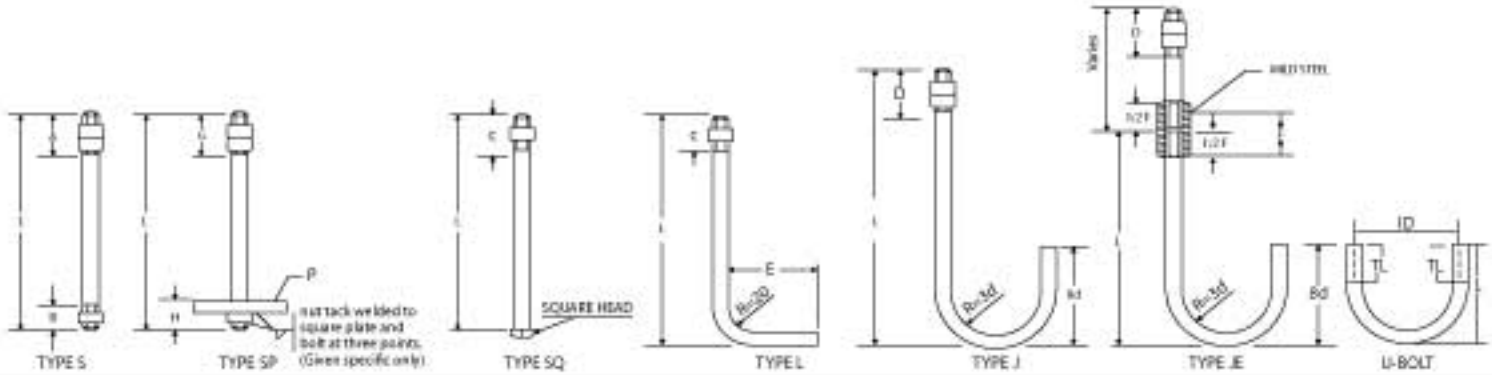
DIMENSIONS:

Thread Size	Pitch	W Max.	C Max.	H Nom.
M12	1.75	19.0	21.90	10.00
M14	2.0	22.0	25.40	11.00
M16	2.0	24.0	27.70	13.00
M18	2.5	27.0	31.20	15.00
M20	2.5	30.0	34.60	16.00
M22	2.5	32.0	37.00	18.00
M24	3.0	36.0	41.60	19.00
M27	3.0	41.0	47.30	22.00
M30	3.5	46.0	53.10	24.00
M33	3.5	50.0	57.70	26.00
M36	4.0	55.0	63.50	29.00
M39	4.0	60.0	69.30	31.00



PHYSICAL PROPERTIES

Nut Size	Property Class 5		Property Class 6		Property Class 8		Property Class 10		Property Class 12	
	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness Max.	Proof Load Stress	Hard-ness	Proof Load Stress	Hard-ness
	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]	N/mm²	[HR.]
M12-M16	610	C30	700	C30	880	C30	1050	C28-C38	1190	C31-C36
M16-M39	630	C30	720	C30	920	C30	1080	C28-C38	1200	C28-C38
For use with bolts of property	4.6, 4.8, 5.6, 5.8		4.6, 4.8, 5.6, 5.8 6.8		4.6, 4.8, 5.6, 5.8 6.8 and 8.8		8.8 and 10.9		10.9 - 12.9	



ANCHOR THREAD DIAMETER	DIAMENSIONS mm										CUTTING LENGTH mm									
	A	B	C	D	E	F	G	H	P		TYPE									
									SQUARE PLATE		S	SP	SQ		L		J		JE	
									T	W	L	L	L	CUT LENGTH	L	CUT LENGTH	L	CUT LENGTH	L	CUT LENGTH
M12	40	16	40	45	100	-	50	29	10	75	330	330	355	381	355	455	410	542	-	-
M16	50	19	40	55	100	-	65	35	12	90	400	400	355	384	355	455	420	595	-	-
M20	60	22	50	70	150	50	75	39	12	90	480	480	405	442	405	555	485	705	355	575
M22	70	25	50	75	150	55	80	48	16	100	570	570	460	498	460	610	545	787	415	657
M24	85	28	55	90	200	65	90	55	20	100	700	700	510	553	510	710	610	874	475	739
M27	-	-	75	100	200	75	-	-	-	-	-	-	560	610	560	760	673	970	535	832
M30	100	36	75	115	200	85	110	64	20	125	820	820	610	667	610	810	735	1065	596	926
M33	-	-	90	125	200	90	-	-	-	-	-	-	-	-	660	880	800	1163	655	1018
M36	115	42	90	125	200	95	115	76	25	150	1010	1010	-	-	710	910	865	1261	715	1111
M39	-	-	100	145	200	110	-	-	-	-	-	-	-	-	760	960	925	1354	770	1199
M42	130	49	115	150	255	120	130	85	25	175	1120	1120	-	-	815	1070	990	1452	830	1292
M48	150	56	125	180	255	125	-	-	-	-	-	-	-	-	915	1170	1120	1648	956	1484
M56	170	63	140	200	255	145	-	-	-	-	-	-	-	-	1015	1270	1245	1861	1070	1686
M64	190	70	160	220	255	160	-	-	-	-	-	-	-	-	1120	1375	1370	2074	1190	1894

Note: Material: ASTM A36/JIS G3123/SS41 or AISI 1018 ss available (where the required sizeis not available we use next size and thread area will be machined down to the required thread diameter:)

Nuts: DIN 555 Class 5 or better (as available)

Surface Finish: Natural or Hot Dip galv. (ASTM A 153). d = Body Diammeter: In U Bolt- ID (Inside Diameter). T/L. (Thread Length) and L (Total Length) as per customer requirements.

WHY TAURUS BRAND AUTOMOTIVE FASTENERS?

Earth Moving Equipment is very expensive and sophisticated equipment and used under difficult conditions to ensure the work is done in the fastest possible time. In order to get best out of this equipment, it is necessary to take care of maintenance so that down time could be kept to the minimum and machines are working round the clock to keep maximum benefit from heavy investment made on them.

It is therefore, necessary to choose the right quality parts during regular replacement schedules or unforeseen break down. It will be clearly understood that substandard quality parts, even though cheaper, if used in the equipment, would certainly undergo premature failure resulting into down time of the machine which will be far more costly than slightly higher price paid for high quality parts.

TAURUS Automotive brand fasteners are manufactured at Al-Rashed Fasteners factory, which is equipped with latest machinery and state of the art quality control facilities. It is already well known for its high quality products throughout Middle East and also recognized by major structural and construction companies throughout the world.

The Company has added high quality automotive fasteners under brand name TAURUS, to its well-established "Al-Rashed Fasteners" which are very popular among the users. The automotive fasteners range will include complete range of G.E.T Under Carriage and other fasteners (Bolts and Nuts) and Pins for heavy duty earth moving machines and match and surpass any international and OEM standards.

TAURUS brands represents Strength, Durability and Endurance as inherent attributes of the product and our highly experienced team of engineers strives to achieve the excellence in this attributes.
TAURUS Automotive Fasteners are forged at the most modern presses and heat treated in computerized control furnaces to achieve strength up to 12.9 grade as required. The quality of TAURUS brand Automotive Fasteners monitored by our Quality Control department right from incoming material during manufacturing process include forging, heat treatment and packing which is based on ISO 9001: 2008.

The Company has valid accreditation from ISO 9001 for the last 15 years and also has API License. Quality importance is recognized and applied at all stages right from vendors/ customer orders, raw material, production, packaging and shipping. All these processes are fully checked by our Quality Control Inspectors on regular basis without any failure.

TAURUS brand automotive fasteners eliminate chance of critical failure in costly repairs and machine down time and guarantees much longer uptime of the equipment.

ALRASHED Fasteners manufacture theme "Do it right first time, Every Time". All these quality measures increase customer's confidence, better service and more productivity.

TAURUS AUTOMOTIVE HARDWARE

The tough one is being where hardware lines stop. Our hardware line "TAURUS" brand meets O.E.M. specifications for Bolts and Nuts having proof load of 120,000 PSI (minimum) and tensile strength of 150,000 PSI (minimum) and also meets strength requirements of international standards like ASTM/SAE/DIN/JIS standards in grades 8/Class 8.8 and 12.9 respectively.

TAURUS BOLTS IDENTIFICATIONS:

I. TRACK BOLTS:

High Dome Hex Head (Fine Pitch Threads)
Proof load 135,000 PSI and up.....
Tensile Strength 170,000 PSI minimum
HRC Hardness-Rockwell C38 to 44
Equivalent to property Class 12.9

II. CUTTING EDGE BOLTS & NUTS:

Round dome shaped head having seven radial dashes
Proof load 120,000 PSI minimum
Hardness - Rockwell C 33 to 39 (Exceed SAE Grade 8 requirements)
Tensile Strength 156,000 PSI minimum

III. END BIT BOLTS:

Also round dome shaped head having seven radial dashes
Proof load 135,000 PSI minimum
Tensile Strength 160,000 PSI minimum
Hardness - Rockwell C 38 to 44 (equivalent to property Class 12.9)

IV. HIGH TORQUE STEEL NUTS:

Hex and square shape head
Proof load - comparable with cutting edge & track bolts
Hardness - Rockwell C 30 to 38

V. GENERAL STANDARD AUTOMOTIVE BOLTS & NUTS:

Hex head - three/ six/ seven radial dashes as per strength grade.
Proof load - as per strength grade
Tensile strength as per strength grade
Hardness Rockwell as per strength grade

AUTOMOTIVE FASTENERS FOR OFF-HIGHWAY CONSTRUCTION EQUIPMENT

Sr. No.	Item Code	OE Part #	DESCRIPTION
CATERPILLAR G.E.T. HARDWARE & U/C NUTS, BOLTS			
1		340707	WASHER- Segment
2	22524	0L1178	HEX HD BOLT- UNC
3	22508	0S0484	HEX HD BOLT- UNF
4	22516	0S1569	HEX HD BOLT- UNC
5	22484	0S1571	HEX HD BOLT- UNC
6	22498	0S1573	HEX HD BOLT- UNC
7	22507	0S1579	HEX HD BOLT- UNF
8	22506	0S1584	HEX HD BOLT- UNF
9	22489	0S1585	HEX HD BOLT- UNC
10	22494	0S1587	HEX HD BOLT- UNC
11	22482	0S1588	HEX HD BOLT- UNC
12	22510	0S1589	HEX HD BOLT- UNC
13	22550	0S1590	HEX HD BOLT- UNC
14	22483	0S1591	HEX HD BOLT- UNC
15	22503	0S1593	HEX HD BOLT- UNF
16	22487	0S1595	HEX HD BOLT- UNC
17	22521	0S1602	HEX HD BOLT- UNF
18	22505	0S1603	HEX HD BOLT- UNF
19	22509	0S1604	HEX HD BOLT- UNF
20	22512	0S1625	HEX HD BOLT- UNC
21	22522	0S1626	HEX HD BOLT- UNC
22	22528	0S1627	HEX HD BOLT- UNC
23	22537	0S1629	HEX HD BOLT- UNF
24	21202	0V0269	Track ShoeBolt
25	22523	1A0458	HEX HD BOLT- UNC
26	22511	1A1135	HEX HD BOLT- UNC
27	22495	1A1460	HEX HD BOLT- UNC
28	22481	1A2029	HEX HD BOLT- UNC
29	22480	1A2343	HEX HD BOLT- UNF
30	22485	1A5183	HEX HD BOLT- UNC
31	22496	1A5822	HEX HD BOLT- UNC
32	22525	1A8063	HEX HD BOLT- UNC
33	22513	1A8537	HEX HD BOLT- UNC
34	22479	1A9579	HEX HD BOLT- UNC
35	22520	1B7709	HEX HD BOLT- UNC
36	22497	1D4566	HEX HD BOLT- UNC
37	22499	1D4569	HEX HD BOLT- UNC
38	22536	1D4572	HEX HD BOLT- UNC
39	22501	1D4574	HEX HD BOLT- UNC
40	22514	1D4585	HEX HD BOLT- UNC
41	22515	1D4586	HEX HD BOLT- UNC
42	22517	1D4588	HEX HD BOLT- UNC
43	22518	1D4595	HEX HD BOLT- UNC
44	22519	1D4599	HEX HD BOLT- UNC
45	22526	1D4610	HEX HD BOLT- UNC
46	22529	1D4615	HEX HD BOLT- UNC
47	22530	1D4620	HEX HD BOLT- UNC
48	22532	1D4626	HEX HD BOLT- UNC
49	21801	1D4628	HEX HD BOLT- UNC
50	22534	1D4640	HEX HD BOLT- UNC

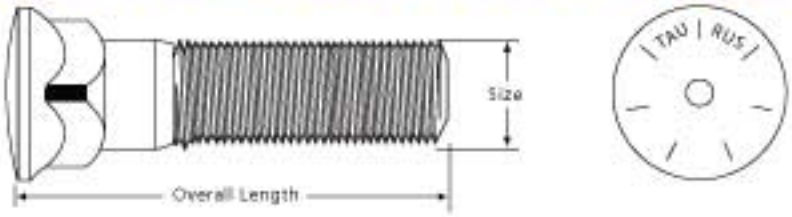
Sr. No.	Item Code	OE Part #	DESCRIPTION
CATERPILLAR G.E.T. HARDWARE & U/C NUTS, BOLTS			
51		1D4717	HEX NUT- UNC
52		1D4719	HEX NUT- UNC
53	22533	1D5976	HEX HD BOLT-UNC
54	21783	1J6762	Plow Bolt
55	22421	1M1408	Nut Track Shoe (Square)
56		151859	Track Shoe Bolt
57	21816	151860	Track Square Nut
58	21818	156421	Track Square Nut
59	22417	1V3323	Wheel Bolt Knurled
60	22502	2A1531	HEX NUT- UNC
61	22395	2B2006	HEX NUT- UNC
62	22535	2H6488	HEX NUT- UNC
63		2J2548	Plow Bolt
64		2J3505	HEX NUT
65	21809	2J3506	HEX NUT For Plow Bolt
66	21813	2J3507	Nut
67	21812	2M5656	Track Shoe NutHex
68	21794	2M5657	Dome Head Track Bolt
69	22410	2P9670	BOLT-MASTER STD(Dome)
70		250115	Washer (3/4")
71	21817	252140	Track Square Nut
72		255658	Washer (5/8")
73	21837	2V0250	Track Square Nut
74	21778	3F5108	Plow Bolt
75	22425	3F9549	Retainer With Plastic Cover
76	22426	3G9609	Retainer With Plastic Cover
77		3K0453	HEX NUT For Wheel Bolt
78		3K5234	Washer (1")
79	22539	3K7127	HEX HD BOLT-UNC
80	22419	3K9770	HEX NUT
81	22414	350336	BOLT-Segment (Hex Hd)
82		351349	Washer (1-1/8")
83		351356	Nut Sprocket Segment
84		356292	Track Shoe Nut
85		357461	Sprocket Segment Bolt
86		358182	Sprocket Segment Bolt
87		3T6308	Track Shoe Bolt
88	22418	3V4247	WHEEL BOLT (KNURLED)
89	21779	4F3658	Bolt
90	21780	4F7827	Plow Bolt
91	21784	4J9058	Plow Bolt
92		4J9208	Plow Bolt
93	21807	4K0367	Hex Nut For Plow Bolt
94	22504	4K7502	HEX HD BOLT- UNF
95	22486	4L6454	HEX HD BOLT- UNC
96		4T2479	PIN
97	22538	5J1702	HEX HD BOLT- UNC
98	21782	5J4771	Plow Bolt
99	21781	5J4773	Plow Bolt
100	21805	5P0233	Sprocket Segment Bolt

AUTOMOTIVE FASTENERS FOR OFF-HIGHWAY CONSTRUCTION EQUIPMENT

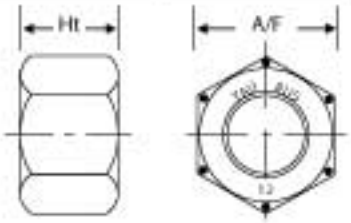
Sr. No.	Item Code	OE Part #	DESCRIPTION
CATERPILLAR G.E.T. HARDWARE & U/C NUTS, BOLTS			
101		5P3868	Bolt Track Shoe (Dome)
102	22415	5P4130	BOLT-Sprocket (HexBolt)
103	22416	5P5422	BOLT-Sprocket (HexBolt)
104		5P6604	Washer-Hardened
105	21804	5P7655	BOLT-Sprocket (HexBolt)
106		5P8221	NUT Track Shoe (SQ Dome)
107		5P8222	Master Link Bolt
108		5P8248	Washer (1-1/4")
109		5P8249	Washer (7/8")
110		5P8250	Washer (1")
111	21787	5P8361	Plow Bolt
112	21815	5P8362	Hex Tapered Nut (Plow)
113	21786	5P8823	Plow Bolt
114		5W4016	Track Shoe Nut
115		5W4022	Track Shoe Bolt
116	22420	6B6682	Hex Nut
117		6J8811	Pin With Sleeve
118		6K0697	Grease Plug Bolt
119	21795	6T2638	Dome Head Hex Bolt
120		6T8520	Master Link Bolt
121		6T8521	Master Link Bolt
122		6T8853	Track Shoe Bolt
123		6V0937	Sprocket Segment Bolt
124	21791	6V1723	Dome Head Hex Bolt
125	21792	6V1724	Bolt- Master Link
126	21793	6V1725	Bolt- Master Link
127	21796	6V1726	Domehead Hex Bolt
128	21797	6V1727	Bolt- Master Link
129	21799	6V1728	Bolt- Master Link
130		6V1792	Track Shoe Bolt
131		6V1793	Track Shoe Bolt
132	22407	6V6535	Plow Bolt
133	22408	6V8360	Plow Bolt
134	22488	7B3235	Hex HD Bolt-UNC
135	22531	7B5163	Hex HD Bolt-UNF
136	22527	7F5227	Hex HD Bolt-UNC
137	21820	7G0343	Nut- (SQ Dome)
138	21819	7G6442	Nut- (SQ Dome)
139	21788	7H3597	Domehead Hex Bolt
140	21789	7H3598	Domehead Hex Bolt
141	21790	7H3599	Domehead Hex Bolt
142	21808	7H3607	Track Hex Nut
143	21810	7H3608	Track Hex Nut
144	21811	7H3609	Track Shoe Nut Hex
145		7T0998	Master Link Bolt
146		7T0999	Master Link Bolt
147		7T1000	Track Shoe Bolt
148		7T1243	Sprocket Segment Bolt
149	21802	7T1248	Bolt Sprocket
150	21798	7T2283	Bolt- Master Link
151		7T2638	Track Shoe Bolt

Sr. No.	Item Code	OE Part #	DESCRIPTION
CATERPILLAR G.E.T. HARDWARE & U/C NUTS, BOLTS			
152		7T1748	Track Shoe Bolt
153	22396	8F8804	HEX HD BOLT-UNC
154	21785	8J2928	Plow Bolt
155	21814	8J2933	Hex Trapered Nut (Plow)
156		8J2935	Plow Bolt
157		8M3832	Washer-Hardened
158	22412	8S0395	BOLT-MASTER STD (Dome)
159	22413	8S1723	BOLT-MASTER STD (Dome)
160	22500	8S9089	HEX HD BOLT-UNC
161	22422	9J2258	(8E68) PIN
162	22423	9J2308	(1073308) PIN
163	22424	9J2358	(8E6359) PIN
164		9S1838	Master Link Bolt
165	21800	9S2727	Sprocket Segment Bolt
166		9S2728	Sprocket Segment Bolt
167		9S9779	Washer
168		9W3361	Track Shoe Nut
169		9W3619	Track Shoe Nut
170	21803	9W8328	BOLT-SPROCKET
CATERPILLAR G.E.T. HARDWARE & U/C NUTS, BOLTS			
1		01010-31235	HEX HD BOLT Gr 8.8
2		01010-31435	HEX HD BOLT Gr 8.8
3		01010-32455	HEX HD BOLT Gr 8.8
4		01010-32480	HEX HD BOLT Gr 8.8
5	21848	01010-32490	BOLT- Hex Hd Cl 10.9
6		01010-32490	HEX HD BOLT Gr 8.8
7	21827	01011-62415	BOLT-ROLLER 8.8
8	21847	01011-62710	Bolt (Square Neck)
9		0160-202-783	WASHER (Spring)
10	21834	01803-02026	NUT-Hex
11	21835	01803-02430	NUT Sprocket (Th. Hex)
12		020-90-1270	BOLT- Cutting Edge (Sq Neck)
13	22069	02091-11205	Bolt (SQ Neck)
14	21830	02290-11219	NUT- Hex
15		09244-02508	PIN & SPLIT SLEEVE
16	21825	154-32-21321	Dome Head Hex Bolt
17	21833	154-32-21330	NUT- Hex
18	21826	175-32-11210	BOLT -Shoe
19	21822	175-71-11454	BOLT-EDGE (Plow)
20	21823	175-71-11463	Bolt-END BIT (Plow)
21	21831	175-71-11530	NUT - EDGE
22	21829	178-27-11150	BOLT- Sprocket (D hd)
23	21836	178-32-11220	Nut-Shoe
24		195-27-12632	BOLT- Sprocket (D hd)
25		195-32-11210	BOLT-Shoe
26		195-32-11221	Nut-Shoe (Square)
27	21824	207-32-11310	Dome Head Hex Bolt
28		232-70-12450	Bolt (Square Neck) Plow
29		232-70-12460	Bolt (Square Neck) Plow
30		232-70-12480	NUT-HEX
31	21828	01011-62415	BOLT-ROLLER 10.9

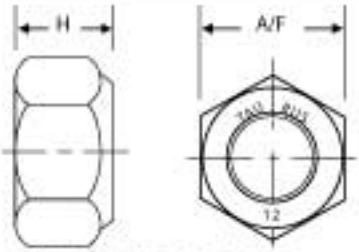
TRACK, MASTER LINK (DOME HEAD) BOLTS & NUTS



SIZE 5/8"	OE PART =	TAURUS CODE	BOLT LENGTH
5/8" - 11UNC	3F5108	21778	2-1/4"(58mm)
	4F3656		2-1/2"(63.5mm)
	4F3658	21779	3"(76mm)
	232-70-12450		2-1/4"(58mm)
	232-70-12460		2-1/2"(63.5mm)
3/4" - 10UNC	4F7827	21780	2-1/4"(58mm)
	5J4773	21781	2-5/8"(66mm)
	5J4771	21782	2-3/4"(70mm)
	1J6762	21783	3-1/8"(80mm)
	020-90-1270		2-3/4"(70mm)
	02091-11205	22069	4-1/8"(105mm)
7/8" - 9UNC	8J2935		3-1/4"(82.5mm)
	2J2548		3-1/2"(89mm)
	175-71-11454	21822	3-1/8"(80mm)
	175-71-11463	21823	3.66"(93mm)
1" - 8UNC	4J9058	21784	3-1/4"(82.5mm)
	4J9208		3-1/2"(89mm)
	8J2928	21785	3-15/16"(100mm)
	01011-62710	21847	3-1/4"(82.5mm)
1-1/4" - 7UNC	6V6535	22407	3-3/4"(95.5mm)
	5P8823	21786	4-3/16"(108mm)
	6V8360	22408	4-1/2"(114.5mm)
	5P8361	21787	5-1/32"(128mm)



HEX NUT



HEX TRAPERED NUT

SIZE	OE PART =	TAURUS CODE	A/F in (mm)	Ht in (mm)
HEX NUT				
5/8" - 11UNC	4K0367	21807	15/16"(23.82)	0.55"(14.00)
3/4" - 10UNC	2J3506	21809	1-1/8"(28.58)	0.64"(16.25)
3/4" - 10UNC	02290-11219	21830	1-1/4"(31.75)	0.75"(19.05)
7/8" - 9UNC	2J3505		1-5/16"(33.33)	0.75"(19.05)
7/8" - 9UNC	175-71-11530	21831	1-5/16"(33.33)	0.75"(19.05)
1" - 8UNC	2J3507	21813	1-1/2"(38.10)	0.86"(21.85)
1-1/4" - 7UNC	3K9770		1-7/8"(47.63)	1.06"(26.92)
HEX TAPERED NUT				
1" - 8UNC	8J2933	21814	1-1/2"(38.10)	0.86"(21.85)
1-1/4" - 7UNC	5P8362	21815	1-7/8"(47.63)	1.06"(26.92)

FOR METRIC BOLTS GRADE MARKING IS 15, 12, 9.

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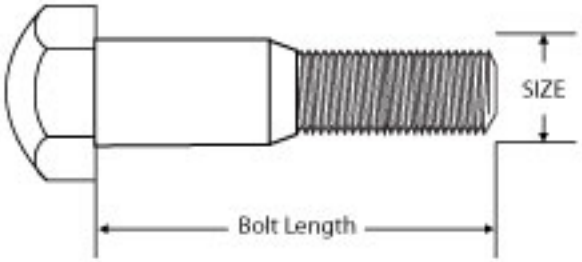
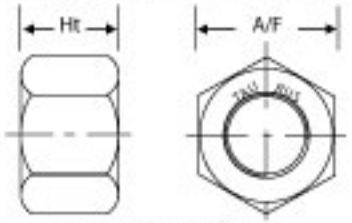
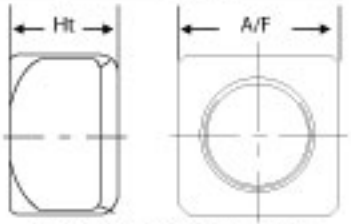
TRACK, MASTER LINK (DOME HEAD) BOLTS & NUTS



SIZE 5/8"	OE PART =	TAURUS CODE	BOLT LENGTH
5/8" - 18UNF	7H3597	21788	2"(51mm)
3/4" - 16UNF	1S1859		2-5/32"(55mm)
	7H3598	21789	2-13/32"(61mm)
	6V1792		2-13/32"(61mm)
	9S1838		4-7/32"(107mm)
	2P9670	22410	4-15/32"(113.5mm)
7/8" - 14UNF	7H3599	21790	2-21/32"(67mm)
	6V1723	21791	3-7/16"(87mm)
	6V1724	21792	3-13/16"(97mm)
	8S0395	22412	4-27/32"(123mm)
	6V1725	21793	5-1/16"(128.5mm)
1"-14UNS	2M5657	21794	2-15/16"(75mm)
	3T6308		3-1/8"(79mm)
	6T2638	21795	3-9/16"(90.5mm)
	6V1726	21796	3-13/16"(97mm)
	6V1727	21797	4-3/8"(111mm)
	7T2283	21798	4-13/16"(122mm)
	8S1723	22413	5-9/16"(141.5mm)
	6V1728	21799	5-13/16"(148mm)
1-1/8"x 12UNF	5P3868		4-3/16"(106.5mm)
M19x1.5P	207-32-11310	21824	55mm
M20x1.5P	9w3619		55mm
	154-32-21321	21825	65mm
M24x1.5P	175-32-11210	21826	76mm
M27x1.5P	195-32-11210		82mm



TRACK NUT (HEX)



TRACK NUT (SQUARE)

SIZE	OE PART =	TAURUS CODE	A/F in (mm)	Ht in (mm)
TRACK NUT (HEX)				
5/8" - 18UNF	7H3607	21808	15/16"(23.82mm)	3/4"(19.05)
3/4" - 16UNF	7H3608	21810	1-1/8"(28.58mm)	3/4"(19.05)
7/8" - 14UNF	7H3609	21811	1-5/16"(33.33mm)	0.86"(21.85)
1" - 14UNS	2M5656	21812	1-1/2"(38.10mm)	1"(25.400)
M19- 1.5P	154-32-21330	21833	30mm	18.50mm
M20- 1.5P	.01803-02026	21834	30mm	23.50mm
TRACK NUT (SQUARED)				
5/8" -18UNF	1M1408		24.75mm	0.72"(18.30)
3/4" -16UNF	121860	21816	28.25mm	0.75"(19.05)
7/8" -14UNF	2S2140	21817	33.40mm	0.91"(23.10)
1" -14UNS	1S26421	21811	38mm	1"(25.40)
M19- 1.5P	178-32-11220	21818	34.90mm	24.25mm
M20- 1.5P	195-32-11221	21836	40.90mm	27.10mm

FOR METRIC BOLTS GRADE MARKING IS 15, 12, 9.

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