PRIME INDUSTRIAL FASTENERS

FASTENER TECHNICAL DATA AND CHARTS

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INDUSTRY STANDARDS AND SPECIFICATIONS

INDUSTRY STANDARDS

Most industrial fasteners are covered by two basic standards: one for materials and properties; the other, for dimensions and tolerances. Specifications for materials and properties are published by the American Society for Testing and Materials (ASTM), although other groups such as the Society of Automotive Engineers (SAE) also publish specifications covering these requirements.

Standards for dimensions and tolerances are issued by the American National Standards Institute (ANSI) in cooperation with the American Society of Mechanical Engineers (ASME) and the Industrial Fasteners Institute (IFI).

Where applicable, published specifications covering a particular fastener will be referenced in the section of this booklet dealing with that fastener.

When referring to standards and specifications, we will use only the well-known initials of the above societies-ANSI, ASME, IFI, ASTM and SAE.

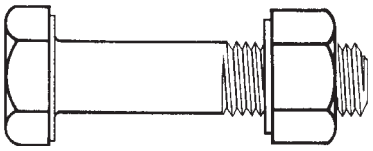
Standard fasteners are basic industrial fasteners - square and hex bolts, cap screws, carriage bolts, plow bolts, lag screws, studs, nuts, rivets and others - which have been standardized over the years as to type', style, usage, properties, dimensions and tolerances.

These include a vast range of sizes and types stocked by distributors and manufacturers for an almost limitless range of applications: the assembly and maintenance of vehicles, appliances, farm equipment, construction equipment, industrial and plant machinery of all kinds, furniture and toys.

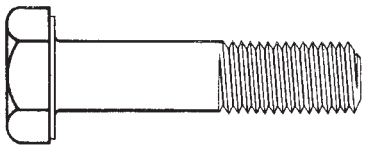
Wherever there's a need for holding parts together, holding them apart, holding them up, or holding them down, a standard fastener can usually be found to do the job efficiently and economically.

Modern industrial fasteners are manufactured to a variety of standards covering dimensions, tolerances, materials, mechanical properties, testing procedures, etc.

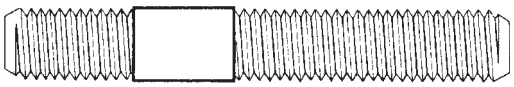
BASIC FASTENER TYPES



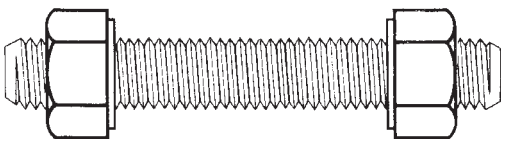
A *Bolt* is a device with a head on one end of a shank or body and a thread on the other end. Designed for insertion through holes in assembly parts, it is mated with a tapped nut. Tension is normally induced in the bolt to compress the assembly by rotating the nut. This may also be done by rotation of the bolt head.



A *Screw* is a headed and threaded bolt used without a nut. It is inserted into an internally tapped hole and tension is induced by rotation of the screw head.



A *Stud* is a fastener with no head but it has threads at both ends of the shank. It, like a screw, has one end that screws into a tapped hole. A nut is used on the other end to create tension.

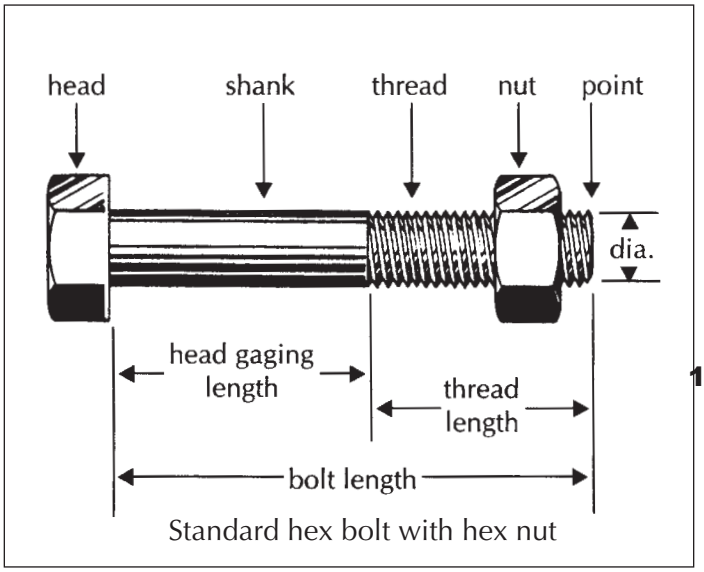


If a stud is threaded its entire shank length and a nut used on both ends to create tension, it serves the function of a bolt and is then classified as a *Stud Bolt.*

PRIME INDUSTRIAL FASTENERS

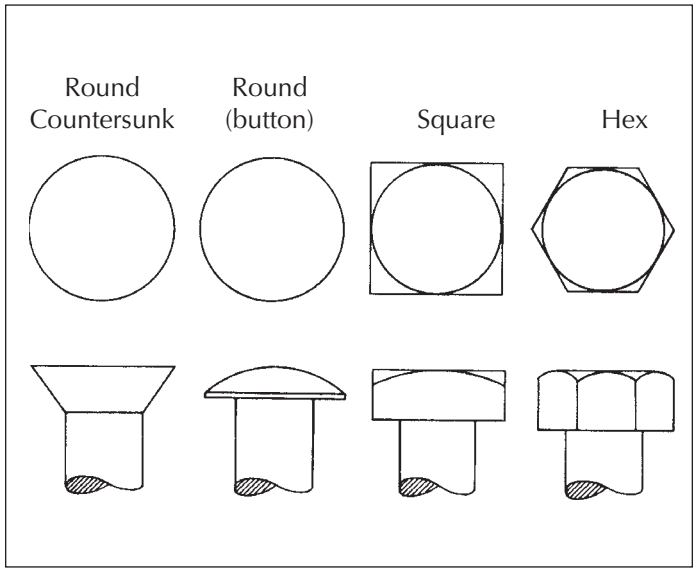
BASIC FASTENER DATA

TERMINOLOGY AND MEASUREMENTS



Standard hex bolt with hex nut

STYLES OF HEAD



The diameter of all bolts is measured as the outside of major diameter of the thread. The length of a headed bolt is measured from the largest diameter of the bearing surface of the head to the extreme end of the point in a line parallel to the axis of the bolt. For example, square or hex head bolts are measured from under the head to the end of the bolt; a bolt with a countersunk head is measured overall. The point of a bolt is always included in the measured length. Headless fasteners such as studs are measured overall, including points, except for continuous-thread alloy studs made to ASTM Specification A193. This type is measured from first thread to first thread.

Bolts have various styles of heads. Some of the more popular styles are illustrated above.

HEAVY HEADS AND NUTS

Bolt users may require a bolt head or nut of greater width to compensate for wide clearance in bolt holes or unusually heavy loading. For such needs we offer heavy bolt heads and nut sizes. Heavy nuts are quite common and readily available in various types and sizes but heavy head bolts have more limited availability.

BOLT AND NUT BEARING SURFACES

Cold-upset bolts made on a "boltmaker" usually are washer faced but large or very long bolts may have a flat face (not machined). Nuts made on cold "nut-formers" may have double chamfered or washer faces. Large size nuts have hot-forged washer bearing faces, not machined, unless specially ordered.

HEAT TREATMENT

Heat treatment covers various techniques that may be used to develop certain end-product characteristics. Customary procedures for fasteners include annealing, stress relieving, case hardening, direct quench and temper, and carbon restoration.

ANNEALING

A thermal cycle involving heating to, and holding at a suitable temperature and then cooling at a suitable rate, for such purposes as reducing hardness, improving machinability, facilitating cold working, producing a desired microstructure, or obtaining desired mechanical or other properties.

STRESS RELIEVING

A thermal cycle involving heating to a suitable temperature, usually 1000/1200°F, holding long enough to reduce residual stresses from either cold deformation or thermal treatment, and then cooling slowly enough to minimize the development of new residual stresses.

CASE HARDENING

A term descriptive of one or more processes of hardening steel in which the outer portion, or case, is made substantially harder than the inner portion, or core. Most of the processes involve either enriching the surface layer with carbon and/or nitrogen, usually followed by quenching and tempering, or the selective hardening of the surface layer by means of flame or induction hardening.

QUENCHING AND TEMPERING

A thermal process used to increase the hardness and strength of steel. It consists of austenitizing, then cooling at a rate sufficient to achieve partial or complete transformation to martensite. Tempering should follow immediately, and involves reheating to a temperature below the transformation range and then cooling at any rate desired. Tempering improves ductility and toughness, but reduces the quenched hardness by an amount determined by the tempering temperature used.

MECHANICAL PROPERTIES

Standard industrial fasteners are manufactured from either carbon or alloy steels. When strength requirements are moderate, low-carbon steel is used. High-strength fasteners are made from medium-high carbon or alloy steels and are heat treated to develop desired properties. Most fasteners are covered by specifications that define required mechanical properties such as tensile strength, yield strength, proof load, and hardness.

TENSILE STRENGTH

The maximum tensile stress in pounds per sq. in. which a material is capable of sustaining, as developed by a tension test.

YIELD STRENGTH

The stress at which a material exhibits a specified deviation from the proportionality of stress to strain. The deviation is expressed in terms of strain, and in the offset method, usually a strain of 0.2 percent is specified.

PROOF LOAD

The point to which a material may be stressed without evidence of permanent deformation.

HARDNESS

The resistance of a material to plastic deformation. Usually measured in steels by the Brinell, Rockwell, or Vickers indentation-hardness text methods.

SCREW THREADS

THREAD FORMS

Screw threads are spiral grooves produced on the outside of a bolt (external threads) or machined inside a nut (internal threads). Four thread forms have been established by the ANSI: UN (internal and external threads). UNR (external threads only), UNK (external threads only), UNJ (internal and external threads).

CUT VS. ROLLED THREADS

The terms “rolled thread” and “cut thread” refer solely to the physical characteristics of commercial bolts or studs, not to the method of thread production. A cut-thread bolt has a shank diameter equal to the threaded diameter; a rolled-thread bolt has a shank diameter less than the threaded diameter.

CLASSES OF THREAD FIT

Classes of thread fit are distinguished from each other by the amounts of tolerance specified. Classes 1A, 2A, and 3A apply to external threads; Classes 1B, 2B and 3B, to internal threads.

Classes 1A and 1B are shown in ANSI standards but are rarely used. Most standard fasteners are produced with a Class 2A fit for bolts and a Class 2B fit for nuts. The Class 2A allowance assures easier assembly of mating parts, minimizes galling and seizing in high-cycle wrench assembly, and can be used to accommodate commercial electroplated finishes. Classes 3A and 3B afford no allowance or clearance for mating parts and are used chiefly for applications where a close tolerance fit is important.

Class 5 is a special interference fit which results in an actual overlap of dimensions when threaded parts are fitted together. It is normally used only on the tap-end of studs.
Threading requirements are designated (1) by the number of threads per inch applied to a specific diameter; (2) by the initial letters of the thread standard (UNR or UN); (3) by the letters C, F, or numeral 8 to indicate coarse-, fine-, or 8-thread series; and (4) by the thread fit. The following example illustrates the method of designating a screw thread:

1/2 in. -13 UNRC-2A

where

1/2 in.	=	nominal diameter of thread
13	=	number of threads per inch
UNR	=	thread form standard (Unified National Radius-Root)
C	=	coarse-thread series
2A	=	class of thread fit

The coarse-thread series (UNRC or UNC) is used on the vast majority of bolts and nuts. Number of threads per inch ranges from 20 threads for a 1/4-in.- diameter bolt to 4 threads for a 4-in.-diameter bolt. The fine-thread series (UNRF or UNF) is found mostly in automotive and aeronautical work. Threads per inch range from 28 threads for a 1/4-in.-diameter bolt to 12 threads for a 1-1/2-in.-diameter bolt. There is no fine-thread standard for fasteners over 1-1/2 in.

The 8-thread series (8UNR or 8UN) is used only for sizes over 1 in. in diameter, usually in high-temperature, high pressure service.

STANDARD STAINLESS STEEL SPECIFICATIONS

Type 301: Cr. 18, Ni. 8 (18-8 type), austenitic, hardenable by cold work only; t.s., 80-270,000 psi: y.s. 30-240,000 psi.; elongation in 2 in., 40-5%. In rods, bars, billets, wire, sheet, plate, strip and tubing. For parts requiring good corrosion resistance combined with high tensile strength and good ductility.

Type 302: Cr. 18, Ni. 8 (18-8 type), austenitic, hardenable by cold work only; t.s. 80-250,000 psi.; y.s. 30-225,000 psi.; elongation in 2 in., 60-5%; fair machinability excellent cold forming and welding properties. Furnished in sheet, strip, plate, bar, rod, forging billets and tube rounds, tubing, cold drawn shapes and structural shapes. For parts in acid handling food and dairy equipment; shafting, bearing plates, heat exchanger tubes, hydraulic tubing, piston rods, plungers, etc.

Type 303: Cr. 18, Ni. 8 (18-8 type), austenitic, hardenable by cold work only; t.s., 80-200,000 psi.; y.s. 30-135,000 psi.; elong. in 2 in. 55-10%; good machinability; fair cold forming and welding properties. In sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn and structural shapes. For working parts in pumps and valves which must resist corrosion; screw machine parts requiring strength, good corrosion resistance.

Type 304: Cr. 18, Ni. 8 (18-8 type), austenitic, hardenable by cold work only; t.s., 85-250,00 psi; y.s., 30-225,000 psi; elongation in 2 in. 60-5%; slightly better corrosion resistance than Type 302. Furnished in rods, bars, billets, wire, sheet, plate strip, tubing and castings. For parts in chemical equipment such as shafting, bearing plates, heat exchanger tubes, etc.

Type 309: Cr. 25, Ni. 12 (25-12 type), austenitic, hardenable by cold work only; t.s., 95-190,000 psi.; y.s. 45-165,000 psi.; elong. in 2 inches, 50-5%; resists scaling to 2000°F, fair machinability, good cold C forming properties, excellent weldability. Furnished in sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn shapes and structural shapes. For parts that must operate continuously at high temperatures; oil burner parts, furnace parts, heat exchangers, air heaters, baffle plates, etc.

Type 310: Cr. 25, Ni. 20 (25-20 type), austenitic, hardenable by cold work only; t.s., annealed, 70-155,000 psi.; elong. in 2 in., 55-5% good weldability, drawing, stamping properties; fair machinability. In sheet, strip, plate, bar, rod, forging billet, tube rounds, tubing, cold drawn, structural shapes. For parts subject to intermittent heating and cooling; oil burner parts, heat exchangers; dye house, paper mill, chemical equipment.

Type 316: Cr. 18, Ni. 12, No. 3 (18-12-3 type), austenitic, hardenable by cold work only; t.s., 80-170,000 psi; y.s., 35-150,000 psi; elong. in 2 in., 55-5% fair machinability; excellent welding, cold forming properties. Best creep strength at high temp. and best corrosion resistance of all grades. In sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn and structural shapes.

Type 321: Cr. 18, Ni. 8, Ti. 4 x C min.; austenitic hardenable by cold work only; t.s., 80-170,000 psi.; y.s., 30-145,000 psi.; elong. in 2 in., 55-5%; fair machinability, excellent welding and cold forming properties. In sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn shapes, structural shapes. For welded parts not annealed after welding or which operate at 800-1200°F; aircraft engine exhaust rings, flanges, etc.

Type 347: Cr. 8, Ni. 18, Cr. 8 x C min.; austenitic, hardenable by cold work only; t.s. 80-170,000 psi.; y.s., 30-150,000 psi.; elong. in 2 in. 50-5%; fair machinability, excellent welding and cold forming properties. In sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing cold drawn and structural shapes. For welded parts not annealed after welding or which operate at 800-1200°F; aircraft engine exhaust rings, flanges, etc.

Type 410: Cr. 12 (straight chromium type), hardenable by heat treatment; t.s., 60-180,000 psi: y.s.30-160,000 psi.; elong. in 2 in., 30-15%, good machinability, cold forming properties; good welding properties when annealed; most popular forging grade. In sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn and structural shapes. Used where corrosion not severe, for bolts, nuts, shafting turbine blading, valve trim, heat treated parts; where hardness, toughness, desired.

Type 416: Cr. 12 (straight chromium type with sulphur or selenium added); excellent machinability; t.s., 70-170,000 psi; y.s., 4-140,000 psi; elong. in 2 in. 30-10%; fair cold forming properties, fair corrosion resistance. In bar, rod, forging billets, wire, cold drawn shapes. For mass production machined parts; Carburetor, instrument and electrical parts; screw machine parts.

Type 420: Cr. 13, C. 35; a widely used stainless cutlery steel. In the hardened and tempered condition, it combines an adequate hardness and cutting edge with good flexibility. It retains a bright polished finish and can be hardened io Rockwell C55. Maximum corrosion resistance is obtained in the hardened condition.

Type 420F: Cr. 13, C.35; free machining; has sulphur intentionally added to the base Type 420 analysis to make it easier to machine, grind and polish. Type 420°F has practically the same mechanical hardness, and corrosion resisting properties as Type 420.

Type 430: Cr. 17 (straight chromium type), non-hardenable by heat treatment; resists scaling to 1500°F; excellent cold heading properties, excellent machinability; does not discolor in atmosphere. t.s., 60-85,000 psi.: y.s. 35-55,000 psi.; elongation in 2 in. 35-20%. Furnished in sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn shapes and structural shapes. For press plates, oil burner parts, screw machine parts, trim for automobiles such as body moldings, hub caps, finishing washers, gas tank caps, etc.; also trim for appliances.

Type 430F: Cr. 17 with 0.07 S. or Se.; straight chromium free machining type, non-hardenable by heat treatment; t.s., 60-85,000 psi.: 35-55,000 psi.: elong. in 2 in., 25-10% excellent machinability, fair cold forming properties. In forging billets, hot-rolled and cold-finished bars, wire and polished shafting. Particularly suitable for parts requiring considerable machining and only moderate corrosion resistance; screw machine parts.

Type 431: Cr. 16, Ni. 2 (straight chromium type), hardenable by heat treatment: t.s., 110-200,000 psi.; 80-150,000 psi.; elongation in 2 in., 20-15%: good machinability; fair cold forming properties: resists scaling to 1500°F. Best corrosion resistance of all hardenable stainless steels. Furnished in sheet, strip, plate, bar, rod, forging billets, tube rounds, tubing, cold drawn shapes, structural shapes. For parts requiring excellent physical properties coupled with high corrosion resistance.

Type 440 C and 440 A, B and C: Cr. 17, C 1.00 (straight chromium type) hardenable by heat treatment: t.s., 110-285,000 psi; 60-275,000 psi.: elong. in 2 in., 15-21%; fair machinability., cold forming properties. Types A, B, same analysis except for lower carbon content: less hardenable; Type F, free machining. In sheet, strip, plate, bar, rod, forging billets, tube round tubing, cold drawn and structural shapes; needle, ball check valves; ball bearings, scissors, rules, cutlery, etc.

Types 501 and 502: Type 501, 4/6 Cr. plus Mo. over .10 C. Type 502, 4/6 Cr. plus Mo., over .10 C. maximum. Both types are recommended for use in the petroleum industry. In refinery equipment, particularly where sour crudes are encountered, a life of four to ten times that of mild steel is not uncommon. These alloys are suitable for use at slightly elevated temperatures, and are more resistant to scaling or oxidation that is mild steel. Scaling temperature about 1150° Fahrenheit.

BRASS

DESCRIPTION:
Brass, composed nominally of Copper and Zinc, is the most common copper-base alloy. Its uses are myriad since it is relatively inexpensive, is easily worked into any shape or form and possesses strength, toughness and good corrosion resistance.

CHARACTERISTICS:
Cold drawn Brass has an even greater tensile strength than mild Carbon Steel. It is both tough and malleable, qualities that make it particularly desirable for fasteners. It is immune to rust with generally high resistance to corrosion. It takes a high, lustrous finish and is non-magnetic.

USES:
Fastenings made from Brass and related alloys are widely used in electrical communications equipment, builders' hardware, marine hardware, a wide variety of out-of-doors assemblies, uncountable consumer, industrial and scientific products and for general use where a rustproof bolt or screw is required.

SILICON BRONZE

DESCRIPTION:
Silicon Bronze is the generic term used for various types of Copper-Silicon alloys. The most common of these are Everdur, Duronze, Herculoy, PMG Metal and Olympic Bronze. The properties of these trade named alloys are all basically the same with high percentages of Copper and small amounts of Silicon, Manganese or Aluminum added for strength. Lead is also added for free machining qualities where required.

CHARACTERISTICS:
Silicon Bronze possesses high tensile strength superior to mild Steel. It has high resistance to corrosive influences such as extreme temperatures, atmospheric conditions, natural and sea water, gases and sewage. It is non-magnetic and has excellent machining and working characteristics.

USES:
Pole line hardware, switchgear equipment, sewage disposal, marine applications, water meters, valves and systems, chemical, plumbing and liquid handling equipment, food machinery, petroleum processing and all applications where exposure to the elements is a factor.

STAINLESS STEEL

DESCRIPTION:
Stainless Steels are broadly defined as Iron alloys containing from 12 to 30% Chromium and from 0 to 20% Nickel. This analysis is further modified by additions of Carbon and other minor elements which contribute specific effects either to control mechanical properties or to improve corrosion resistance. The corrosion resistance of Stainless Steels is attributed to a surface phenomenon, passivity. When oxygen comes in contact with the surface it forms an invisible film which protects the underlying metal from rusting and corrosion under severe environment.

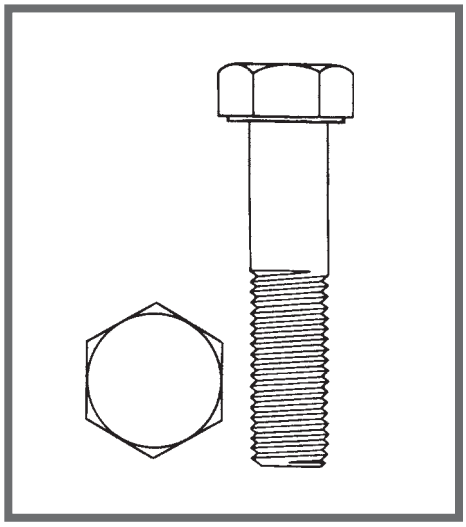
CHARACTERISTICS:
The family of Stainless Steels is divided into three general classifications:
"Austenitic" Stainless Steels make up the general group of the 18-8 (or 300) series. They are the Chromium-Nickel type containing upwards of 8% Nickel. They are not hardenable by heat treatment, non-magnetic for practical purposes and offer the greatest degree of corrosion resistance.
"Martensitic" Stainless Steels contain from 12 to 20% Chromium. They are magnetic and hardenable. Type 410 and 416, common fastening alloys, are Martensitic Stainless Steels.
"Ferritic" alloys are also Chromium Stainless Steel alloys. They are magnetic and not hardenable by heat treatment. Type 430 is an example.

USES:
There are almost as many uses for Stainless Steel fastenings as there are problems of corrosion, temperature and strength. Because of its high tensile strength, corrosion resistant qualities and ability to attain a mirror-like finish it is one of the most versatile of all metals. Applications include its use in the petroleum, chemical, food, plumbing, transportation and oil equipment industries to mention just a few. Listed on page 152 are the types of various Stainless Steel alloys which are most frequently used in the manufacture of fastenings.

PRIME INDUSTRIAL FASTENERS

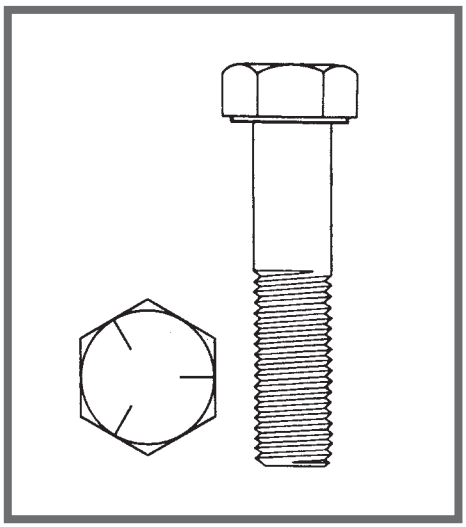
CAP SCREWS

SAE STANDARD J429 - GRADES 2, 5 AND 8



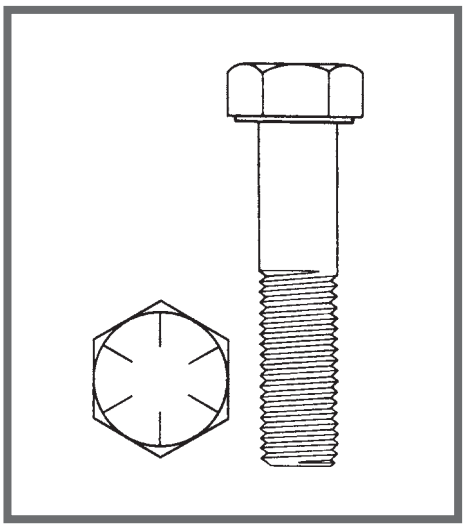
GRADE 2

Low-carbon bright 1/4 in. to 1 1/2 in. inclusive, with minimum tensile strength of 74,000 psi in diameters through 3/4 in. and 60,000 psi for diameters over 3/4 in. through 1 1/2 in.



GRADE 5

Medium-carbon, heat treated in a carbon controlled atmosphere, 1/4 in. to 1 1/2 in., inclusive, with minimum tensile strength of 120,000 psi in diameters through 1 in. and 105,000 psi for diameters over 1 in. through 1 1/2 in. Grade 5 will also meet other specifications such as ASTM A449.



GRADE 8

Alloy, heat treated in a carbon controlled atmosphere, 1/4 in. to 1 in., inclusive, with minimum tensile strength of 150,000 psi. Grade 8 will also meet ASTM specification A354 Grade BD.

NOTICE TO FINE THREAD USERS!

Grade 2 is not recommended for use with fine threads.

We suggest the use of Grade 5 or better because of superior resistance to stripping during tightening. Grade 2 may be used as an alternate for ASTM A307 Grade A.



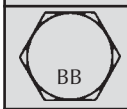
Prime Industrial Fasteners focuses on quality, customer service and pricing.

We are open to the public offering an extensive range of products in stock, free daily local deliveries, export services, private labeling, and a friendly knowledgeable staff with over 20 years of experience.

PRIME INDUSTRIAL FASTENERS

IDENTIFICATION MARKINGS ON BOLT HEADS

ASTM AND SAE STANDARDS - SPECIFICATIONS - PROOF LOADS - TENSILE STRENGTHS

Grade Marking	Specification	Material	Bolt and Screw Size (Inches)	Proof Load psi	Tensile Strength min. psi
	SAE-J429 Grade 1	Low or Medium Carbon Steel	1/4 thru 1-1/2	33,000	60,000
	ASTM-A307		1/4 thru 4		60,000
	SAE-J429 Grade-2	Low or Medium Carbon Steel	1/4 thru 3/4 Over 3/4 thru 1-1/2	55,000 33,000	74,000 60,000
	SAE-J429 Grade 5	Medium Carbon Steel Quenched and Tempered	1/4 thru 1 Over 1 thru 1-1/4	85,000 74,000	120,000 105,000
	ASTM-A449		1/4 thru 1 Over 1 thru 1-1/2 Over 1-1/2 thru 3	85,000 74,000 55,000	120,000 105,000 90,000
	ASTM-A325 Type 1	Medium Carbon Steel Quenched and Tempered	1/2 thru 1-1/2 Over 1 thru 1-1/2	85,000 74,000	120,000 105,000
	ASTM-A325 Type 3	Weather Resistant Steel Quenched and Tempered	1-1/8 thru 1-1/2 1/2 thru 1	74,000 85,000	105,000 120,000
	ASTM-A354 Grade BB	Low Alloy Steel Quenched and Tempered	1/4 thru 2-1/2 Over 2-1/4 thru 4	80,000 75,000	105,000 100,000
	ASTM-A354 Grade BC	Alloy Steel Quenched and Tempered	1/4 thru 4 Over 2-1/2 thru 4	105,000 95,000	125,000 115,000
	SAE-J429 GRADE 8	Medium Carbon Alloy Steel Quenched and Tempered	1/4 thru 1-1/2	120,000	150,000
	ASTM-A354 Grade BD	Alloy Steel Quenched and Tempered			
	ASTM-A490 Type 1	Alloy Steel Quenched and Tempered	1/2 thru 1-1/2	120,000	150,000

*Radial lines on Type 1 bolts are optional to manufacturer.

Bolt Head markings include manufacturers identity symbols.

CAP SCREWS - SAEJ429

PROOF LOAD AND TENSILE STRENGTH REQUIREMENTS

COARSE THREAD SERIES — UNC

Nominal Dia. Of Products And Threads Per Inch	Grade 2		Grade 5		Grade 8	
	Proof Load, Lb.	Tensile Strength Min., Lb.	Proof Load, Lb.	Tensile Strength Min., Lb.	Proof Load, Lb.	Tensile Strength Min., Lb.
1/4 - 20	1,750	2,350	2,700	3,800	3,800	4,750
5/16 -18	2,900	3,900	4,450	6,300	6,300	7,850
3/8 - 16	4,250	5,750	6,600	9,300	9,300	11,600
7/16 - 14	5,850	7,850	9,050	12,800	12,800	15,900
1/2 - 13	7,800	10,500	12,100	17,000	17,000	21,300
9/16 - 12	10,000	13,500	15,500	21,800	21,800	27,300
5/8 - 11	12,400	16,700	19,200	27,100	27,100	33,900
3/4 - 10	18,400	24,700	28,400	40,100	40,100	50,100
7/8 - 9	15,200	27,700	39,300	55,400	55,400	69,300
1 - 8	20,000	36,400	51,500	72,700	72,700	90,900
1-1/8 - 7	25,200	45,800	56,500	80,100	91,600	114,400
1-1/4 - 7	32,000	58,100	71,700	101,700	116,300	145,400
1-3/8 - 6	38,100	69,300	85,500	121,300	138,600	173,200
1-1/2 - 6	46,400	84,300	104,000	147,500	168,600	210,800

FINE THREAD SERIES — UNF

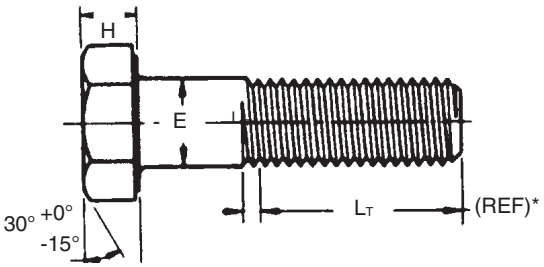
Nominal Dia. Of Products And Threads Per Inch	Grade 2		Grade 5		Grade 8	
	Proof Load, Lb.	Tensile Strength Min., Lb.	Proof Load, Lb.	Tensile Strength Min., Lb.	Proof Load, Lb.	Tensile Strength Min., Lb.
1/4 - 28	2,000	2,700	3,100	4,350	4,350	5,450
5/16 - 24	3,200	4,300	4,900	6,950	6,950	8,700
3/8 - 24	4,800	6,500	7,450	10,500	10,500	13,200
7/16 - 20	6,550	8,800	10,100	14,200	14,200	17,800
1/2 - 20	8,800	11,800	13,600	19,200	19,200	24,000
9/16 - 18	11,200	15,000	17,300	24,400	24,400	30,400
5/8 - 18	14,100	18,900	21,800	30,700	30,700	38,400
3/4 - 16	20,500	27,600	31,700	44,800	44,800	56,000
7/8 - 14	16,800	30,500	43,300	61,100	61,100	76,400
1 - 12	21,900	39,800	56,400	79,600	79,600	99,400
1 - 14 uns	22,400	40,700	57,700	81,500	81,500	101,900
1 - 1/8 - 12	28,200	51,400	63,300	89,900	102,700	128,400
1 - 1/4 - 12	35,400	64,400	79,400	112,700	128,800	161,000
1 - 3/8 - 12	43,400	78,900	97,300	138,100	157,800	197,200
1 - 1/2 - 12	52,200	94,900	117,000	166,000	189,700	237,200

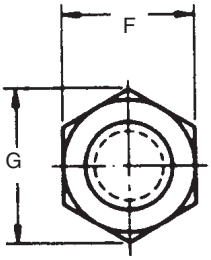
SAE GRADES 2, 5 AND 8 SUGGESTED TORQUE VALUES AND CLAMP LOADS

Nominal Diameter And TPI (Inches)	Thread Stress Area (Sq. In.)	Grade 2		Grade 5		Grade 8	
		Clamp Load 60-90% Proof (Pounds)	Tightening Torque (Ft.-Lbs.)	Clamp Load 60-90% Proof (Pounds)	Tightening Torque (Ft.-Lbs.)	Clamp Load 60-90% Proof (Pounds)	Tightening Torque (Ft.-Lbs.)
1/4 - 20	0.0318	1,049 - 1,574	4 - 7	1,622 - 2,433	7 - 10	2,290 - 3,434	10 - 14
1/4 - 28	0.0364	1,201 - 1,802	5 - 8	1,856 - 2,785	8 - 12	2,621 - 3,931	11 - 16
5/16 - 18	0.0524	1,729 - 2,594	9 - 14	2,672 - 4,009	14 - 21	3,773 - 5,659	20 - 29
5/16 - 24	0.0580	1,914 - 2,871	10 - 15	2,958 - 4,437	15 - 23	4,176 - 6,264	22 - 33
3/8 - 16	0.0775	2,558 - 3,868	16 - 24	3,953 - 5,929	25 - 37	5,580 - 8,370	35 - 52
3/8 - 24	0.0878	2,897 - 4,346	18 - 27	4,478 - 6,717	28 - 42	6,322 - 9,482	40 - 59
7/16 - 14	0.1063	3,508 - 5,262	26 - 38	5,421 - 8,132	40 - 59	7,654 - 11,480	56 - 84
7/16 - 20	0.1187	3,917 - 5,876	29 - 43	6,054 - 9,081	44 - 66	8,546 - 12,820	62 - 93
1/2 - 13	0.1419	4,683 - 7,024	39 - 59	7,237 - 10,855	60 - 90	10,217 - 15,325	85 - 128
1/2 - 20	0.1599	5,277 - 7,915	44 - 66	8,155 - 12,232	68 - 102	11,513 - 17,269	96 - 144
9/16 - 12	0.1820	6,006 - 9,009	56 - 84	9,282 - 13,923	87 - 131	13,104 - 19,656	123 - 184
9/16 - 18	0.2030	6,699 - 10,049	63 - 94	10,353 - 15,530	97 - 146	14,616 - 21,924	137 - 206
5/8 - 11	0.2260	7,458 - 11,187	78 - 117	11,526 - 17,289	120 - 180	16,272 - 24,408	170 - 254
5/8 - 18	0.2560	8,448 - 12,672	88 - 132	13,056 - 19,584	136 - 204	18,432 - 27,648	192 - 288
3/4 - 10	0.3340	11,022 - 16,533	138 - 207	17,034 - 25,551	213 - 319	24,048 - 36,072	301 - 451
3/4 - 16	0.3730	12,309 - 18,464	154 - 231	19,023 - 28,535	238 - 357	26,856 - 40,284	336 - 504
7/8 - 9	0.4620	15,246 - 22,869	222 - 334	23,562 - 35,343	344 - 515	33,264 - 49,896	485 - 728
7/8 - 14	0.5090	16,797 - 25,196	245 - 367	25,959 - 38,939	379 - 568	36,648 - 54,972	534 - 802
1 - 8	0.6060	19,998 - 29,997	333 - 500	30,906 - 46,359	515 - 773	43,632 - 65,448	727 - 1,091
1 - 14	0.6790	22,407 - 33,611	373 - 560	34,629 - 51,944	577 - 866	48,888 - 73,332	815 - 1,222
1-1/8 - 7	0.7630	25,179 - 37,769	472 - 708	33,877 - 50,816	635 - 953	54,936 - 82,404	1,030 - 1,545
1-1/8 - 12	0.8560	28,248 - 42,372	530 - 794	38,006 - 57,010	713 - 1,069	61,632 - 92,448	1,156 - 1,733
1-1/4 - 7	0.9690	31,977 - 47,966	666 - 999	43,024 - 64,535	896 - 1,344	69,768 - 104,652	1,454 - 2,180
1-1/4 - 12	1.0730	35,409 - 53,114	738 - 1,107	47,641 - 71,462	993 - 1,489	77,256 - 115,884	1,610 - 2,414

PRIME INDUSTRIAL FASTENERS

HEX HEAD CAP SCREWS





* BASIC THREAD LENGTH, L_T, is a reference dimension, intended for calculation purposes only, which represents the distance from the extreme end of the screw or bolt to the last complete (full form) thread.

Nominal Size Or Basic Screw Dia.	E		F			G		H			L_T (Ref.)*	
	Body Dia.		Width Across Flats			Width Across Corners		Height			Thread Lengths For Screw Length	
											≤6 in.	≥.6 in.
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Basic	Basic
1/4	0.2500	0.2450	7/16	0.438	0.428	0.505	0.488	5/32	0.163	0.150	0.750	1.000
5/16	0.3125	0.3065	1/2	0.500	0.489	0.577	0.557	13/64	0.211	0.195	0.875	1.125
3/8	0.3750	0.3690	9/16	0.562	0.551	0.650	0.628	15/64	0.243	0.226	1.000	1.250
7/16	0.4375	0.4305	5/8	0.625	0.612	0.722	0.698	9/32	0.291	0.272	1.125	1.375
1/2	0.5000	0.4930	3/4	0.750	0.736	0.866	0.840	5/16	0.323	0.302	1.250	1.500
9/16	0.5625	0.5545	13/16	0.812	0.798	0.938	0.910	23/64	0.371	0.348	1.375	1.625
5/8	0.6250	0.6170	15/16	0.938	0.922	1.083	1.051	25/64	0.403	0.378	1.500	1.750
3/4	0.7500	0.7410	1 1/8	1.125	1.100	1.299	1.254	15/32	0.483	0.455	1.750	2.000
7/8	0.8750	0.8660	1 5/16	1.312	1.285	1.516	1.465	35/64	0.563	0.531	2.000	2.250
1	1.0000	0.9900	1 1/2	1.500	1.469	1.732	1.675	39/64	0.627	0.591	2.250	2.500
1 1/8	1.1250	1.1140	1 11/16	1.688	1.631	1.949	1.859	11/16	0.718	0.658	2.500	2.750
1 1/4	1.2500	1.2390	1 7/8	1.875	1.812	2.165	2.066	25/32	0.813	0.749	2.750	3.000
1 3/8	1.3750	1.3630	2 1/16	2.062	1.994	2.382	2.273	27/32	0.878	0.810	3.000	3.250
1 1/2	1.5000	1.4880	2 1/4	2.250	2.175	2.598	2.480	15/16	0.974	0.902	3.250	3.500
1 3/4	1.7500	1.7380	2 5/8	2.625	2.538	3.031	2.893	1 3/32	1.134	1.054	3.750	4.000
2	2.0000	1.9880	3	3.000	2.900	3.464	3.306	1 7/32	1.263	1.175	4.250	4.500
2 1/4	2.2500	2.2380	3 3/8	3.375	3.262	3.897	3.719	1 3/8	1.423	1.327	4.750	5.000
2 1/2	2.5000	2.4880	3 3/4	3.750	3.625	4.330	4.133	1 17/32	1.583	1.479	5.250	5.500
2 3/4	2.7500	2.7380	4 1/8	4.125	3.988	4.763	4.546	1 11/16	1.744	1.632	5.750	6.000
3	3.0000	2.9880	4 1/2	4.500	4.350	5.196	4.959	1 7/8	1.935	1.815	6.250	6.500

A325 BOLTS, NUTS AND WASHERS

BOLT DIMENSIONS

Nominal Size of Basic Bolt Dia.	E		F			G		H			R		L_T (Ref)	Y (Ref)	Runout of Bearing Surface FIR
	Body Diameter		Width Across Flats			Width Across Corner		Height			Radius Of Fillet		Thread Length	Transition Thread Length	
	Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Max
1/2 0.5000	0.515	0.482	7/8	0.875	0.850	1.010	0.969	5/16	0.323	0.302	0.031	0.009	1.00	0.19	0.016
5/8 0.6250	0.642	0.605	1-1/16	1.062	1.031	1.227	1.175	25/64	0.403	0.378	0.062	0.021	1.25	0.22	0.019
3/4 0.7500	0.768	0.729	1-1/4	1.250	1.212	1.443	1.383	15/32	0.483	0.455	0.062	0.021	1.38	0.25	0.022
7/8 0.8750	0.895	0.852	1-7/16	1.438	1.394	1.660	1.589	35/64	0.563	0.531	0.062	0.031	1.50	0.28	0.025
1 1.0000	1.022	0.976	1-5/8	1.625	1.575	1.876	1.796	35/64	0.627	0.591	0.093	0.062	1.75	0.31	0.028
1-1/8 1.1250	1.149	1.098	1-13/16	1.812	1.756	2.093	2.002	11/16	0.718	0.658	0.093	0.062	2.00	0.34	0.032
1-1/4 1.2500	1.277	1.223	2	2.000	1.938	2.309	2.209	25/32	0.813	0.749	0.093	0.062	2.00	0.38	0.035
1-3/8 1.3750	1.404	1.345	2-3/16	2.188	2.119	2.526	2.416	27/32	0.878	0.810	0.093	0.062	2.25	0.44	0.038
1-1/2 1.5000	1.531	1.470	2-3/8	2.375	2.300	2.742	2.622	15/16	0.974	0.902	0.093	0.062	2.25	0.44	0.041

ASTM F436 WASHER DIMENSIONS

Bolt Size E	Circular Washers				Square or Rectangular Beveled Washers for American Standard Beams and Channels		
	Nominal Outside Diameter	Nominal Diameter of Hole	Thickness		Minimum Side Dimension	Mean Thickness	Slope or Taper in Thickness
			Min.	Max.			
1/2	1-1/16	17/32	0.097	0.177	1-3/4	5/16	1:6
5/8	1-5/16	11/16	0.122	0.177	1-3/4	5/16	1:6
3/4	1-15/32	13/16	0.122	0.177	1-3/4	5/16	1:6
7/8	1-3/4	15/16	0.136	0.177	1-3/4	5/16	1:6
1	2	1-1/8	0.136	0.177	1-3/4	5/16	1:6
1-1/8	2-1/4	1-1/4	0.136	0.177	2-1/4	5/16	1:6
1-1/4	2-1/2	1-3/8	0.136	0.177	2-1/4	5/16	1:6
1-3/8	2-3/4	1-1/2	0.136	0.177	2-1/4	5/16	1:6
1-1/2	3	1-5/8	0.136	0.177	2-1/4	5/16	1:6

WASHER DIMENSIONS TOLERANCES (INCHES)

Dimensions	Washer Size To 1-1/2 in. Nominal Bolt Size, incl.
Nominal diameter of hole	-0: + 1/32
Nominal outside dimensions	-1/32 + 1/4
Flatness: max. deviation from straight edge placed on "cut" side shall not exceed	0.01
Burr shall not project above immediately adjacent washer surface more than	0.01

A563 GrC/DH NUT DIMENSIONS

Nut Size in Inches	Inches	
	Heavy Hex Nuts	
	Width Across Flats F	Height G
1/2	7/8	31/64
5/8	1-1/16	39/64
3/4	1-1/4	47/64
7/8	1-7/16	55/64
1	1-5/8	63/64
1-1/8	1-13/16	1-7/64
1-1/4	2	1-7/32
1-3/8	2-3/16	1-11/32
1-1/2	2-3/8	1-15/32

PRIME INDUSTRIAL FASTENERS

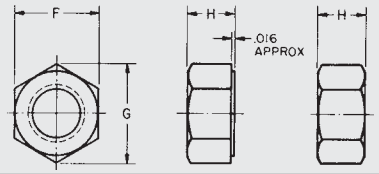
NUTS - HEX AND HEAVY HEX

ASTM A563 - GRADE A

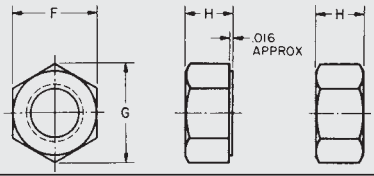
DIMENSIONS

Hex nuts are available in diameters ranging from 1/4 in. to 2 in.
Double chamfered through the 1 in. size, and washer faced in sizes over 1 in.
Heavy hex nuts are available from 1/4 in. to 4 in., washer faced in
the full range of sizes, as well as double chamfered in sizes through 1 in.

HEX NUTS WASHER FACED AND DOUBLE CHAMFERED



HEAVY HEX NUTS WASHER FACED AND DOUBLE CHAMFERED



HEX NUTS DIMENSIONS (IN.) ANSI B18.22

Nominal Size or Basic Major Dia. of Thread		F - Width Across Flats			G - Width Across Corners		H - Thickness Finish Hex Nuts		
		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	7/32	0.226	0.212
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	17/64	0.273	0.258
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	21/64	0.337	0.320
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	3/8	0.385	0.365
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	7/16	0.448	0.427
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	31/64	0.496	0.473
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	35/64	0.559	0.535
3/4	0.7500	1 1/8	1.125	1.088	1.299	1.240	41/64	0.665	0.617
7/8	0.8750	1 5/16	1.312	1.269	1.516	1.447	3/4	0.776	0.724
1	1.0000	1 1/2	1.500	1.450	1.732	1.653	55/64	0.887	0.831
1 1/8	1.1250	1 11/16	1.688	1.631	1.949	1.859	31/32	0.999	0.939
1 1/4	1.2500	1 7/8	1.875	1.812	2.165	2.066	1 1/16	1.094	1.030
1 3/8	1.3750	2 1/16	2.062	1.994	2.382	2.273	1 11/64	1.206	1.138
1 1/2	1.5000	2 1/4	2.250	2.175	2.598	2.480	1 9/32	1.317	1.245
1 3/4	1.7500	2 5/8	2.625	2.538	3.031	2.883	1 1/2	1.540	1.460
2	2.0000	3	3.000	2.900	3.464	3.306	1 23/32	1.763	1.675

HEAVY HEX NUTS DIMENSIONS (IN.) ANSI B18.22

Nominal Size or Basic Major Dia. of Thread		F - Width Across Flats			G - Width Across Corners		H - Thickness Heavy Hex Nuts		
		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.
1/4	0.2500	1/2	0.500	0.488	0.577	0.556	15/64	0.250	0.218
5/16	0.3125	9/16	0.562	0.546	0.650	0.622	19/64	0.314	0.280
3/8	0.3750	11/16	0.688	0.669	0.794	0.763	23/64	0.377	0.341
7/16	0.4375	3/4	0.750	0.728	0.866	0.830	27/64	0.441	0.403
1/2	0.5000	7/8	0.875	0.850	1.010	0.969	31/64	0.504	0.464
9/16	0.5625	15/16	0.938	0.909	1.083	1.037	35/64	0.568	0.526
5/8	0.6250	1 1/16	1.062	1.031	1.227	1.175	39/64	0.631	0.587
3/4	0.7500	1 1/4	1.250	1.212	1.443	1.382	47/64	0.758	0.710
7/8	0.8750	1 7/16	1.438	1.394	1.660	1.589	55/64	0.885	0.833
1	1.0000	1 5/8	1.625	1.575	1.876	1.796	63/64	1.012	0.956
1 1/8	1.1250	1 13/16	1.812	1.756	2.093	2.002	1 7/64	1.139	1.079
1 1/4	1.2500	2	2.000	1.938	2.309	2.209	1 7/32	1.251	1.187
1 3/8	1.3750	2 3/16	2.188	2.119	2.526	2.416	1 11/32	1.378	1.310
1 1/2	1.5000	2 3/8	2.375	2.300	2.742	2.622	1 15/32	1.505	1.433
1 5/8	1.6250	2 9/16	2.562	2.481	2.959	2.828	1 19/32	1.632	1.556
1 3/4	1.7500	2 3/4	2.750	2.662	3.175	3.035	1 23/32	1.759	1.679
1 7/8	1.8750	2 15/16	2.938	2.844	3.392	3.242	1 27/32	1.886	1.802
2	2.0000	3 1/8	3.125	3.025	3.608	3.449	1 31/32	2.013	1.925
2 1/4	2.2500	3 1/2	3.500	3.388	4.041	3.862	2 13/64	2.251	2.155
2 1/2	2.5000	3 7/8	3.875	3.750	4.474	4.275	2 29/64	2.505	2.401
2 3/4	2.7500	4 1/4	4.250	4.112	4.907	4.688	2 45/64	2.759	2.647
3	3.0000	4 5/8	4.625	4.475	5.340	5.102	2 61/64	3.013	2.893
3 1/4	3.2500	5	5.000	4.838	5.774	5.515	3 3/16	3.252	3.124
3 1/2	3.5000	5 3/8	5.375	5.200	6.207	5.928	3 7/16	3.506	3.370
3 3/4	3.7500	5 3/4	5.750	5.562	6.640	6.341	3 11/16	3.760	3.616
4	4.0000	6 1/8	6.125	5.925	7.073	6.755	3 15/16	4.014	3.862

PRIME INDUSTRIAL FASTENERS

CARBON AND ALLOY STEEL NUTS FOR HIGH-PRESSURE AND HIGH-TEMPERATURE SERVICE

ASTM A194 - GRADE 2H, 4 AND 7

AN STANDARD B18.2.2

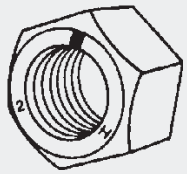
For high-temperature, high-pressure in combination with alloy studs and bolts. These nuts are tapped UNC-2B in sizes of 1 in. and under or 8UN-2B over 1 in.

ASTM A194 - GRADE 2H

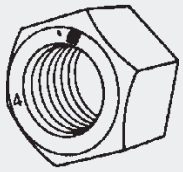
Quenched nuts suitable for high-temperature and high-pressure conditions.

ASTM A194 - GRADES 4 AND 7

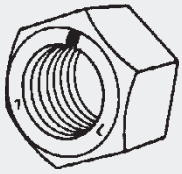
Heat-treated carbon-molybdenum and chromium molybdenum steel nuts suitable for severe temperature and pressure conditions.



Grade 2H
ASTM A194



Grade 4
ASTM A194



Grade 7
ASTM A194

Chemical Composition							
Grade	**C**	**Mn**	**P**	**S**	**Si**	**M0**	**Cr**
2H	0.40min	—	0.04 max	0.05 max	—	—	—
4	0.40 to 0.50	0.70 to 0.90	0.035 max	0.04 max	0.20 to 0.35	0.20 to 0.30	—
7	0.38 to 0.48	0.75 to 1.00	0.04 max	0.04 max	0.20 to 0.35	0.15 to 0.25	0.80 to 1.10

Hardness Requirements			
Grade	**Brinell**	**Rockwell B**	**Rockwell C**
2H	248 to 352	—	24 to 38
4 and 7	248 to 352	—	24 to 38



QUICK TURNAROUND

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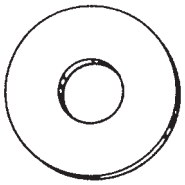
Customer Service is our top priority, bottom line.

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We do not sell products. We sell solutions at a competitive price.

PRIME INDUSTRIAL FASTENERS

FLAT WASHERS



U.S. STANDARD (USS)

Developed to satisfy engineering requirements in the majority of industrial application in all fields of manufacturing, maintenance and repair. The O.D., I.D. and thickness specifications were developed to meet the optimum of applications.

All listed sizes are available in plain and zinc plated.

Bolt Size In.	Outside Diameter In.	Inside Diameter In.	Thickness
3/16	9/16	1/4	.036/.065
1/4	3/4	5/16	.051/.080
5/16	7/8	3/8	.064/.104
3/8	1	7/16	.064/.104
7/16	1 1/4	1/2	.064/.104
1/2	1 3/8	9/16	.086/.132
9/16	1 1/2	5/8	.086/.132
5/8	1 3/4	11/16	.108/.160
3/4	2	13/16	.122/.177
7/8	2 1/4	15/16	.136/.192
1	2 1/2	1 1/16	.136/.192
1 1/8	2 3/4	1 1/4	.136/.192
1 1/4	3	1 3/8	.136/.192
1 3/8	3 1/4	1 1/2	.153/.213
1 1/2	3 1/2	1 5/8	.153/.213
1 5/8	3 3/4	1 3/4	.153/.213
1 3/4	4	1 7/8	.153/.213
1 7/8	4 1/4	2	.153/.213
2	4 1/2	2 1/8	.153/.213
2 1/4	4 3/4	2 3/8	.193/.248
2 1/2	5	2 5/8	.210/.280
2 3/4	5 1/4	2 7/8	.228/.310
3	5 1/2	3 1/8	·249/.327

S.A.E.

Specifications for S.A.E. washers were developed and specified by the Society of Automotive Engineers to meet the requirements in most of the applications in its field. They are smaller O.D. and thinner gauges than their counterpart bolt sizes of U.S. Standard washers.

Bolt Size In.	Outside Diameter In.	Inside Diameter In.	Thickness
#6	3/8	5/32	.036/.065
#8	7/16	3/16	.036/.065
#10	1/2	7/32	.036/.065
#12	9/16	1/4	.051/.080
1/4	5/8	9/32	.051/.080
5/16	11/16	11/32	.051/.080
3/8	13/16	13/32	.051/.080
7/16	59/64	15/32	.051/.080
1/2	1 1/16	17/32	.074/.121
9/16	1 3/16	19/32	.074/.121
5/8	1 5/16	21/32	.074/.121
3/4	1 1/2	13/16	.108/.160
7/8	1 3/4	15/16	.108/.160
1	2	1 1/16	.108/.160
1 1/8	2 1/4	1 3/16	.108/.160
1 1/4	2 1/2	1 5/16	.136/.192
1 3/8	2 3/4	1 7/16	.136/.192
1 1/2	3	1 9/16	.153/.213

ANSI specifications allow a tolerance of plus or minus a gauge on nominal thickness of commercial washers.

SPLIT LOCKWASHERS

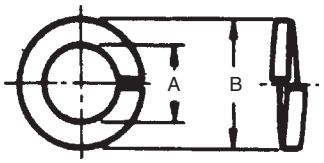
MEDIUM SPLIT HELICAL SPRING LOCKWASHERS



Nominal Washer Size		A Inside Diameter		B Outside Diameter	W Washer Section Width	T² t - 2 Washer Section Thickness
		Min.	Max.	Max.²	Min.	Min.
2	0.086	0.088	0.094	0.172	0.035	0.020
4	0.112	0.115	0.121	0.209	0.040	0.025
5	0.125	0.128	0.134	0.236	0.047	0.031
6	0.138	0.041	0.148	0.250	0.047	0.031
8	0.164	0.168	0.175	0.293	0.055	0.040
10	0.190	0.194	0.202	0.334	0.062	0.047
12	0.216	0.221	0.229	0.377	0.070	0.056
1/4	0.250	0.255	0.263	0.489	0.109	0.062
5/16	0.312	0.318	0.328	0.586	0.125	0.078
3/8	0.375	0.382	0.393	0.683	0.141	0.094
7/16	0.438	0.446	0.459	0.779	0.156	0.109
1/2	0.500	0.509	0.523	0.873	0.171	0.125
9/16	0.562	0.572	0.587	0.971	0.188	0.141
5/8	0.625	0.636	0.653	1.079	0.203	0.156
3/4	0.750	0.763	0.783	1.271	0.234	0.188
7/8	0.875	0.890	0.912	1.464	0.266	0.219
1	1.000	1.017	1.042	1.661	0.297	0.250
1 1/16	1.062	1.080	1.107	1.756	0.312	0.266
1 1/8	1.125	1.144	1.172	1.853	0.328	0.281
1 3/16	1.188	1.208	1.237	1.950	0.344	0.297
1 1/4	1.250	1.271	1.302	2.045	0.359	0.312
1 1/2	1.500	1.525	1.561	2.430	0.422	0.375

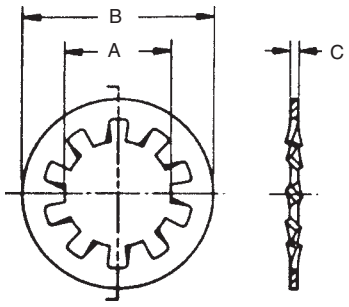
LOCKWASHERS

HI-COLLAR HELICAL SPRING



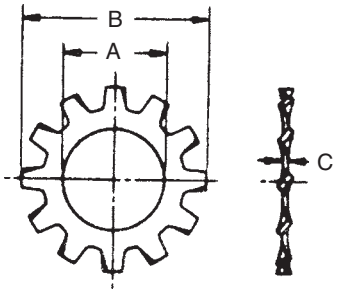
Nominal Washer Size		A Inside Diameter		B Outside Diameter	W Washer Section Width	T² t - 2 Washer Section Thickness
		Min.	Max.	Max.²	Min.	Min.
4	0.112	0.115	0.121	0.173	0.022	0.022
6	0.138	0.141	0.148	0.216	0.030	0.030
8	0.164	0.168	0.175	0.267	0.042	0.047
10	0.190	0.194	0.202	0.294	0.042	0.047
1/4	0.250	0.255	0.263	0.365	0.047	0.078
5/16	0.312	0.318	0.328	0.460	0.062	0.093
3/8	0.375	0.382	0.393	0.553	0.076	0.125

INTERNAL TOOTH LOCKWASHERS



Nominal Washer Size		A Inside Diameter		B Outside Diameter		C Thickness	
		Min.	Max.	Max.	Min.	Max.	Min.
2	0.086	0.089	0.095	0.200	0.175	0.015	0.010
4	0.112	0.115	0.123	0.270	0.255	0.019	0.015
6	0.138	0.141	0.150	0.295	0.275	0.021	0.017
8	0.164	0.168	0.176	0.340	0.325	0.023	0.018
10	0.190	0.195	0.204	0.381	0.365	0.025	0.020
12	0.216	0.221	0.231	0.410	0.394	0.025	0.020
1/4	0.250	0.256	0.267	0.478	0.460	0.028	0.023
5/16	0.312	0.320	0.332	0.610	0.594	0.034	0.028
3/8	0.375	0.384	0.398	0.692	0.670	0.040	0.032
7/16	0.438	0.448	0.464	0.789	0.740	0.040	0.032
1/2	0.500	0.512	0.530	0.900	0.867	0.045	0.037
5/8	0.625	0.640	0.663	1.071	1.045	0.050	0.042

EXTERNAL TOOTH LOCKWASHERS



Nominal Washer Size		A Inside Diameter		B Outside Diameter		C Thickness	
		Min.	Max.	Max.	Min.	Max.	Min.
4	0.112	0.115	0.123	0.260	0.245	0.019	0.015
6	0.138	0.141	0.150	0.320	0.305	0.022	0.016
8	0.164	0.168	0.176	0.381	0.365	0.023	0.018
10	0.190	0.195	0.204	0.410	0.395	0.025	0.020
12	0.216	0.221	0.231	0.475	0.460	0.028	0.023
1/4	0.250	0.256	0.267	0.510	0.494	0.028	0.023
5/16	0.312	0.320	0.332	0.610	0.588	0.034	0.028
3/8	0.375	0.384	0.398	0.694	0.670	0.040	0.032
7/16	0.438	0.448	0.464	0.760	0.740	0.040	0.032
1/2	0.500	0.513	0.530	0.900	0.880	0.045	0.037
5/8	0.625	0.641	0.663	1.070	1.045	0.050	0.042

PRIME INDUSTRIAL FASTENERS

HEAT-TREATED ALLOY STUDS, BOLTS AND THREADED BARS

CHEMICAL COMPOSITION, HEAT-TREATED, ALLOY STEEL STUDS

Elements	A354 Grades BC, BD + See note below		A193 Grade B7 Chromium Molybdenum (AISI 4140, 4142, 4145)	
	Range percent	Check variation over percent	Range percent	Check variation Over or under percent
Carbon	—	—	•0.38- 0.48	0.02
Manganese	—	—	0.75-1.00	0.04
Phosphorus, max	0.04	0.005	0.04	0.005 over
Sulphur, max	0.04	0.005	0.04	0.005 over
Silicon	—	—	0.20- 0.35	0.02
Chromium	—	—	0.80-1.10	0.05
Molybdenum	—	—	0.15-0.25	0.02

Elements	A193 Grade B16, Chromium, Molybdenum, Vanadium	
	Range percent	Check variation Over or under percent
Carbon	0.36-0.44	0.02
Manganese	0.45-0.70	0.03
Phosphorus, max	0.04	0.005 over
Sulphur, max	0.04	0.005 over
Silicon	0.20-0.35	0.02
Chromium	0.80-1.15	0.05
Molybdenum	0.50-0.65	0.03
Vanadium	0.25-0.35	0.03

Elements	A320 Grade L7 Chromium-Molybdenum (AISI 4140, 4142, 4145)		A320 Grade L43 Nickel-Chromium Molybdenum (AISI 4340)	
	Range percent	Check variation over or under percent	Range percent	Check variation Over or under percent
Carbon	•0.38-0.48	0.02	0.38-0.43	0.02
Manganese	0.75-1.00	0.04	0.60-0.85	0.03
Phosphorus, max	0.04	0.005 over	0.04	0.005 over
Sulphur, max	0.04	0.005 over	0.04	0.005 over
Silicon	0.20-0.35	0.02	0.20-0.35	0.02
Nickel	—	—	1.65-2.00	0.05
Chromium	0.80-1.10	0.05	0.70-0.90	0.03
Molybdenum	0.15-0.25	0.02	0.20-0.30	0.02

• For bar sizes over 3-1/2 in. to 4 in., inclusive, the carbon content may be 0.50 pct max
+ Any alloy steel capable of meeting the tensile requirements of Specification A354 may be used

TENSILE REQUIREMENTS, HEAT-TREATED, ALLOY STEEL STUDS

Grade	Diameter, in.	Min. tempering temp F	Tensile strength min psi	Yield point min psi	Elon-gation in 2 in. min pct	Reduc-tion of area min pct
A354 Grade BC	2-1/2 and under	850	125,000	109,000	16	50
	Over 2-1/2 to 4 incl	850	115,000	99,000	16	45
A354 Grade BD	1-1/2 and under	850	150,000	125,000	14	35
A193 Grade B7	2-1/2 and under	1100	125,000	105,000	16	50
Chromium	Over 2-1/2 to 4 incl	1100	115,000	95,000	16	50
Molybdenum	Over 4 to 7 incl	1100	100,000	75,000	18	50
A193 Grade B16	2-1/2 and under					
Chromium	Over 2-1/2 to 4 incl	1200	125,000	105,000	18	50
Molybdenum	Over 4 to 7 incl	1200	110,000	95,000	17	45
Vanadium		1200	100,000	85,000	16	45
A320 Grade L7	2-1/2 and under	—	125,000	105,000	16	50
Chromium						
Molybdenum						
A320 Grade L43	4 and under	—	125,000	105,000	16	50
Nickel						
Chromium						
Molybdenum						

Commonly used are the following grades of heat-treated alloy steel for high-pressure or extreme temperature service in diameters of 1/2 in. to 2 in., inclusive. Other grades and other diameters are available on special order.

ASTM A354 - Grades BC and BD

Heat treated alloy steels for applications at normal atmospheric temperatures where high strength is required.

ASTM A193 - Grade B7

A heat treated chromium-molybdenum steel widely used for medium high-temperature service.

ASTM A193 - Grade B16

A heat treated chromium-molybdenum-vanadium steel widely used for high-temperature service.

ASTM A320 - Grade L7

This grade is intended for low-temperature service down to minus 150° F and has a minimum Charpy impact value of 15 ft-lb at this temperature. Sizes 2-1/2 in. and under.

ASTM A320 - Grade L43

The same properties offered by Grade L7 in sizes up to 2-1/2 in. are obtainable up to 4 in. in Grade L43.

Heat-treated alloy steel bolts and threaded bars are also available in the grades listed above.

Bolts in diameters of 3/8 in. to 1-1/4 in., inclusive; bars in diameters of 1/2 in. to 2 in., inclusive.

These are available only on special order.

ANCHOR BOLTS

ASTM F1554

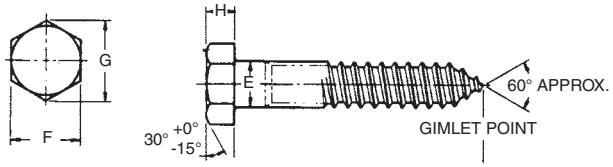
GRADE 36, 55, 105

(Mechanical Properties)

The ASTM F1554 specification was introduced in 1994 and covers anchor bolts designed to anchor structural supports to concrete foundations. F1554 anchor bolts can take the form of either headed bolts, straight rods, or bent anchor bolts. The three grades 36, 55 and 105 designate the minimum yield strength (ksi) of the anchor bolt. The bolts can either be cut or roll threaded and a weldable grade 55 can be substituted for grade 36 at the supplier's option. Color coding on the end 36 blue, 55 yellow and 105 red - helps facilitate easy indentification in the field. Permanent manufacturer and grade marking is allowed under the supplementary requirements.

Grade	Size	Tensile, ksi	Yield, ksi, min	Yield, MPa, min	Elong % min	RA % min	Nuts Size	Nuts Plain	Nuts Galv	Washers
36	1/4 - 4	58-80	36	248	23	40	1/4 - 1-1/2	A563A HEX	A563A HEX	F436
							1-5/8 - 4	A563A HEAVY HEX	A563A HEAVY HEX	F436
55	1/4 - 2	75-95	55	380	21	30	1/4 - 1-1/2	A563A HEAVY HEX	A563A HEAVY HEX	F436
	2-1/8 - 2-1/2	75-95	55	380	21	22				
	2-5/8 - 3	75-95	55	380	21	20	1-5/8 - 4	A563A HEAVY HEX	A563A HEAVY HEX	F436
	3-1/8 - 4	75-95	55	380	21	18				
105	1/4 - 3	125-150	105	724	15	45	1/4 - 1-1/2	A563DH HEX	A563DH HEAVY HEX	F436
							1-5/8 - 3	A563DH HEAVY HEX	A563DH HEAVY HEX	F436

HEX HEAD LAG SCREWS



Nominal Size Or Basic Product Dia.	E Body Or Shoulder Diameter Max.	E Max.	F Width Across Flats Basic	F Max.	F Min.	G Width Across Corners Max.	G Min.	H Height Basic	H Max.	H Min.	Threads Per Inch
No.10	0.199	0.178	9/32	0.281	0.271	0.323	0.309	1/8	0.140	0.110	11
1/4	0.260	0.237	3/8	0.375	0.362	-	-	-	-	-	10
1/4	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	10
5/16	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	9
3/8	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	7
7/16	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	7
1/2	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	6
5/8	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	5
3/4	0.768	0.729	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	4 1/2
7/8	0.895	0.852	1 15/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	4
1	1.022	0.976	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	3 1/2
1 1/8	1.149	1.098	1 11/16	1.688	1.631	1.949	1.859	3/4	0.780	0.658	3 1/4
1 1/4	1.277	1.223	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749	3 1/4

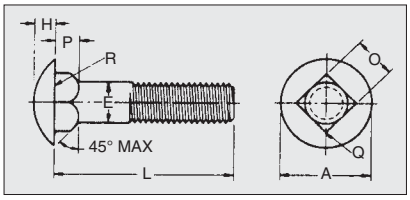
CARRIAGE BOLTS

ASTM A307 Grade A - (Mechanical Properties)

MINIMUM THREAD LENGTH

The formula for determining thread length is,
Bolts 6 in. and shorter, 2 diameters plus 1/4 in.
Bolts over 6 in. 2 diameters plus 1/2 in. If bolts are too short to apply the formula, the thread will be extended as close to head as possible.

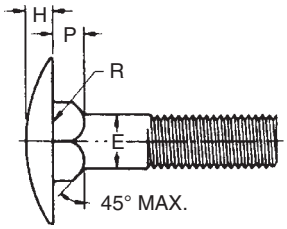
SQUARE-NECK CARRIAGE BOLT DIMENSIONS (in.) ANSI B18.5

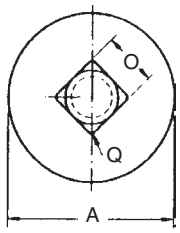


Nominal Size or Basic Bolt Diameter		Body Diameter E Max.	Body Diameter E Min.	Head Diameter A Max.	Head Diameter A Min.	Head Height H Max.	Head Height H Min.	Square Width O Max.	Square Width O Min.	Square Depth P Max.	Square Depth P Min.	Corner Radius on Square Q Max.	Fillet Radius R Max.
3/16	0.1900	0.199	0.182	0.469	0.438	0.114	0.094	0.199	0.185	0.125	0.094	0.031	0.031
1/4	0.2500	0.260	0.237	0.594	0.563	0.145	0.125	0.260	0.245	0.156	0.125	0.031	0.031
5/16	0.3125	0.324	0.298	0.719	0.688	0.176	0.156	0.324	0.307	0.187	0.156	0.031	0.031
3/8	0.3750	0.388	0.360	0.844	0.782	0.208	0.188	0.388	0.368	0.219	0.188	0.047	0.031
7/16	0.4375	0.452	0.421	0.969	0.907	0.239	0.219	0.452	0.431	0.250	0.219	0.047	0.031
1/2	0.5000	0.515	0.483	1.094	1.032	0.270	0.250	0.515	0.492	0.281	0.250	0.047	0.031
5/8	0.6250	0.642	0.605	1.344	1.219	0.344	0.313	0.642	0.616	0.344	0.313	0.078	0.062
3/4	0.7500	0.768	0.729	1.594	1.469	0.406	0.375	0.768	0.741	0.406	0.375	0.078	0.062

Full size body bolts are furnished unless user specifies undersize body bolts

STEP BOLTS

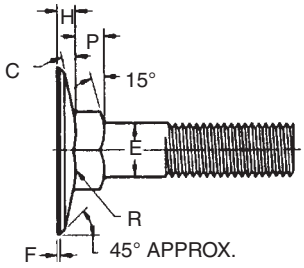


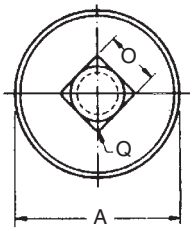


Nominal Size[1] or Basic Bolt Diameter	E		A		H		O		P		Q	R
	Body Diameter		Head Diameter		Head Height		Square Width		Square Depth		Corner Radius on Square	Fillet Radius
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.
No.10	0.199	0.182	0.656	0.625	0.114	0.094	0.199	0.185	0.125	0.094	0.031	0.031
1/4	0.260	0.237	0.844	0.813	0.145	0.125	0.260	0.245	0.156	0.125	0.031	0.031
5/16	0.324	0.298	1.031	1.000	0.176	0.156	0.324	0.307	0.187	0.156	0.031	0.031
3/8	0.388	0.360	1.249	1.188	0.208	0.188	0.388	0.368	0.219	0.188	0.047	0.031
7/16	0.452	0.421	1.406	1.375	0.239	0.219	0.452	0.431	0.250	0.219	0.047	0.031
1/2	0.515	0.483	1.594	1.563	0.270	0.250	0.515	0.492	0.281	0.250	0.047	0.031

NOTES: 1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

ELEVATOR BOLTS



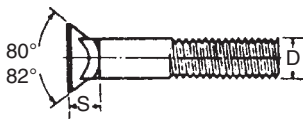


Nominal Size[1] or Basic Bolt Diameter	E		A			C	F	H		O		P		Q	R
	Body Diameter		Head Diameter			Head Angle	Flat on Min. Dia. Head	Head Height		Square Width		Square Depth		Corner Radius on Square	Fillet Radius
	Max.	Min.	Max. Edge Sharp	Min. Edge Sharp	Min. Edge Flat	Ref.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.
No.10	0.199	0.182	0.790	0.750	0.740	9°	0.025	0.082	0.062	0.210	0.185	0.125	0.094	0.031	0.031
1/4	0.260	0.237	1.008	0.969	0.938	9°	0.035	0.098	0.078	0.280	0.245	0.219	0.188	0.031	0.031
5/16	0.324	0.298	1.227	1.188	1.157	9°	0.035	0.114	0.094	0.342	0.307	0.250	0.219	0.031	0.031
3/8	0.388	0.360	1.352	1.312	1.272	11°	0.040	0.145	0.125	0.405	0.368	0.250	0.219	0.047	0.031
7/16	0.452	0.421	1.477	1.438	1.397	13°	0.040	0.176	0.156	0.468	0.431	0.281	0.250	0.047	0.031
1/2	0.515	0.483	1.602	1.562	1.532	12°	0.040	0.176	0.156	0.530	0.492	0.281	0.250	0.047	0.031

NOTES: 1. Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

NO. 3 HEAD PLOW BOLTS

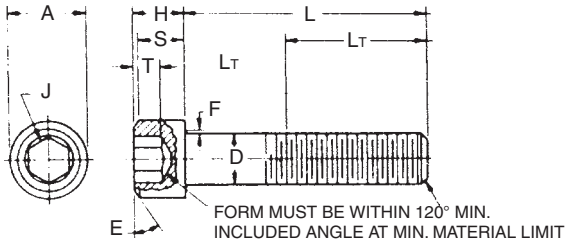




D	A			F	S		B	
Nominal Diameter of Bolt	Diameter of Head			Feed Thickness	Depth of Square and Head		Width of Square	
	Max.	Min. Sharp	Abs. Min. With Flat	Max.	Max.	Min.	Max.	Min. (Basic)
3/8	0.708	0.671	0.656	0.031	0.312	0.281	0.387	0.375
7/16	0.826	0.781	0.766	0.036	0.364	0.328	0.450	0.438
1/2	0.945	0.890	0.875	0.042	0.417	0.375	0.515	0.500
5/8	1.147	1.094	1.063	0.050	0.506	0.456	0.640	0.625

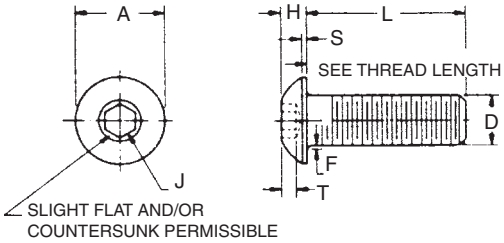
PRIME INDUSTRIAL FASTENERS

HEX SOCKET HEAD CAP SCREWS



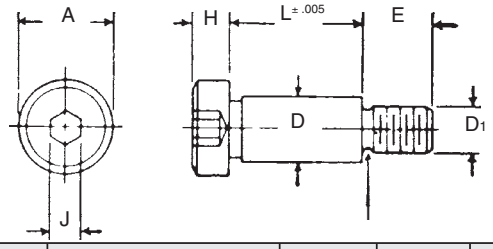
Nominal Size or Basic Screw Diameter		D Body Diameter		A Head Diameter		H Head Height		S Head Side Height	J Hexagon Socket Size		T Key Engagement	F Fillet Extension Above D		LT Thread Length
		Max.	Min.	Max.	Min.	Max.	Min.	Min.	Nom.		Min.	Max.	Min.	Min.
0	0.0600	0.0600	0.0568	0.096	0.091	0.060	0.057	0.054	0.050		0.025	0.007	0.003	0.50
1	0.0730	0.0730	0.0695	0.118	0.112	0.073	0.070	0.066	1/16	0.062	0.031	0.007	0.003	0.62
2	0.0860	0.0860	0.0822	0.140	0.134	0.086	0.083	0.077	5/64	0.078	0.038	0.008	0.004	0.62
3	0.0990	0.0990	0.0949	0.161	0.154	0.099	0.095	0.089	5/64	0.078	0.044	0.008	0.004	0.62
4	0.1120	0.1120	0.1075	0.183	0.176	0.112	0.108	0.101	3/32	0.094	0.051	0.009	0.005	0.75
5	0.1250	0.1250	0.1202	0.205	0.198	0.125	0.121	0.112	3/32	0.094	0.057	0.010	0.006	0.75
6	0.1380	0.1380	0.1329	0.226	0.218	0.138	0.134	0.124	7/64	0.109	0.064	0.010	0.006	0.75
8	0.1640	0.1640	0.1585	0.270	0.262	0.164	0.159	0.148	9/64	0.141	0.077	0.012	0.007	0.88
10	0.1900	0.1900	0.1840	0.312	0.303	0.190	0.185	0.171	5/32	0.156	0.090	0.014	0.009	0.88
1/4	0.2500	0.2500	0.2435	0.375	0.365	0.250	0.244	0.225	3/16	0.188	0.120	0.014	0.009	1.00
5/16	0.3125	0.3125	0.3053	0.469	0.457	0.312	0.306	0.281	1/4	0.250	0.151	0.017	0.012	1.12
3/8	0.3750	0.3750	0.3678	0.562	0.550	0.375	0.368	0.337	5/16	0.312	0.182	0.020	0.015	1.25
7/16	0.4375	0.4375	0.4294	0.656	0.642	0.438	0.430	0.394	3/8	0.375	0.213	0.023	0.018	1.38
1/2	0.5000	0.5000	0.4919	0.750	0.735	0.500	0.492	0.450	3/8	0.375	0.245	0.026	0.020	1.50
5/8	0.6250	0.6250	0.6163	0.938	0.921	0.625	0.616	0.562	1/2	0.500	0.307	0.032	0.024	1.75
3/4	0.7500	0.7500	0.7406	1.125	1.107	0.750	0.740	0.675	5/8	0.625	0.370	0.039	0.030	2.00
7/8	0.8750	0.8750	0.8647	1.312	1.293	0.875	0.864	0.787	3/4	0.750	0.432	0.044	0.034	2.25
1	1.0000	1.0000	0.9886	1.500	1.479	1.000	0.988	0.900	3/4	0.750	0.495	0.050	0.040	2.50
1 1/4	1.2500	1.2500	1.2336	1.875	1.852	1.250	1.236	1.125	7/8	0.875	0.620	0.060	0.050	3.12
1 1/2	1.5000	1.5000	1.4818	2.250	2.224	1.500	1.485	1.350	1	1.000	0.745	0.070	0.060	3.75

HEX SOCKET BUTTON HEAD SCREWS



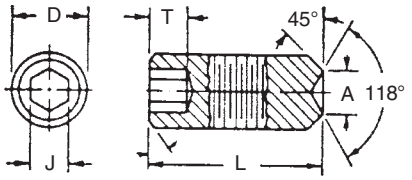
D Nominal Size or Basic Screw Diameter		A Head Diameter		H Head Height		S Head Side Height	J Hexagon Socket Size		T Key Engagement	F Fillet Extension Above D		L Maximum Standard Length
		Max.	Min.	Max.	Min.	Ref.	Nom.		Min.	Max.	Min.	Nom.
2	0.0860	0.164	0.154	0.046	0.038	0.010	0.050		0.028	0.010	0.005	1/2
3	0.0990	0.188	0.176	0.052	0.044	0.010	1/16	0.062	0.035	0.010	0.005	1/2
4	0.1120	0.213	0.201	0.059	0.051	0.015	1/16	0.062	0.035	0.010	0.005	1/2
5	0.1250	0.238	0.226	0.066	0.058	0.015	5/64	0.078	0.044	0.010	0.005	1/2
6	0.1380	0.262	0.250	0.073	0.063	0.015	5/64	0.078	0.044	0.010	0.005	5/8
8	0.1640	0.312	0.298	0.087	0.077	0.015	3/32	0.094	0.052	0.015	0.010	3/4
10	0.1900	0.361	0.347	0.101	0.091	0.020	1/8	0.125	0.070	0.015	0.010	1
1/4	0.2500	0.437	0.419	0.132	0.122	0.031	5/32	0.156	0.087	0.020	0.015	1
5/16	0.3125	0.547	0.527	0.166	0.152	0.031	3/16	0.188	0.105	0.020	0.015	1
3/8	0.3750	0.656	0.636	0.199	0.185	0.031	7/32	0.219	0.122	0.020	0.015	1 1/4
1/2	0.5000	0.875	0.851	0.265	0.245	0.046	5/16	0.312	0.175	0.030	0.020	2
5/8	0.6250	1.000	0.970	0.331	0.311	0.062	3/8	0.375	0.210	0.030	0.020	2

HEX SOCKET SHOULDER SCREWS

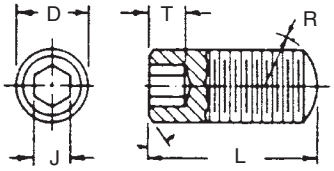


Nominal Size or Basic Shoulder Diameter	D		A		H		D		E	I	J
	Shoulder Diameter		Head Diameter		Head Height		Nominal Thread Size or Basic Thread Diameter	Threads Per Inch	Thread Length	Thread Neck Width	Hexagon Socket Size
	Max.	Min.	Max.	Min.	Max.	Min.			Basic	Max.	Nom.
1/4 0.250	0.2480	0.2460	0.375	0.357	0.188	0.177	10 0.1900	24	0.375	0.062	1/8 0.125
5/16 0.312	0.3105	0.3085	0.438	0.419	0.219	0.209	1/4 0.2500	20	0.438	0.075	5/32 0.156
3/8 0.375	0.3730	0.3710	0.562	0.543	0.250	0.240	5/16 0.3125	18	0.500	0.083	3/16 0.188
1/2 0.500	0.4980	0.4960	0.750	0.729	0.312	0.302	3/8 0.3750	16	0.625	0.093	1/4 0.250
5/8 0.625	0.6230	0.6210	0.875	0.853	0.375	0.365	1/2 0.5000	13	0.750	0.115	5/16 0.312
3/4 0.750	0.7480	0.7460	1.000	0.977	0.500	0.490	5/8 0.6250	11	0.875	0.136	3/8 0.375
1 1.000	0.9980	0.9960	1.312	1.287	0.625	0.610	3/4 0.7500	10	1.000	0.150	1/2 0.500

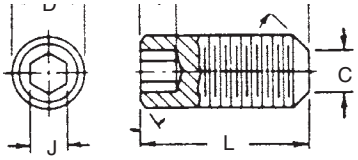
HEX SOCKET SET SCREWS



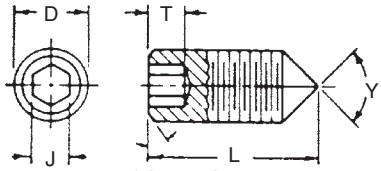
CUP POINT



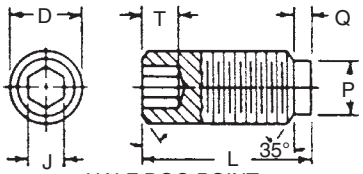
OVAL POINT



FLAT POINT



CONE POINT

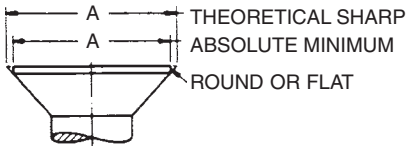


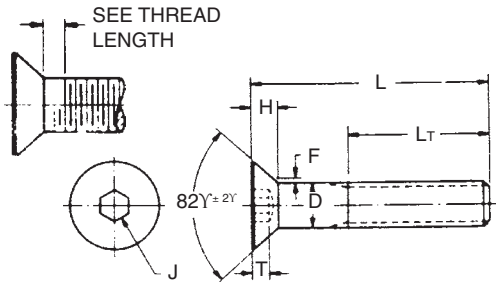
HALF DOG POINT

D	A		R	Y	P		Q	J	T	Shortest Length to which Column T Applies
Nominal Diameter	Cup and Flat Point Diameter		Oval Point Radius	Cone Point Angle 90±2 for these Lengths and Over	Half Dog Point[1]			Socket Width Across Flats	Key Engagement	
					Diameter		Length Nom.			
	Max.	Min.			Max.	Min.		Nom.	Min.	
0	0.033	0.027	0.045	5/64	0.040	0.037	0.015	0.028	0.050	7/64
1	0.040	0.033	0.055	3/32	0.049	0.045	0.019	0.035	0.060	1/8
2	0.047	0.039	0.064	7/64	0.057	0.053	0.022	0.035	0.060	1/8
3	0.054	0.045	0.074	1/8	0.066	0.062	0.025	0.050	0.070	9/64
4	0.061	0.051	0.084	5/32	0.075	0.070	0.028	0.050	0.070	9/64
5	0.067	0.057	0.094	3/16	0.083	0.078	0.030	1/16	0.080	3/16
6	0.074	0.064	0.104	3/16	0.092	0.087	0.035	1/16	0.080	11/64
8	0.087	0.076	0.123	1/4	0.109	0.103	0.040	5/64	0.090	3/16
10	0.102	0.088	0.142	1/4	0.127	0.120	0.045	3/32	0.100	3/16
1/4	0.132	0.118	0.188	5/16	5/32	0.149	1/16	1/8	0.125	1/4
5/16	0.172	0.156	0.234	3/8	13/64	0.195	5/64	5/32	0.156	5/16
3/8	0.212	0.194	0.281	7/16	1/4	0.241	3/32	3/16	0.188	3/8
7/16	0.252	0.232	0.328	1/2	19/64	0.287	7/64	7/32	0.219	7/16
1/2	0.291	0.270	0.375	9/16	11/32	0.334	1/8	1/4	0.250	1/2
5/8	0.371	0.347	0.469	3/4	15/32	0.456	5/32	5/16	0.312	5/8
3/4	0.450	0.425	0.562	7/8	9/16	0.549	3/16	3/8	0.375	3/4
7/8	0.530	0.502	0.656	1	21/32	0.642	7/32	1/2	0.500	7/8
1	0.609	0.579	0.750	1 1/8	3/4	0.734	1/4	9/16	0.562	1

PRIME INDUSTRIAL FASTENERS

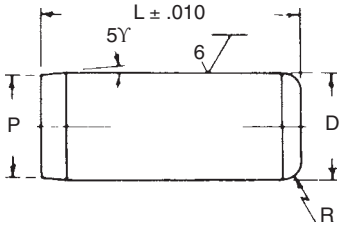
HEX SOCKET FLAT HEAD SCREWS

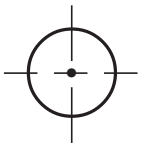




Nominal Size or Basic Screw Diameter		D Body Diameter		A Head Diameter		H Head Height		J Hexagon Socket Size		T Key Engagement	F Fillet Extension Above D Max.	LT Basic Thread Length
				Theoretical Sharp	Abs. Min.	Reference	Flushness Tolerance					
		Max.	Min.	Max.				Nom.		Max.	Max.	Min
4	0.1120	0.1120	0.1075	0.255	0.218	0.083	0.011	1/16	0.062	0.055	0.012	0.750
5	0.1250	0.1250	0.1202	0.281	0.240	0.090	0.012	5/64	0.078	0.061	0.014	0.750
6	0.1380	0.1380	0.1329	0.307	0.263	0.097	0.013	5/64	0.078	0.066	0.015	0.750
8	0.1640	0.1640	0.1585	0.359	0.311	0.112	0.014	3/32	0.094	0.076	0.015	0.875
10	0.1900	0.1900	0.1840	0.411	0.359	0.127	0.015	1/8	0.125	0.087	0.015	0.875
1/4	0.2500	0.2500	0.2435	0.531	0.480	0.161	0.016	5/32	0.156	0.111	0.015	1.000
5/16	0.3125	0.3125	0.3053	0.656	0.600	0.198	0.017	3/16	0.188	0.135	0.015	1.125
3/8	0.3750	0.3750	0.3678	0.781	0.720	0.234	0.018	7/32	0.219	0.159	0.015	1.250
7/16	0.4375	0.4375	0.4294	0.844	0.781	0.234	0.018	1/4	0.250	0.159	0.015	1.375
1/2	0.5000	0.5000	0.4919	0.938	0.872	0.251	0.018	5/16	0.312	0.172	0.015	1.500
5/8	0.6250	0.6250	0.6163	1.188	1.112	0.324	0.022	3/8	0.375	0.220	0.015	1.750
3/4	0.7500	0.7500	0.7406	1.438	1.355	0.396	0.024	1/2	0.500	0.220	0.015	2.000

DOWEL PINS





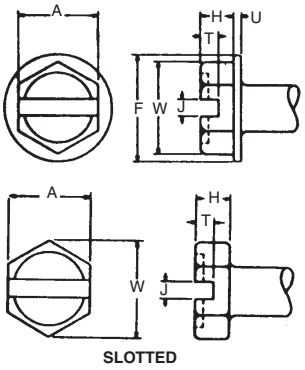
Nominal Size	D Standard Pin (.0002 over basic size)		D Oversize Pin (.001over basic size)		P Point Diameter	R Top Radius	Shear Strength Double Shear (Lbs.)
	Max.	Min.	Max.	Min.	Max.		
1/8	.1253	.1251	.1261	.1259	.119	3/64	3,600
3/16	.1878	.1876	.1886	.1884	.176	3/64	8,000
1/4	.2503	.2501	.2511	.2509	.239	1/16	14,400
5/16	.3128	.3126	.3136	.3134	.301	1/16	22,400
3/8	.3753	.3751	.3761	.3759	.364	5/64	32,400
7/16	.4378	.4376	.4386	.4384	.4205	3/32	44,000
1/2	.5003	.5001	.5011	.5009	.483	7/64	57,400
5/8	.6253	.6251	.6261	.6259	.608	1/8	89,800
3/4	.7503	.7501	.7511	.7509	.728	1/8	129,200
7/8	.8753	.8751	.8761	.8759	.853	1/8	176,000
1	1.0003	1.0001	1.0001	1.0009	.978	1/8	230,000

PRIME INDUSTRIAL FASTENERS

HEX HEAD - HEX WASHER HEAD

MACHINE SCREWS • TAPPING SCREWS • SELF DRILLING SCREWS

Nominal Size	A		W	H		F		U		I		T	
	Width Across Flats		Width Across Corners	Height of Head		Diameter of Washer		Thickness of Washer		Width of Slot		Depth of Slot	
	Max.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
4	.187	.181	.202	.060	.049	.243	.225	.019	.011	.039	.031	.042	.025
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057
12	.312	.305	.340	.155	.139	.432	.398	.039	.022	.067	.056	.103	.077
14	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035	.084	.072	.134	.100

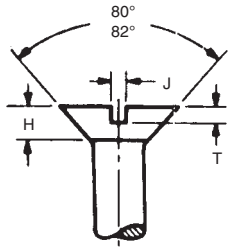


SLOTTED

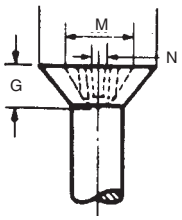
FLAT HEAD

MACHINE SCREWS • WOOD SCREWS • TAPPING SCREWS

Basic Screw Diameter	A		H	J		T	
	Head Diameter		Head Height	Slot Width		Slot Depth	
	Max. Edge Sharp	Min. Edge Round or Flat	Ref.	Max.	Min.	Max.	Min.
0000	0.043	0.037	0.011	0.008	0.004	0.007	0.003
000	0.064	0.058	0.016	0.011	0.007	0.009	0.005
00	0.092	0.076	0.028	0.017	0.010	0.014	0.009
0	0.119	0.099	0.035	0.023	0.016	0.015	0.010
1	0.146	0.123	0.043	0.026	0.019	0.019	0.012
2	0.172	0.147	0.051	0.031	0.023	0.023	0.015
3	0.199	0.171	0.059	0.035	0.027	0.027	0.017
4	0.225	0.195	0.067	0.039	0.031	0.030	0.020
5	0.252	0.220	0.075	0.043	0.035	0.034	0.022
6	0.279	0.244	0.083	0.048	0.039	0.038	0.024
8	0.332	0.292	0.100	0.054	0.045	0.045	0.029
10	0.385	0.340	0.116	0.060	0.050	0.053	0.034
12	0.438	0.389	0.132	0.067	0.056	0.060	0.039
1/4	0.507	0.452	0.153	0.075	0.064	0.070	0.046
5/16	0.635	0.568	0.191	0.084	0.072	0.088	0.058
3/8	0.762	0.685	0.230	0.094	0.081	0.106	0.070
7/16	0.812	0.723	0.223	0.094	0.081	0.103	0.066
1/2	0.875	0.775	0.223	0.106	0.091	0.103	0.065
9/16	1.000	0.889	0.260	0.118	0.102	0.120	0.077
5/8	1.125	1.002	0.298	0.133	0.116	0.137	0.088
3/4	1.375	1.230	0.372	0.149	0.131	0.171	0.111



SLOTTED



PHILLIPS

Nominal Size[1] Basic Or Screw Diameter		M Recess Diameter		G Recess Depth		N Recess Width	Driver Size
		Max.	Min.	Max.	Min.	Min.	
0	0.0600	0.069	0.056	0.043	0.027	0.014	0
1	0.0730	0.077	0.064	0.051	0.035	0.015	0
2	0.0860	0.102	0.089	0.063	0.047	0.017	1
3	0.0990	0.107	0.094	0.068	0.052	0.018	1
4	0.1120	0.128	0.115	0.089	0.073	0.018	1
5	0.1250	0.154	0.141	0.086	0.063	0.027	2
6	0.1380	0.174	0.161	0.106	0.083	0.029	2
8	0.1640	0.189	0.176	0.121	0.098	0.030	2
10	0.1900	0.204	0.191	0.136	0.113	0.032	2

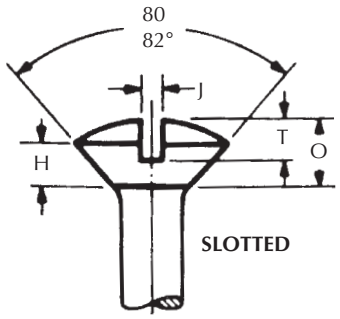
Nominal Size[1] Basic Or Screw Diameter		M Recess Diameter		G Recess Depth		N Recess Width	Driver Size
		Max.	Min.	Max.	Min.	Min.	
12	0.2160	0.268	0.255	0.156	0.133	0.035	3
1/4	0.2500	0.283	0.270	0.171	0.148	0.036	3
5/16	0.3125	0.365	0.352	0.216	0.194	0.061	4
3/8	0.3750	0.393	0.380	0.245	0.223	0.065	4
7/16	0.4375	0.409	0.396	0.261	0.239	0.068	4
1/2	0.5000	0.424	0.411	0.276	0.254	0.069	4
9/16	0.5625	0.454	0.431	0.300	0.278	0.073	4
5/8	0.6250	0.576	0.553	0.342	0.316	0.079	5
3/4	0.7500	0.640	0.617	0.406	0.380	0.087	5

OVAL HEAD

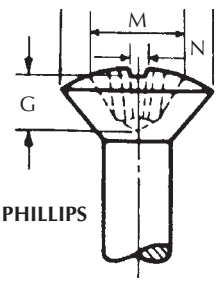
MACHINE SCREWS • TAPPING SCREWS • WOOD SCREWS

Basic Screw Diameter	A		H	O		J		T	
	Head Diameter		Head Side Height	Total Head Height		Slot Width		Slot Depth	
	Max. Edge Sharp	Min. Edge Rounded or Flat	Ref.	Max.	Min.	Max.	Min.	Max.	Min.
00	0.093	0.083	0.028	0.042	0.034	0.017	0.010	0.023	0.016
0	0.119	0.099	0.035	0.056	0.041	0.023	0.016	0.030	0.025
1	0.146	0.123	0.043	0.068	0.052	0.026	0.019	0.038	0.031
2	0.172	0.147	0.051	0.080	0.063	0.031	0.023	0.045	0.037
3	0.199	0.171	0.059	0.092	0.073	0.035	0.027	0.052	0.043
4	0.225	0.195	0.067	0.104	0.084	0.039	0.031	0.059	0.049
5	0.252	0.220	0.075	0.116	0.095	0.043	0.035	0.067	0.055
6	0.279	0.244	0.083	0.128	0.105	0.048	0.039	0.074	0.060
8	0.332	0.292	0.100	0.152	0.126	0.054	0.045	0.088	0.072
10	0.385	0.340	0.116	0.176	0.148	0.060	0.050	0.103	0.084
12	0.438	0.389	0.132	0.200	0.169	0.067	0.056	0.117	0.096
1/4	0.507	0.452	0.153	0.232	0.197	0.075	0.064	0.136	0.112
5/16	0.635	0.568	0.191	0.290	0.249	0.084	0.072	0.171	0.141
3/8	0.762	0.685	0.230	0.347	0.300	0.094	0.081	0.206	0.170
7/16	0.812	0.723	0.223	0.345	0.295	0.094	0.081	0.210	0.174
1/2	0.875	0.775	0.223	0.354	0.299	0.106	0.091	0.216	0.176
9/16	1.000	0.889	0.260	0.410	0.350	0.118	0.102	0.250	0.207
5/8	1.125	1.002	0.298	0.467	0.399	0.133	0.116	0.285	0.235
3/4	1.375	1.230	0.372	0.578	0.497	0.149	0.131	0.353	0.293

Basic Screw Diameter	M Recess Diameter		G Recess Depth		N Recess Width	Driver Size
	Max.	Min.	Max.	Min.	Min.	
0	0.074	0.061	0.045	0.027	0.014	0
1	0.077	0.064	0.048	0.030	0.015	0
2	0.112	0.099	0.069	0.052	0.018	1
3	0.124	0.111	0.081	0.064	0.019	1
4	0.136	0.123	0.094	0.077	0.019	1
5	0.158	0.145	0.085	0.061	0.028	2
6	0.178	0.165	0.105	0.080	0.030	2
8	0.192	0.179	0.119	0.095	0.031	2
10	0.209	0.196	0.137	0.113	0.033	2
12	0.270	0.257	0.152	0.128	0.038	3
1/4	0.290	0.277	0.173	0.148	0.040	3
5/16	0.381	0.368	0.226	0.202	0.064	4
3/8	0.400	0.387	0.245	0.221	0.066	4
7/16	0.410	0.397	0.257	0.233	0.068	4
1/2	0.422	0.409	0.269	0.245	0.070	4

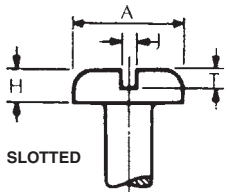


SLOTTED



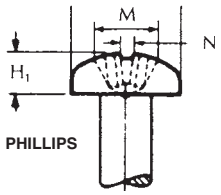
PHILLIPS

PRIME INDUSTRIAL FASTENERS



PAN HEAD

MACHINE SCREWS • TAPPING SCREWS • SELF DRILLING SCREWS



Nominal Size[1] or Basic Screw Diameter	A Head Diameter		H Head Height (Slotted)		J Slot Width		T Slot Depth	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0000	0.042	0.036	0.016	0.010	0.008	0.004	0.008	0.004
000	0.066	0.060	0.023	0.017	0.012	0.008	0.012	0.008
00	0.090	0.082	0.025	0.032	0.017	0.010	0.016	0.010
0	0.116	0.104	0.039	0.031	0.023	0.016	0.022	0.014
1	0.142	0.130	0.046	0.038	0.026	0.019	0.027	0.018
2	0.167	0.155	0.053	0.045	0.031	0.023	0.031	0.022
3	0.193	0.180	0.060	0.051	0.035	0.027	0.036	0.026
4	0.219	0.205	0.068	0.058	0.039	0.031	0.040	0.030
5	0.245	0.231	0.075	0.065	0.043	0.035	0.045	0.034
6	0.270	0.256	0.082	0.072	0.048	0.039	0.050	0.037
8	0.322	0.306	0.096	0.085	0.054	0.045	0.058	0.045
10	0.373	0.357	0.110	0.099	0.060	0.050	0.068	0.053
12	0.425	0.407	0.125	0.112	0.067	0.056	0.077	0.061
1/4	0.492	0.473	0.144	0.130	0.075	0.064	0.087	0.070
5/16	0.615	0.594	0.178	0.162	0.084	0.072	0.106	0.085
3/8	0.740	0.716	0.212	0.195	0.094	0.081	0.124	0.100
7/16	0.863	0.837	0.247	0.228	0.094	0.081	0.142	0.116
1/2	0.987	0.958	0.281	0.260	0.106	0.091	0.161	0.131
9/16	1.041	1.000	0.315	0.293	0.118	0.102	0.179	0.146
5/8	1.172	1.125	0.350	0.325	0.133	0.116	0.197	0.162
3/4	1.435	1.375	0.419	0.390	0.149	0.131	0.234	0.192

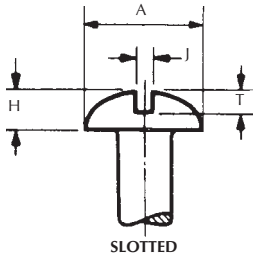
Nominal Size[1] or Basic Screw Diameter	H[1] Head Height (Recessed)		M Recess Diameter		Recess Depth		N Recess Width	Driver
	Max.	Min.	Max.	Min.	Max.	Min.	Min.	Size
0	0.044	0.036	0.067	0.054	0.039	0.021	0.013	0
1	0.053	0.044	0.074	0.061	0.045	0.025	0.014	0
2	0.062	0.053	0.104	0.091	0.059	0.041	0.017	1
3	0.071	0.062	0.112	0.099	0.068	0.050	0.019	1
4	0.080	0.070	0.122	0.109	0.078	0.060	0.019	1
5	0.089	0.079	0.158	0.145	0.083	0.057	0.028	2
6	0.097	0.087	0.166	0.153	0.091	0.066	0.028	2
8	0.115	0.105	0.182	0.169	0.108	0.082	0.030	2
10	0.133	0.122	0.199	0.186	0.124	0.100	0.031	2
12	0.151	0.139	0.259	0.246	0.141	0.115	0.034	3
1/4	0.175	0.162	0.281	0.268	0.161	0.135	0.036	3
5/16	0.218	0.203	0.350	0.337	0.193	0.169	0.059	4
3/8	0.261	0.244	0.389	0.376	0.233	0.210	0.065	4
7/16	0.305	0.284	0.413	0.400	0.259	0.234	0.068	4
1/2	0.348	0.325	0.435	0.422	0.280	0.255	0.071	4
9/16	0.391	0.366	0.470	0.447	0.312	0.288	0.076	4
5/8	0.434	0.406	0.587	0.564	0.343	0.314	0.081	5
3/4	0.521	0.488	0.633	0.610	0.382	0.355	0.086	5

PRIME INDUSTRIAL FASTENERS

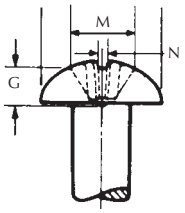
ROUND HEAD

MACHINE SCREWS • WOOD SCREWS

Basic Screw Diameter	A Head Diameter		H Head Height		J Slot Width		T Slot Depth	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0000	0.041	0.035	0.022	0.016	0.008	0.004	0.017	0.013
000	0.062	0.056	0.031	0.025	0.012	0.008	0.018	0.012
00	0.089	0.080	0.045	0.036	0.017	0.010	0.026	0.018
0	0.113	0.099	0.053	0.043	0.023	0.016	0.039	0.029
1	0.138	0.122	0.061	0.051	0.026	0.019	0.044	0.033
2	0.162	0.146	0.069	0.059	0.031	0.023	0.048	0.037
3	0.187	0.169	0.078	0.067	0.035	0.027	0.053	0.040
4	0.211	0.193	0.086	0.075	0.039	0.031	0.058	0.044
5	0.236	0.217	0.095	0.083	0.043	0.035	0.063	0.047
6	0.260	0.240	0.103	0.091	0.048	0.039	0.068	0.051
8	0.309	0.287	0.120	0.107	0.054	0.045	0.077	0.058
10	0.359	0.334	0.137	0.123	0.060	0.050	0.087	0.065
12	0.408	0.382	0.153	0.139	0.067	0.056	0.096	0.073
1/4	0.472	0.443	0.175	0.160	0.075	0.064	0.109	0.082
5/16	0.590	0.557	0.216	0.198	0.084	0.072	0.132	0.099
3/8	0.708	0.670	0.256	0.237	0.094	0.081	0.155	0.117
7/16	0.750	0.707	0.328	0.307	0.094	0.081	0.196	0.148
1/2	0.813	0.766	0.355	0.332	0.106	0.091	0.211	0.159
9/16	0.938	0.887	0.410	0.385	0.118	0.102	0.242	0.183
5/8	1.000	0.944	0.438	0.411	0.133	0.116	0.258	0.195
3/4	1.250	1.185	0.547	0.516	0.149	0.131	0.320	0.242



SLOTTED

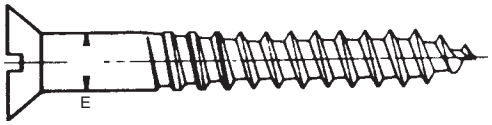


PHILLIPS

Basic Screw Diameter	M Recess Diameter		G Recess Depth		N Recess Width	Driver Size
	Max.	Min.	Max.	Min.	Min.	
0	0.073	0.060	0.042	0.022	0.014	0
1	0.082	0.069	0.052	0.033	0.015	0
2	0.100	0.087	0.053	0.034	0.017	1
3	0.109	0.096	0.062	0.042	0.018	1
4	0.118	0.105	0.072	0.053	0.019	1
5	0.154	0.141	0.074	0.046	0.027	2
6	0.162	0.149	0.084	0.056	0.027	2
8	0.178	0.165	0.101	0.075	0.030	2
10	0.195	0.182	0.119	0.093	0.031	2

Basic Screw Diameter	M Recess Diameter		G Recess Depth		N Recess Width	Driver Size
	Max.	Min.	Max.	Min.	Min.	
12	0.249	0.236	0.125	0.099	0.032	3
1/4	0.268	0.255	0.147	0.121	0.034	3
5/16	0.308	0.295	0.187	0.161	0.040	3
3/8	0.387	0.374	0.228	0.202	0.064	4
7/16	0.402	0.389	0.241	0.216	0.066	4
1/2	0.416	0.403	0.256	0.231	0.068	4
9/16	0.459	0.436	0.292	0.265	0.075	4
5/8	0.554	0.531	0.318	0.277	0.077	5
3/4	0.654	0.631	0.418	0.379	0.088	5

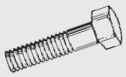
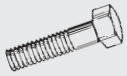
WOOD SCREWS



Nominal Size or Basic Screw Diameter		Threads Per Inch	E Body Diameter	
			Max.	Min.
4	0.112	22	0.116	0.105
5	0.125	20	0.129	0.118
6	0.138	18	0.142	0.131
7	0.151	16	0.155	0.144
8	0.164	15	0.168	0.157
9	0.177	14	0.181	0.170
10	0.190	13	0.194	0.183
12	0.216	11	0.220	0.209
14	0.242	10	0.246	0.235

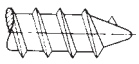
PRIME INDUSTRIAL FASTENERS

FASTENER HOLE GUIDE

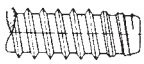
Drill This Size Hole		 To Tap For This Size Bolt or Screw	 For This Size Wood Screw Pilot In Hard Wood	Drill This Size Hole		 To Tap For This Size Bolt or Screw	 For This Size Wood Screw Pilot In Hard Wood	Drill This Size Hole		 To Tap For This Size Bolt or Screw
Drill Size	Dec. Equiv.			Drill Size	Dec. Equiv.			Drill Size	Dec. Equiv.	
60	.0400			9/64	.1406			E	.2500	
59	.0410			27	.1440	9 - 30		F	.2570	5/16 - 18
58	.0420			26	.1470	3/16 - 24		G	.2610	
57	.0430			25	.1495	10 - 24	No. 14	17/64	.2656	5/16 - 18*
56	.0465	0 - 80		24	.1520			H	.2660	
3/64	.0469			23	.1540	10 - 28		I	.2720	5/16 - 24
55	.0520			5/32	.1562			J	.2770	
54	.0550	1 - 56	No. 3	22	.1570	10 - 30		K	.2810	
53	.0595	1 - 64 - 72		21	.1590	10 - 32		9/32	.2812	5/16 - 24
1/16	.0625			20	.1610	3/16 - 32		L	.2900	
52	.0635		No. 4	19	.1660			M	.2950	
51	.0670			18	.1695		No. 16	19/64	.2969	
50	.0700	2 - 56-64		11/64	.1719			N	.3020	
49	.0730		No. 5	17	.1730			5/16	.3125	3/8 - 16
48	.0760			16	.1770	12 - 24		O	.3160	
5/64	.0781			15	.1800			P	.3230	
47	.0785	3 - 48	No. 6	14	.1820	12 - 28		21/64	.3281	3/8 - 24
46	.0810			13	.1850	12 - 32	No. 18	Q	.3332	
45	.0820	3 - 56		3/16	.1875			R	.3390	
44	.0860	4 - 36	No. 7	12	.1890			11/32	.3437	
43	.0890	4 - 40		11	.1910			S	.3480	
42	.0935	4 - 48		10	.1935			T	.3580	
3/32	.0937			9	.1960			23/64	.3594	
41	.0960			8	.1990			U	.3680	
40	.0980	5 - 36	No. 8	7	.2010	1/4 - 20		3/8	.3750	7/16 - 14
39	.0995			13/64	.2031			V	.3770	
38	.1015	5 - 40		6	.2040			W	.3860	
37	.1040	5 - 44	No. 9	5	.2055			25/64	.3906	7/16 - 20
36	.1069			4	.2090	1/4 - 24	No. 20	X	.3970	
7/64	.1094			3	.2130	1/4 - 28		Y	.4040	
35	.1100	6 - 32		7/32	.2187	1/4 - 32		13/32	.4062	
34	.1110	6 - 36		2	.2210			Z	.4130	
33	.1130	6 - 40	No. 10	1	.2280		No. 24	27/64	.4219	1/2 - 12-13
32	.1160			A	.2340			7/16	.4375	
31	.1200		No. 11	15/64	.2344			29/64	.4531	1/2 - 20
1/8	.1250	7 - 36		B	.2380			15/32	.4687	
30	.1285	8 - 30	No. 12	C	.2420			31/64	.4844	9/16 - 12
29	.1360	8 - 32-36		D	.2460			1/2	.5000	
28	.1405	8 - 40		1/4	.2500					

*All Tap Drill Sizes are for 75% Full Thread Except Asterisked Sizes which are 60% Full Thread

SELF-TAPPING SCREWS

TYPE A 

TYPE A-B 

TYPE B 

Screw Size	Metal Thickness		Type A-B Sharp Pt. Use Drill	Screw Size	Metal Thickness		Type A-AB Sharp Pt. Use Drill	Screw Size	Metal Thickness		Type B Blunt Pt. Use Drill	Screw Size	Metal Thickness		Type B Blunt Pt. Use Drill
	Gage	Inch.			Gage	Inch.			Gage	Inch.			Gage	Inch.	
	28	.016	No. 44		26	.019	No. 33		28	.016	No. 44		26	.019	No. 32
	26	.019	44		24	.025	33		26	.019	44		24	.025	32
No. 4	24	.025	42	No. 8	22	.031	32	No 4	24	.025	43	No. 8	22	.031	32
(.112″)	22	.031	42	(. 165″)	20	.038	31	(. 112″)	22	.031	42	(.163″)	20	.038	32
	20	.038	40		18	.050	30		20	.038	42		18	.050	30
	28	.016	No. 39		26	.019	No. 30		28	.016	No. 37		26	.019	No. 27
	26	.019	39		24	.025	30		26	.019	37		24	.025	27
No. 6	24	.025	39	No. 10	22	.031	30	No. 6	24	.025	36	No. 10	22	.031	27
(.138″)	22	.031	38	(.191 ″)	20	.038	29	(.137″)	22	.031	36	(.186″)	20	.038	27
	20	.038	36		18	.050	25		20	.038	35		18	.050	27
	28	.016	No. 37		24	.025	No. 26		26	.019	No. 32		24	.025	No. 19
	26	.019	37	No. 12	22	.031	25		24	.025	32	No. 12	22	.031	19
No. 7	24	.025	35	(.218″)	20	.038	24	No. 7	22	.031	32	(.212″)	20	.038	19
(.155″)	22	.031	33		18	.050	22	(.151″)	20	.038	32		18	.050	18

PRIME INDUSTRIAL FASTENERS

METRIC CONVERSION GUIDE

CONVERSION OF METRIC UNITS OF MEASURE INTO CUSTOMARY EQUIVALENTS

TO CONVERT FROM	TO	MULTIPLY BY
Millimeters (mm)	Inches (in.)	3.937×10^{-2}
Meters (m)	Inches (in.)	3.937×10
Square Millimeters (mm^2)	Square Inches ($in.^2$)	1.55×10^{-3}
Square Meters (m^2)	Square Inches ($in.^2$)	1.55×10^{3}
Cubic Millimeters (mm^3)	Cubic Inches ($in.^3$)	6.10234×10^{-5}
Cubic Meters (m^3)	Cubic Inches ($in.^3$)	6.10234×10^{4}
Grams (g)	Ounces (avdp) (oz)	3.527×10^{-2}
Kilograms (kg)	Pounds (avdp) (lb)	2.20462
Newtons (N)	Pound Force (lbf)	2.248×10^{-1}
Kilogram Force Per Square Millimeter (kgf/mm^2)	Pounds Per Square Inch (psi)	1.4223×10^{3}
Newton Per Square Millimeter (N/mm^2)	Pounds Per Square Inch (psi)	1.45038×10^{2}
Newton Per Square Meter (N/m^2)	Pounds Per Square Inch (psi)	1.45038×10^{-4}
Newton - Meter (N • m)	Ounce - Inch (oz - in.)	1.41612×10^{2}
Newton - Meter (N • m)	Pound - Inch (lb - in.)	8.85073
Newton - Meter (N • m)	Pound - Foot (lb - ft)	7.3756×10^{-1}
Degree Fahrenheit	Degree Celsius	$tc = (tf - 32)/1.8$
Kelvin (K)	Degree Celsius	$tc = tk - 273.15$

CONVERSION OF CUSTOMARY UNITS OF MEASURE INTO METRIC EQUIVALENTS

Inches (in.)	Millimeters (mm)	2.54×10
Inches (in.)	Meters (m)	2.54×10^{-2}
Square Inches ($in.^2$)	Square Millimeters (mm^2)	6.4516×10^{2}
Square Inches ($in.^2$)	Square Meters (m^2)	6.4516×10^{-4}
Cubic Inches ($in.^3$)	Cubic Millimeters (mm^3)	1.638706×10^{4}
Cubic Inches ($in.^3$)	Square Meters (m^3)	1.638706×10^{-5}
Ounces (avdp) (oz)	Kilograms (kg)	2.83495×10^{-2}
Pounds (avdp) (lb)	Kilograms (kg)	4.53592×10^{-1}
Pound Force (lbf)	Newtons (N)	4.448
Pounds Per Square Inch (psi)	Kilograms Force Per Square Millimeter (kgf/mm^2)	7.0307×10^{-4}
Pounds Per Square Inch (psi)	Newton Per Square Meter (N/m^2)	6.894757×10^{3}
Pounds Per Square Inch (psi)	Mega Newton Per Square Millimeter (MN/m^2)	6.894757×10^{-3}
Ounce - Inch (oz - in.)	Newton - Meter (N • m)	7.061552×10^{-3}
Pound - Inch (lb - in.)	Newton - Meter (N • m)	1.129848×10^{-1}
Pound - Foot (lb - ft)	Newton - Meter (N • m)	1.355818
Degree Celsius	Kelvin (K)	$tk = tc + 273.15$
Degree Fahrenheit	Kelvin (K)	$tk = (tf + 459.67)/1.8$
Degree Rankine	Kelvin (K)	$tk = tR/1.8$

ISO METRIC AND UNIFIED THREAD DESIGNATIONS

ISO Metric screw threads are designated by basic diameter and thread pitch. As an example, M 8 x 1 is a standard ISO Metric screw thread having a basic diameter of 8 millimeters and a thread pitch of 1 millimeter. To convert an ISO Metric screw thread designation to a Unified (American) designation divide the basic diameter by 25.4 and multiply the reciprocal of the pitch by 25.4 to determine nominal size in inches and threads per inch. By so doing, M 8 x 1 becomes 0.315-25.4 UNS.

Unified screw threads are designated by nominal size and number of threads per inch. As an example, 3/4 - 10 UNC is a standard Unified screw thread having a nominal size of 3/4 inches and 10 threads per inch. To convert a Unified screw thread designation to an ISO Metric screw thread designation multiply nominal size by 25.4 and multiply the reciprocal of threads per inch by 25.4 to determine basic diameter in millimeters and pitch in millimeters. By so doing, 3/4 - 10 UNC converted to ISO Metric becomes M 19.05 x 2.54.

PRIME INDUSTRIAL FASTENERS

TAP DRILL SIZES AND PERCENTAGE OF THREADS

TAP					TAP					TAP				
NOM. SIZE	T.P.I.	TAP DRILL	DECIMAL EQUIV.	THEOR. % OF THREAD	NOM. SIZE	T.P.I.	TAP DRILL	DECIMAL EQUIV.	THEOR. % OF THREAD	NOM. SIZE	T.P.I.	TAP DRILL	DECIMAL EQUIV.	THEOR. % OF THREAD
0	80	56	.0465	83	1/4	28	7/32	.2188	67	7/8	12	51/64	.7969	72
		3/64	.0469	81			2	.2210	63	7/8	14	51/64	.7969	84
1	64	54	.0550	89	1/4	32	7/32	.2188	77			13/16	.8125	67
		53	.0595	67	5/16	18	F	.2570	77	7/8	16	13/16	.8125	77
1	72	53	.0595	75			G	.2610	71	7/8	20	53/64	.8281	72
		1/16	.0625	58			17/64	.2656	65	15/16	12	55/64	.8594	72
2	56	51	.0670	82	5/16	20	17/64	.2656	72	15/16	16	7/8	.8750	77
		50	.0700	69	5/16	24	I	.2720	75	15/16	20	57/64	.8906	72
		49	.0730	56			J	.2770	66	1	8	7/8	.8750	77
2	64	50	.0700	79	5/16	32	9/32	.2812	77			57/64	.8906	67
		49	.0730	64	3/8	16	5/16	.3125	77	1	12	59/64	.9219	72
3	48	5/64	.0781	77			O	.3160	73			15/16	.9375	58
		47	.0785	76			P	.3230	64	1	14	59/64	.9219	84
		46	.0810	67	3/8	20	21/64	.3281	72			15/16	.9375	67
3	56	46	.0810	78	3/8	24	Q	.3320	79	1	16	15/16	.9375	77
		45	.0820	73			R	.3390	67	1	20	61/64	.9531	72
		44	.0860	56	3/8	32	11/32	.3438	77	1-1/8	7	63/64	.9844	76
4	40	43	.0890	71	7/16	14	U	.3680	75			1	1.0000	67
		42	.0935	57			3/8	.3750	67	1-1/8	12	1-1/32	1.0312	87
4	48	42	.0935	68			V	.3770	65			1-3/64	1.0469	72
		3/32	.0938	68	7/16	20	W	.3860	79	1-1/8	16	1-1/16	1.0625	77
5	40	39	.0995	79			25/64	.3906	72	1-1/8	18	1-1/16	1.0625	87
		38	.1015	72	7/16	24	X	.3970	75	1-1/4	7	1-3/32	1.0938	84
5	44	38	.1015	79	7/16	28	Y	.4040	72			1-7/64	1.1094	76
		37	.1040	71	1/2	13	27/64	.4219	78			1-1/8	1.1250	67
6	32	36	.1065	78			7/16	.4375	63	1-1/4	12	1-5/32	1.1562	87
		7/64	.1094	70	1/2	20	29/64	.4531	72			1-11/64	1.1719	72
		35	.1100	69	1/2	24	29/64	.4531	87	1-1/4	16	1-3/16	1.1875	77
6	40	33	.1130	77	1/2	28	15/32	.4688	67	1-1/4	18	1-3/16	1.1875	87
		32	.1160	68	9/16	12	15/32	.4688	87	1-3/8	6	1-3/16	1.1875	87
8	32	29	.1360	69			31/64	.4844	72			1-13/64	1.2031	79
		28	.1405	58	9/16	18	1/2	.5000	87			1-7/32	1.2188	72
8	36	29	.1360	78			33/64	.5156	65			1-15/64	1.2344	65
		28	.1405	68	9/16	24	33/64	.5156	87	1-3/8	12	1-9/32	1.2812	87
		9/64	.1406	68	5/8	11	17/32	.5312	79			1-19/64	1.2969	72
10	24	25	.1495	75			35/64	.5469	66	1-3/8	16	1-5/16	1.3125	77
		24	.1520	70	5/8	12	35/64	.5469	72	1-3/8	18	1-5/16	1.3125	87
		23	.1540	67	5/8	18	9/16	.5625	87	1-1/2	6	1-5/16	1.3125	87
10	32	22	.1570	81			37/64	.5781	65			1-21/64	1.3281	79
		21	.1590	76	5/8	24	37/64	.5781	87			1-11/32	1.3438	72
		20	.1610	71	11/16	12	39/64	.6094	72			1-23/64	1.3594	65
12	24	17	.1730	79	11/16	24	41/64	.6406	87	1-1/2	12	1-13/32	1.4062	87
		16	.1770	72	3/4	10	41/64	.6406	84			1-27/64	1.4219	72
		15	.1800	67			21/32	.6562	72	1-1/2	16	1-7/16	1.4375	77
12	28	15	.1800	78	3/4	12	43/64	.6719	72	1-1/2	18	1-7/16	1.4375	87
		14	.1820	73	3/4	16	11/16	.6875	77	1-3/4	16	1-11/16	1.6875	77
		13	.1850	67	3/4	20	45/64	.7031	72	2	16	1-15/16	1.9375	77
1/4	20	7	.2010	75	13/16	12	47/64	.7344	72	2-1/4	16	2-3/16	2.1875	77
		13/64	.2031	72	13/16	16	3/4	.7500	77	2-1/2	16	2-7/16	2.4375	77
		6	.2040	71	13/16	20	49/64	.7656	72	2-3/4	16	2-11/16	2.6875	77
		5	.2055	69	7/8	9	49/64	.7656	76	3	16	2-15/16	2.9375	77
1/4	24	4	.2090	76			25/32	.7812	65					

PRIME INDUSTRIAL FASTENERS

METRIC TAP DRILL SIZES AND PERCENTAGE OF THREADS

TAP	TAP DRILL	DECI. EQUIV.	THEOR. % OF THREAD	TAP	TAP DRILL	DECI. EQUIV.	THEOR. % OF THREAD	TAP	TAP DRILL	DECI. EQUIV.	THEOR. % OF THREAD
M1.6 x .35	1.25mm	.0492	77		I	.2720	67	M22 x 1.5	20.5mm	.8071	77
	1.3mm	.0512	66	M8 x 1	7mm	.2756	77		13/16	.8125	70
	#55	.0520	61		J	.2770	74	M24 x 3	21mm	.8268	77
M1.8 x .35	1.45mm	.0571	77	M10 x 1.5	8.5mm	.3346	77		27/32	.8438	66
	1.5mm	.0591	66		R	.3390	71	M24 x 2	22mm	.8661	77
	#53	.0595	64	M10 x 1.25	8.75mm	.3445	77		7/8	.8750	68
M2 x 4	1.6mm	.0630	77		S	.3480	71	M27 x 3	24mm	.9449	77
	#52	.0635	74	M12 x 1.75	13/32	.4062	74		61/64	.9531	72
M2.2 x .45	1.75mm	.0689	77		Z	.4130	66	M27 x 2	25mm	.9843	77
	#50	.0700	72	M12 x 1.25	27/64	.4219	79		63/64	.9844	77
M2.5 x .45	2.05mm	.0807	77		11mm	.4331	62	M30 x 3.5	26.5mm	1.0433	77
	#45	.0820	71	M14 x 2	12mm	.4724	77		1-1/16	1.0625	66
M3 x .5	2.5mm	.0984	77		31/64	.4844	65	M30 x 2	28mm	1.1024	77
	#39	.0995	73	M14 x 1.5	12.5mm	.4921	77		1-7/64	1.1094	70
M3.5 x .6	2.9mm	.1142	77		1/2	.5000	67	M33 x 3.5	29.5mm	1.1614	77
	#32	.1160	71	M16 x 2	14mm	.5512	77		1-11/64	1.1719	71
M4 x .7	3.3mm	.1299	77		9/16	.5625	66	M33 x 2	31mm	1.2205	77
	3.4mm	.1339	66	M16 x 1.5	14.5mm	.5709	77		1-15/64	1.2344	63
	#29	.1360	60		37/64	.5781	68	M36 x 4	32mm	1.2598	77
M4.5 x .75	3.75mm	.1476	77	M18 x 2.5	15.5mm	.6102	77		1-17/64	1.2656	74
	#25	.1495	72		5/8	.6250	65	M36 x 3	1-19/64	1.2969	78
M5 x .8	4.2mm	.1654	77	M18 x 1.5	16.5mm	.6496	77		33mm	1.2992	77
	#18	.1695	67		21/32	.6562	68		1-5/16	1.3125	68
M6 x 1	5mm	.1969	77	M20 x 2.5	17.5mm	.6890	77	M39 x 4	1-3/8	1.3750	78
	#8	.1990	73		45/64	.7031	66		35mm	1.3780	77
M7 x 1	6mm	.2362	77	M20 x 1.5	18.5mm	.7283	77		1-25/64	1.3906	71
	B	.2380	74		47/64	.7344	69	M39 x 3	36mm	1.4173	77
M8 x 1.25	6.75mm	.2657	77	M22 x 2.5	19.5mm	.7677	77		1-27/64	1.4219	74
	6.8mm	.2677	74		25/32	.7812	66				

PIPE TAP DRILL SIZES

TAP SIZE	• NPT		• NPTF		• STRAIGHT	
	TAP DRILL	DECIM. EQUIV.	TAP DRILL	DECIM. EQUIV.	TAP DRILL	DECIM. EQUIV.
1/16	D	.2460	D	.2460	1/4	.2500
1/8	Q	.3320	R	.3390	11/32	.3438
1/4	7/16	.4375	7/16	.4375	7/16	.4375
3/8	9/16	.5625	37/64	.5781	37/64	.5781
1/2	45/64	.7031	45/64	.7031	23/32	.7188
3/4	29/32	.9062	59/64	.9219	59/64	.9219
1	1-9/64	1.1406	1 -5/32	1.1562	1 -5/32	1.1562
1-1/4	1-31/64	1.4844	1-1/2	1.5000	1-1/2	1.5000
1-1/2	1-47/64	1.7344	1-47/64	1.7344	1-3/4	1.7500
2	2-13/64	2.2031	2-7/32	2.2188	2-7/32	2.2188
2-1/2	2-5/8	2.6250	2-41/64	2.6408	2-21/32	2.6562
3			3-17/64	3.2656		

• FOR TAPPING WITHOUT REAMING