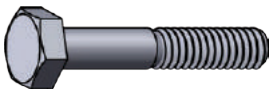
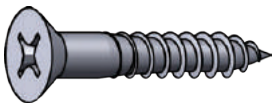
Fastener Basics

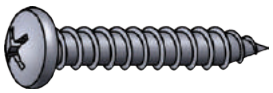
Common Fastener Types



Hex bolts, or hex cap screws, are used in machinery and construction. Can be used with a nut, or in a tapped hole. Fully threaded hex bolts are also known as tap bolts.



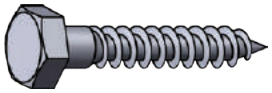
Wood screws have large threads and a smooth shank for pulling two pieces of material together. They can be used in wood and other soft materials.



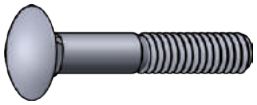
Sheet metal screws have sharp points and threads, and are designed to be driven directly into sheet metal. They can also be used in softer materials like plastic, fiberglass, or wood.

Machine screws are fully threaded for use with a nut or in a tapped hole. Certain types are sometimes referred to as stove bolts.

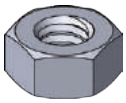
Socket screws are machine screws with an internal hex socket (Allen) drive. Longer lengths may have a smooth shank.



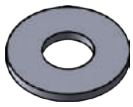
Lag bolts, or lag screws, are large wood screws with hex heads. Typically used for wood construction.



Carriage bolts have smooth, domed heads with a square section underneath that pulls into the material to prevent spinning during installation.



Nuts are used to fasten machine threaded fasteners in through-hole applications. Lock nuts help prevent loosening.



Washers spread the load over a greater surface area when tightening a bolt, screw or nut. Lock washers help prevent loosening.

Tip: Find a more comprehensive fastener type chart at www.mbs-standoffs.com

Grade/Class & Fastener Strength

Fastener Grade (US) or Class (metric) refers to the mechanical properties of the fastener material. Generally, a higher number indicates a stronger, more hardened (but also more brittle) fastener.

For a chart of fastener grades, head markings and mechanical properties, see Mbs Standoffs Grade markings and Strength Chart at www.mbs-standoffs.com

US bolt head markings

Low Carbon | Grade 5 | Grade 8

Metric bolt head markings

Class 8.8 | Class 10.9 | Class 12.9

Note: In addition to these markings, the head will often have a manufacturer stamp.

Fastener Materials

Note: Do not rely on this guide for color-matching. The appearance of these materials sometimes differs significantly from the photos below.

Zinc-plated steel is a low carbon steel for general use. Relatively inexpensive, with the zinc plating providing moderate corrosion resistance suitable for indoors or otherwise dry conditions. Color is either a blue-ish tint or yellow depending on the exact process.

Hot-dipped galvanized steel has a thicker zinc coating for better corrosion resistance. making it suitable for outdoor use. Because of the thick plating, only galvanized nuts and washers will fit galvanized bolts. The coating typically has a rough, dull grey finish.

Stainless steel offers good corrosion resistance, making it suitable for outdoor use and marine applications, but is more expensive than zinc plated.

Chrome and nickel plated steel are smooth and polished for appearance. The plating offers moderate corrosion resistance.

Brass and bronze are copper alloys with good corrosion resistance. More expensive than steel, these materials are typically used for decorative applications. Colors can vary significantly.

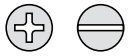
Alloy steel is highly hardened and usually black oxide and/or oil coated, offering little corrosion resistance.

How Fasteners are Notated: An Example

Machine screws, Phillips pan head, Stainless steel 18-8, #12-24 x 1"

Fastener type | Drive Types | Head Styles | Material | Diameter | Thread Count (TPI) | Length

Drive Types

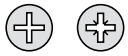


Phillips Slotted

Phillips and Slotted drives are common in screws, but prone to cam-out (stripping).

Combo

Combo drives, that can be used with either driver, are available for many fastener types.



Frearson Pozidriv

Frearson and Pozidriv are similar to Phillips, but less prone to cam-out.

Hex socket (Allen)

Hex socket (Allen) drives are compact and easy to drive, but prone to cam-out.

Star Square (Robertson)

Star and Square drive are resistant to cam-out and can be installed single-handed.

Note: Most drive types (Frearson and Slotted being notable exceptions) require the correct driver size for proper installation.

Head Styles

Hex heads are typically used with larger bolts and screws, and tightened with a wrench.

Pan heads have a slightly domed head that sits above the surface.

Flat heads are installed in a countersunk hole for a flat surface.

Round heads are tall domed heads, used primarily for decorative purposes.

Oval heads are a low domed and countersunk heads, used primarily for decorative purposes.

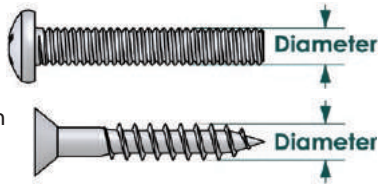
Truss heads are slightly domed, with a wide head for an extra large surface area.

Socket heads are narrow with a socket drive, and knurled or smooth sides.

Button heads feature a medium dome. Typically used with a hex socket drive.

Measuring Diameter

For most types of fasteners, the diameter is measured on the outside of the threads.



Note: US diameters under 1/4" are given as numbers (e.g. #12) instead of inches, in order of increasing size. If you need to find the actual diameter, use a table corresponding to your fastener type at www.mbs-standoffs.com

Thread Count & Thread Pitch

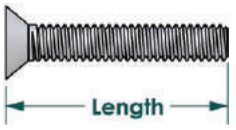
Machine threaded fasteners specify a thread density in Threads Per Inch (US) or as a Thread Pitch in mm (Metric).

For a given diameter, a fastener may be available in coarse (standard), fine and sometimes super fine thread.

Measuring Length

Fastener length is usually measured from where the material is assumed to be to the end of the fastener.

Thus, countersunk fasteners are measured overall and non-counter - sunk fasteners are measured from under the head.

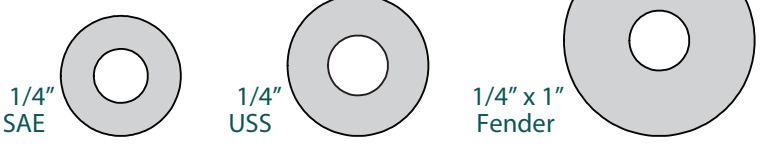


Nut & Washer Sizes

Nut and washer sizes indicate the screw or bolt they fit. For example:

3/8"-16 Hex Bolt | 3/8" Washer | 3/8" -16 Nut

Different washer patterns have different outside diameters . For example, hardened US washers are available in USS (wider) and SAE (narrower) patterns. Fender washers have large outside diameters.



1/4" SAE | 1/4" USS | 1/4" x 1" Fender

More Information

At www.mbs-standoffs.com you'll find:

- In-depth fastener info
- Charts and tables
- Printable lay-over charts and tools for quickly identifying fastener sizes and types
- Much more...

Fastener Type Chart

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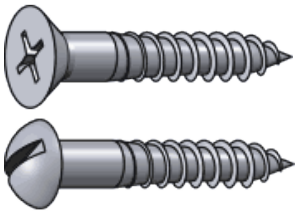
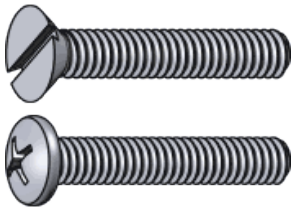
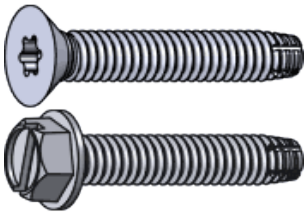
Fastener Categories



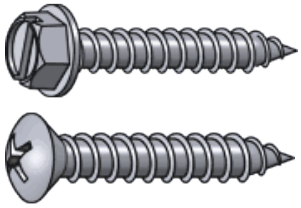
Wood Screws
Screws with a smooth shank and tapered point for use in wood. Abbreviated WS.



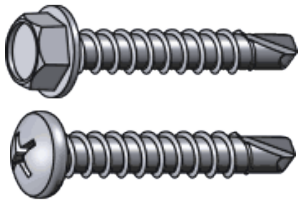
Machine Screws
Screws with threads for use with a nut or tapped hole. Abbreviated MS.



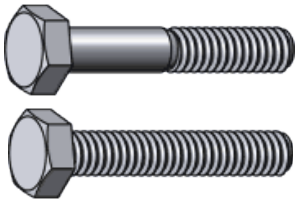
Thread Cutting Machine Screws
Machine screws with a thread cutting (self tapping) point.



Sheet Metal Screws
Fully threaded screws with a point for use in sheet metal. Abbreviated SMS.

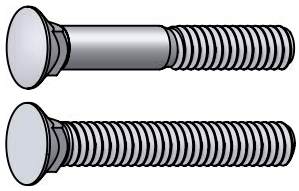


Self Drilling SMS
A sheet metal screw with a self drilling point.

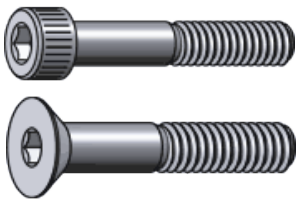


Hex Bolts
Bolts with a hexagonal head with threads for use with a nut or tapped hole. Abbreviated HHMB or HXBT.

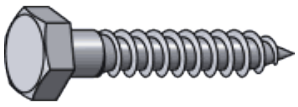
Carriage Bolts
Bolts with a smooth rounded head that has a small square section underneath.



Plow Bolts
Similar to carriage bolts but used for attaching the cutting edge of a plow to the plow blade.



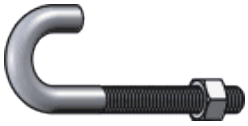
Socket Screws
Socket screws, also known as Allen Head, are fastened with a hex Allen wrench.



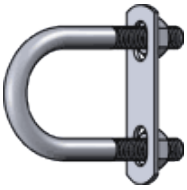
Lag Bolts
Bolts with a wood thread and pointed tip. Abbreviated Lag.

Eye Bolts
A bolt with a circular ring on the head end. Used for attaching a rope or chain.

Eye Lags
Similar to an eye bolt but with wood threads instead of machine thread.



J-Bolts
J shaped bolts are used for tie-downs or as an open eye bolt.



U-Bolts
Bolts in U shape for attaching to pipe or other round surfaces. Also available with a square bend.

Shoulder Bolts
Shoulder bolts (also known as stripper bolts) are used to create a pivot point.

Elevator Bolts
Elevator bolts are often used in conveyor systems. They have a large, flat head.

Fastener Type Chart

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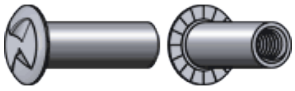
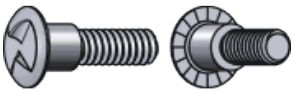
Fastener Categories (continued)



Sex Bolts

Sex bolts (a.k.a. barrel nuts or Chicago bolts) have a female thread and are used for through bolting applications where a head is desired on both sides of the joint.



Mating Screws

Mating screws have a shoulder that matches the diameter of the sex bolts they are used with.

Hanger Bolts

Hanger bolts have wood thread on one end and machine thread on the other end

Set Screws

Machine screws with no head for screwing all the way into threaded holes.

Timber Bolts

Machine threaded fasteners with a wide domed head. The head has fins underneath that prevent the bolt from spinning during installation. Typically used in wood.

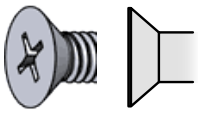
Cotter Pins

Cotter or split pins have two tines which are bent apart to hold them in place.

Rivets

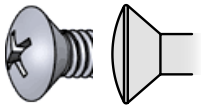
Used to join sheets of metal. During installation the rivet body is deformed to perma - nently lock in place. Blind rivets can be installed without access to the back side of the material.

Head Styles



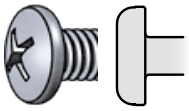
Flat

A countersunk head with a flat top.
Abbreviated FH



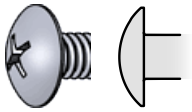
Oval

A countersunk head with a rounded top.
Abbreviated OH or OV



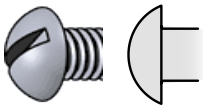
Pan

A slightly rounded head with short vertical sides.
Abbreviated PN



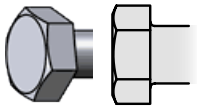
Truss

An extra wide head with a rounded top.



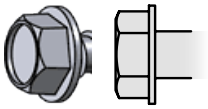
Round

A domed head.
Abbreviated RH



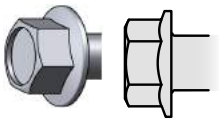
Hex

A hexagonal head
Abbreviated HH or HX



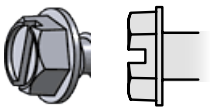
Hex Washer

A hex head with built in washer.



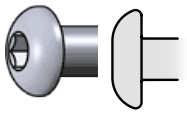
Hex Flange

A hex head with built in flange.



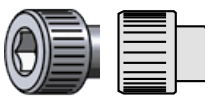
Slotted Hex Washer

A hex head with built in washer and a slot.



Button

A low-profile rounded head using a socket drive.



Socket Cap

A small cylindrical head using a socket drive.

Fastener Type Chart

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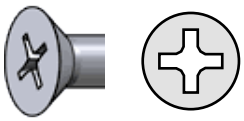
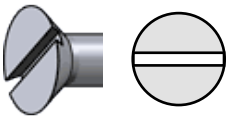
Drive Types



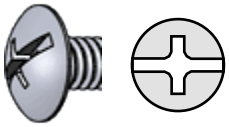
Phillips and Frearson

An X-shaped drive.
Abbreviated PH.



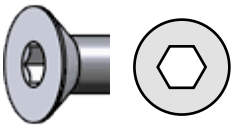
Slotted

A slot in the head.
Abbreviated SL.



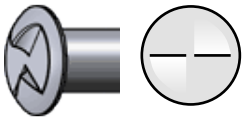
Combination

A combination of slotted and Phillips drives.
Abbreviated combo.



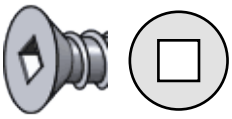
Socket, Hex or Allen

A hexagonal hole for use with an Allen wrench.



One Way

Installs with a normal slotted driver but can not be removed without special tools.



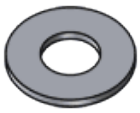
Square

Also known as Robertson drive.
Abbreviated SQ or SD.

Star

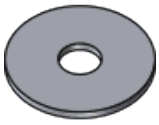
A six-pointed star pattern, specifically designed to prevent cam-out and stripped heads.

Washer Types



Flat

A flat washer, used to distribute load. Available in SAE, USS and other patterns.



Fender

An oversize flat washer used to further distribute load especially on soft materials.

Finishing

A washer used to obtain a 'finished' look. Usually used with oval head screws.

Split Lock

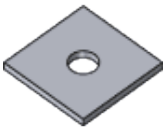
The most common style of washer used to prevent nuts and bolts from backing out.

External Tooth Lock

A washer with external 'teeth'. Used to prevent nuts and bolts from backing out.

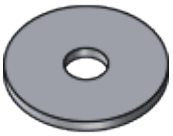
Internal Tooth Lock

A washer with internal 'teeth'. Used to prevent nuts and bolts from backing out.



Square

A square shaped washer.



Dock

Dock washers have a larger outside diameter and are thicker than standard.

Ogee

Thick, large diameter, cast iron washers with a curved or sculpted appearance. Typically used in dock and wood construction.

Fastener Type Chart

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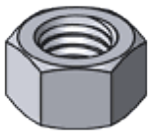
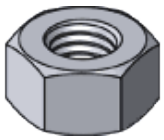
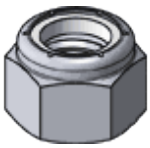
Nut Types



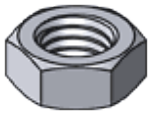
Hex
A six sided nut. Also referred to as a Finished Hex Nut.



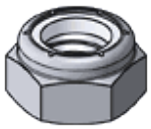
Heavy Hex
A heavier pattern version of a standard hex nut.



Nylon Insert Lock
A nut with a nylon insert to prevent backing off. Also referred to as a Nylock.

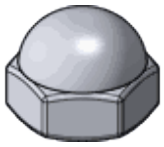


Jam
A hex nut with a reduced height.



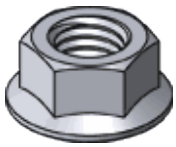
Nylon Insert Jam Lock
A nylock nut with a reduced height.

Wing
A nut with 'wings' for hand tightening.

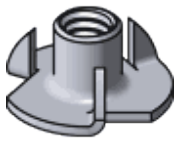


Cap
A nut with a domed top over the end of the fastener.

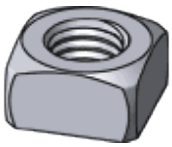
Acorn
Acorn nuts are a high crown type of cap nut, used for appearance.



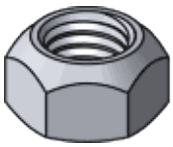
Flange
A nut with a built in washer like flange.



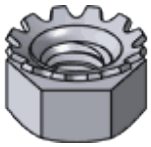
Tee
A nut designed to be driven into wood to create a threaded hole.



Square
A four sided nut.

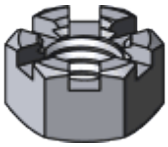


Prevailing Torque Lock
A non-reversible lock nut used for high temperature applications.

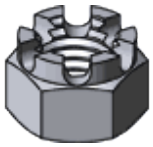


K-Lock or Kep
A nut with an attached free-spinning external tooth lock washer.

Coupling
Coupling nuts are long nuts used to connect pieces of threaded rod or other male fasteners.



Slotted
Slotted nuts are used in conjunction with a cotter pin on drilled shank fasteners to prevent loosening.



Castle
Castle nuts are used in conjunction with a cotter pin on drilled shank fasteners to prevent loosening.

Pin Lock
A nut that does not require an high installation torque and can be installed and removed without thread damage.

Fastener Type Chart

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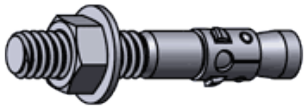
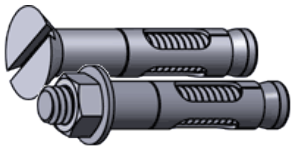
Anchoring Products



Stud Anchors

A.k.a. Wedge Anchors. One piece expansion bolts for heavy duty fastening into stone or solid concrete.

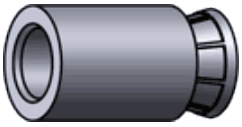


Sleeve Anchors

Heavy duty masonry anchors. Does not require a solid base material for installation.

Lag Shields

Medium dury anchors for use in concrete, brick or mortar. Use with a lag bolt.

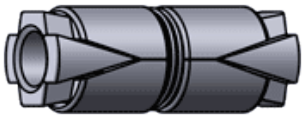


Machine Screw Anchors

A two-piece machine thread anchor for use in stone, brick, or concrete.

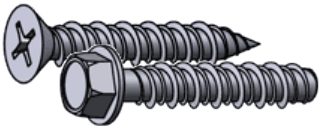
Drop-in Anchors

A heavy duty machine thread anchor for concrete or stone.



Double Expansion Sleeves

Expansion anchor for masonry that ensures contact along the length of the hole.



Concrete Screws

Used in concrete, brick or block. A quick and easy way to fasten in light to medium duty applications

Spring Toggle Wings

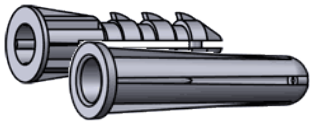
Non-removable fasteners that expand behind the material, e.g. inside a wall, for a secure grip.

Plastic Toggle

When these anchors are driven in they expand inside the hole for a secure grip. Drill hole the same size as the anchor. Non-removable.

Kaptoggle®

A non removable anchor commonly used for hollow spaces such as drywall and masonry block.

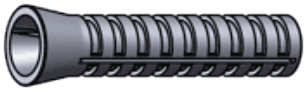


Conical Anchors

Plastic anchors used with sheet metal screws. Can be used in most materials.

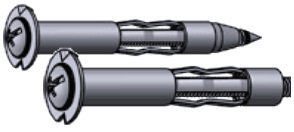
Self Drilling Drywall Anchors

Quick-install plastic anchors used in drywall with sheet metal screws.



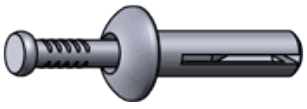
Wood Screw Anchors

This anchor is made of lead and can be used with wood screws or sheet metal screws.



Hollow Wall Anchors

A.k.a. Molly Bolts. Used for light duty anchoring in drywall or other hollow walls.



Nail Drive Anchors

Non removable anchors that expand inside the hole when the nail like pin is driven.

Anchor Bolts

L shaped, machine threaded anchors. Typically embedded in concrete when it is poured.

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US and Metric Ruler

For more printable tools and charts, see
www.mbs-standoffs.com

cut or fold

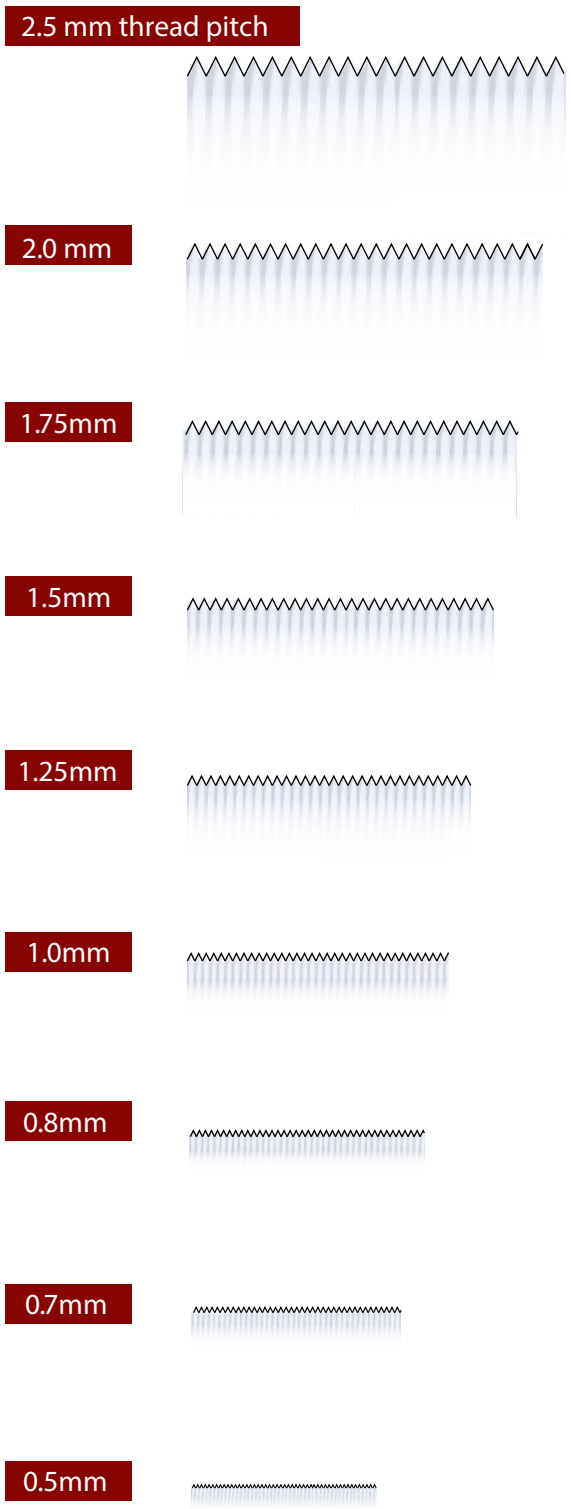
IMPORTANT: Make sure to print this chart to **Actual Size** (no scaling).

After printing, check the ruler (e.g. against the short side of a letter size paper - 8 ½ in - or another ruler) to ensure correct scale. See www.mbs-standoffs.com for more details.

US and Metric Thread Sizes

US Thread Sizes

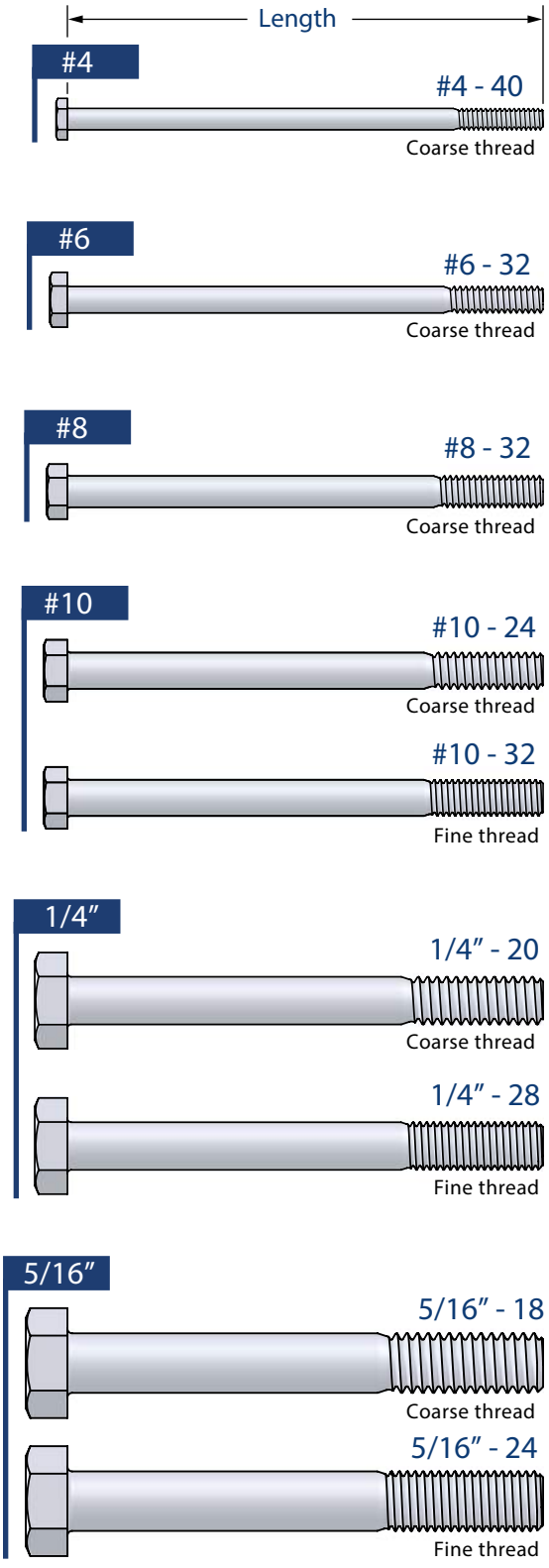
Metric Thread Pitches



IMPORTANT: Make sure to print this chart Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for details.

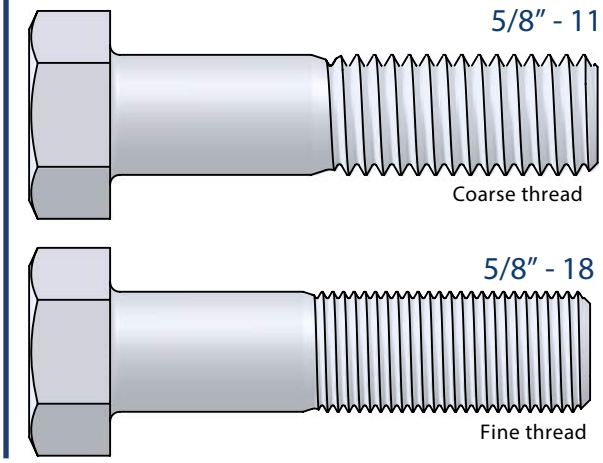
US Hex Bolt Sizes and Thread Pitches

Length is measured from under the head to the end of the bolt

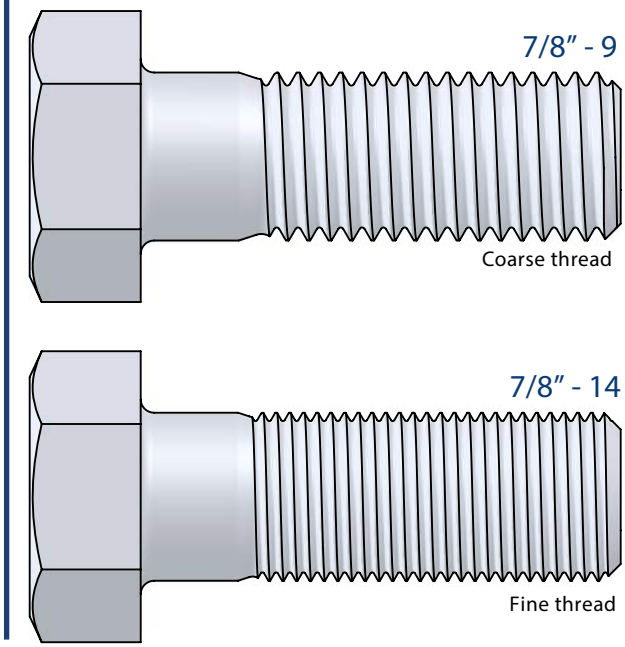


IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

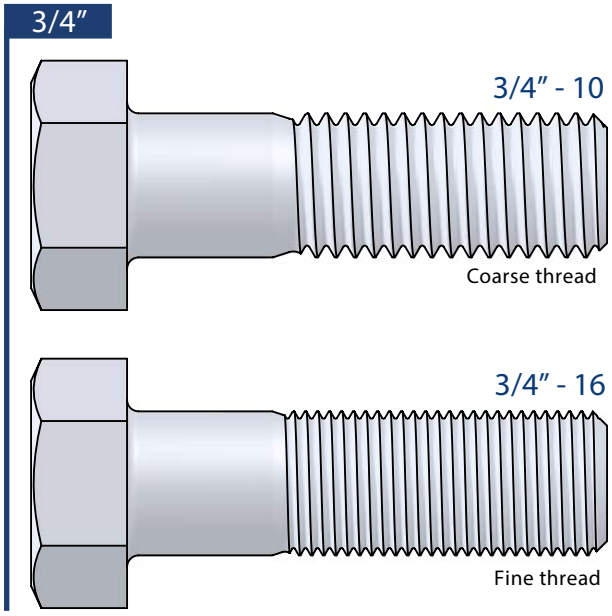
5/8″



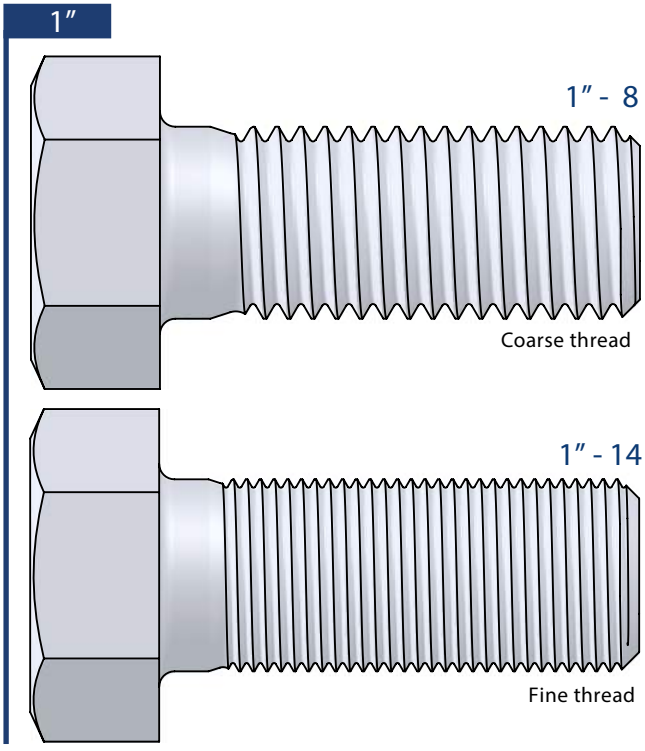
7/8″



3/4″



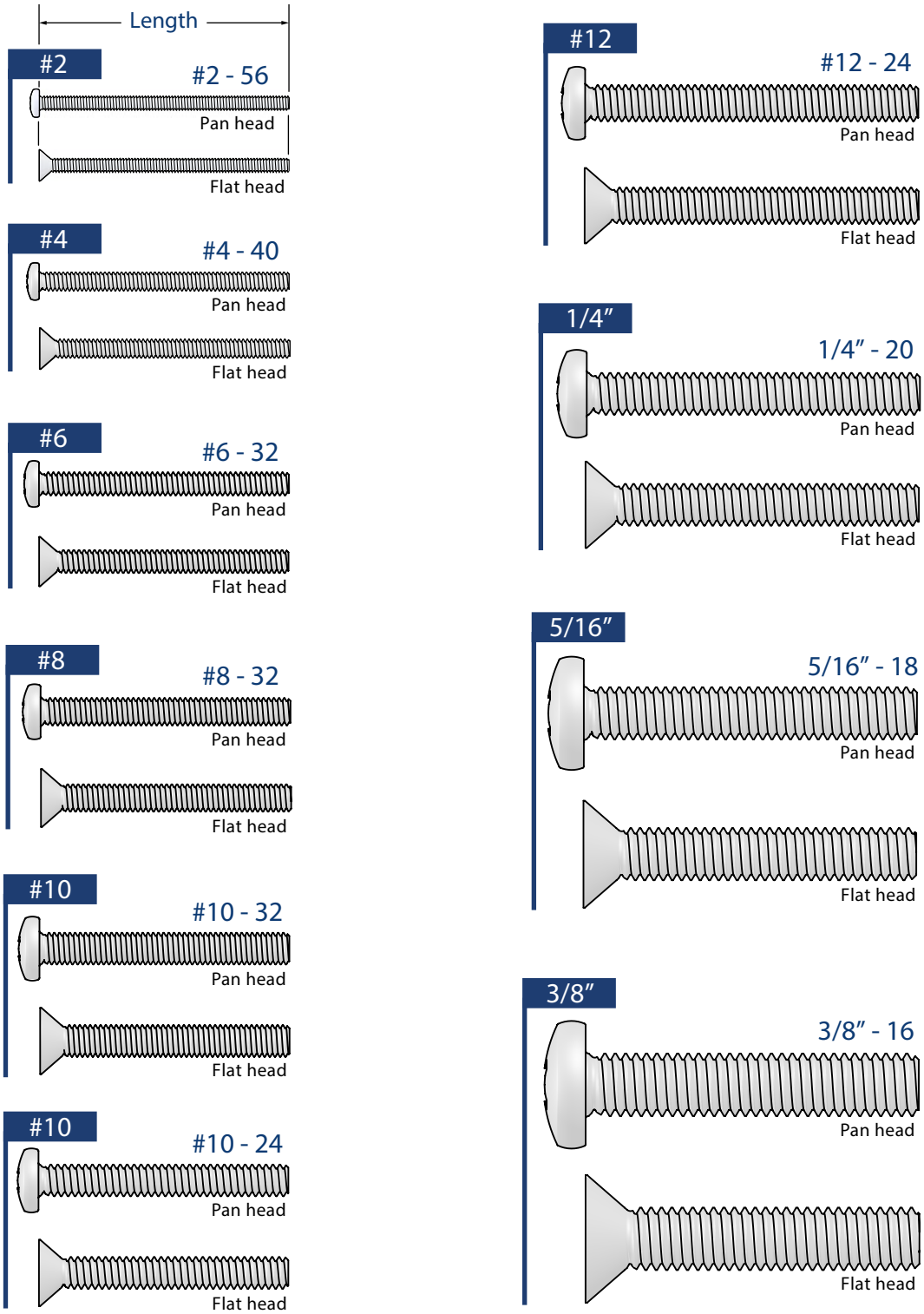
1″



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

US Machine Screw Sizes

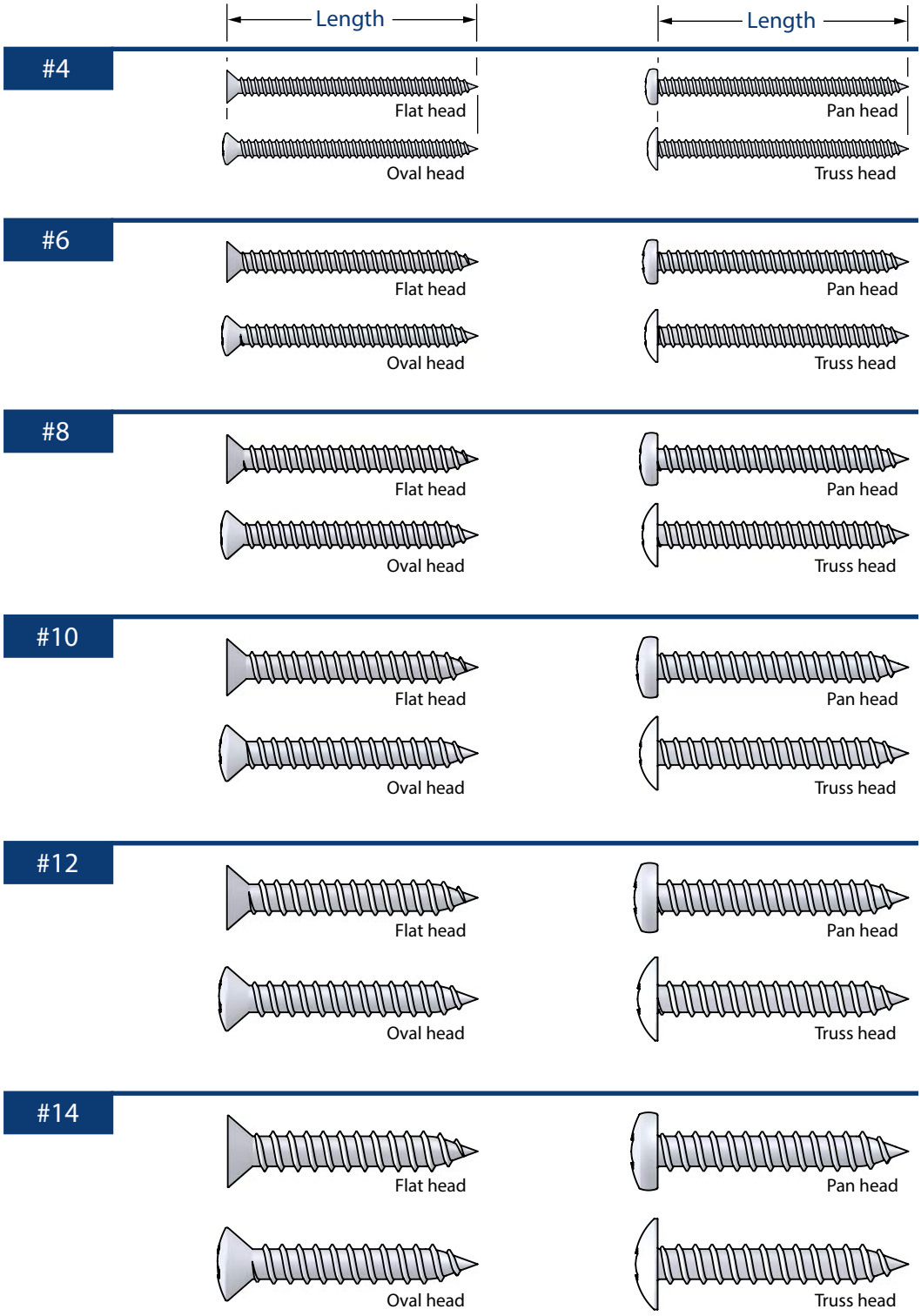
Length is measured from where the surface is assumed to be, to the end of the screw. Therefore, pan head screws are measured from under the head, and flat head screws are measured overall.



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

Sheet Metal Screw Sizes

Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
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US Nut Sizes

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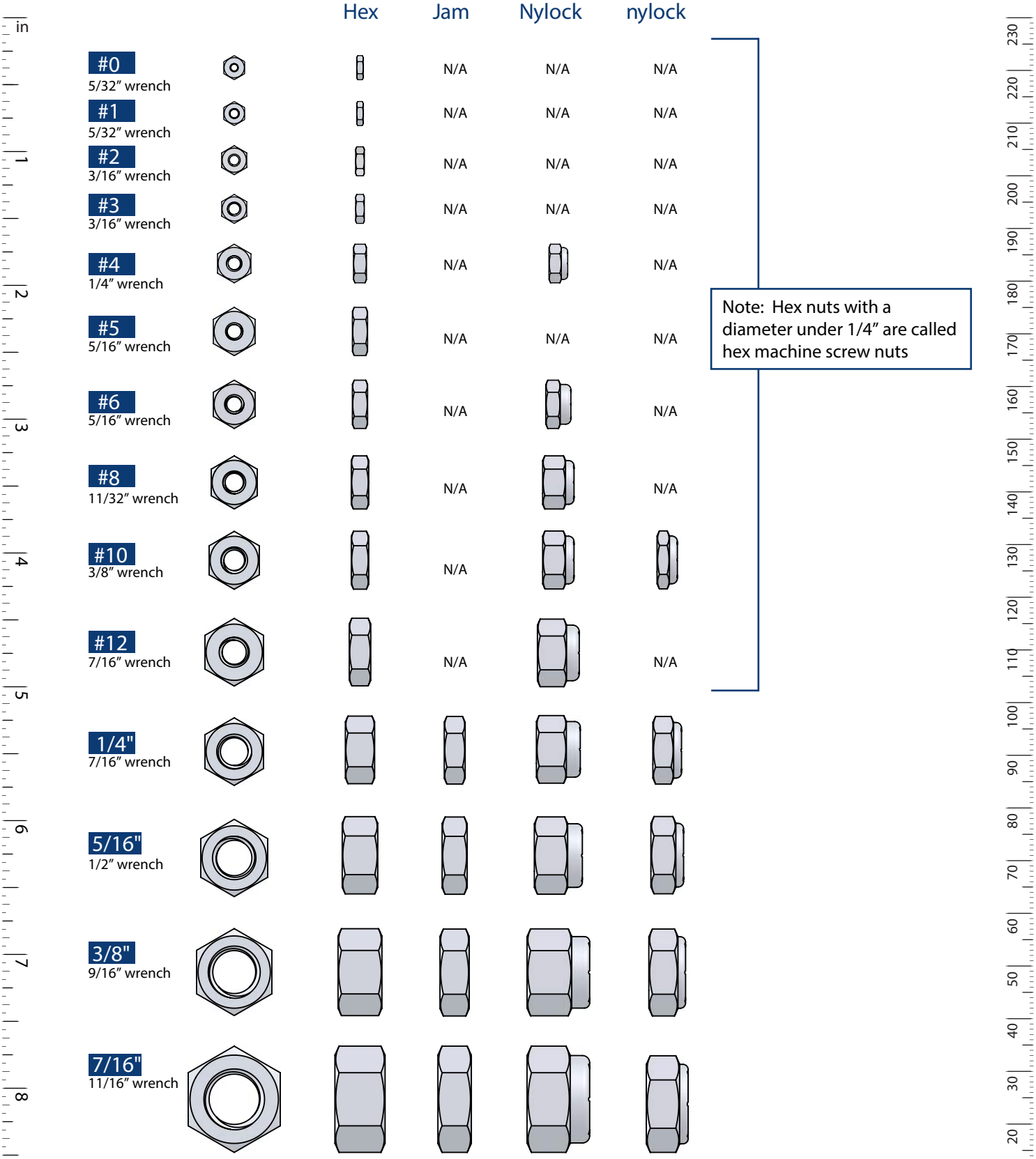
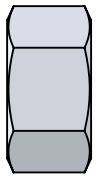
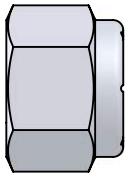
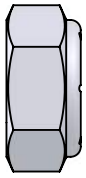
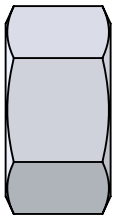
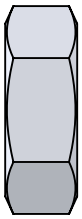
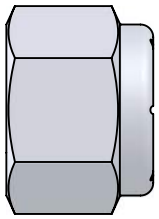
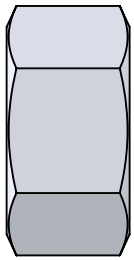
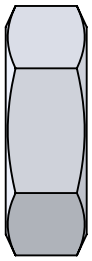
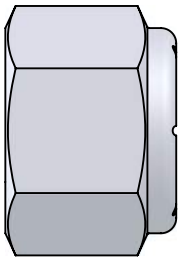
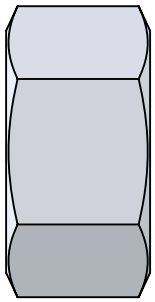
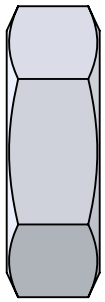
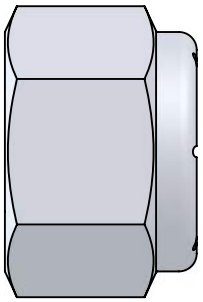
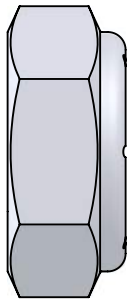
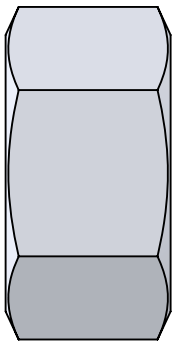
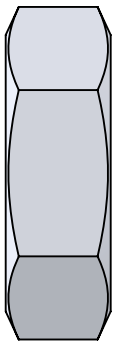
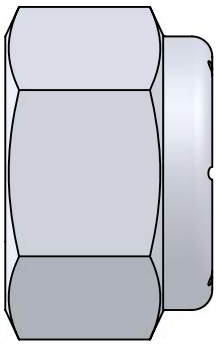
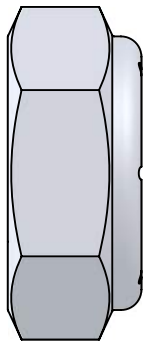


IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

US Nut Sizes (continued)

		Hex	Jam	Nylock	Jam nylock
1/2"	3/4" wrench				
5/8"	15/16" wrench				
3/4"	1-1/8" wrench				
7/8"	1-5/16" wrench				
1"	1-1/2" wrench				

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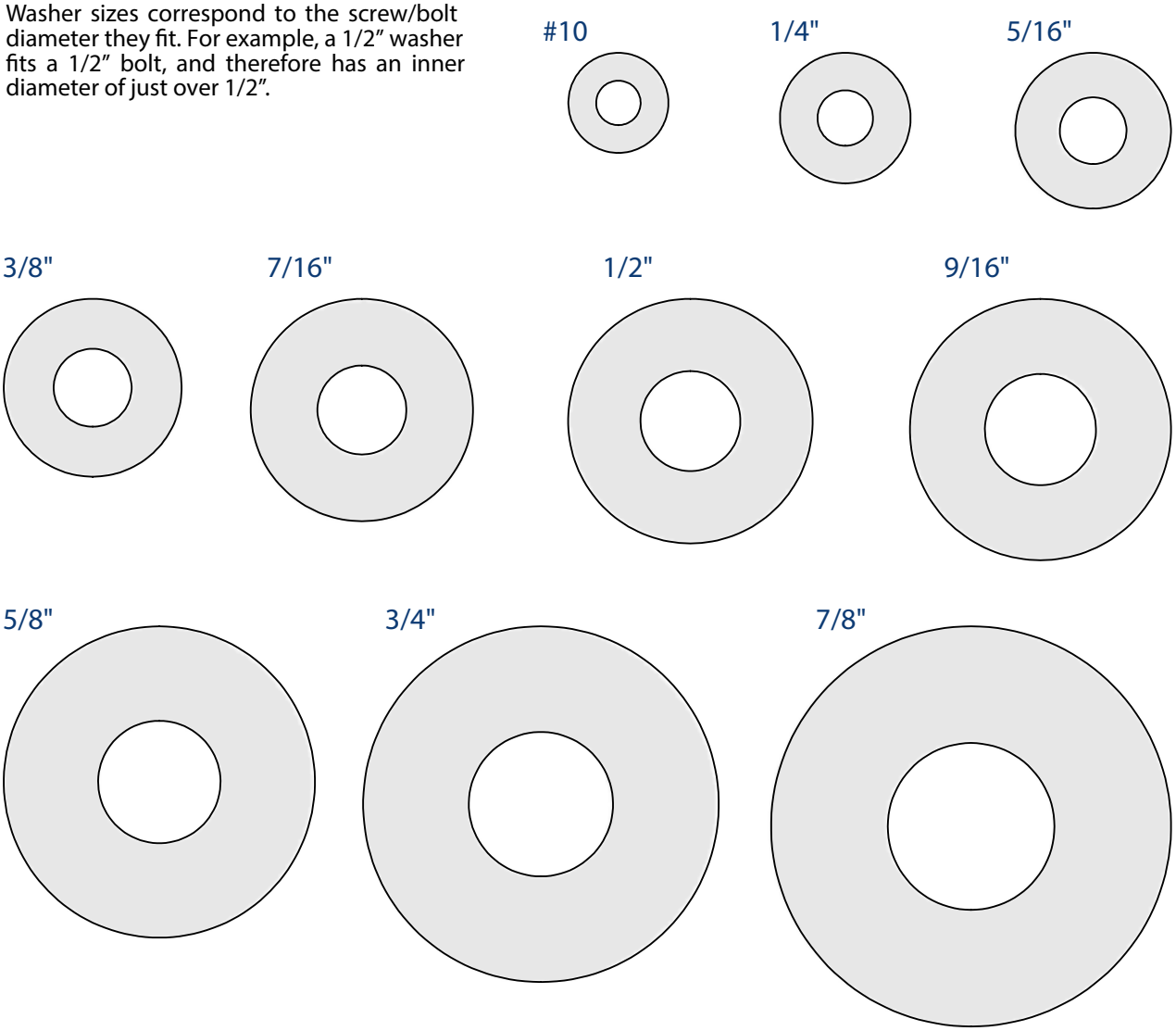
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

in 1 2 3 4 5 6 7 8 9

mm 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230

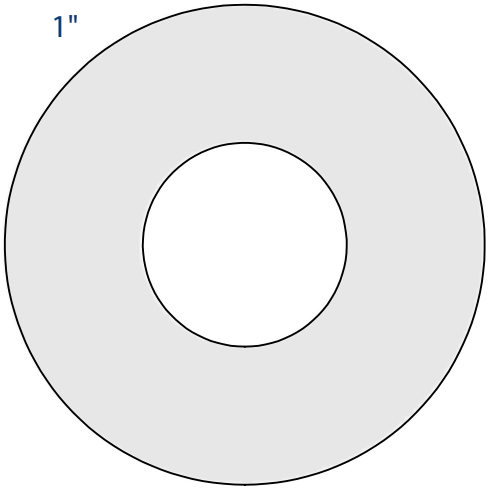
USS Flat Washer Sizes

Washer sizes correspond to the screw/bolt diameter they fit. For example, a 1/2" washer fits a 1/2" bolt, and therefore has an inner diameter of just over 1/2".



Large USS Washer Sizes

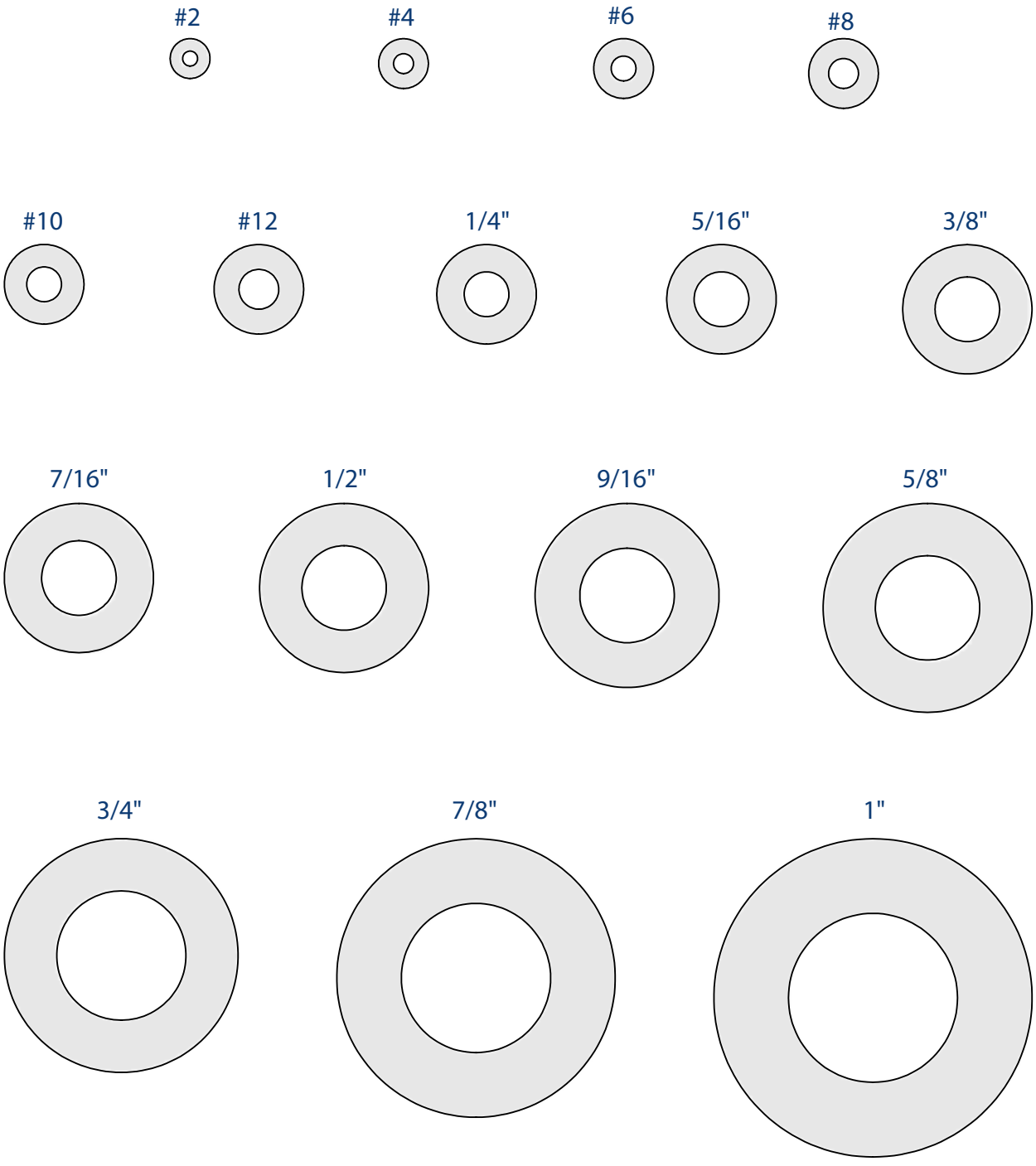
Size	Diameter	
	Inside	Outside
1-1/8"	1-1/4"	2-3/4"
1-1/4"	1-3/8"	3"
1-3/8"	1-1/2"	3-1/4"
1-1/2"	1-5/8"	3-1/2"
1-5/8"	1-3/4"	3-3/4"
1-3/4"	1-7/8"	4"
2"	2-1/8"	4-1/2"



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

SAE Flat Washer Sizes

Washer sizes correspond to the screw/bolt diameter they fit. For example, an 1/4" washer fits an 1/4" bolt, and therefore has an inner diameter of just over 1/4".



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

US Socket Cap Sizes

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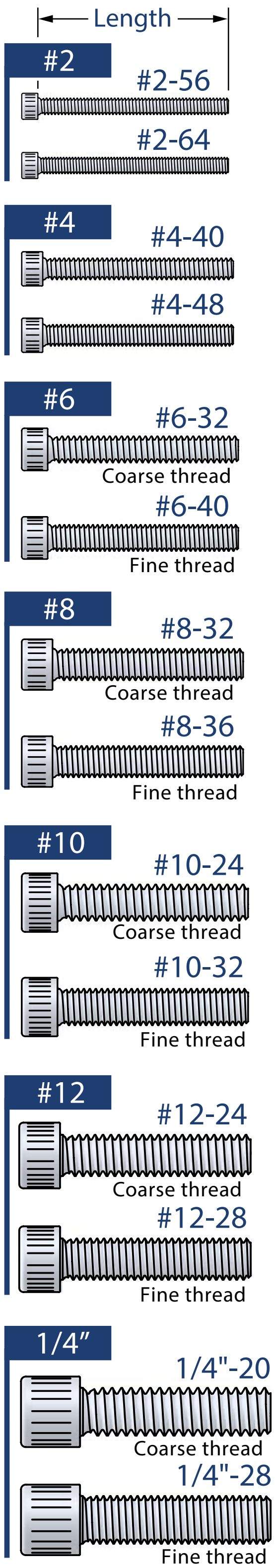
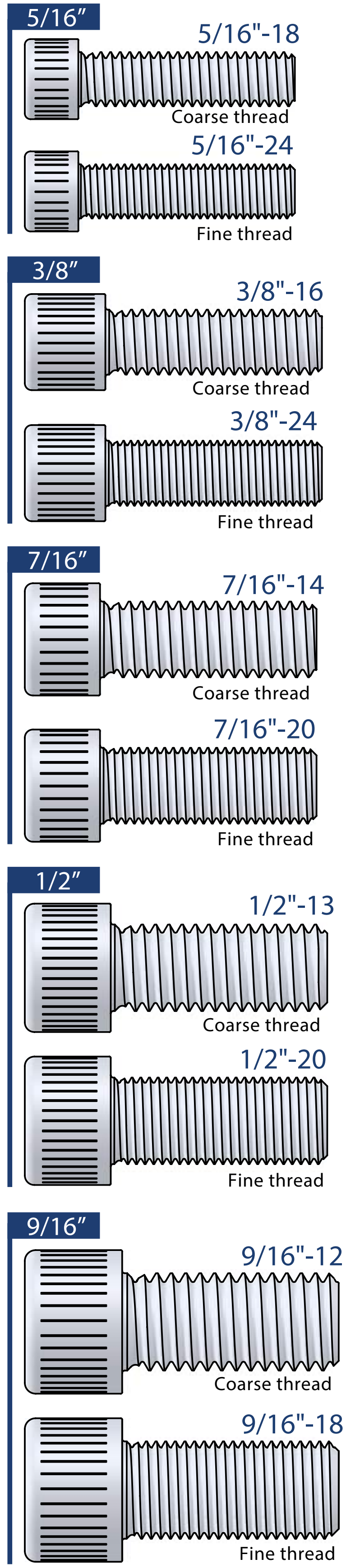
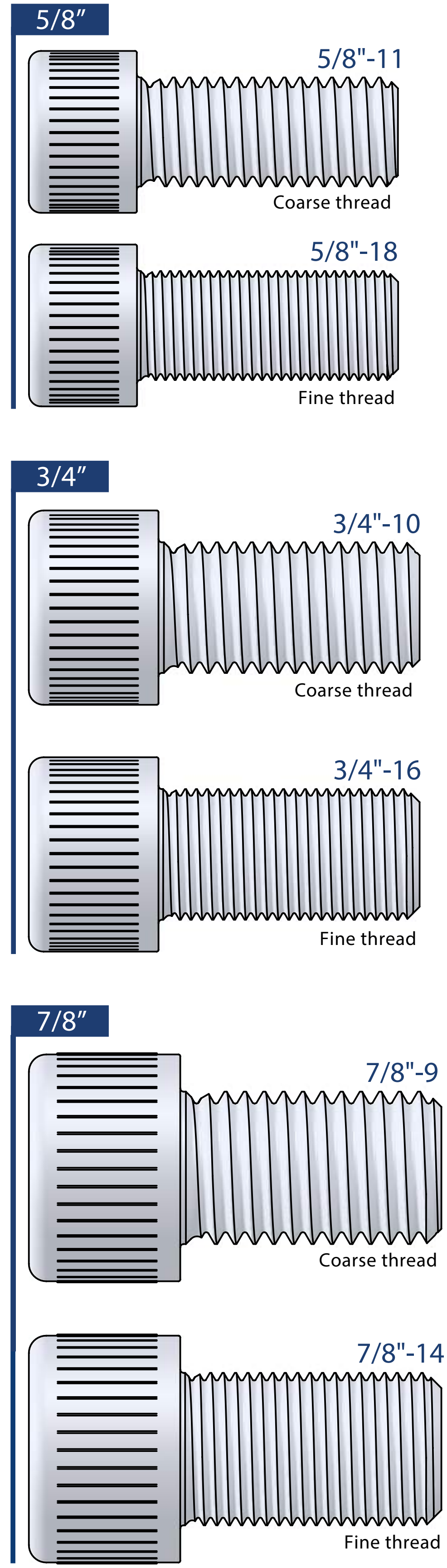
Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.





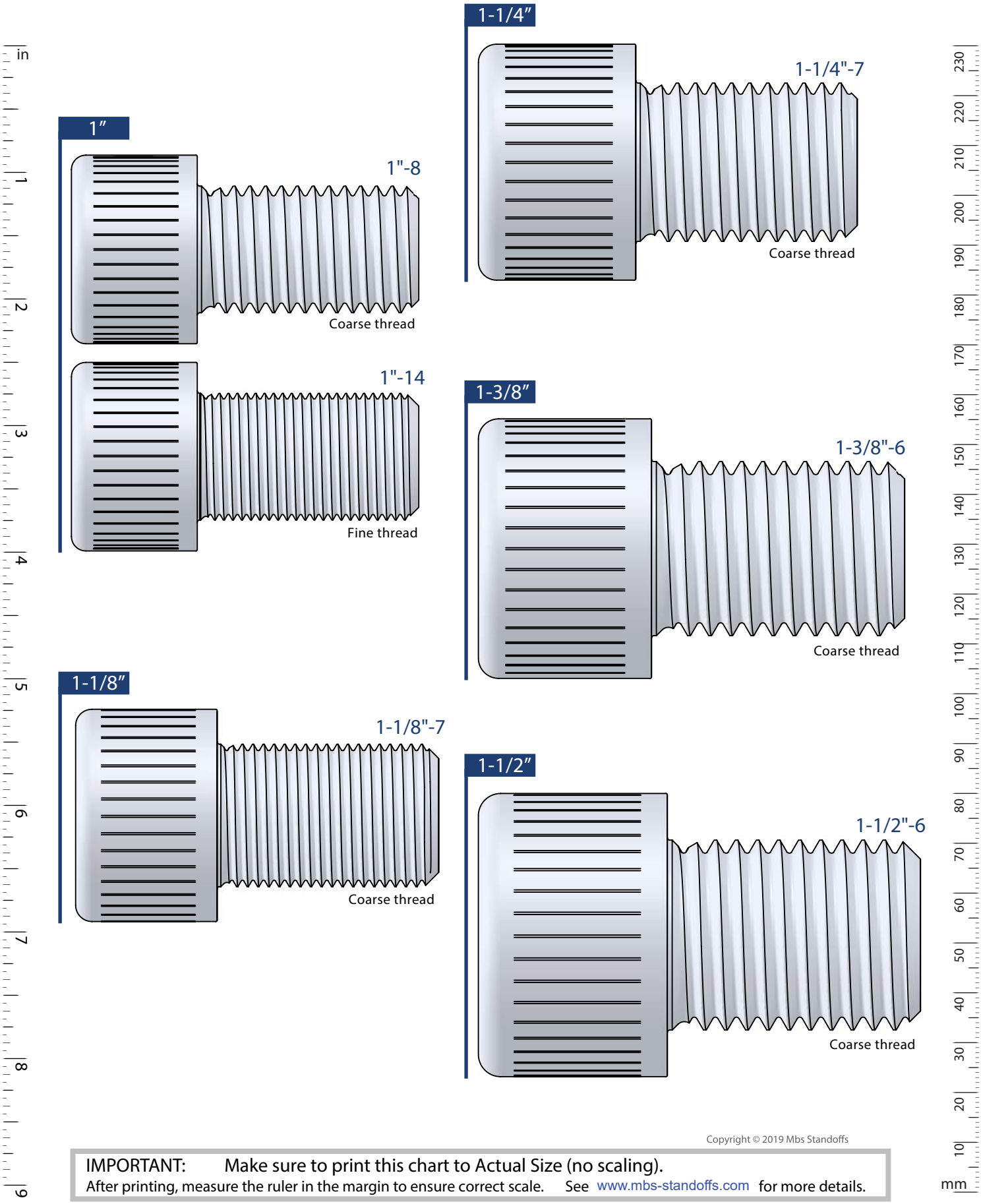


in 1 2 3 4 5 6 7 8 9

mm 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230

IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

US Socket Cap Sizes (continued)



IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

US Socket Flat Head Sizes

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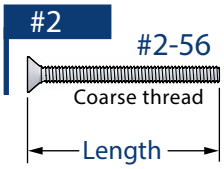
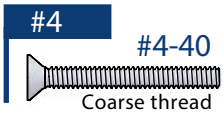
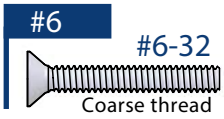
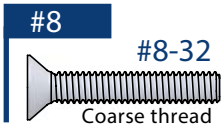
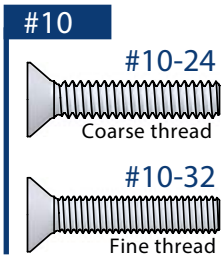
Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.

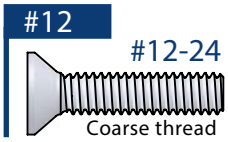


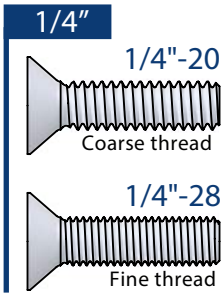


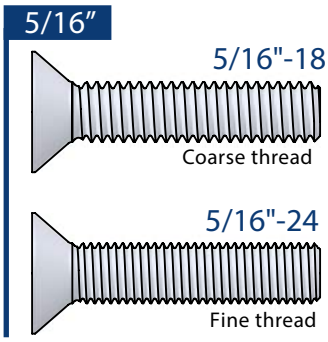


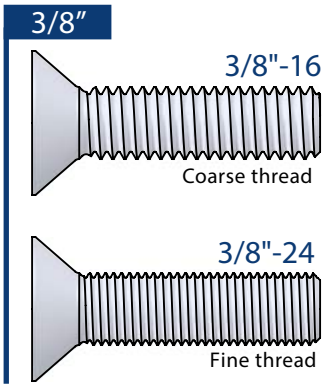


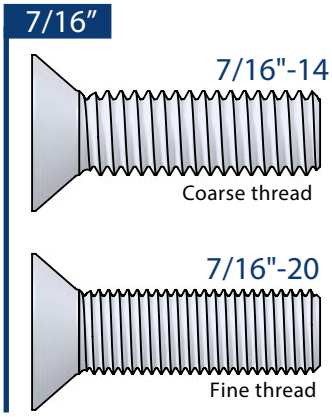


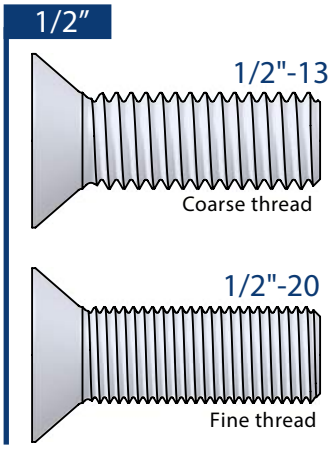


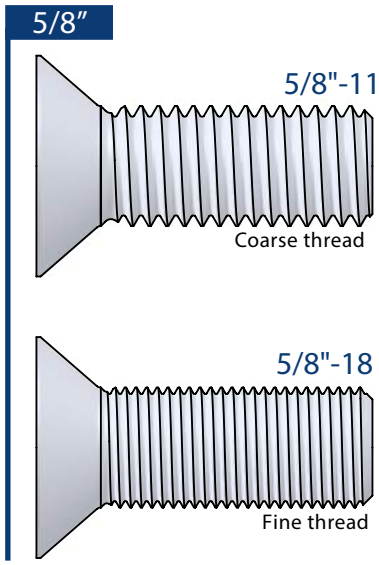


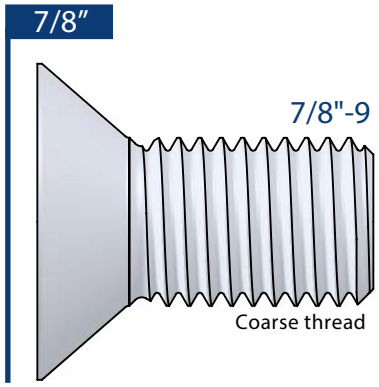


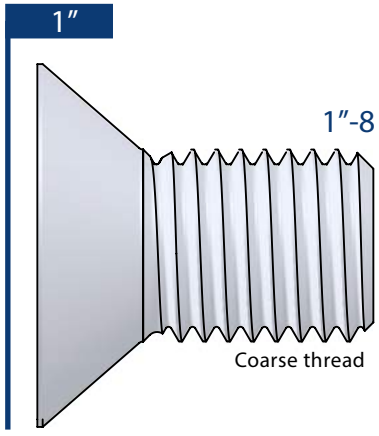








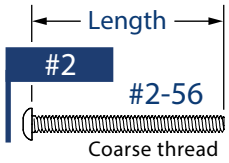


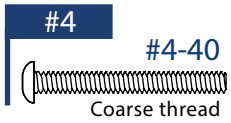


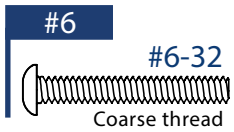
IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

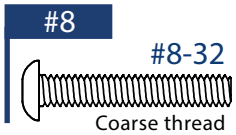
US Socket Button Head Sizes

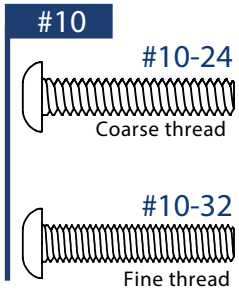
Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.

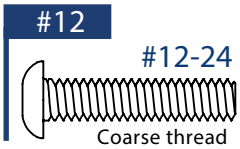


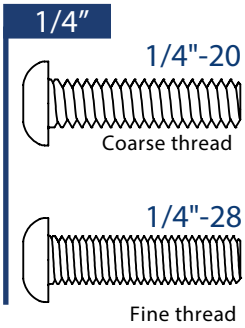


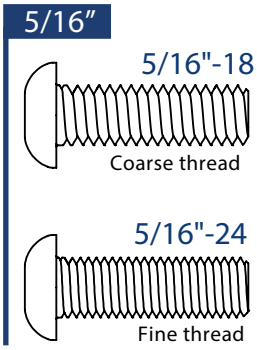


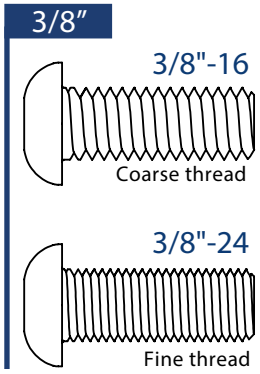


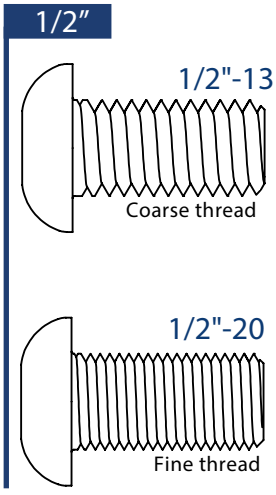












IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
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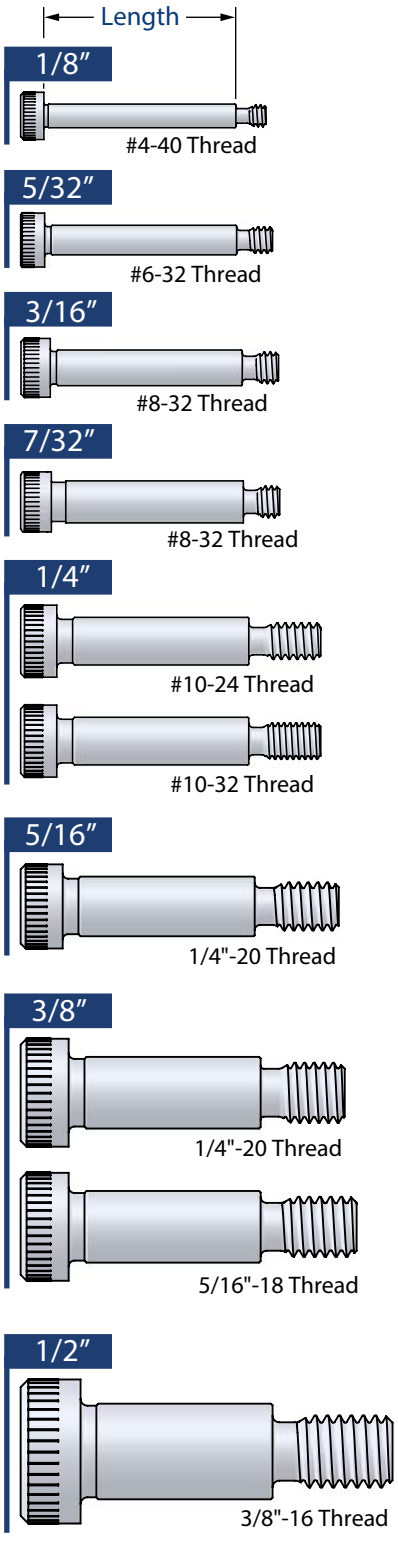
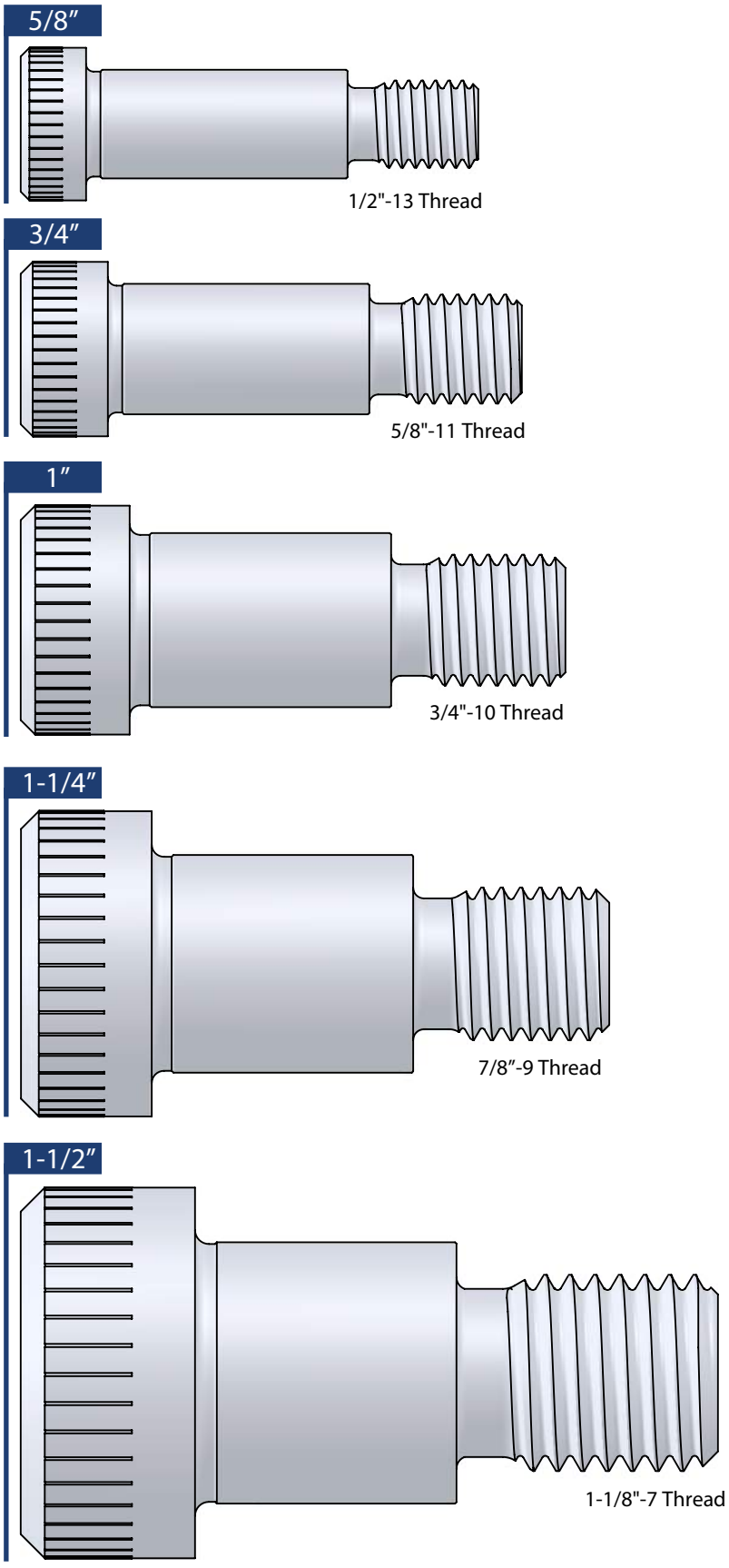
US Shoulder Bolt Sizes

Shoulder bolt size is determined by the diameter and length of the shoulder.

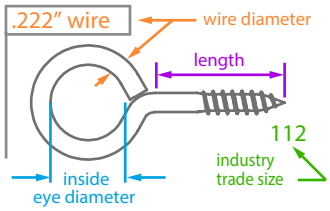




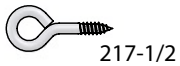
IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

Screw Eye Sizes

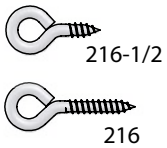
Screw eyes are sold by industry trade sizes (e.g. 112), which correspond to a specific wire diameter, inside eye diameter and length.



.056" wire

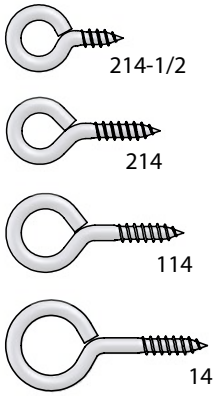


.062" wire



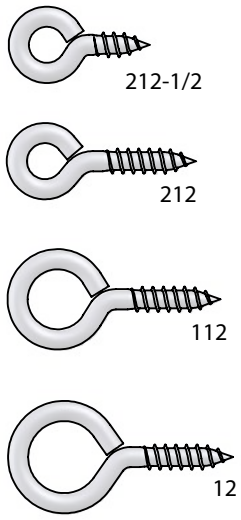
.072" wire

.080" wire

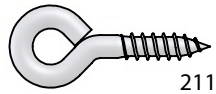


.120" wire

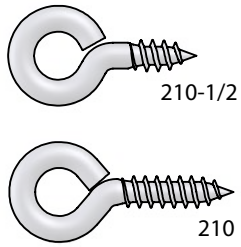
.105" wire



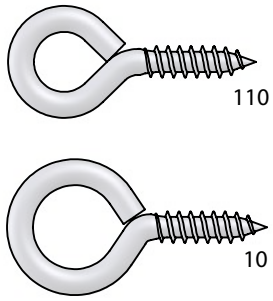
.120" wire



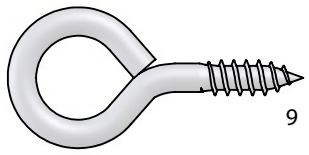
.135" wire



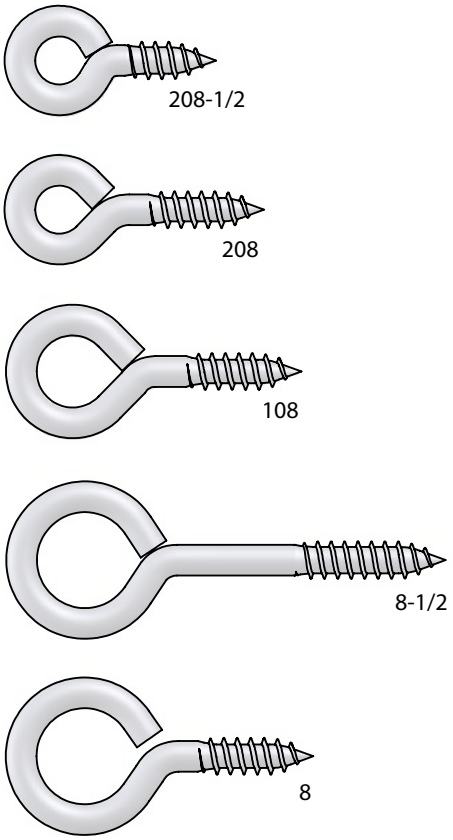
.135" wire continued



.148" wire

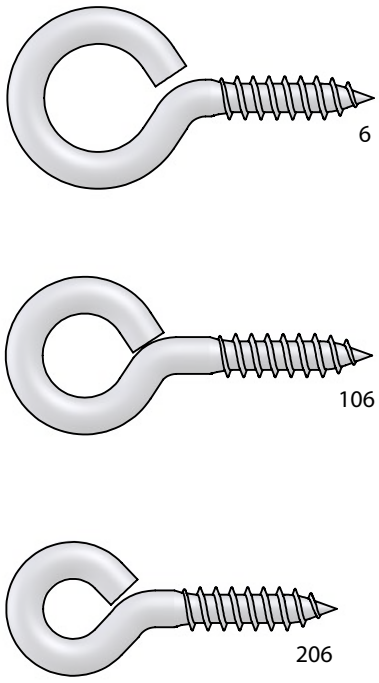


.160" wire

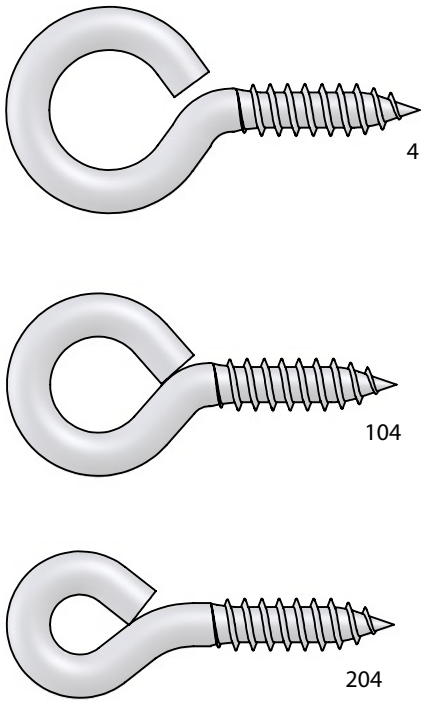


IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

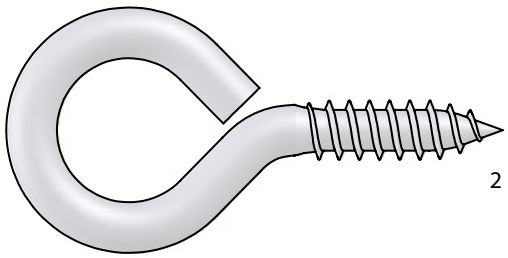
.192″ wire



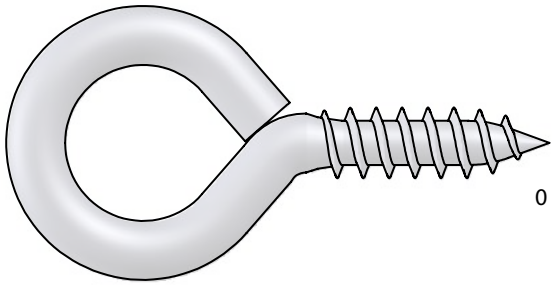
.225″ wire



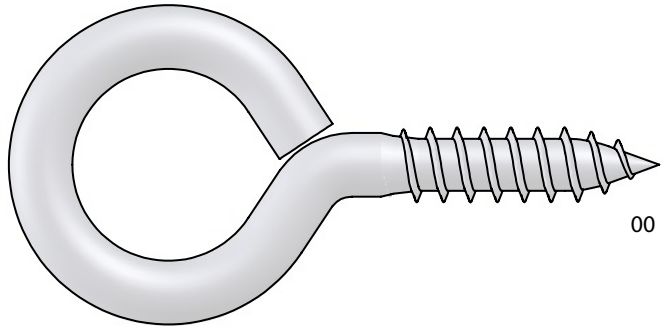
.264″ wire



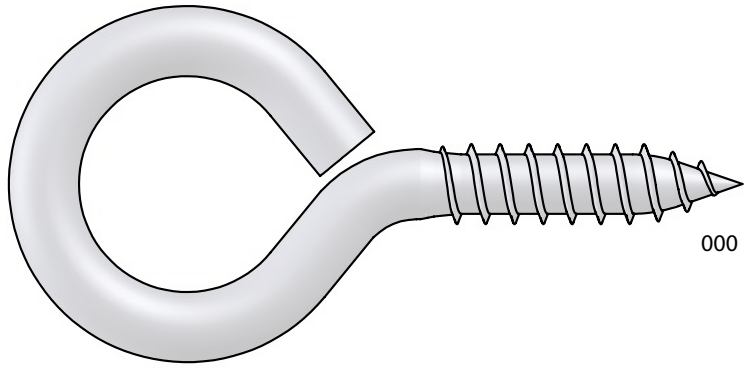
.307″ wire



.331″ wire



.365″ wire

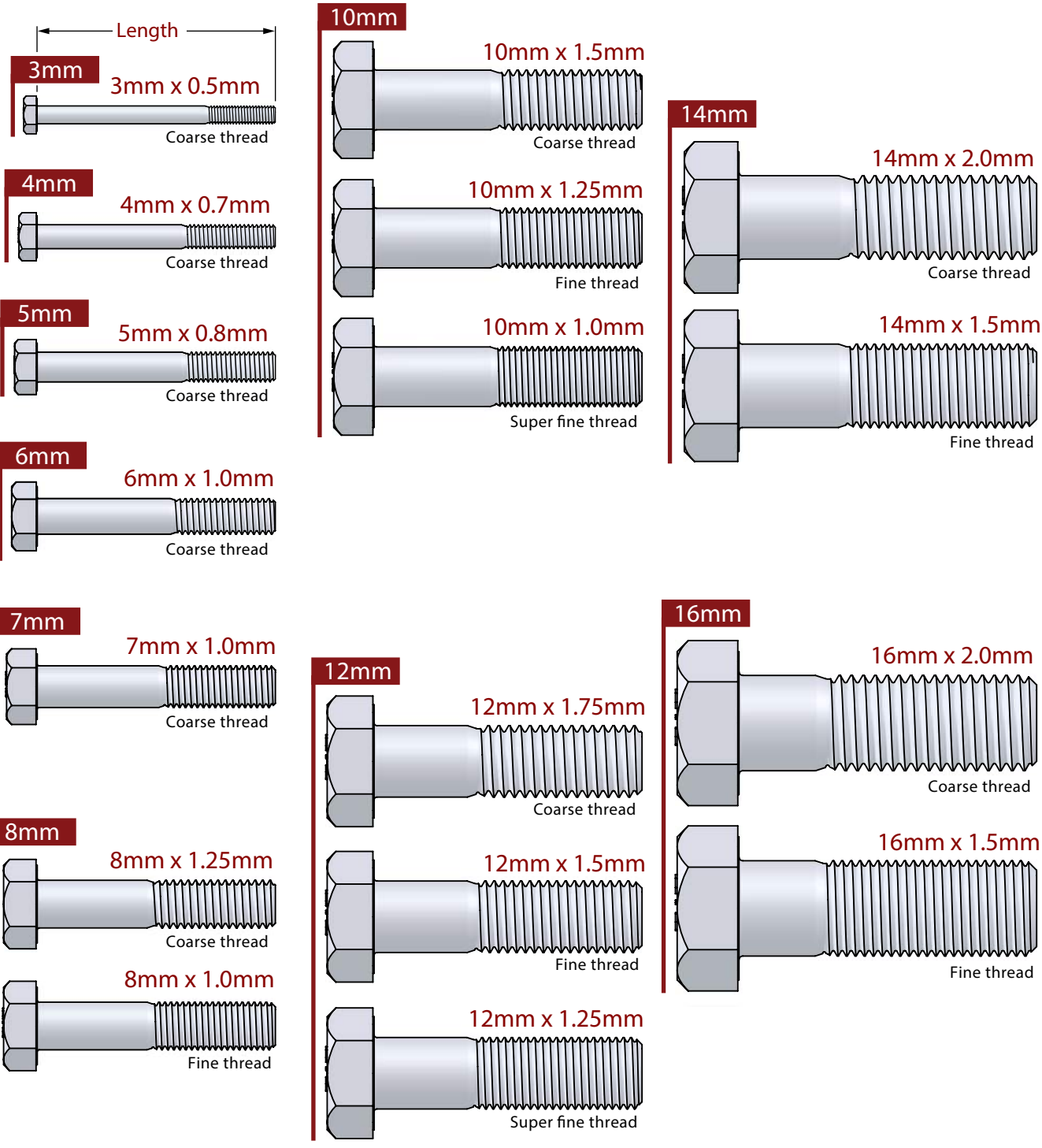


IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

Metric Hex Bolt Diameters and Thread Pitches

Length is measured from under the head to the end of the bolt

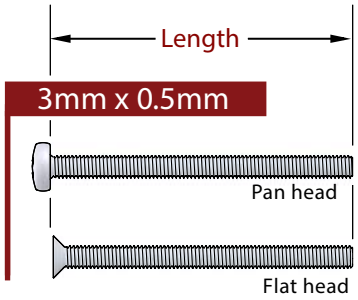
Note: Head sizes may differ from what is shown due to differences between metric standards

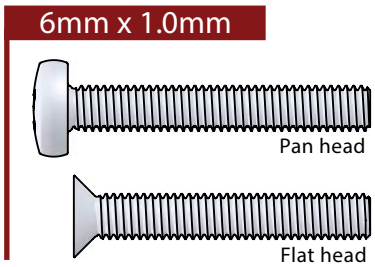


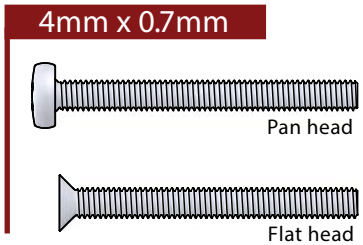
IMPORTANT: Make sure to print this chart to Actual Size (no scaling).
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

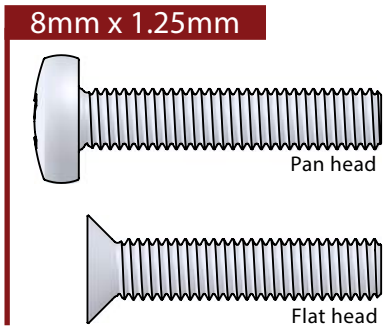
Standard Metric Machine Screw Sizes

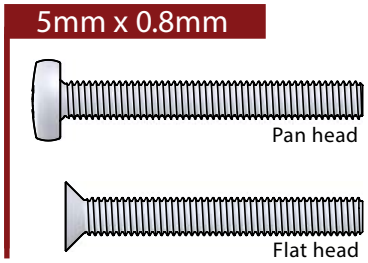
Length is measured from where the surface is assumed to be, to the end of the screw. Therefore, pan head screws are measured from under the head, and flat head screws are measured overall.

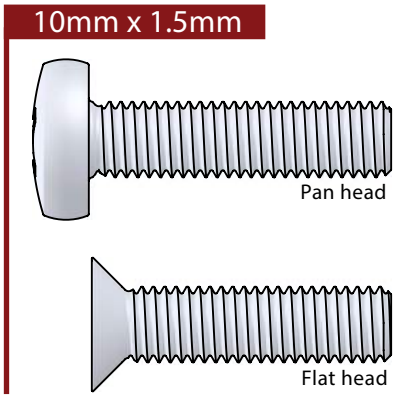












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Metric Nut Sizes

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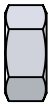
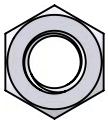
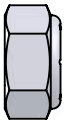
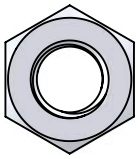
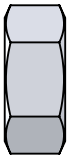
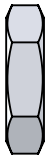
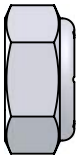
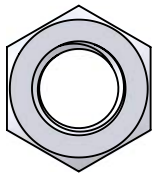
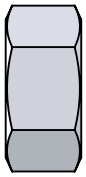
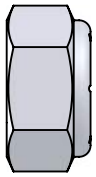
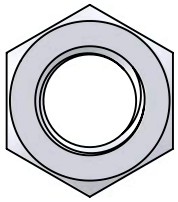
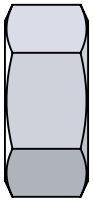
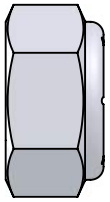
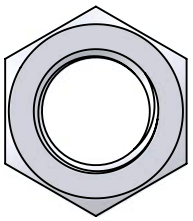
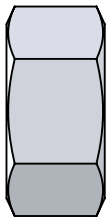
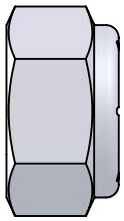
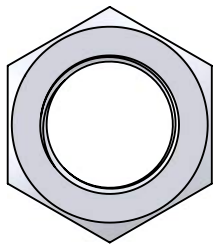
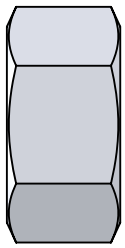
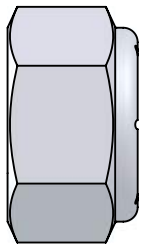
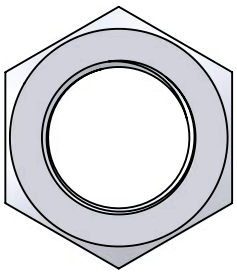
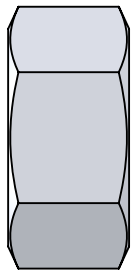
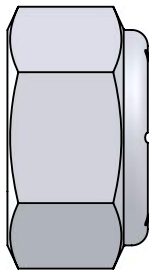
	Hex	Jam	Nylock
2mm 4mm wrench				N/A
2.5mm 5mm wrench				N/A
3mm 5.5mm wrench				
4mm 7mm wrench				
5mm 8mm wrench				
6mm 10mm wrench				
7mm 11mm wrench			N/A	
8mm 13mm wrench				
10mm 17mm wrench				

	Hex	Jam	Nylock
12mm 19mm wrench				
14mm 22mm wrench				
16mm 24mm wrench				
18mm 27mm wrench			N/A	
20mm 30mm wrench			N/A	

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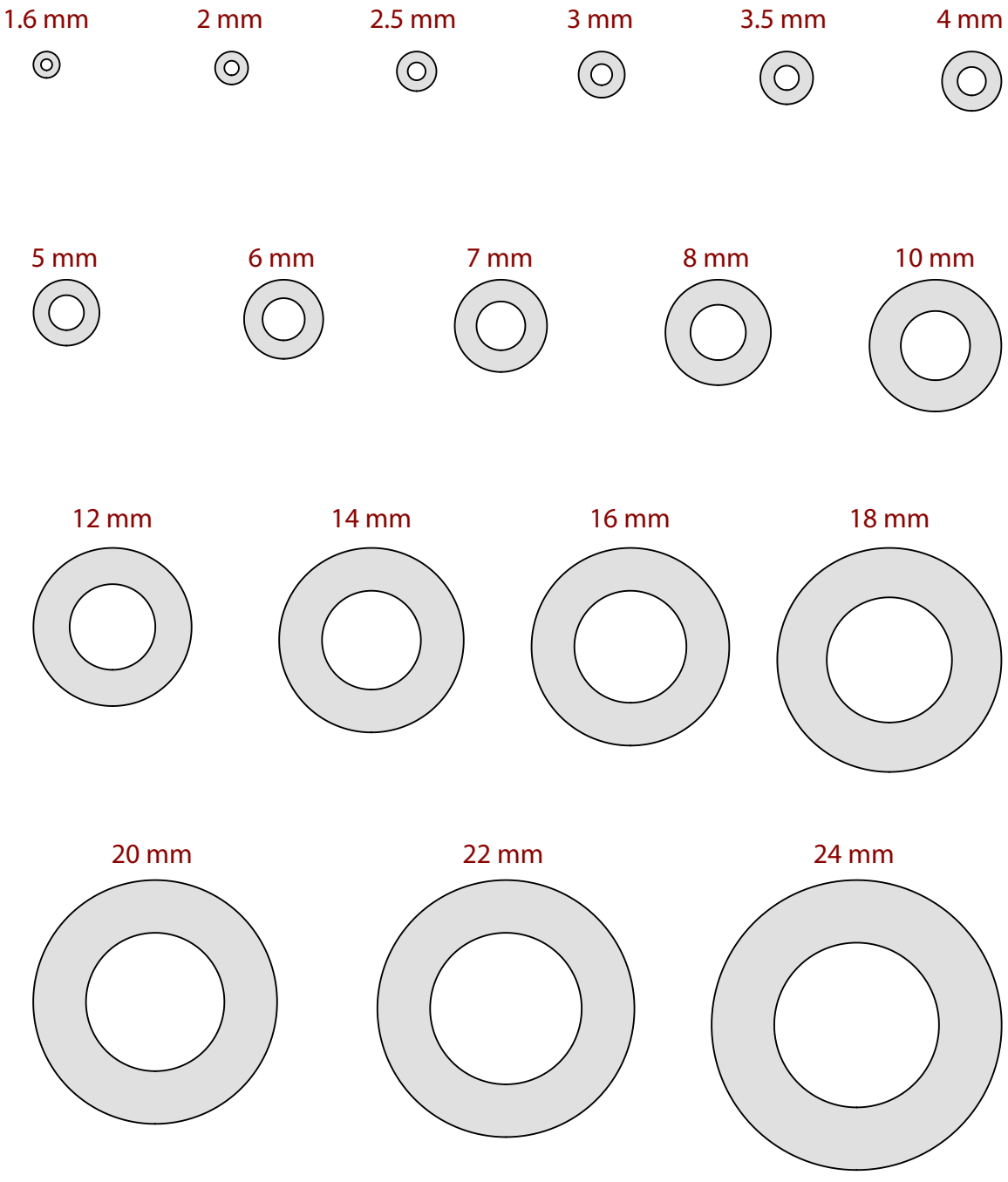
in 1 2 3 4 5 6 7 8 9

mm 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230

Metric Flat Washer Sizes

Washer sizes correspond to the screw/bolt diameter they fit. For example, an 8mm washer fits an 8mm bolt, and therefore has an inner diameter of just over 8mm.



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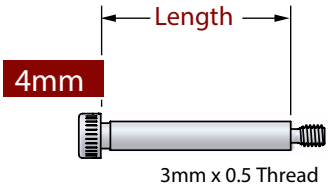
After printing, measure the ruler in the margin to ensure correct scale. See www.mbs-standoffs.com for more details.

Metric Shoulder Bolt Sizes

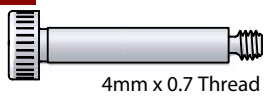
Shoulder bolt size is determined by the diameter and length of the shoulder.



4mm

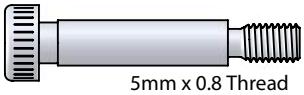
3mm x 0.5 Thread

5mm



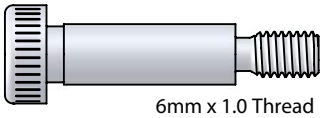
4mm x 0.7 Thread

6mm



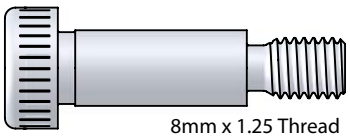
5mm x 0.8 Thread

8mm



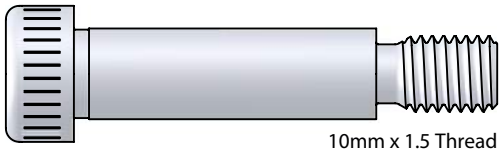
6mm x 1.0 Thread

10mm



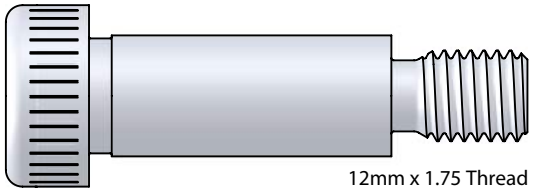
8mm x 1.25 Thread

12mm



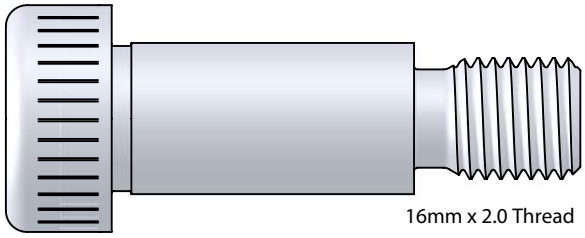
10mm x 1.5 Thread

16mm



12mm x 1.75 Thread

20mm



16mm x 2.0 Thread

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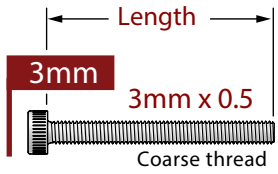
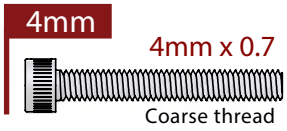
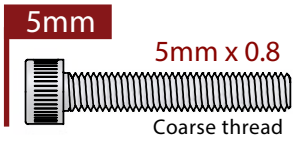
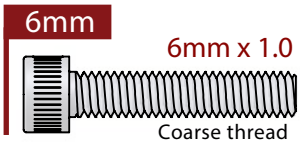
Metric Socket Cap Sizes

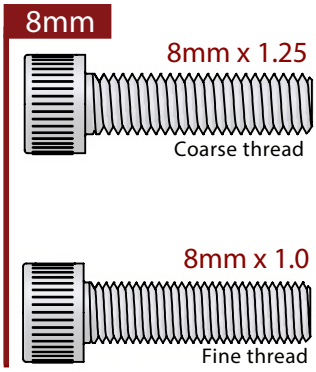
Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.

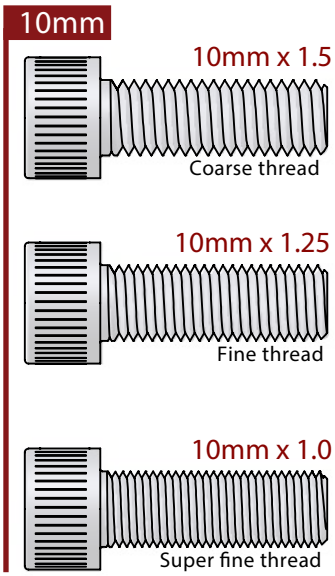


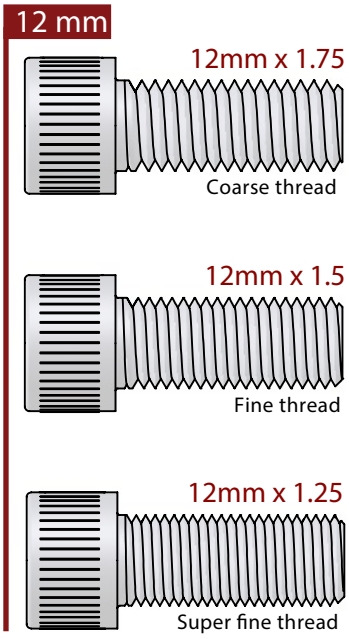


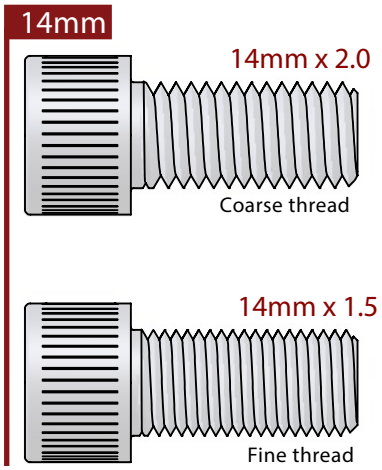


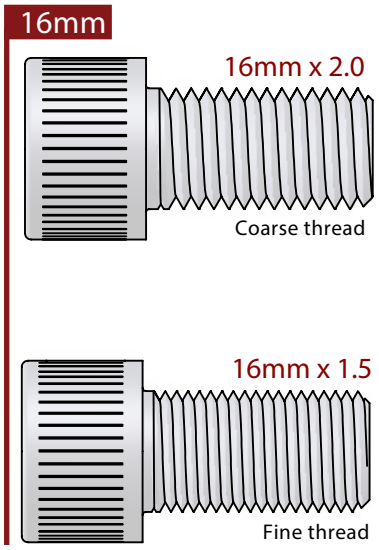












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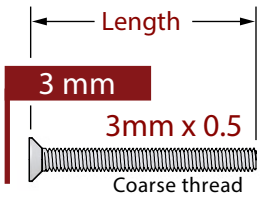
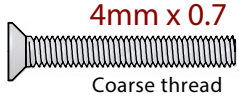
Metric Socket Flat Head Sizes

Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.

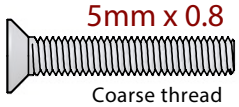


3 mm

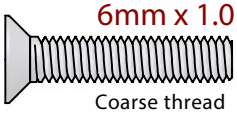
4 mm



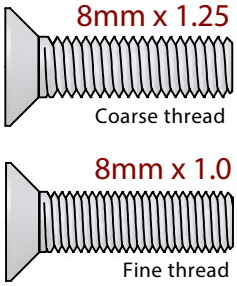
5 mm



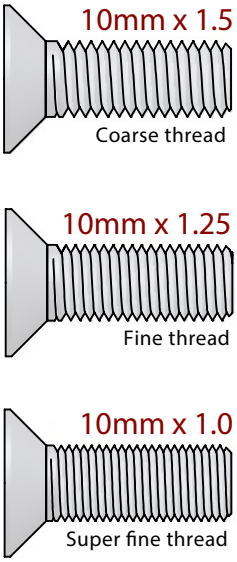
6 mm



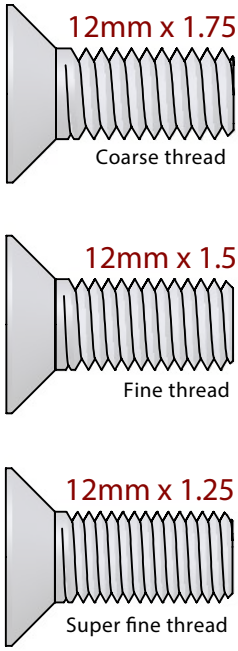
8 mm



10 mm



12 mm



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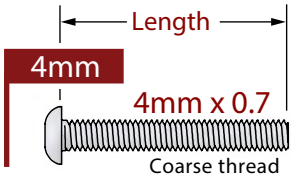
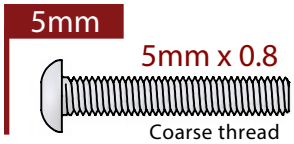
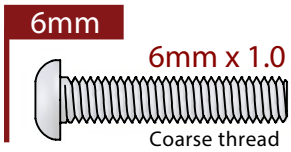
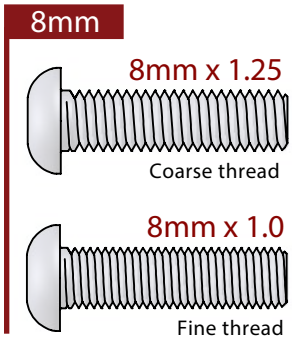
Metric Socket Button Head Sizes

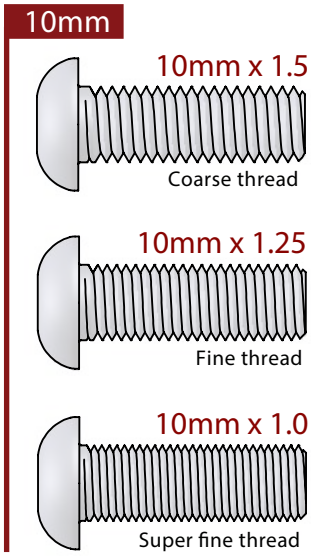
Fastener length is measured from where the material surface is assumed to be, to the end of the fastener.

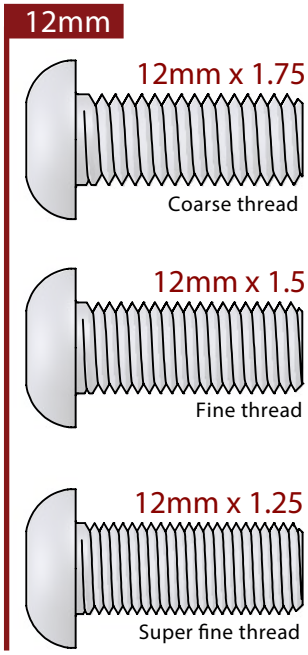












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