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Thread Identification and Sizing Charts

Measuring Threads In General

Thread TPI or Pitch:
You can purchase a cheap template with different size threads to size screws/bolts or go by your local hardware store to use theirs.
But you don't really need one to accurately find the size of most bolts or thread patterns.
You can do some measuring and use the charts below to find bolt / thread sizes of fasteners used on a Sportster.

Thread TPI or pitch can be measured with a thread gauge or by setting a bolt / fitting across a measuring tape and measuring the number of teeth / width respectively.
SAE threads, one inch or longer can be measured by counting how many teeth appear within an inch span.
Shorter SAE threads can be measured by counting how many teeth are in a half inch and doubling the result, quarter inch and multiplying the result by 4 and etc.
And of course, metrics simply measure the distance between two teeth.
A thread gauge can be bought online or usually comes standard in tap and die sets. They are very useful little items to keep in your toolbox.
It comes with teeth cut into it with tooth counts on each blade.

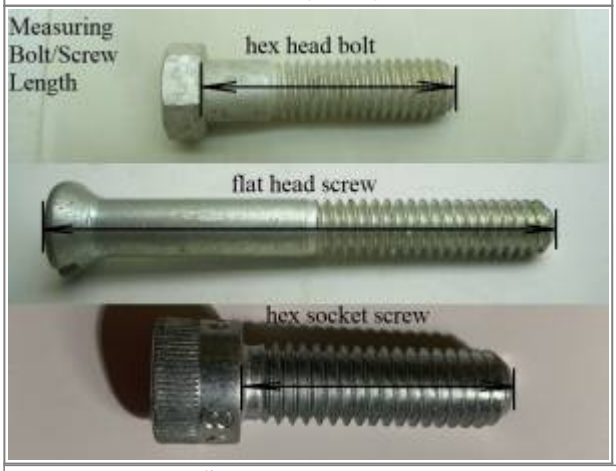
Thread width can be measured with a tape measure.
The outside diameter of the threads are measured from peak to peak and will not reflect the exact standard size.
But you can easily deduce the sizes from there.
A caliper can also be used to measure the width. Just turn the threads at an angle so you catch the outside peaks of the threads on both sides.
Holding a caliper at a 90 degree angle over the threads may result in the tool sinking into the thread valley and giving a false reading.

You can buy tap/drill and metric conversion charts pretty cheap online or at some bolt or hardware stores.
Then hang them up in your shop where you can always find them when needed.

Bolt/Screw Length:

Length is measured from the very end of a bolt/screw to where the fastened surface is assumed to be.
Panhead screws / hex bolts / cap screws etc. are measured from under the head to the end.
Flat head screws, tapered shanks under the head, are measured for overall end to end length (head is assumed to end flush with fastened piece).

Measuring length [1)]



SAE thread gauge: [2)]

Tap/drill and metric conversion charts.

Threads Per Inch (TPI) vs Thread Pitch

Thread Pitch and Threads Per Inch are both used to measure the threading of a bolt or nut to ensure that they are going to couple together properly. [3)]
If the threading of a bolt and nut are different, they will either seize or strip the threading resulting in an unusable connection.

Threads per inch, commonly abbreviated as TPI, is a term frequently used in US fasteners and is a term used to help identify how many threads are in an inch.
To determine treads per inch, an inch of the threads are measured longways and then the peaks on the fastener are counted within that inch.
For threads shorter than 1 in, you can measure half an inch of threads and double the result to get the TPI.

Thread pitch is a term used in place of TPI in metric fasteners and is the distance from one thread to the adjacent thread measured longways across the thread peaks.

Below are charts of the different thread sizes (mainly sizes used on Sportsters plus extras). You can download full size charts from the net if needed.
These are just for quick reference.

Pitch to TPI Conversion Table

The table below is a reprint from THA [4)]

MM per thread (Pitch) = Threads per inch (TPI)					
Pitch (mm)	Pitch (in)	Treads Per Inch	Pitch (mm)	Pitch (in)	Treads Per Inch
0.2	0.0079	127.00	1.25	0.0492	20.32
0.25	0.0098	101.60	1.5	0.0591	16.93
0.3	0.0118	84.67	1.75	0.0689	14.51
0.35	0.0138	72.57	2.0	0.0787	12.70
0.4	0.0157	63.50	2.5	0.0984	10.16
0.45	0.0177	56.44	3.0	0.1181	8.47
0.5	0.0197	50.80	3.5	0.1378	7.26
0.6	0.0236	42.33	4.0	0.1575	6.35
0.7	0.0276	36.29	4.5	0.1772	5.64
0.75	0.0295	33.78	5.0	0.1969	5.08
0.8	0.0315	31.75	5.5	0.2165	4.62
1.0	0.0394	25.40	6.0	0.2362	4.23

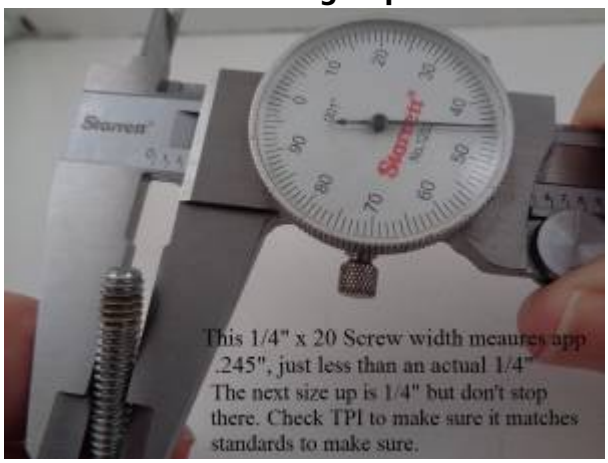
US Nut/Bolt Threads

US threads generally have 3 numbers although the last can be left off unless required.
The first number is a whole number and/or fraction, the second number is the threads per in (TPI), followed by the length in inches.
The diameter is the outside diameter of the thread peaks.
In an example of a 1/4“ bolt bolt; 1/4” x 20 x 1-1/2“ states that the (nominal) diameter of the threads is 1/4”, the TPI is 20 and it's 1-1/2“ long.

- **Field measuring a bolt or screw**:
- Measure the outside diameter of the threads (major diameter) in inches using a tape measure or caliper.
  - The result will be slightly smaller than the (nominal diameter).
  - Check the chart below and match the result with the dimension of the next higher diameter.
  - This will give you nominal thread diameter (or the first number).
- Measure the threads per inch using a tape measure or a thread gauge.
  - This will give you the TPI (or second number).

US Thread Pitch								
Bolt (nominal) Diameter	Decimal	TPI (course)	TPI (fine)		Bolt (nominal) Diameter	Decimal	TPI (course)	TPI (fine)
1/4”	.25“	20	28		**3/4”**	.75“	10	16
5/16”	.3125“	18	24		**7/8”**	.875“	9	14
3/8”	.375“	16	24		**1”**	1“	8	12

Methods of measuring in pics:



5)

Field measuring 3/8" x 16 Bolt threads

6)

Metric Nut/Bolt Threads

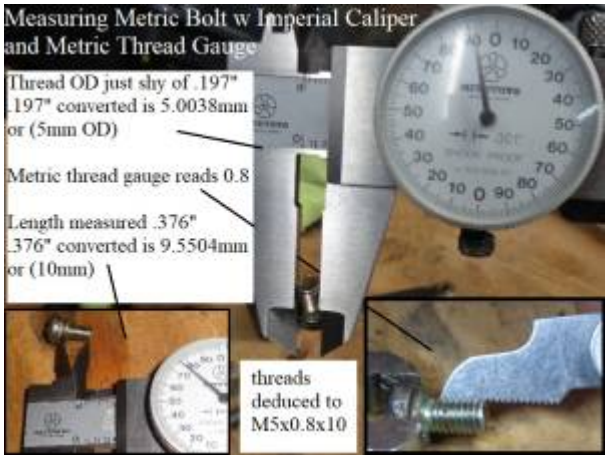
Metric bolts are written down as an “M” followed by 3 numbers and again the last can be left off unless required.
The first number is the diameter, the second the thread pitch, and the third the length in millimeters. 7)
The diameter is the outside diameter of the thread peaks.

In example of a 10mm bolt; M10x1.25×35 states that the diameter of the threads is 10mm, the thread pitch is 1.25mm and it's 35mm long.

Metric Thread Pitch

Thread OD Metric	Thread OD Inches (app)	Standard Pitch (mm)	Fine Pitch (mm)	Extra Fine Pitch (mm)
4mm	0.157”	0.70	-	-
5mm	0.197“	0.80	-	-
6mm	0.236”	1.00	-	-
7mm	0.275“	1.00	-	-
8mm	0.315”	1.25	1.00	-
10mm	0.394“	1.50	1.25	1.00
12mm	0.472”	1.75	1.50	1.25
14mm	0.551“	2.00	1.50	-
16mm	0.630”	2.00	-	-
18mm	0.708“	2.50	-	-
20mm	0.787	2.50	-	-
24mm		3.00	-	-

Methods of measuring in pics:
Metric screw thread OD can be deduced by using an imperial (US) scale caliper using the chart above. Your measurements may not be an exact match to the dims above but will be close enough to make a judgement on the metric counterpart size.



[8]


[9]

Common Brake Line Threads

Most brake systems use flared fittings since they have strong metal to metal connections.
There are two types of brake flare fittings used in brake systems, 37° and 45°. [10]
45° brake line flares are the most commonly used in all kinds of vehicles (using double flared or bubble flared tubing).
AN or JIC fittings require 37° flared tubing.
Single flared lines should not be used in brake systems.

The most common sizes for brake line connections are 3/8”-24, 7/16“-24, 1/2”-20, 5/8“-18, 10mm-1.0 and 12mm-1.0. [11]

3/8” x 24 vs M10 x 1.0mm
3/8“ x 24 TPI equates to a thread pitch of 0.0416666666666667” or 1.05833333mm.
3/8“ x 24 stated in metric units equates to 9.525mm x 1.05833333mm
So a 3/8” fitting is slightly smaller in diameter than the 10mm fitting but each thread is .058mm farther apart than a 10mm fitting's threads.

A 3/8“ x 24 UNF American nut will thread very easily and loosely into a 10mm x 1.0 thread fitting but will most likely strip the threads when you tighten it down. [12)]
You can start a 10mm x 1.0 threaded nut into a 3/8” x 24 UNF thread fitting but it will immediately begin stripping the threads.
It will catch the first thread, making you think that it will go in, but it will destroy the threads as you tighten it.

Thread Conversion Comparisons		
Thread Size	Metric Diameter	Metric Thread Pitch
3/8“ x 24	9.525mm	1.05833333mm
M10 x 1.0	10mm	1.0mm
7/16” x 24	11.1125mm	1.05833333mm
M12 x 1.0	12mm	1.0mm

NPT Pipe Threads

NPT stands for National Pipe Thread. Descriptions are commonly used as either straight (NPS) or tapered (NPT). [13)]
Pipe thread sizes do not refer to any physical dimension.
NPT has flattened peaks and troughs where BSP is rounded. NPT has a thread angle of 60º where BSP is 55º.
NPT threads are tapered to create an interference fit and often use thread tape or thread sealant to form a liquid tight seal without using washers, O-rings or gaskets.

There is no direct naming relationship between the measured diameter of NPT pipe threads and the corresponding NPT size.
The measurements are “trade sizes.” That means they are uniform sizes according to the diameter of the pipe or fitting that they can be used with.
The outside diameter of each pipe fitting can be measured and compared to the table below for size identification. [14)]
The OD measurement for a male connection should be taken near the base of the threads, farthest from the (tapered) end of the part.
An ID measurement for female connection should be taken as close to the opening as possible while remaining within the threads.
An OD measurement for a female connection is more difficult, but sometimes may be taken by measuring the outermost edge of the threads at the pipe opening.

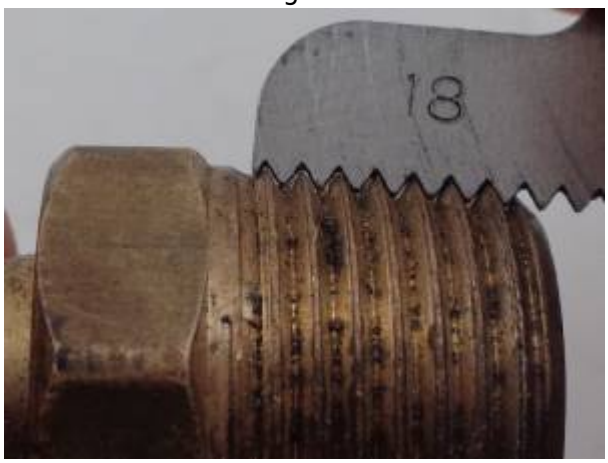
Little known fact:
All iron heads pipe threads used in cases, rocker boxes, and oil pumps are straight female thread, fitted

with tapered thread male fittings.[15)]
This holds true for Evo Sportsters also.

- The sizes in the chart below are the major dia of the male straight thread (as the pipe OD is the major).
  And the major dia. of a tapered male thread at it's big end. [16)]
- The tapered thread has it's diameter reduced on a taper of .0625“ per inch of thread length. Almost all hardware store fittings will be tapered thread.[17)]

Nominal pipe size (NPT) (male threads)	Threads per inch	Actual outside diameter, (OD)	
		Inch	MM
1/8”	27	.405	10.3
1/4“	18	.540	13.7
3/8”	18	.675	17.1
1/2“	14	.840	21.3
3/4”	14	1.050	26.7
1“	11-1/2	1.315	33.4
1-1/4”	11-1/2	1.660	42.2
1-1/2“	11-1/2	1.900	48.3
2”	11-1/2	2.375	60.3
2-1/2“	8	2.875	73.0

Methods of measuring:



[18)]

AN and JIC Flared Fitting Threads

Flare Angle Compatibility

- Flared connections generally consist of 2 parts (a flared fitting or a flared tubing end connected to another part that has the same receiving flared angle seat so that both flared portions ensure metal-to-metal contact between the mated parts to preventing leaks and maintain system

pressure. [19)]
- It's important that the flare angle is the same for the fitting/tubing and it's mating seat to maintain the integrity of the seal. JIC and AN fittings have 37° flare angles while SAE fittings have 45° flare angles. Fittings with different flare angles are not compatible and should not be mated. An incorrect angle prevents proper seating, leading to leaks even if other dimensions are accurate, compromising the entire hydraulic or fluid system's integrity.
- Accurately identifying the flare angle requires a dedicated flare gauge. This tool confirms if the angle is precisely 37 or 45 degrees, eliminating guesswork. Visual inspection alone is often insufficient and can lead to costly fitting errors. [20)]
- Thread sizes have nothing to do with flare angles. While flare fittings have threads, the flare angle is independent of the thread size or pitch. Two fittings can have identical threads but different flare angles, making angle verification a distinct and essential step in proper fitting identification and selection. [21)]

AN

AN (or Army/Navy) was never intended to characterize an entire fluid system, and is mostly designed as a thread specification.
AN fittings are flared fittings with a 37° chamfer seating surface and straight threads.
They can also be reused many times unless the seats are damaged.
AN sizes range from -2 to -32 in irregular steps, with each step equating to the OD (outside diameter) of the tubing in 1/16" increments.
This system does not specify the inside diameter of the tubing because the tube wall can vary in thickness. [22)]

- You can measure male AN or JIC threads by either using a caliper or simply laying a fitting across a tape measure.
  Measure the OD of the threads and count the number of threads per inch to confirm with the chart below.
  Thread OD will not exactly match the SAE thread size but will get you close enough if you have a AN fitting.

JIC

JIC (Joint Industry Council) fittings are flared fittings with a 37° chamfer seating surface and straight threads. [23)]
The JIC fitting uses it's flared seating surface to seal, instead of an O-ring that could corrode or NPTF fittings.
This means that they can be re-used, and disconnected & reconnected repeatedly with little or no deformation and hold a high pressure seal.

The sizes run the same as other SAE fittings (IE: SAE #4, #6, #12, etc) so they are very easy to size.
JIC fittings are dimensionally identical to AN (Army-Navy) fittings, but are produced to less exacting tolerances and are generally less costly. [24)]
SAE 45° flare fittings are similar in appearance, but are not interchangeable, though dash sizes 2, 3, 4, 5,

8, 10, 14, and 16 share the same thread size.

- You can measure male JIC threads by either using a caliper or simply laying a fitting across a tape measure.
  Measure the OD of the threads and count the number of threads per inch to confirm with the chart below.
  Thread OD will not exactly match the SAE thread size but will get you close enough if you have a JIC fitting.

SAE

SAE (Society of Automotive Engineers) is a global organization that develops engineering standards for the automotive industry.
Characteristics of SAE Flare Fittings are 45° flare angles (which distinguishes them from JIC fittings, which have a 37° flare angle.
Flared SAE fittings are also used in a wide range of applications including braking systems, fuel lines, hydraulic systems, refrigeration / air conditioning and plumbing systems.

JIC Size	AN Size	Thread Size	Male Thread O.D.	Female Thread O.D
1/8“	-2	5/16”-24	5/16“	9/32”
3/16“	-3	3/8”-24	3/8“	11/32”
1/4“	-4	7/16”-20	7/16“	13/32”
5/16“	-5	1/2”-20	1/2“	15/32”
3/8“	-6	9/16”-18	9/16“	17/32”
1/2“	-8	3/4”-16	3/4“	11/16”
5/8“	-10	7/8”-14	7/8“	13/16”
3/4“	-12	1-1/16”-12	11/16“	1”
7/8“	-14	1-3/16”-12	1-3/16“	1-1/8”
1“	-16	1-5/16-12	1-5/16”	1-1/4“

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2) , 5) , 6) , 18)
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3)
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