Inch, Metric, Fine, Coarse, Thread Confusion

As the motosports world becomes more globalised, race cars built with metric hardware are becoming more common in markets were Imperial or Inch hardware is the norm. At the same time, cars built in inch hardware markets are continuing to be used worldwide. One consequence of this is confusion and misidentification of parts such as rod ends and spherical bearings. This sometimes results in racers looking for replacements for “coarse inch thread” rod ends.

As background, it needs to be recognized that from the time rod ends and spherical bearings were first made commercially available 70 years ago, the driving force for technical development was the aerospace and aviation markets. As this field was led by the US and Britain, hardware was built around inch dimensions. This followed thru to high end motorsports. While there were significant aerospace vehicles built in metric countries, with the result that race cars were built with metric hardware in those countries, for decades these were exceptions, not the norm.

It is becoming more common for racers to ask suppliers for “coarse thread” rod ends. The standard thread for inch series rod ends is broadly classified as UNF or “Fine”. “Coarse” is broadly classified UNC. It is quick and easy for a supplier to dismiss inquiries for UNC threaded parts either out of hand, or with only minimal factory consultation. It is a fact, that except for very few non catalog specialty parts, manufacturers do not make coarse thread inch series rod ends.

What often happens is that the user is actually mistaking a metric part for an inch size rod end. In many instances, the standard metric rod end thread is deceptively similar to a nominally similar inch size.

Let’s try to understand some basics.

Example: M8 vs. 5/16-20.

First, both inch and metric threads call out the size as the nominal diameter of the threads. An 8mm thread would be 8mm. in diameter, a 5/16” thread, 5/16” in diameter. 5/16” is expressed decimally as .3125”. Converted to millimeters, that is 7.94 mm. 8mm converted to inches, expressed decimally, is .3150”. Very close. So based on diameter in this instance, the two sizes can easily be confused.

Threads are expressed different in the two conventions. In inch, threads are expressed as the number of threads in the span of one inch. A 5/16 – 24 (UNF) thread will have 24 threads over the space of an inch. A 5/16 – 20 (UNC) will have 20 threads over the same distance.

In metric, threads are expressed as pitch, or the distance from any one point on a thread to a corresponding point on the next thread. This is often thought of as the distance between threads. A standard metric 8mm thread is 1.25 mm from point to point. A “fine” 8mm thread is 1.0 from point to point.

Note how in inch threads the designator number is larger for a fine thread (in this case 24 “finer” than 20), while in metric the opposite is true (1.0 “finer” than 1.25). Further, in metrics, the absence of a numerical call out after the diameter indicates standard or “coarse” threads. M8 indicates 8mm diameter and 1.25 threads per inch. M8 x 1.0 specifically notes the fine thread.

Going back to the root of our discussion, if you convert the M8 threads, 1.25mm from point to point, to threads per inch, you get 20.25. So you see, the M8 thread is very, very close to 5/16 UNC.

Compounding this is the similarity in bore dimension for 5/16” and 8mm bearings.

The high end of the bore tolerance for a 5/16” part such as an Aurora COM-5 is .3134” or 7.976 mm. Very close. The low end for the bore tolerance on an 8mm bearing such as an Aurora MM-M8 is 7.987. 5/16” is 7.9375mm.

So you see, a standard 8mm rod end such as an Aurora MM-M8 could be easily mistaken for a “coarse thread 5/16ths rod end”.

While I’ve used 5/16” / 8mm for my example, this occurs in many other, although not all, metric sizes. 3/8” and 10mm are very close, as is 5/8” and 16mm. With Aurora parts, similarities in diameters can be noted in the catalog, either by comparing the inch and metric specification boxes, or using the dimensional conversion chart on page 79. Pitch/threads per inch can be compared on the accompanying chart.

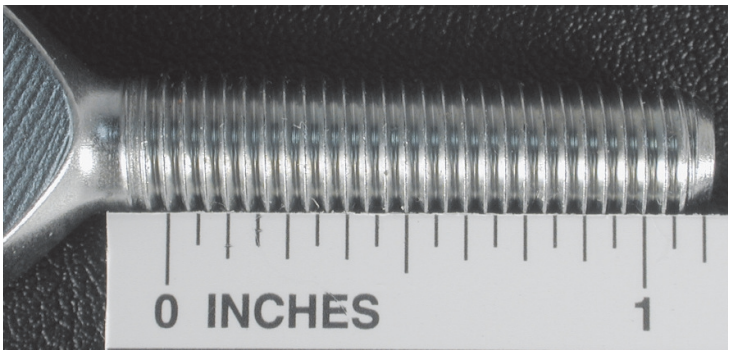
So the next time you are presented with a motorsport need for a “coarse inch thread” rod end, dig a little deeper. You might find that there is an unexpected solution to the problem.

Metric thread pitch compared to threads per inch

Metric call out	Pitch, mm	Threads per Inch, aprox.
M3	0.5	50.75
M5	0.8	31.75
M6	1	25.5
M8	1.25	20.25
M8 X 1.00	1	25.5
M10	1.5	17
M10X1.25	1.25	20.25
M12	1.75	14.5
M12X1.25	1.25	20.25
M14	1.5	17
M14X1.5	1.75	14.5
M16	2	12.75
M16X1.5	1.5	17
M20	2.5	10.25
M20X1.5	1.5	17
M24X2.0	2	12.75
M30X2.0	2	12.75

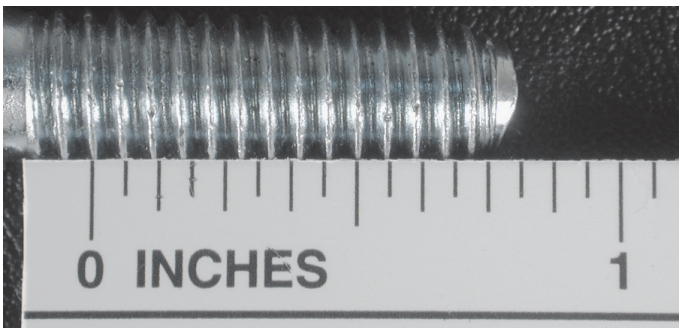
Left to Right: M8, M8 x 1.0, 5/16 - 24, and 5/16 -20 Threads.

5/16 - 24 UNF thread



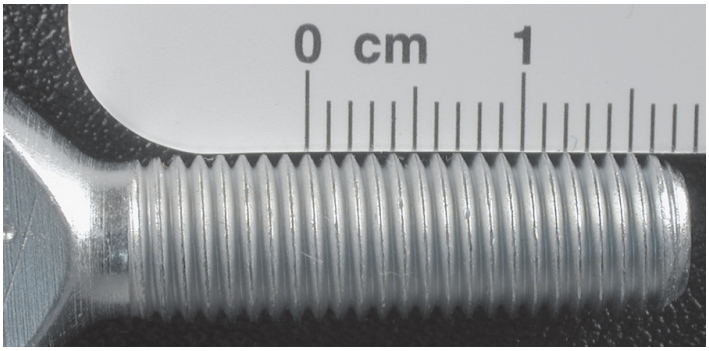
Look closely and count. 24 threads per inch.

5/16 - 20 UNC thread



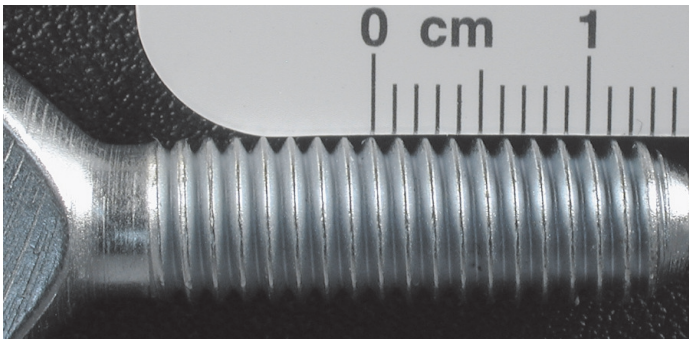
10 threads in 1/2”, 20 threads per inch.

M8 x 1.0 Thread



Clearly 1 mm from thread point to point

M8 thread



Hard to see, 1.25 mm thread to thread. However, note that in 5mm there are 4 threads, or 1.25mm per thread!