THREAD INSPECTION USING THREAD PLUG & RING GAUGES

Thread gauges are widely used and have the advantage of being easy to use by all. The GO gauge should go on or in a threaded component and the NOGO shouldn’t.

However problems do arise and this is written for those situations where there is a problem that can perhaps be resolved with a little thought.

**EXTERNAL THREAD**

\[ d = \text{Major diameter} \]

A thread ring gauge does not look at this feature. Measure by other means.

\[ d_2 = \text{Pitch diameter} \]

\[ d_1 = \text{Minor diameter} \]

A thread ring gauge does not reveal a too small nose radius (too “sharp”). Measure by other means.

**INTERNAL THREAD**

\[ D = \text{Major diameter} \]

A thread plug gauge does not reveal a too small nose radius (too “sharp”). Measure by other means.

\[ D_2 = \text{Pitch diameter} \]

\[ D_1 = \text{Minor diameter} \]

A thread plug gauge does not look at this feature. Measure by other means.

\[ P = \text{Pitch} \]

\[ \alpha = \text{Flank angle} \]

Where “Measure by other means” is written then this is usually only necessary when critical.

The GO ring gauge assesses the maximum material condition of the part thread considering all aspects except the major diameter. The GO plug gauge assesses the maximum material condition of the part thread considering all aspects except the minor diameter. The NOGO gauges only look at the Pitch Diameter. Maximum material condition includes all features of the thread which includes the flanks and pitch but excludes the major or minor diameter as previously noted.

A thread gauge does not “measure” anything. Properly used, gauges only assure a fit with the mating component. What thread gauges do is to establish if a threaded component can be screwed into or on the presumably correct mating threaded component. A thread gauge will also reveal immediately if the thread pitch is correct or not.

A thread gauge will not reveal whether or not the flank angle is within the specified tolerance or if diameter \( d_1 \) is too small (sharp) or diameter \( D \) is too large (sharp). Just because a GO gauge won’t go on or in does not mean that it is the thread pitch diameter that is the problem. If a thread pitch diameter is measured and found within tolerance and the GO thread gauge won’t go in or on, then the problem will almost certainly be elsewhere.

When machining a thread with a tool note the pitch diameter tolerance. If the gauge is just about able to go on or in the thread, or can go in or on with difficulty, then half the pitch diameter tolerance can be removed by the tool without a problem. A good thread lies in the middle of the pitch diameter tolerance, not near the top or bottom.

Here are some facts that may give rise to speculation at times.

A matching set of thread ring and plug gauges. The plug gauge cannot be screwed into the ring gauge. The ring gauge is intended for a smaller pitch diameter \( d_2 \) than the plug gauge \( D_2 \). A thread ring gauge is in fact a screw turned “inside out” and vice versa for the plug gauge.

The GO gauge can’t go on or in but the NOGO gauge can. This could be because the thread cutting tool is either worn or broken at the tip.

If a thread is very close to a diameter limit and one set of gauges is used for manufacturing and one for inspecting then the newer set should be used for manufacturing to allow for gauge wear. The opposite can result in acceptable threads being rejected.

If anyone can think of other unusual things that can be included or mentioned here let me know and I’ll add them on.

Email: gc @ f-m-s.dk and give number 4.04 as a reference.

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