

# Practical Gaging Solution Where Pitch Diameter is Designated as the Datum

GREENSLADE & COMPANY INC  
2234 WENNECA AVE  
FORT WORTH TX 76102



Properly designed attribute gages offer advantages over variable gage systems for inspecting true position features.

More prints are being generated daily using Geometric Dimensioning and Tolerancing as specified in the **American Society of Mechanical Engineers (ASME) Y14.5**. The biggest problem created by the users of this drafting standard is the use of the thread pitch diameter as a measurement datum.

A datum is a reference characteristic from which the dimensional relationship of another part characteristic is to be found. This is a relatively easy concept to understand, and in cases where the datum is easily grasped, measuring that geometric relationship is fairly straightforward. The effective grasping of an external thread pitch diameter is impossible. I have worked with customers trying to develop a gaging approach that will provide measurements that will withstand the scrutiny of GR&R analysis for several years without success.

One of the biggest problems associated with grasping the pitch diameter effectively and repeatedly is that most commercial threads on products larger than 5/16" and 8 mm have small, unavoidable nicks in the threads. When any type of gage tries to grasp the pitch diameter, the thread nicks influence the position and angle at which the part is held. The way in which the threads are grasped over the thread nicks does not provide the true position of thread's pitch diameter. This makes the measurements resulting from this type of grasping error meaningless.

My suggestion for providing a practical, reliable method for inspecting the true position of a feature where pitch diameter is designated as the datum is to use an attribute gaging system that simulates how the part will actually be used. The accompanying illustration shows such a gage. The primary element of this gaging approach is a GO thread ring gage. The GO gage is securely attached to an appropriately designed cylinder that provides a barrier for the true position limits specified on the part's drawing.

A master setting plug is used to setup and periodically verify the gaging system. This plug must simulate the part's maximum material size of the pitch diameter and the maximum true position limits for the feature being inspected. After the gaging system is setup using the master, the system is ready for simple, easy-to-understand use.

The acceptance of the true position feature of a part where

the pitch diameter is the datum is a simple GO inspection. The part must completely enter the entire system, including both the threaded ring and the gaging cylinder in order to be acceptable. If the part hangs up at any point in the gage, the part is nonconforming.

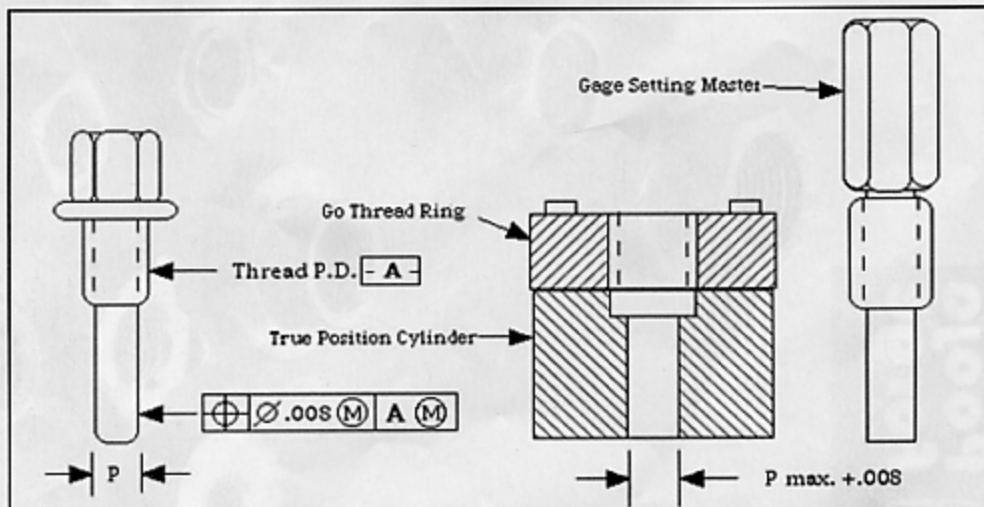
I do not believe any variable true position gaging system in which the pitch diameter is used as the datum provides GR&R results less than 30%. This means that none of these systems are truly suitable for use.

Properly designed attribute gages simulate the part's actual use and provide inspection results on which all parties can understand and agree upon. Using a little creativity, an attribute gaging system can be designed to inspect any true position feature where the thread's pitch diameter is designated as the datum.

Fastener manufacturers should reach agreement with their customers on exactly how true position features will be inspected before producing any parts. Based on many years of experience, I suggest that fastener manufacturers propose that an attribute gaging system be used for determining product acceptability for true position feature requirements when the thread's pitch diameter is designated as the datum.

For more information on attribute gages for inspecting true position features, contact the author or **Circle 205**. **FTI**

*Greenslade & Company, Inc. is a supplier of gages, tooling and other equipment to the fastener manufacturing industry. Joe Greenslade is a regular contributor of articles to this magazine. He has been active in the fastener industry since 1970 and has held positions with major fastener producers.*



Attribute gaging system used for true position inspection where pitch diameter is the datum.