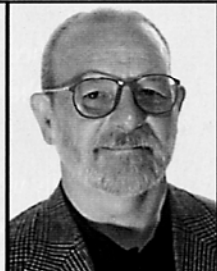


Inspecting Tapped Holes With Fixed Limit Gages

Knowledge of applicable standards is vital

by:

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All internally threaded industrial products should be inspected using the **American Society of Mechanical Engineers (ASME) B1.3M, System 21** unless the product print specifically requires other inspection requirements. *System 21* requires the thread to be inspected for maximum-material (GO), minimum-material (NOT GO or HI) and minor diameter. These three characteristics can be inspected with either fixed limit (GO/NOT GO or GO/HI) gages or with indicating gages. Fixed limited gages include the GO/NOT GO thread plug gage (as seen in **Figure 1**) and the GO/NOT GO minor diameter cylindrical plug gage (as seen in **Figure 2**).

In this article I am limiting my comments to the appropriate use of the fixed limit gages. I have written previously about the use of indicating internal thread gages. Interested readers can contact me for a copy of these articles.

Those inspecting internally threaded fastener products should be aware of the specifications shown in **Figure 3** as

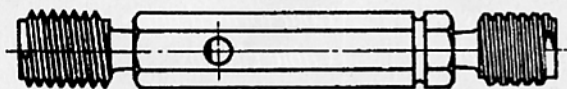


Fig. 1 — GO/NOT GO thread plug gage.

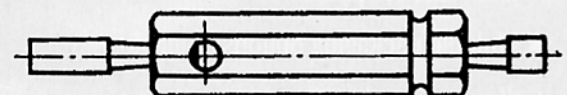


Fig. 2 — GO/NOT GO cylindrical plug gage.

Thread Standard	Applicable Gaging Standard
ASME B1.1, Unified Inch Screw Threads	ASME B1.2, Gages and Gaging for Unified Inch Screw Threads
ASME B1.13M, Metric Screw Threads – M Profile	ASME B1.16M, Gages and Gaging for Metric M Screw Threads
<ul style="list-style-type: none"> • ISO 68, ISO general purpose screw threads – Basic profile • ISO 261, ISO general purpose metric screw threads – General plan • ISO 724, ISO general purpose metric threads – Basic dimensions • ISO 956, ISO general purpose metric screw threads – tolerances (Parts 1, 2 & 3) 	ISO 1502, ISO general-purpose metric screw threads – Gauges and gauging

Fig. 3 — Internal thread gaging standards.

Standard	Characteristic	Applicable Requirements
Inch Threads ASME B1.2	GO functional diameter	Section 4.1.1 – GO thread plug gage must enter and pass through the full-threaded length of the product freely.
	NOT GO (HI) functional diameter	Section 4.2 – NOT GO (HI) functional diameter is acceptable when the NOT GO (HI) thread plug applied to the product thread does not enter more than three complete turns.
	Minor Diameter	Section 4.8.2 – GO cylindrical plug gage must enter and pass through the length of the product thread without force. NOT GO cylindrical plug must not enter.
Metric Threads ASME B1.16M	GO functional diameter	Section 4.1.1 – GO thread plug gages must enter and pass through the full-threaded length of the product freely.
	NOT GO (HI) functional diameter	Section 4.2 – HI functional diameter is acceptable when the HI thread plug gage is applied to the product internal thread it does not enter, or if all complete product threads can be entered, provided that a definite drag from contact with the product material results on or before the second turn of entry.
	Minor Diameter	Section 4.8.2 – GO cylindrical plug gage must enter and pass through the length of the product thread without force. NOT GO cylindrical plug must not enter.
Metric Threads ISO 1502	GO virtual diameter	Section 7.2.1 c) – The GO screw plug gage, when screwed by hand without excessive force, shall enter the whole length of the workpiece thread.
	NOT GO virtual diameter	Section 7.2.2 c) – The NOT GO screw plug gage, when screwed by hand without excessive force, may enter both ends of the threaded part, but by not more than two turns of the thread. If it can be screwed more than two thread turns, the workpiece thread does not comply with the spec. The NOT GO screw plug gage shall not pass completely through a workpiece with a thread length of three threads or less.
	Minor Diameter	Section 7.2.3 c) – The GO plain plug gage, when introduced by hand without using excessive force, shall pass through the workpiece thread. The NOT GO plain plug gage may enter into both ends of the workpiece thread, but only in a zone which has a distance of not more than one pitch length (1P) from the start thread.

Fig. 4 — Internal thread gaging standards requirements.

well as have an understanding of which of these specifications are applicable to the internally threaded components that they are inspecting.

Figure 4 presents the requirements for inspecting internally threaded fastener products to each of the gaging standards shown in **Figure 3**.

Unfortunately, these three standards do not completely agree with one another on the criteria for acceptance of the three thread characteristics. When the thread quality of internally threaded parts is brought into question, the inspector must be familiar with the differences among these standards in order to ensure that the correct determination of acceptance is made.

Figure 5 illustrates my suggestion for inspection requirements for the manufacturers of internally threaded products. If these requirements are utilized for in-process acceptance criteria, then all three thread specification requirements will always be met.

The manufacturers of internally threaded fastener products should own copies of all of the standards and specifications that I have referred to in this article.

The ASME standards can be ordered on the Internet at www.asme.org. Also, the ISO standards are contained in Volume 1 of the *ISO Fasteners and Screw Threads* handbook for the **Society of Automotive Engineers (SAE)**, available by visiting www.sae.org.

To receive additional information, contact the author or **Circle 202**.

Standard	Characteristic	Applicable Requirements
Suggested Internal Thread Acceptance Criteria for Fastener Manufacturers	GO functional diameter	GO thread plug gages must enter and pass through the full-threaded length of the product freely.
	NOT GO (HI) functional diameter	The NOT GO thread plug gage must not enter the workpiece more than two complete turns. The NOT GO thread plug gage shall not pass fully through a workpiece with a length of thread of three threads or less.
	Minor diameter	GO cylindrical plug gage must enter and pass through the length of the product thread without force. NOT GO cylindrical plug must not enter thread.

Fig. 5 — Internal thread gaging standards requirements.

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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.