The Proper Gaging of Inch Nut Threads

by Larry Borowski

It is important for suppliers of inch nuts to understand the standards and gaging practices required by those standards to avoid customer complaints and rejections. This article will provide the list of standards that cover the requirements for inch nuts and the critical thread gaging practices that apply.

Most inch nuts are manufactured according to dimensional standards published by the American Society of Mechanical Engineers (ASME). ASME B18.2.2 covers the exterior dimensions such as the nut's thickness, width across flats, and width across corners. This standard covers all types of nuts including square, slotted, hex flange, jam, heavy, etc. Though the external appearance of the nuts may differ due to application, one thing remains consistent, the threads. ASME B1.1 covers inch nut thread dimensions. ASME B1.2 covers the thread gages and thread gaging practices. Below are excerpts from reference standards that apply to inch nut thread dimensions and gaging practices.

ASME B18.2.2
Section 3.10: THREADS

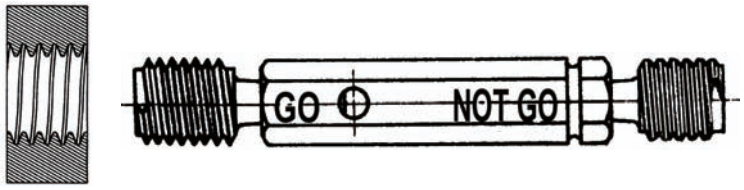
3.10.1 Threads shall be Unified Standard, Class 2B, of the series specified in the notes on the respective dimensional tables, in accordance with American Society of Mechanical Engineers, ASME B1.1.

3.10.2 Thread Gaging. Unless otherwise specified by the purchaser, gaging for screw thread acceptability shall be in accordance with Gaging System 21 as specified in American Society of Mechanical Engineers, ASME B1.3M.

ASME B1.1
Section 1.7: ACCEPTABILITY

Acceptability of product threads shall be in accordance with ASME B1.3M. Gages and gaging shall be in accordance with ASME B1.2.

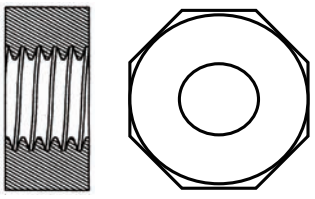
ASME B1.2
Section 4: TYPES OF GAGES FOR PRODUCT INTERNAL THREAD
4.1: GO Working Thread Plug Gages (Table 2 - Gage 1.1)



4.1.1 Purpose and Use. The GO thread plug gage inspects the maximum-material GO functional limit, A1, of product internal thread. The GO thread gage represents the maximum-material GO functional limit of the product internal thread, and its purpose is to assure interchangeable assembly of maximum material mating parts. GO thread plug gages must enter and pass through the full-threaded length of the product freely. The GO thread plug gage is a cumulative check of all thread elements except the minor diameter.

4.2: NOT GO (HI) Thread Plug Gages (Table 2 - Gage 1.2)

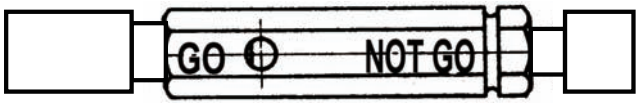
4.2.1 Purpose and Use. The NOT GO (HI) thread plug gage inspects the NOT GO (HI) functional diameter limit, B1, of product internal thread. The NOT GO



(HI) thread plug gage represents the NOT GO (HI) functional diameter limit of the product internal thread. Thread plug gages when applied to the product internal thread may engage only the end threads (which may not be representative of the complete thread). Entering threads on product are incomplete and permit gage to start. Starting threads on NOT GO (HI) plugs are subject to greater wear than the remaining threads. Such wear in combination with the incomplete product threads permits further entry of the gage. NOT GO (HI), functional diameter, is acceptable when the NOT GO (HI) thread plug gage applied to the product internal thread does not enter more than three complete turns. The gage should not be forced. Special requirements such as exceptionally thin or ductile material, small number of threads, etc., may necessitate modification of this practice.

4.8.2: GO and NOT GO Plain Cylindrical Plug Gages (Table 2 - Gage 3.1(a) & (b)).

Plug gages shall be made to Z tolerances. GO shall be made to a plus tolerance; NOT GO shall be made to a minus tolerance. GO cylindrical plug gage must enter and pass through the length of the product without force. NOT GO cylindrical plug must not enter.



The pitch diameter of the tap, the tapping lubricant, and the type and condition of the tapping equipment has an impact on the way in which the threaded plug gage enters the nut's thread. The use of variable thread gaging equipment like the BI-POINT™ Internal Indicating Gaging System is essential when using statistical process control (SPC) during tapping to produce consistently good threads, but the NOT GO fixed limit threaded plug gage should also be used periodically during tapping to assure that the lead-in threads do not become oversized allowing the NOT GO gage to enter more than the three allowable turns.

The sole determinant of the gaging results when using the cylindrical plug gage is the size of the hole in the nut before the tapping operation is performed. If the inside diameter of the nut hole is larger than the minor diameter listed in ASME B1.1 the nuts will fail the cylindrical NOT GO gaging requirement as stated in ASME B1.2 after tapping. This inspection must be performed at the nut forming operation. To wait to do this inspection during tapping is too late. The only exception to this is when internal threads are rolled or formed rather than cut. Rolled or formed threads must start with a slightly larger hole in order for material to flow properly to achieve the appropriate finished minor diameter.

All thread inspection systems require that both the internal thread's functional pitch diameter and its minor diameter must be inspected and must both be compliant with their dimensional specifications for the parts to be acceptable. The suppliers of inch nuts should have copies of all three of the ASME standards referred to in this article and be thoroughly familiar with them to avoid customer complaints and product rejections.

Many of these same principles apply to metric threads as well; however care should be taken to look up the applicable standards to insure compliance of measuring methods and rules of gaging.