The Ten Most Frequently Asked Questions About Inspecting Threads

By Joe Greenslade

Industry in general is becoming much more concerned about the quality of all the products and components received because it is realized that high quality assemblies can not be produced without starting with high quality components. Since fasteners play such a vital role in producing high quality assemblies efficiently they are coming under closer scrutiny every day. One obvious reaction by fastener end users is a desire to inspect and measure the thread of fasteners more thoroughly and completely. Unfortunately there are several misunderstandings about the correct practices, procedures and gages to be used in inspecting threads.

The same questions and misunderstandings occur frequently. Below are the 10 most commonly asked questions and simple explanations for them:

Question #1: If a print specifies a 2A external thread and is to be commercially plated, what are the correct gages to use?

Answer:
A. Unless a print states "2A after plate" it must be assumed that the 2A gaging is required before and not after plating.

B. Per A.N.S.I. B1.1 Section 6 1982 specification: "Threads accepted to Class 2A limits before coating are accepted after coating by basic size Class 3A Go gaging."

Question #2: Why can't you measure a Class 2A part with 2A gages before and after plating?

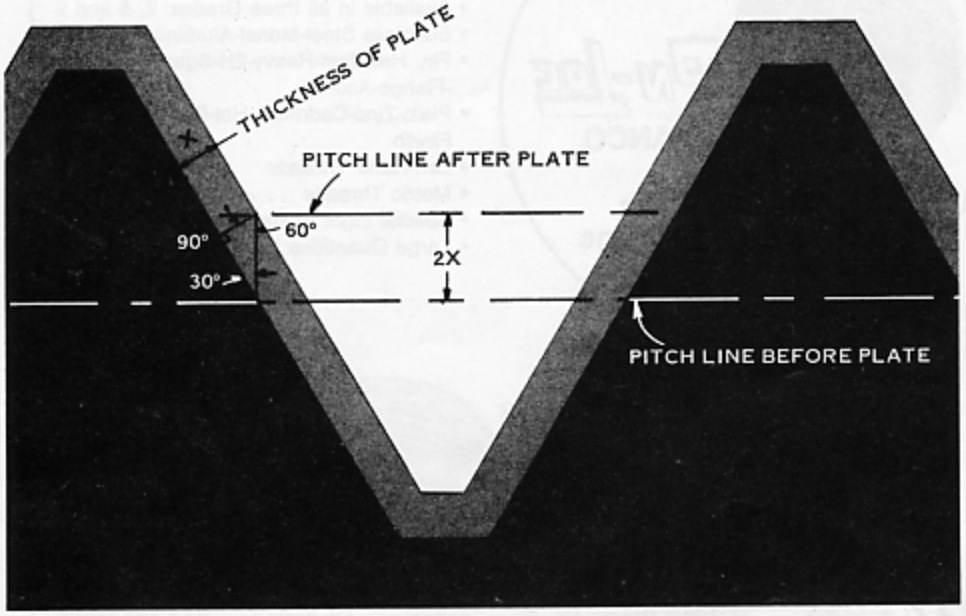
Answer:
A. Plating is a deposit on the surface of a part. This deposit must therefore increase the size of the thread. If a part gages at 2A high limit before plating it must be acceptable at some larger size after plating.

B. Class 2A threads have a plating allowance provided. This means that the maximum 2A pitch diameter may be increased by the amount of the plating allowance and still be an acceptable thread.

You will note that the maximum pitch diameter of a 1/4-20 2A thread (.2164) plus the allowance (.0011) is exactly equal to the 1/4-20 3A maximum pitch diameter (.2175).

	.2164	1/4-20 2A max. P.D.
plus	.0011	+1/4-20 2A allowance
equals	.2175	1/4-20 3A max. P.D.

C. A 60 degree thread's pitch diameter increases by 4 times the thickness of the plating thickness applied. This is because the gaging position has moved outward on two adjacent thread flanks on both sides of the part, increasing the pitch diameter a total of 4 times the plating thickness.



The effect of plating build up on thread pitch diameters

Question #3: Can I buy plain finish 3A parts, have them plated and gage them?

Answer:
No. Plain finish 3A threads such as are common on socket head cap screws can not be plated and still be expected to gage. Class 3A has no plating allowance. If a product is to gage "3A after plating" the pitch diameter must be made 4 to 6 times smaller than the thickness of the plating to be applied.

Question #4: Since a plated Class 2A external thread is gaged with a 3A Go gage after plating, is a 2B internal thread gaged with a 3B Go gage after plating?

Answer:
No. Per A.N.S.I. B1.1 Section 7.7 (1982): "The minimum material limit of tolerance classes for internal threads is basic, with no allow-ance available to accommodate a coating."

If internal threads are to be plated they must be produced oversized by 4 to 6 times the thickness of the plating to be applied. When a print specifies a Class 2B thread and plating, it must be assumed that the parts must gage 2B after plating.

Question #5: How does plating affect metric 6g external threads?

Answer:
Per A.N.S.I. B1.13M Section 8.2 (1982): "Unless otherwise specified, size limits for standard external threads tolerance Class 6g...apply prior to coating... The thread after coating is subject to acceptance using a basic (tolerance position h) size Go thread gage..." This means you are to use 6h Go gages after plating.

Question #6: What about 6H internal metric threads which are plated?

Answer:
Internal metric 6H threads do not have a plating allowance. The threads must be tapped with a pitch diameter 4 to 6 times larger than the thickness of the plating to be applied.

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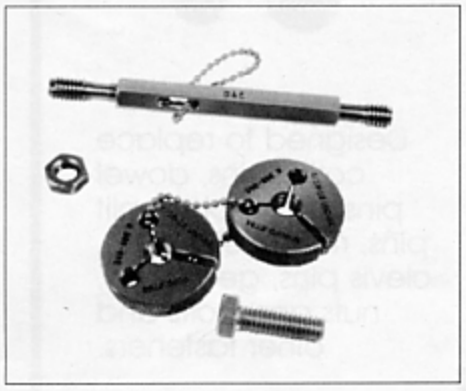
Question #7: Can a thread enter a NoGo gage at all and be acceptable?

Answer:
Yes. Per A.N.S.I. B1.2 (1974) and Fed-Std-H28/6A (March 5, 1985):
"NoGo plug and ring gages accept product threads based upon engagement with no more than 3 threads."

In other words a NoGo ring gage may go onto a bolt or screw up to but not more than 3 threads and still be acceptable.



Thread Ring and Plug Gages

Question #8: Can parts be accepted if the threads are nicked?

Answer:
It depends on how bad the nicks are. Per the IFI 5th edition IFI-105 section 4.10:
"Nicks and gouges located in the threaded length are permissible discontinuities providing the proper Go thread gage will assemble on the thread with the application of not more than 12 times D inch pounds of torque, where D is the nominal bolt or screw in inches."

Example: 1/2-13 Bolt
.500 x 12 = 6 inch pounds
Maximum torque to apply Go thread ring.

Question #9: How can I inspect threads with my certified ring gages and pass them and my customer inspect the same part with his certified ring gages and reject them?

Answer:
A. Standard "X" tolerance adjustable ring gages have a .0003 (3 tenths) tolerance on their pitch diameter settings.

Example: 1/4-20 2A thread maximum Pitch Diameter .2164

1/4-20 2A Go Ring Tolerance .2161 to .2164

Therefore if the parts you are submitting measure .2164 to .2164 and your Go gage is set correctly at .2164, you rightfully accept the parts. However, if your customer's gage is set at .2161 he rightfully rejects the parts.

"A new certified Go ring gage may completely wear out after measuring only 150 to 300 parts."

Both of you are correct and both of you have good gages. These situations must be resolved by measuring the parts with a variable gaging system such as the Tri-Roll Thread Comparator to determine what the actual thread size is to determine if they are in fact good or bad.

B. This situation occurs frequently and is one of the reasons why variable thread gaging is gaining rapid acceptance. It eliminates controversy.

C. Many companies try to save money by not having setting plugs for their adjustable ring gages and rely solely on outside calibration services to inspect their gages. This is a dangerous way to save money. Adjustable ring gages are just that. They can be adjusted to change size. If they are dropped on a hard surface they can easily be knocked out of calibration, but without a setting plug you do not know that. Also, ring gages wear out, particularly the Go gage. A new certified Go ring gage may completely wear out after measuring only 150 to 300 parts. This is especially possible if you are measuring socket products on Grade 8 parts with slightly nicked threads.

Again, if you do not have your own setting plugs you can not tell this. If you recalibrate your ring gages once a year outside you may be using a bad gage for 11-1/2 months and not know it.

It is simple to check your own rings with a setting plug. What you save by not buying setting plugs can all be lost on one rejection. An investment in your own setting plugs is money well spent for improved quality.

Tri-Roll Thread Comparators

Question #10: I supply parts to Military specifications that require they be inspected to Mil-Std-7742B and Mil-Std-8879A. What does that mean?

Answer:
It means different things depending on the inspection method specified (A, B or C) and the thread class of the part. Today this is the general interpretation:

Class 2A Threads (Mil-Std 7742B):
Go and NoGo ring gages are acceptable. Class 3A Go rings should be used after plating. This is Method A.

Class 3A Threads (Mil-Std-7742B):
Go Ring can be used. Multiple grove rolls on a variable gaging system may be used instead. Minimum material limits must be inspected with a single element variable device such as the Tri-Roll Comparator Measuring System. This is Method B.

Class 3A "J" Threads (Mil-Std 8879A):
Go ring can be used but variable gaging method preferred. Minimum material limits must be gaged with single element variable gage. Lead error and roundness must be measured with variable measuring devices. This can be done with multiple grooved rolls such as are used for measuring maximum material limits instead of a Go ring. The root radius and minor diameter must be measured with an optical comparator having a minimum of a 20 power lens.

For further clarification on these and other thread measuring questions contact Fastener Inspection Products at (817) 293-8993. ❑

See Reference Illustration on page 29

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