

Effectively Inspecting Slots in Screw Heads

by Joe Greenslade

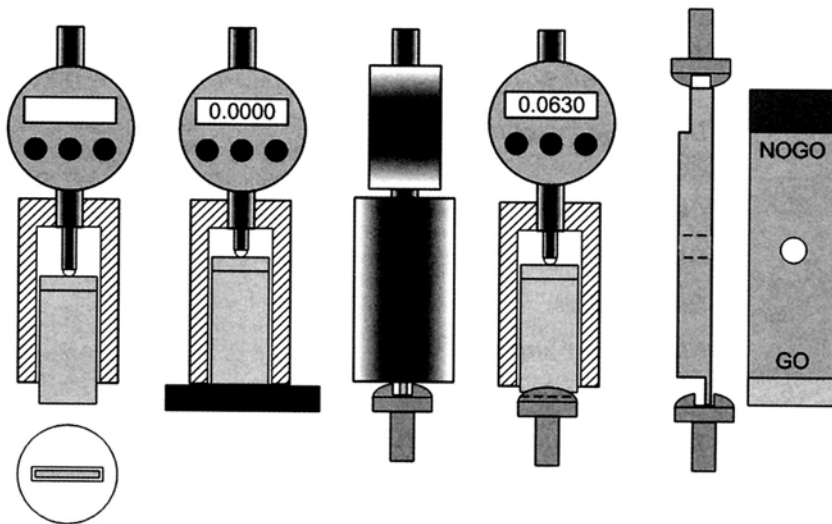
A slot in the head of a screw was undoubtedly the first form of recess ever used in screws hundreds of years ago. Today there are many recess designs available, all of which are much more effective at delivering tightening torque. Not only are slots poor at delivering torque, they are also extremely hard to drive effectively with power drivers.

In spite of the poor performance of slots as a screw drive system, slotted screws are still commonly used in industry because of their easy serviceability. When slotted screws are used in high volume assemblies, slot quality is very critical. Since the performance of even a perfectly formed slot is so poor, the quality of slots in terms of consistent shape and size is essential if any kind of consistent assembleability is to be achieved.

Many suppliers of fasteners try to inspect screw slots using calipers and/or optical comparators. It is impossible to get consistent measurements using either of these methods. When these methods of measurement are subjected to Gage Repeatability and Reproducibility the results are in excess of allowable 30% as required in all SPC systems.

Screw slots should be inspected using the gages specifically designed for slot inspection. These gages are as follows:

- One slot depth gage that will measure all inch and metric slot depths in



screw head styles and in sizes #2 (M2) and larger.

- GO/NOGO slot width gages. The widths of screw slots are consistent with the nominal body diameter regardless of the screw's head style. In inch screws an eleven piece blade set covers #2 through 3/8 and a nine piece blade set covers M2 through M10.

Screw slots are manufactured either by sawing or by striking the slot in the head during the cold heading process.

Screw standard requirements do not differentiate between these two methods of manufacturing. A #8 slotted pan head screw must have a slot depth of .045 to .058 and a slot width of .045 to .054 regardless of how the screw was produced. There is a tendency for slots made during cold heading to be wider at the outer edges than in the middle of the head of the screw. This is allowable as long as the NOGO width blade does not enter either end or in the middle.



Joe Greenslade has been active in the fastener industry since 1970. He has held positions with major fastener producers in sales engineering, marketing, product design, manufacturing management, and research and development management.

Mr. Greenslade holds twelve U.S. patents on various fastener related products. He has authored over 136 trade journal articles on fastener applications, manufacturing and quality issues. He is one of the fastener industry's most frequent speakers at trade association meetings and conferences. He is the youngest person ever inducted to the Fastener Industry Hall of Fame.

Mr. Greenslade is active in numerous fastener industry associations and societies holding office in several of them.

In addition to guiding the activities of Greenslade & Company, Mr. Greenslade works as a consultant with fastener suppliers and end users on product design, applications engineering, and quality issues. In this capacity he works to resolve fastener applications problems, to help select the best fastening approaches in new product designs, to assist in the standardization of fasteners used within an organization, and to provide training on various aspects of fastening technology and fastener quality assurance. He also serves as Expert Witness in litigation involving fastener related issues. He can be reached at: phone 817-870-8888, fax 817-870-9199 or email: greensladeandcompany@sbcglobal.net.

INCH SCREWS		
Nominal Screw Size	Slot Width (in.)	
	Max	Min
#2	0.031	0.023
#3	0.035	0.027
#4	0.039	0.031
#5	0.043	0.035
#6	0.048	0.039
#8	0.054	0.045
#10	0.060	0.050
#12	0.067	0.056
1/4	0.075	0.064
5/16	0.084	0.072
3/8	0.094	0.081

METRIC SCREWS		
Nominal Screw Size	Slot Width (mm)	
	Max	Min
M2	0.7	0.5
M2.5	0.8	0.6
M3	1.0	0.8
M3.5	1.2	1.0
M4	1.5	1.2
M5	1.5	1.2
M6	1.9	1.6
M8	2.3	2.0
M10	2.8	2.5

Suppliers of high volume slotted screws, manufacturers and distributors, should use slot depth and slot width gages for slot inspection to assure consistent quality screws are provided to end users. Consistent screw slot depths and slot widths are essential for achieving consistent assembly results. ■

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