# Proper Inspection of 一字型螺絲頭部的適當檢測 Slotted Recesses In Screw Heads

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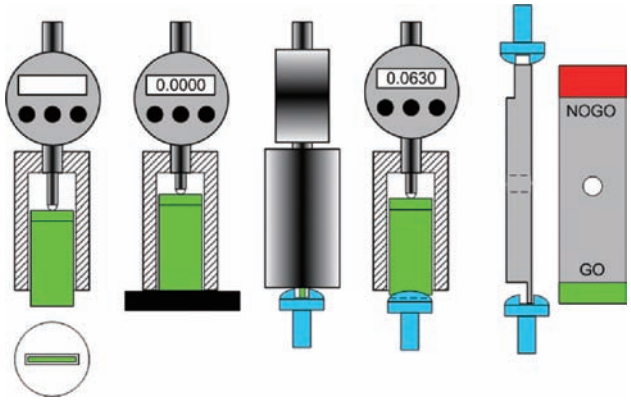


A slot in the head of a screw was undoubtedly the first form of a recessed driving mechanism ever used in screws hundreds of years ago. Today there are many recess designs available, all of which are much more effective at delivering tightening torque. Not only are slots poor at delivering torque, they 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 the industry because of their easy serviceability. In fact, many "combo drives" incorporate a slot in conjunction with a 6-lobe, cross recess, or square recess, simply for the option of using either type of driver when servicing an assembly. 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 efficient assembly of items is to be achieved.

If you have ever used a slotted screw to assemble items, you can relate to this. They have a tendency to cause the screw driver blade to slip latterly out of the slot. If the screw driver blade is worn or is not seated perfectly in the slot, it has a tendency to strip the recess. Also, if the required torque is too high, the slot can deform to a point that is no longer even useable for tightening or loosening. For these reasons, it is critical that the slot is manufactured correctly, and periodically inspected for tooling wear and breakdown.

Many suppliers of fasteners try to inspect screw slot using calipers and/or optical comparators. It is impossible to get consistent measurements using either of these methods. When these methods of measurement are subject to Gage Repeatability and Reproducibility studies, the results are in excess of the 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:

1. One slot depth gage that will measure all inch and metric slot depths in screw head styles and in sizes #2 (M2) and larger.

2. 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 will cover #2 through 3/8. For metric screws, a nine piece blade set will cover M2 through M10.

| 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) | |
| | Min. | Max. |
| M2 | 0.5 | 0.7 |
| M2.5 | 0.6 | 0.8 |
| M3 | 0.8 | 1.0 |
| M3.5 | 1.0 | 1.2 |
| M4 | 1.2 | 1.5 |
| M5 | 1.2 | 1.5 |
| M6 | 1.6 | 1.9 |
| M8 | 2.0 | 2.3 |
| M10 | 2.5 | 2.8 |

Screw slots are manufactured either by sawing, machining, or by striking the slot in the head during the cold heading process. Screw standard requirements do not differentiate between these methods of manufacturing, meaning that the method used is up to the manufacturer, but the slot still has to conform dimensionally, even if the process chosen inherently produces variations. For example, 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.

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 efficient and effective assembly results.