

TOOL INFORMATION NO.3



MURATA TOOL, LTD.

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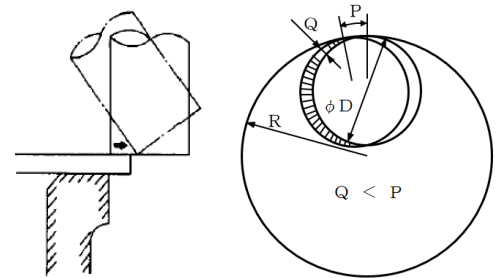
TECHNICAL REPORT

Nibbling with round tool

When a round punch is used in nibbling operation, only a tiny portion of its cutting head is in use. The punch is exposure to uneven load and horizontal pressure.

In the most unfortunate case, the punch slides and then collides against the die. Such a risk increases with thicker sheets, or with harder materials.

Cutting margin Q is typically smaller than P (see right). The difference is larger if punch size D is larger against R . If Q is too small to P , the result will be a rough, or even shaggy contour.

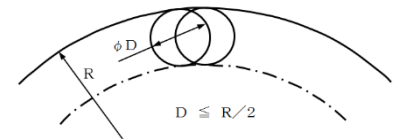


Key is a proper tool, a proper punch size (D has to be limit by R) and a proper pitch.

What is 'proper tool'?

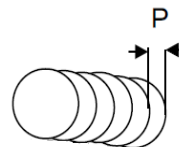
- Vulcantool punch and metal stripper*
- D must be smaller than half of R ($D \leq R/2$)

*Vulcantool is better against uneven loading, compared with Style 114.



What is 'proper P'?

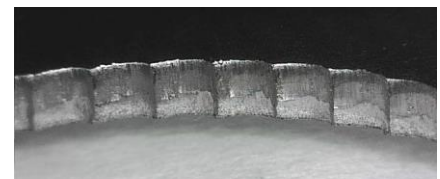
Proper P provides a clear border between shear (a) and fracture (b)



- P shall be larger than the following:
Thickness of mild steel $P \geq t$
Thickness x2 of stainless steel $P \geq t \times 2$
- P shall be smaller than the following:
5mm: Nibbling mode (NBL/)
8mm: Slow mode in M5000, V3 series or V5 series

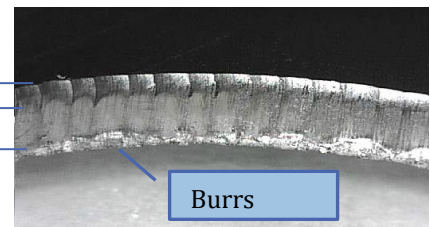
There is more thing to consider:

- Tolerance(s)
The nibbled contour has many Ss (see below). To make S smaller, D should be bigger but P should be smaller.



SPCC t2.3, R17.5 Punch 5.0 P2.3

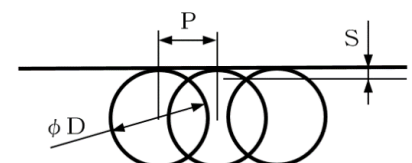
Pitch is good!



SPCC t2.3, R7.5 Punch 5.0 P1.0

Pitch is too small!

Considering all the restrictions above, the best D and P as allowable shall be found.



Countersink

How Countersink is created?

Processed in two progressive steps:

1) Punch a hole; 2) Form a countersink

In formation, *A* is pressed at first, which makes *B* narrower for compensation. *C* is naturally created. The hole on the backside becomes smaller than the pilot hole. It is impossible to end in a sharp angle like *D*.

Can Countersink hole be a little bigger?

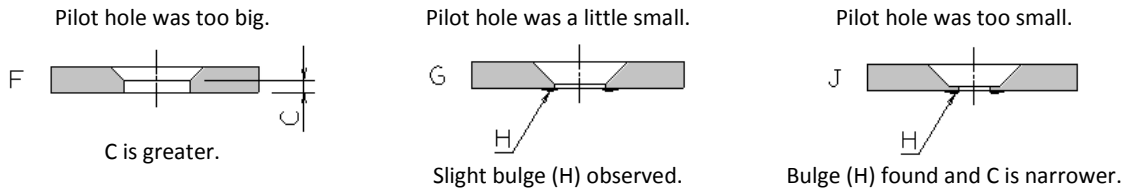
Yes. If you want to nest the screw further below, add a 0.1mm shim to the punching unit. However, remember MTL countersink punch is designed to make ϕE a little bigger (0.6mm bigger as shown in the M4 example to the right), so that the screw sits slightly below the surrounding surface.

***For customization, *E* shall be determined by a customer.

Pilot hole

MTL's recommended pilot holes (see our tooling guidebook) are slightly larger than actual screw sizes. This is to ensure a flatness on the backside of the hole after formation.

The below shows the result of the backside in the relation with the sizes of pilot hole.



Pilot hole and the backside of Countersink

