TAKAMAZ RYU-GI vol.22

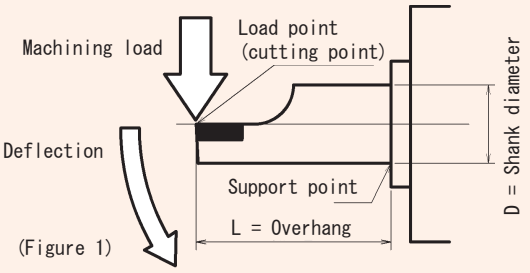
Our special conical round hole bushings are effective in solving the problems of chatter and poor chip discharge during deep hole drilling.

Efficacy of Special Conical Round Hole Bushings in Deep Hole Drilling

Addressing Chatter and Chip Discharge Failures that Occur During Deep Hole Drilling

One of the most important factors in ID cutting is that the shank diameter of the applicable ID holder (hereafter referred to as the "holder") should be made as large as possible considering the machining diameter and shape.

The reason for this is that the larger the overhang ratio, which is obtained as "holder overhang (hereafter L)/shank diameter (hereafter D)", the lower the static rigidity of the holder and the greater the deflection of the shank due to the cutting load, which may cause chatter. (Figure 1)

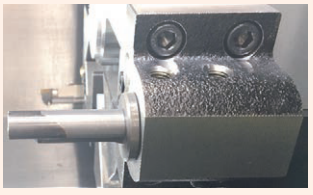


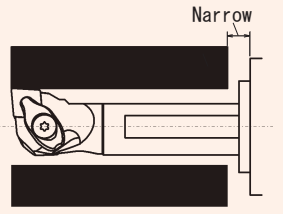
(Figure 1)

Chatter has various causes, but if we focus on overhang ratio, chatter tends to occur when the shank exceeds "L/D = 3" for steel and "L/D = 5" for cemented carbide.

For this reason, in most cases where deep hole drilling exceeds "L/D = 3" the holder is mounted at the machining depth + α (where α = about 5 to 10 mm) to minimize the overhang.

This means that when a standard round hole bushing is used, the gap between the workpiece and the holder is too small to allow an adequate chip discharge path, and depending on the form and size of the chips, they may not be discharged. (Figure 2)





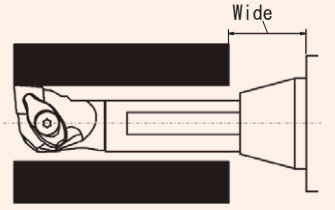
Standard type round hole bushing

(Figure 2)

Cutting with conical round hole bushings

If chips are not discharged out of the hole, various problems will occur. In some cases, this can be solved by enlarging the discharge path for chips by, for example, increasing the overhang or reducing the shank size, but in most cases, the overhang ratio is increased and the static rigidity decreased, causing chatter and worsening the problem. This most commonly happens when "L/D > 5".

A solution to this problem is to use a conical round hole bushing. (Figure 3)

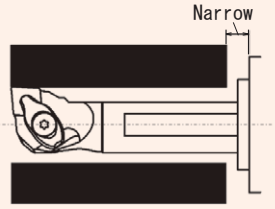


Special conical round hole bushing

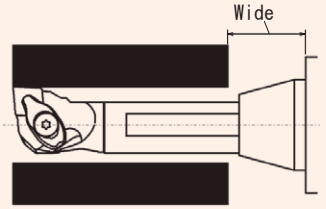
(Figure 3)

Features of conical round hole bushings

1. The length of the bushing is extended while maintaining its rigidity by making the end of the bushing into a cone, thereby securing the chip discharge path.
2. The overhang of the holder can be minimized because the holder can be mounted with approximately the same length as the cutting depth.
3. By providing a coolant path on the inner surface of the bushing and using it in combination with a U-drill turret holder and an ordinary holder, coolant supply comparable to that when using an internally lubricated holder can be achieved with higher rigidity. Usage in combination with a coolant pump with a supply capacity of 1.5 MPa or higher is effective in also preventing chips from wrapping around the shank.
4. For through holes, a rear coolant unit (through-spindle coolant unit) can be used in combination for better results.
5. Effective for deep hole drilling at "L/D = 3" and higher.



Standard type round hole bushing



Special conical round hole bushing

(Figure 4)

Figure 4 shows a comparison of the chip discharge ranges with the same overhang. It can be seen that the conical round hole bushing provides a larger discharge zone even with the same overhang.

The special conical round hole bushing has been well received by many customers as a means of solving the problems with chips and chatter in deep hole drilling because it can improve chip discharge while maintaining rigidity.

Caution This product is not effective for all ID cutting. Since the form of chips varies depending on the workpiece material and cutting conditions (including inserts), the effects may not be seen in some cases.