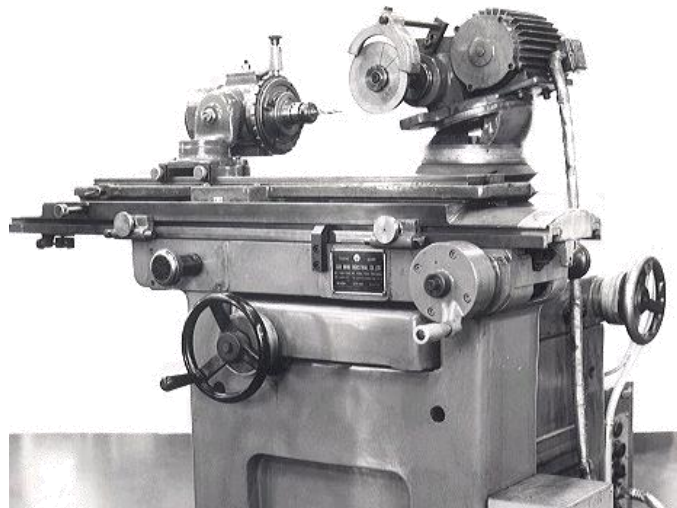


REGRINDING MANUAL FOR SOLID CARBIDE DRILL

WSATR Drill Series

MVS Long /Pilot Type

April 25, 2017



MITSUBISHI MATERIALS CORPORATION ADVANCED MATERIALS & TOOLS

■ Checking conditions of the cutting edge

- Check wear conditions of and damage to the cutting edge.
- If there is serious damage such as fracture on the cutting edge, grind the edge until the damage is all gone.

■ Grinding first relief face

Fig. 1

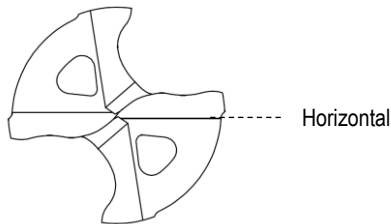


Fig. 2

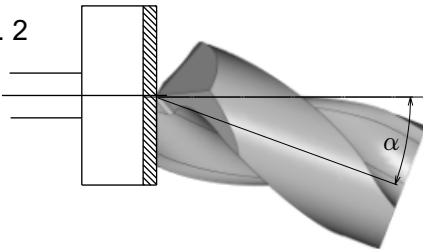
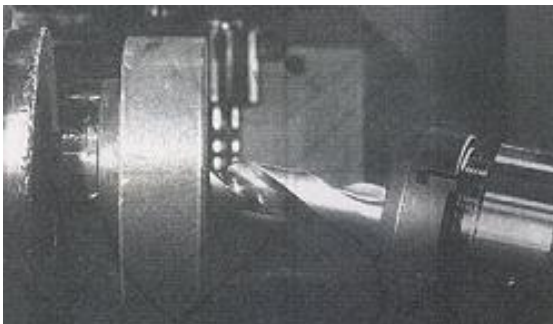
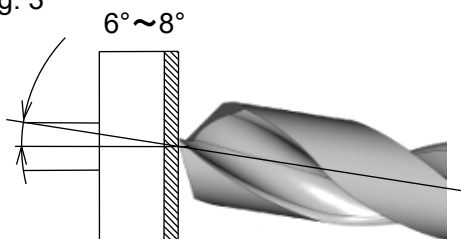


Fig. 3



- Install the drill by using collet chuck. As shown in **fig.1**, set the drill phase in order that the corner of center cutting edge and the shoulder of outer peripheral edge become parallel to each other when seen from the top.
- As shown in **fig.2**, rotate the drill (work head) α° so that the point angle will be 140° or 145° . (Please refer to **table 1**)

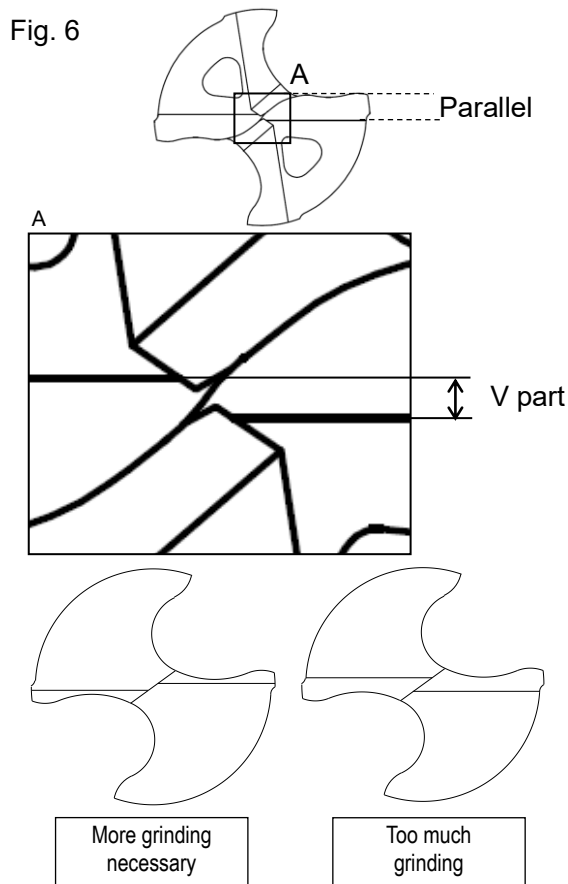
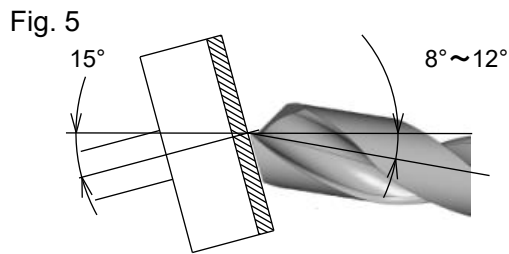
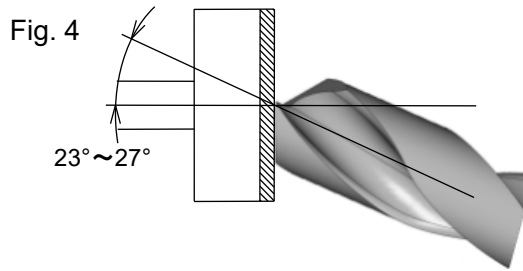
Table 1

	Point angle	α
MVS Long Drill	140°	20°
MVS Pilot Drill	145°	$17^\circ 30'$

- As shown in **fig.3**, set inclination angle of the drill (work head) at $6^\circ \sim 8^\circ$. This angle will become first relief angle.
- Finishing first relief face on one side of the cutting edge, index the drill 180° and grind the other side until both sides are at the same position.
*Depth of cut is $0.02 \sim 0.03\text{mm/path}$.
- Finally decrease depth of cut to about 0.01mm , and finish both sides at the position.
- For finishing, repeat oscillation $2 \sim 3$ times as slow as possible. This also serves for the purpose of spark-out.
- Grind until there is no wear or fracture left on the cutting edge. (Please pay attention to the damage at the margin, too.)

- Grind until lip height difference (axial runout of front cutting edge) is 0.02mm or less.

■ Grinding second relief face



- After grinding first relief face, grind second relief face.
- As shown in **fig.2** of the previous section, keep rotation angle of the drill (work head) at α° .
- As shown in **fig.4**, set inclination angle of the drill (work head) at 23° ~ 27°. If inclination angle of the drill (work head) cannot be increased to 23° ~ 27°, get the wheel inclined 15° as shown in **fig.5**.
- Grind second relief face, and the ridgeline of first and second relief face will appear.
- As shown in **fig.6**, it is ideal that the ridgeline is parallel to the line connecting the corner of center cutting edge and the shoulder of outer peripheral edge. Adjust the drill phase while grinding.
- Grind until the offset amount between the two ridgelines becomes V.
(Please refer to table 2)
By this operation, the center point at the top will be formed. Moreover, please be careful not to grind too much or too little.

Table 2

Tool diameter ϕD	V (mm)
$\phi 3$	0.05 ~ 0.11
$\phi 3$ over $\phi 8$ less	0.07 ~ 0.03
$\phi 8$ over $\phi 12$ less	0.15 ~ 0.21
$\phi 12$ over $\phi 14$ less	0.25 ~ 0.35

■ Grinding thinning face

Fig. 7

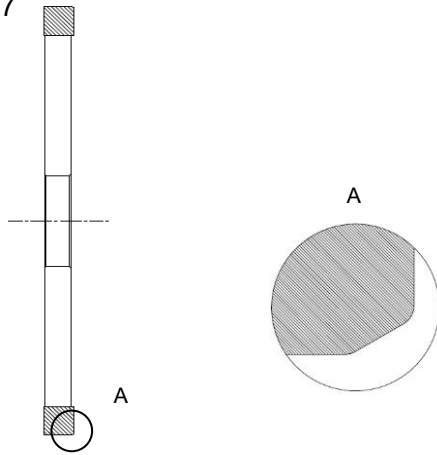


Fig. 8

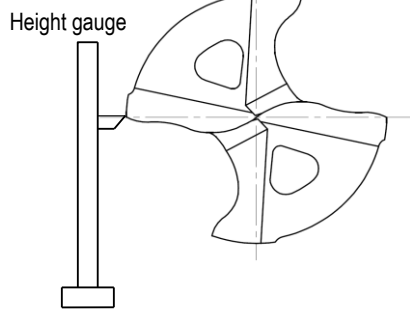


Fig. 9

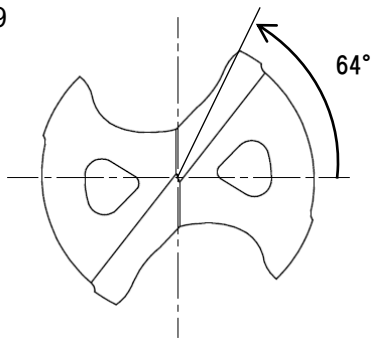
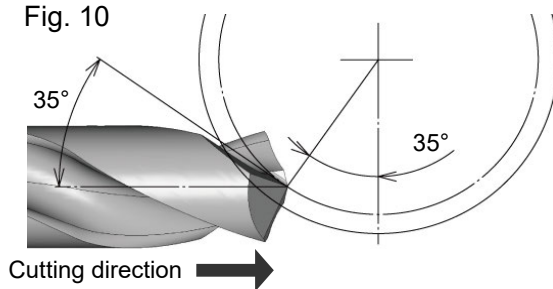


Fig. 10



- After grinding second relief face, grind thinning face. Type of the thinning is **Z-thinning**.
- The wheel figure for grinding thinning face is shown in **fig. 7**. Please see the detailed dimensions Table 4 on the final page (P.8).
- First, set the work head horizontal so that the center of the drill will be horizontal. Drill rotation angle is 0° . Set the direction of table oscillation parallel with the center line of the drill.
- As shown in **fig.8**, set the drill phase so that the line connecting the shoulder of both sides will be horizontal by using a device such as height gauge.
- Then, as shown in **fig.9**, rotate the drill counter clockwise 64° when seen from the top.
- Set the vertical position of the wheel so that the open angle of the thinning from the drill center will be 35° , as shown in **fig.10**.

Fig. 11

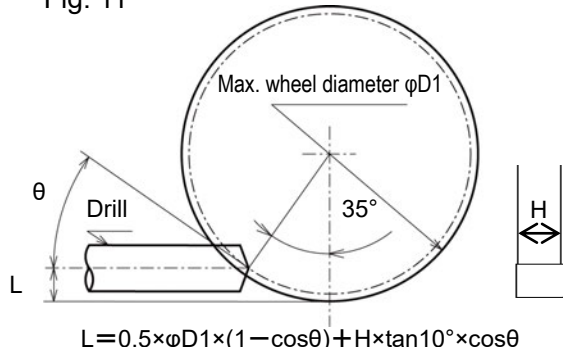
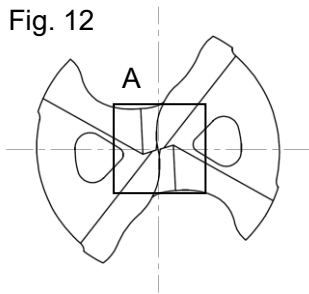
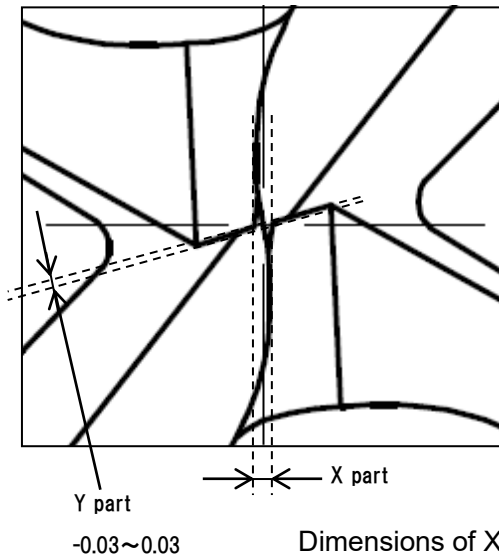


Fig. 12



A



Tool diameter φD	X (mm)
φ3	0.08~0.12
φ3over φ8less	0.13~0.17
φ8over φ12less	0.20~0.24
φ12over φ14less	0.30~0.34

- As shown in **fig.10**, set the wheel height so that the center line of the drill will be higher than the bottom of the the wheel edge by "L". (Please refer to the formula in figure 10.)
- As shown in **fig.11**, grind the thinning face by sliding the table to the direction shown by the arrowhead, pressing the drill against the wheel. Grind slowly adjusting the top end of cut by using a device such as a stopper.
- Adjust the wheel position while grinding so that the measurements of the thinning (X part, Y part) will be the same as those of **fig.12**.
- (Grinding tip) To make the task easy, grind the two cutting edges alternately, using a mirror to check the configuration while grinding.

Honing

Fig. 13

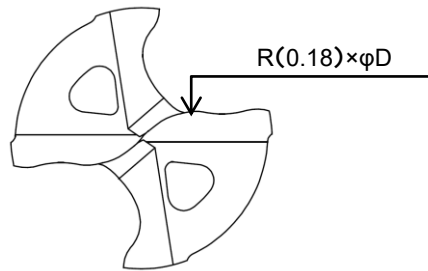


Fig. 14

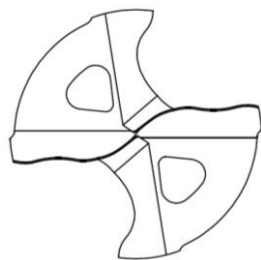


Fig. 15

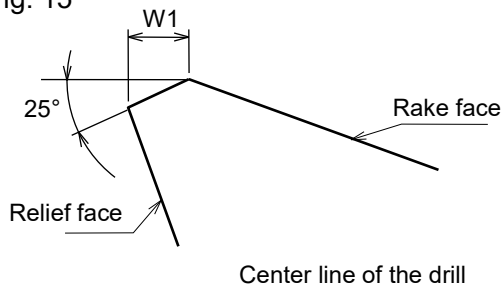
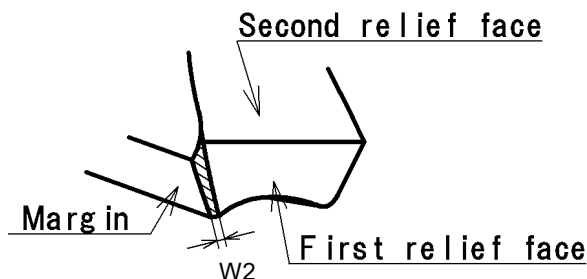


Fig. 16



- After grinding thinning face, grind honed edges. This is the last procedure for regrinding.
- First, as shown in **fig.13**, grind the edge at the cross section of the thinning edge and major cutting edge with diamond file until it becomes R-shaped.
- Appropriate R size is approximately $(0.18) \times \phi D$.
- As shown in **fig.14**, thoroughly grind honed edges on both sides evenly. First, use a diamond file with grain size #400 for honing, and finish by using a hand lap with grain size #1500.
- As shown in **fig.13**, honing angle is 25° .
- Change honing width in accordance with tool diameter (Please refer to **table 2**).

Table 2

Tool diameter ϕD	Honing width (mm)
$\phi 3$	0.03~0.055
$\phi 3$ over $\phi 8$ less	0.04~0.07
$\phi 8$ over $\phi 12$ less	0.07~0.12
$\phi 12$ over $\phi 14$ less	0.12~0.17

- After Honing, grind chamfer As shown in **fig.16**
- Use a diamond file for grind chamfer.
- Chamfer width must not cross the honing width (Please refer to **table 3**).

Table 3

Tool diameter ϕD	Chamfer width W (mm)
$\phi 3$	$(0.03) \times 45^\circ$
$\phi 3$ over $\phi 8$ less	$(0.04) \times 45^\circ$
$\phi 8$ over $\phi 12$ less	$(0.06) \times 45^\circ$
$\phi 12$ over $\phi 14$ less	$(0.11) \times 45^\circ$

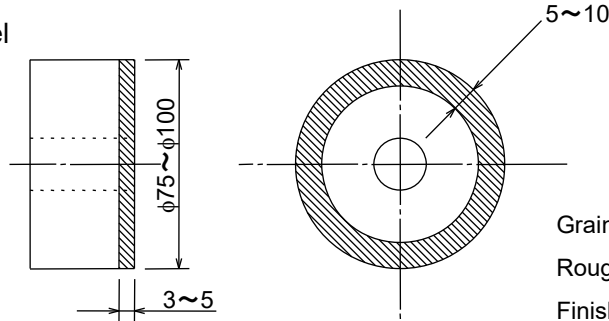
※Chamfer assure enough relief of chamfer.

This is the end of regrinding. Please ascertain that all the following specifications are fulfilled before using WSTAR drill again.

- Lip height difference (axial runout of front cutting edge) < 0.02mm
- There is no damage left on the cutting edge.
- Appropriate honing is applied to the edge.
- There is no grinding burr.
- Chamfer width must not cross the honing width.
- Chamfer assure enough relief of chamfer.

■ Grinding tools for first and second relief face

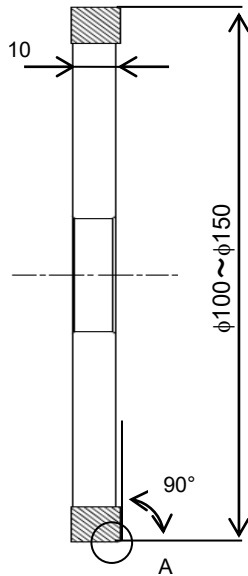
Diamond wheel



Grain size
 Rough grind : #200
 Finish grind : #400 over

■ Grinding tools for thinning face

Diamond wheel



Change W (Z thinning dimension) in accordance with tool diameter.

Please refer to **Table 4**

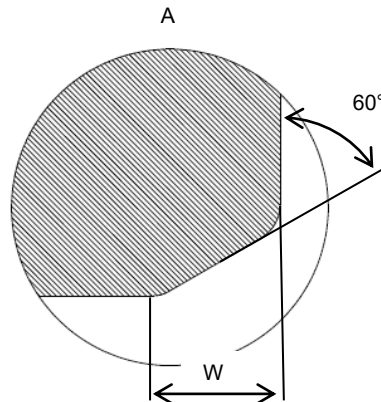
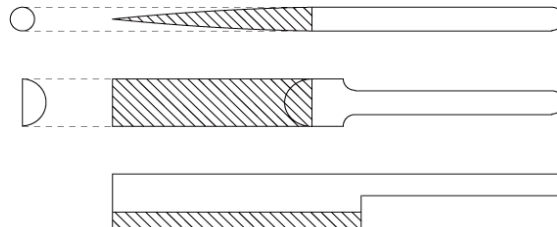


Table 4

Tool diameter ϕD	W
$\phi 3$ & over $\phi 4$ less	0.17
$\phi 4$ over $\phi 5$ less	0.22
$\phi 5$ over $\phi 6$ less	0.26
$\phi 6$ over $\phi 8$ less	0.35
$\phi 8$ over $\phi 10$ less	0.43
$\phi 10$ over $\phi 12$ less	0.55
$\phi 12$ over $\phi 14$ less	0.60

■ Grinding tools for honing

Diamond file



Round file
 Grain size: #600

Half round file
 Grain size: #400

Hand hone
 Grain size: #1500