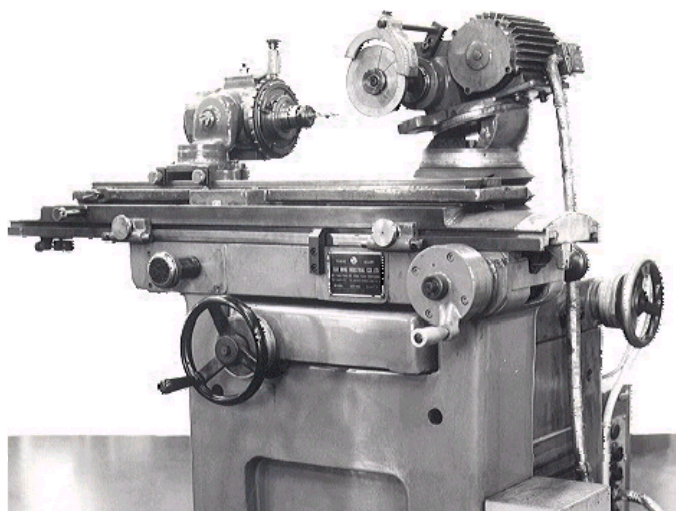


# **ZET1** drill REGRINDING MANUAL

April 28, 2009

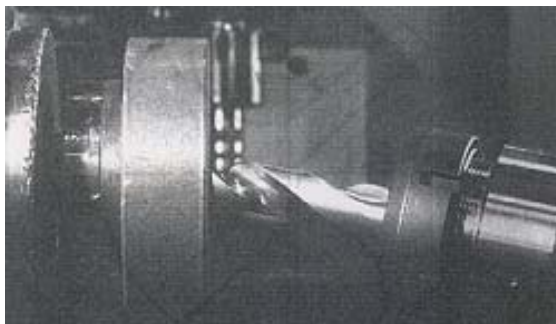
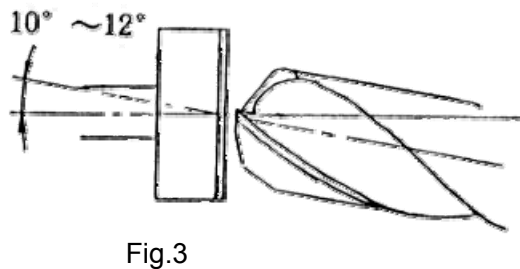
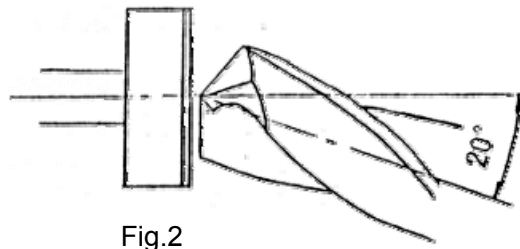
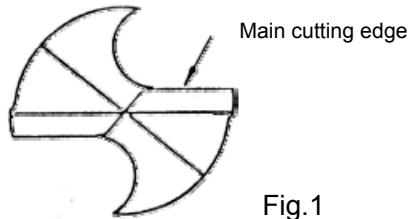


MITSUBISHI MATERIALS CORPORATION CARBIDE & TOOLS DIVISION

## ■ Confirm the cutting edge

- Confirm the worn and damaged condition of the cutting edge.
- In case of extensive chipping on the cutting edge, eliminate the segment with GC wheel.

## ■ Primary relief grinding



- Use a collet chuck when installing a drill. The main cutting edge should be parallel from the drill's point view as shown in **Fig.1**.
  - The point angle of the drill should be 140° with the swivel angle designated to 20° as shown in **Fig.2**.
  - Incline the angle of the drill to 10°-12° (**Fig.3**).
  - The angle will be the primary relief angle of the cutting edge.
  - After the completion of a single cutting edge, index the drill 180° to grind another side of a cutting edge. The grinding depth is 0.02-0.03mm per traverse.
- <Spark out>
- Last, finish the both cutting edges with the grinding depth at 0.01mm. Repeat the procedure 2-3 times including a spark out with a slow traverse for finishing.
- <Axial run out>
- Maintain the axial run out within 0.02mm.
  - Grind until the worn and chipped segment of the cutting edge is eliminated. Pay extra attention to the wear on the major portion.

## ■ Secondary relief grinding

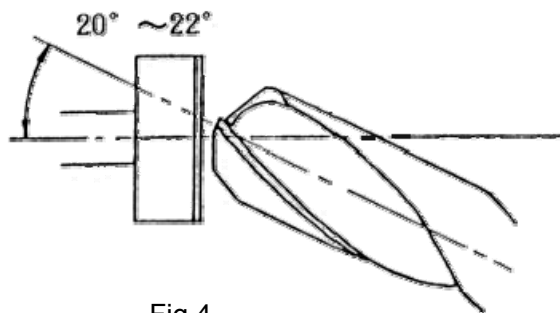


Fig.4

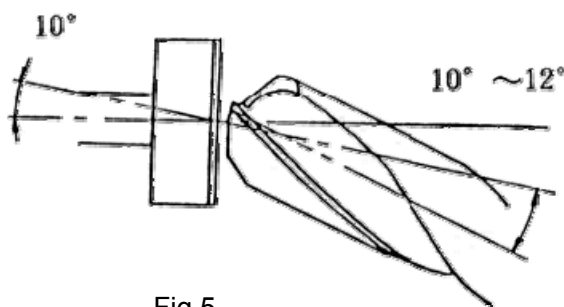


Fig.5

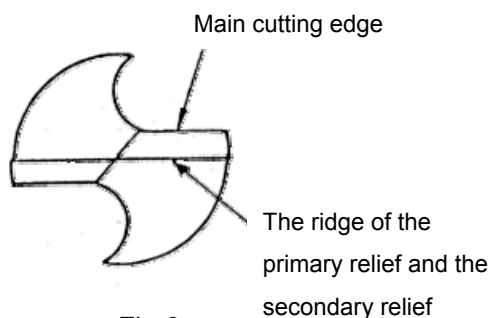
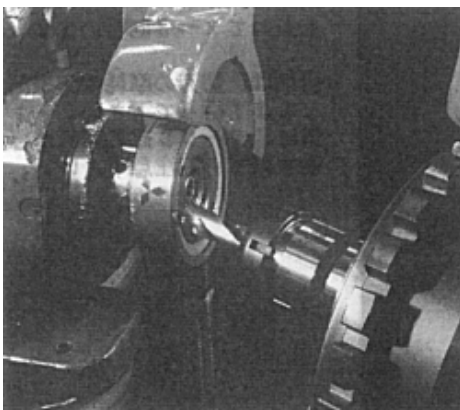


Fig.6



- After the completion of the primary relief, grind the secondary relief.
- Incline the drill (work head) to  $20^\circ$ - $22^\circ$  for the secondary relief grinding (**Fig.4**).
- If it is difficult to deviate the drill angle, incline the wheel  $10^\circ$  as shown in **Fig.5**.
- The swivel angle of the drill for **Fig.4** and **Fig.5** is  $20^\circ$ , and the point angle at  $140^\circ$  (identical as **Fig.2**).
- The ridge in the conjunction with the primary relief will appear after the secondary relief grinding.
- Adjust the rotational position of the drill while grinding (**Fig.6**). It is ideal for the ridge to be parallel with the straight cutting edge.
- Grind until the both ridges become a straight line. It forms a central point on the top of the cutting edge.
- Be extra careful of the overlapping ridges.
- It is easier to adjust a straight line by grinding each secondary relief alternatively.

## ■ Thinning grinding (X thinning)

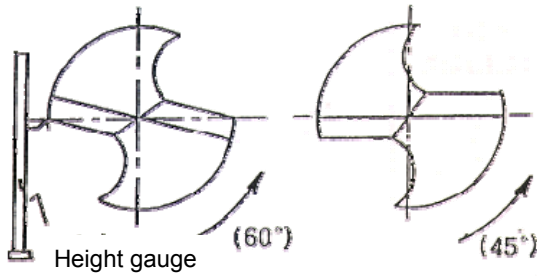


Fig.7

Fig.8

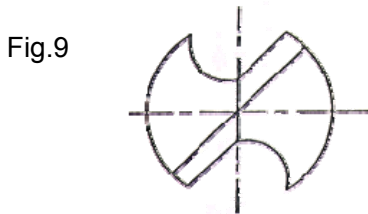


Fig.9

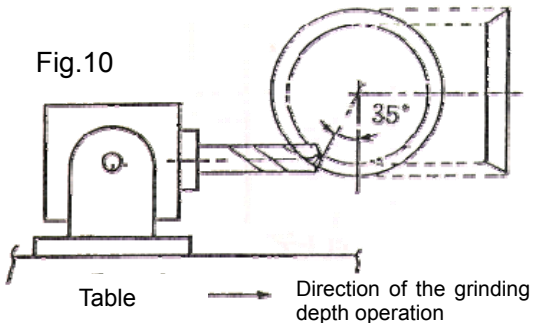


Fig.10

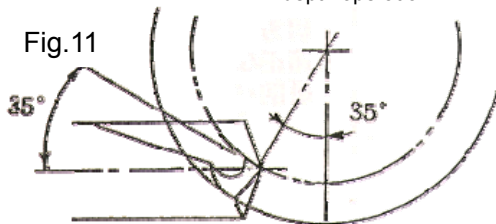


Fig.11

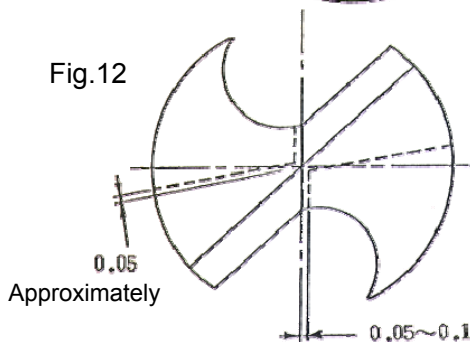
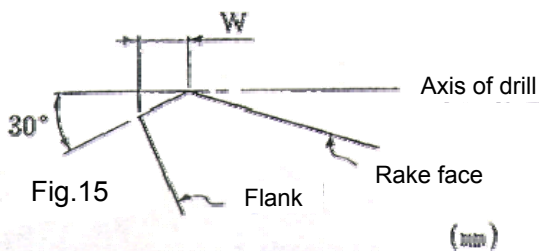
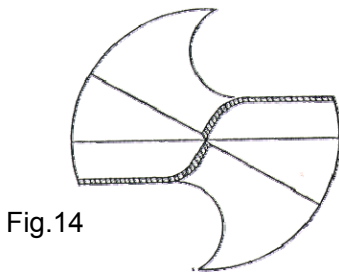
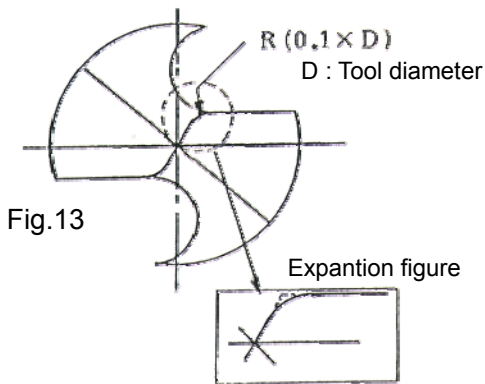


Fig.12

- After the completion of grinding the secondary relief, execute the thinning grind. Type of the thinning is **X-thinning**.
- Set the work head parallel so that the drill axis will be parallel. Set the swivel angle to  $0^\circ$ , and parallelize it according to the traverse table's direction.
- Using a height gauge, establish the rotational position of the drill to be parallel with a line which connects the both cutting edges and a shoulder (**Fig.7**), or the main cutting edge to be parallel as **Fig.8**.
- Rotate  $60^\circ$  counter clockwise for **Fig.7**, and  $45^\circ$  for **Fig.8** (observing from the cutting edge of the tool) to establish a vertical chisel edge completed by grinding the secondary relief.
- For establishing perpendicular direction position of the wheel, set the opening angle to be  $35^\circ$  from the drill axis of the thinning as **Fig.10** and **Fig.11** indicate.
- Grinding will be done by sliding the table to the direction indicated on **Fig.10**, and by pushing the drill to the wheel. The grinding depth operation is done slowly by adjusting the edge of the grinding depth by the stopper.
- The final description of the drill is a dotted line on **Fig.12**. Adjust the wheel position so that off set amount of the thinning cutting edge will be  $0.05\text{mm}$  to  $0.1\text{mm}$  from the drill axis.

## Honing



- After the completion of the thinning, execute the honing.
- Using a diamond file, fabricate a round edge where the thinning and the main cutting edge connect.
- R is proximately 0.1 x D.

- The honing should be done homogeneously on entire cutting edge as Fig.14.

- The honing angle is 30° as shown in Fig.15.
- The honing width is according to the tool diameter.

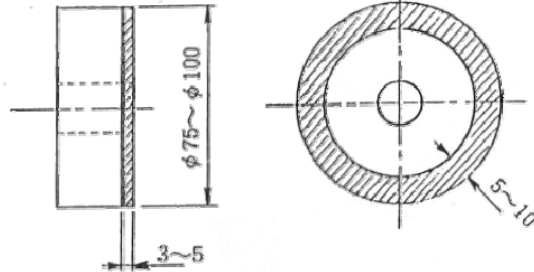
Drill diameter	Honing width W
φ5 less	0.05×30°
φ5 over φ10 less	0.05~0.1×30°
φ10 over φ20 less	0.1~0.15×30°

The completion of the regrinding process. Confirm the following criteria before using;

- Within 0.02mm lip height difference
- Complete grinding of damaged segments of the cutting edge
- Optimal honing
- Grinding burr is eliminated

## ■ Primary, secondary relief grinding

Diamond wheel



If necessary, grind roughly before finish grinding.

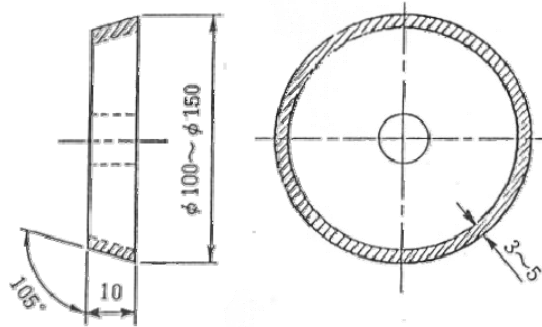
Grain size

Rough grinding : #200

Finish grinding : #400

## ■ Thinning grinding

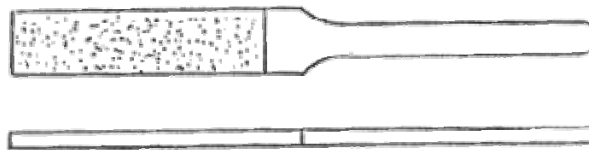
Diamond wheel



Grain size : #200

## ■ Honing

Diamond file



Grain size

Rough grinding : #400

Finish grinding : #1500

※ Diamond wheels and diamond files above are available at our divisions and sales offices. To order these products, please contact one of our sales offices or divisions near from you.