

High-Precision Shoulder Milling Cutter for General Purpose SEC-WAVEMILL WEZ Series

1. Outline

A milling cutter is a cutting tool with a cutting edge on the end face or side face. Various kinds of parts are machined by revolving this cutter. Cutting tools equipped with indexable inserts are widely used today for face milling, shouldering, side milling, slot milling, contouring, ramping, helical milling, and various other types of cutting.

On the other hand, in the field of machining, the accuracy and quality required of parts are becoming stricter year by year. Accordingly, cutting tools are required to provide increasingly enhanced performance in order to be able to cut the surfaces of parts to the required roughness and quality. To realize parts of reduced weight, the quantity of parts made by machining low-rigidity thin-walled workpieces and intricately shaped difficult-to-clamp materials is increasing. As a result, the demand for cutting tools with sharper edges is increasing.

Sumitomo Electric Industries, Ltd. has recently developed the SEC-WAVEMILL WEZ series (“WEZ,” Photo 1), which can be used in a variety of applications. Its sharpness, which is sufficient to ensure high machining quality and cutting performance, contributes to reducing the roughness of machined surfaces, improving machining accuracy, and increasing the productivity of parts.



Photo 1. SEC-WAVEMILL WEZ series

2. Features

2-1 Wide application range

WEZ is a shoulder cutter. Since a shoulder cutter is a milling cutter equipped with both major and wiper cutting edges, it can cut both the wall and bottom surfaces of a

workpiece at the same time. WEZ can be used for various cutting purposes, including face milling, shouldering, side milling, slot milling, and contouring. This cutter is versatile since it is also applicable for ramping and helical milling. The addition of a large minor cutting edge to the main and wiper cutting edges (Fig. 1) has made the new cutter useful for helical milling (Fig. 2) and ramping at deeper ramping angles.

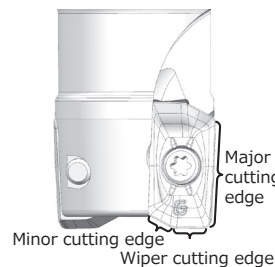


Fig. 1. Cutting edges of WEZ

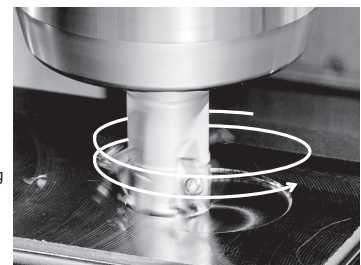


Fig. 2. Helical milling with WEZ

2-2 Excellent wall accuracy

A combination of the optimal design of the major cutting edge shape and a high-precision insert forming technology has made WEZ suitable for machining wall surfaces with good accuracy and finishing them with high quality shoulder milling. Six types of chip breakers are available as

Machine: Vertical M/C BT50
 Work material: Block (S50C)
 Body: WEZ11020E03 (Ø20, 3 teeth)
 Insert: AOET11T308PEER-P20 (ACU2500)
 Cutting condition: $v_c = 150$ m/min, $f_z = 0.1$ mm/t,
 $a_p = 8$ mm \times 3 passes, $a_e = 1$ mm, dry

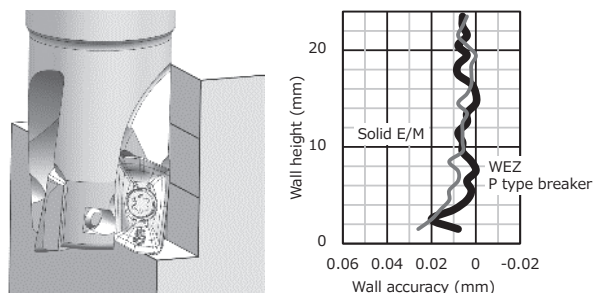


Fig. 3. Accuracy of wall surface machined by P-type breaker

inserts. Different breakers can be used for different purposes. What is remarkable is the P-type high-rake breaker, which is sharp enough to finish the surfaces of parts with extremely high accuracy. This breaker is optimized for each cutting tool diameter by grinding the outer shape of the major cutting edge. Combining a P-type breaker with a cutter body appropriate for the breaker makes the cutting tool capable of ensuring excellent wall accuracy equivalent to that achieved by a solid end mill (Fig. 3). A solid end mill is often used when the highest possible machining accuracy is required.

2-3 Sharp cutting performance

The inserts of WEZ are designed to achieve sharp machining with low cutting force. As a result, the new cutter can be used to machine steel, soft steel, stainless steel, aluminum alloys, and many other types of materials with low machining noise, while reducing the size of chips to a minimum. It is notable that the cutting edge of the F-type breaker is finished by grinding, allowing it to exhibit an extremely sharp machining performance. The sharpness of the cutting edge minimizes the burrs (Fig. 4).

Machine: Vertical M/C BT50
 Work material: Block (SUS304)
 Body: WEZ11050RS07 (Ø50, 7 teeth)
 Insert: AOET11T308PEER-F (ACU2500)
 Cutting condition: $v_c = 120$ m/min, $f_z = 0.12$ mm/t, $a_p = 1$ mm, $a_e = 30$ mm, dry

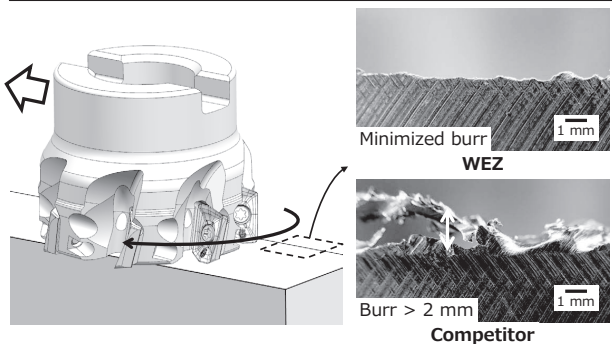
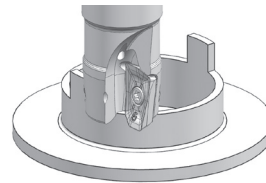


Fig. 4. Comparison of the burr

3. Application Examples

Machine: Vertical M/C BT40
 Work material: Hub (S40C)
 Body: WEZ17025E02 (Ø25, 2 teeth)
 Insert: AOMT170508PEER-G (ACU2500)
 Cutting condition: $v_c = 120$ m/min, $f_z = 0.066$ mm/t, $a_p = 9$ mm, $a_e = 5$ mm, wet



- Ensures stable machining of parts and extends the tool life while suppressing the high chattering noise characteristic of thin-wall workpieces

Machine: Horizontal M/C BT50
 Work material: Machine part (FC250)
 Body: WEZ11050RS07 (Ø50, 7 teeth)
 Insert: AOMT11T308PEER-G (ACU2500)
 Cutting condition: $v_c = 180$ m/min, $f_z = 0.1$ mm/t, $a_p = 0.3$ mm, $a_e = 10$ mm, wet



- Reduces machining noise and improves machining efficiency
- Ensures high finished surface quality with parallelism of 3 µm and flatness of 4 µm

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