



Ceramic End Mill -Corner R type

SCE-R

Achieves high-efficiency machining for superalloy!



Achieves cutting speed of $v_c=800\text{m/min.}$!

SCE-R $\phi 6\sim\phi 12$ (4 Items)

Patent pending

Mitsubishi Hitachi Tool Engineering, Ltd.

Applications & Product concept

- Achieves **ultra-high-efficiency machining** for superalloy.
- The tools employ **a special silicon nitride ceramics** with excellent heat resistance that can withstand flute tip temperatures of more than 1000°C.
- Cutting can be performed at much higher speeds than are normally used.
By achieving **cutting in the softening temperature region** of the work material, tool life is greatly improved.

Cutting region of Ceramic End Mill (Softening temp. region of superalloy)

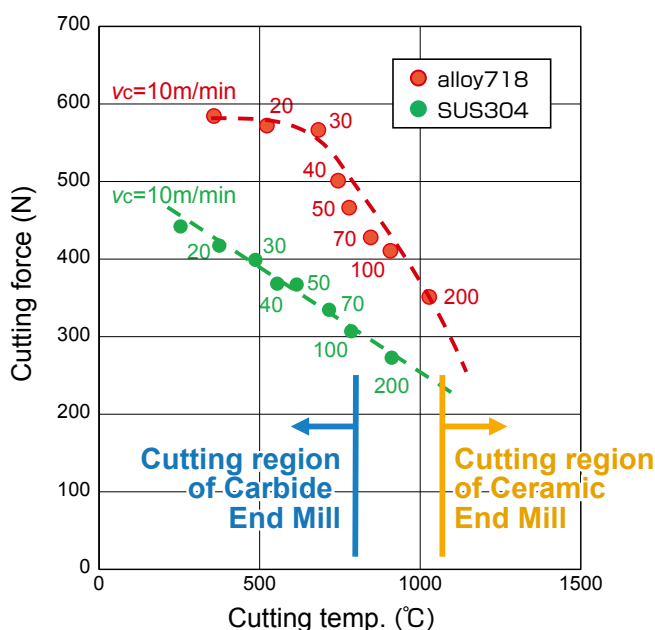


Figure: Correlation diagram between cutting speed and cutting force when cutting alloy 718 and SUS304

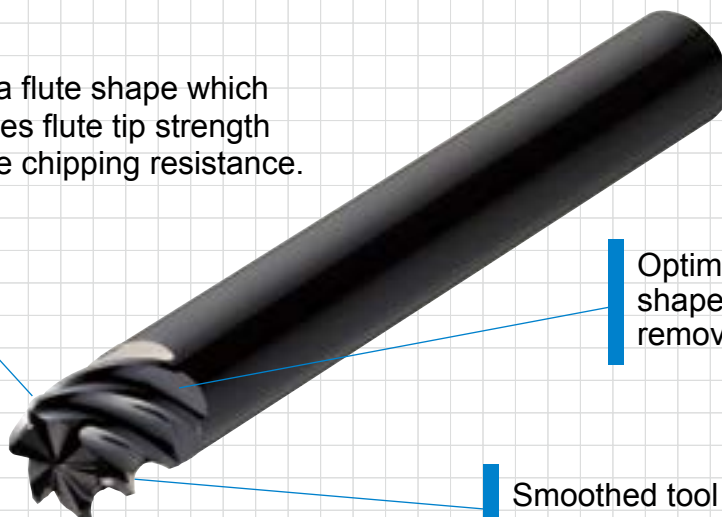
Superalloy known as a difficult-to-cut material is a material that shows high strength even up to high temperatures, but when it reaches 1000 °C or more, the material softens. High speed cutting increases the cutting heat, and the cutting force of superalloy becomes almost the same as that of stainless steel. In other words, the ceramic end mill that enables cutting in this temperature range realizes ultra-high-efficiency machining, greatly improving tool life.

Dimensions & Features

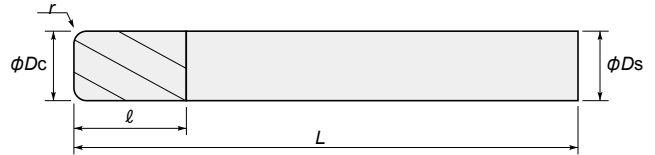
Employs a flute shape which emphasizes flute tip strength to improve chipping resistance.

Optimization of the flute shape improves cutting chip removal characteristics.

Smoothed tool surface provides excellent abrasion resistance.



Line up



SCE6○○○○-R○○.○○○

Tolerance on dia. : -0.01 ~ -0.04
R accuracy : ±0.02



Item code	Stock	Size (mm)					No. of flutes
		Tool dia. D_c	Flute length ℓ	Corner radius r	Overall length L	Shank dia. D_s	
SCE6060-R0.75	●	6	6	0.75	60	6	6
SCE6080-R1.00	●	8	8	1	70	8	6
SCE6100-R1.25	●	10	10	1.25	80	10	6
SCE6120-R1.50	●	12	12	1.5	80	12	6

● : Stocked items.

Cutting conditions

Work material : Superalloy

Tool dia. D_c (mm)	Cutting speed v_c (m/min)	Feed per tooth f_z (mm/t)	Planing		Side cutting	
			Depth of cut a_p (mm)	Depth of cut a_e (mm)	Depth of cut a_p (mm)	Depth of cut a_e (mm)
6	400~1,000	0.024	0.3 or less	3.0 or less	6.0 or less	0.6 or less
8		0.028	0.4 or less	4.0 or less	8.0 or less	0.8 or less
10		0.03	0.5 or less	5.0 or less	10.0 or less	1.0 or less
12		0.032	0.6 or less	6.0 or less	12.0 or less	1.2 or less

Field Data

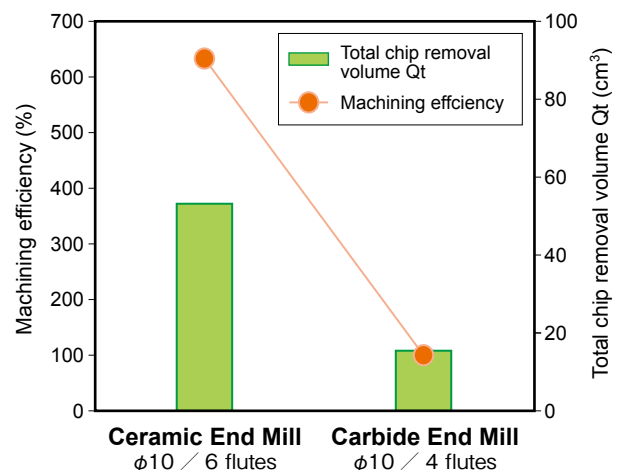
Side milling using Ni-based superalloy

- Comparison of processing efficiencies of ceramic end mills and carbide end mills -


Tool	Ceramic End Mill	Carbide End Mill
Work material	alloy718 (Age-hardened alloy)	
Revolution n [min^{-1}]	20,000	2,547
Cutting speed v_c [m/min]	628	80
Feed rate v_f [mm/min]	3,600	407
Feed per tooth f_z [mm/t]	0.03	0.04
a_p [mm]	7	6
a_e [mm]	0.3	0.5
Chip removal volume Q [cm^3/min]	7.6	1.2

More than 5 times the machining performance!!

More than 3 times the total chip removal volume!!



Re-grinding compatibility range table

Item Code	Product	Line up tool dia. (mm)	Shape	Re-grinding compatibility range(mm)
SCE-R	Ceramic End Mill Corner R type	6~12		6~12

Since regrinding consists of cutting off the used section and re-manufacturing the shape, the overall tool length will be changed greatly. (For details, contact our sales office.)

Cautions on use

- Dry (air blow) cutting is recommended.
- Use of hydro chucks (hydraulic holders) or shrink-fit holders is recommended.
- Down cutting is recommended.
- Continuous cutting is recommended and interrupted cutting should be avoided as much as possible.
- When tool goes into the work material, a machining method that will gradually reach the set cutting depth is recommended.
- After cutting, the tool and tool holder will be at high temperatures. Use sufficient caution when handling.
- Since heat-affected layers may be produced in the work material, a finishing allowance of at least 0.2 mm should be set.

Drawings, data in tables, etc. are examples of test results. not guaranteed performance.

⚠ Attentions on Safety

1. Cautions regarding handling

- (1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.
- (2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

2. Cautions regarding mounting

- (1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
- (2) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.
- (4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. **Please caution of fire while using oil base coolant, fire prevention is necessary.**
- (5) Do not use the tool for any purpose other than that for which it is intended.

4. Cautions regarding regrinding

- (1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.
- (2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.
- (3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with the local laws and regulations regarding prevention of hazards due to specified chemical substances.



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