



C U T T I N G T O O L S

**Solid Ceramic End
Mills and Rods**



Milling with Solid Ceramic End Mills

Materials that are difficult to machine, such as Inconel, place the highest demands on the cutting material and cutting geometry in order to enable efficient and reliable machining. The properties of ceramic cutting materials make them ideally suited for this purpose.

In the industrial segments of aerospace, power generation and oil and gas production, many components are made of heat-resistant nickel-based alloys due to the required properties.

The properties of these alloys : heat resistance, work hardening, the tendency to form carbides, their high ductility as well as their good adhesion to a cutting edge, place the highest demands during machining on the cutting material used and the cutting geometry. This is also true for milling. For this application, CeramTec provides Solid Ceramic milling cutters as well as rods on which the cutting geometry can be applied. The milling cutters and rods are made of a SiAlON cutting material that is specially adapted to the requirements of milling nickel-based alloys.

Good to know

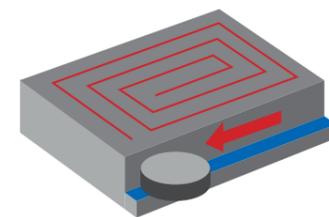
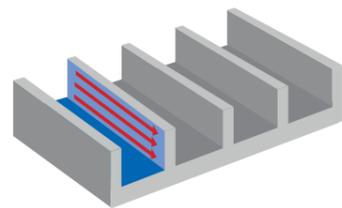
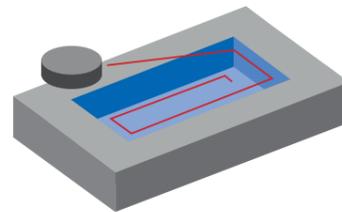
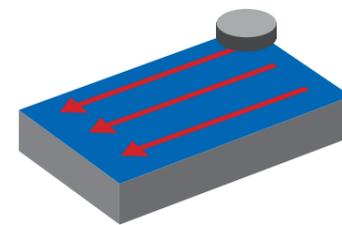
- For nickel-based alloys, cast iron and graphite materials
- A high degree of strength, toughness and wear resistance
- Process reliability of complex cutting geometries

Range of application

Application for Solid Ceramic End Mills

The end mills are designed for a wide range of applications. Depending on the cutting geometry, the end mills can be used for milling of pockets and slots, plunge milling, shoulder milling and ramp milling and of course face milling. The properties of the cutting material permit these wide fields of application.

Depending on the cutting geometry introduced, the solid end mills can be used for roughing or rough-finishing.



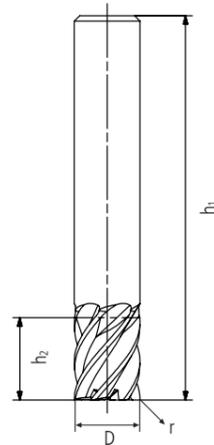
End milling cutter **LSM800**

Rough finishing

6.3 3.2



$v_c = 550 - 750 \text{ m/min}$
 $f_z = 0,03 - 0,06 \text{ mm}$
 $a_p = \text{up to } 0,5 \times D$



Type	SPK-Ref. No.	Dimensions (mm)				
		D	t	r	h ₁	h ₂
CTE-0600Z06R-AA12 LSM800	771.15.060.19.0	6	6	1,20	60	4,5
CTE-0600Z06R-AA20 LSM800	771.15.060.39.0	6	6	2,00	60	4,5
CTE-0600Z06R-AA25 LSM800	771.15.060.29.0	6	6	2,50	60	4,5
CTE-0800Z06R-AB12 LSM800	771.15.080.19.0	8	6	1,20	60	6,5
CTE-0800Z06R-AB20 LSM800	771.15.080.39.0	8	6	2,00	60	6,5
CTE-0800Z06R-AB25 LSM800	771.15.080.29.0	8	6	2,50	60	6,5
CTE-1000Z06R-BB12 LSM800	771.15.100.19.0	10	6	1,20	65	6,5
CTE-1000Z06R-BB20 LSM800	771.15.100.39.0	10	6	2,00	65	6,5
CTE-1000Z06R-BB25 LSM800	771.15.100.29.0	10	6	2,50	65	6,5
CTE-1200Z06R-CD12 LSM800	771.15.120.19.0	12	6	1,20	70	9
CTE-1200Z06R-CD20 LSM800	771.15.120.39.0	12	6	2,00	70	9
CTE-1200Z06R-CD25 LSM800	771.15.120.29.0	12	6	2,50	70	9
CTE-1600Z08R-DE12 LSM800	771.15.160.19.0	16	8	1,20	83	14
CTE-1600Z08R-DE20 LSM800	771.15.160.39.0	16	8	2,00	83	14
CTE-1600Z08R-DE25 LSM800	771.15.160.29.0	16	8	2,50	83	14
CTE-2000Z08R-EE12 LSM800	771.15.200.19.0	20	8	1,20	93	14
CTE-2000Z08R-EE20 LSM800	771.15.200.39.0	20	8	2,00	93	14
CTE-2000Z08R-EE25 LSM800	771.15.200.29.0	20	8	2,50	93	14

Designation system for end mills

CT End mill	S Special	L Left	E 93 mm
- Standard	- Standard	R Right	D 83 mm
Designation	Placeholder	Sense of rotation	Overall length h₁
CT	E	-	12 R 1,2 mm
0800	Z06	R	20 R 2,0 mm
A	B	12	25 R 2,5 mm
Length of cutting edge h₂	No. of teeth z	Nominal diameter D	Type of cutter
A 4,5 mm	Z02 2 teeth	0600 6 mm	E End mill Ceramic solid
B 6,5 mm	Z03 3 teeth	0800 8 mm	F End mill Ceramic Compound
C 7,5 mm	Z04 4 teeth	1000 10 mm	G End mill CBN Compound
D 9 mm	...	1200 12 mm	1600 16 mm
E 14 mm	Z20 20 teeth	1600 16 mm	2000 20 mm
F 16 mm	...	2000 20 mm	...
G 19,5 mm

Ceramics for Milling - Basics

The idea of economical cutting is based on using the highest possible cutting parameters in order to achieve a high metal removal rate. This also shows that the majority of the heat introduced is transported away via the chip and thus does not reach the component.

At temperatures above 800°C, tungsten carbides lose their properties of hot hardness and wear resistance. Likewise, due to the high temperature development and the high cutting forces at the cutting edges, more chemical reactions and diffusion processes take place in tungsten carbides and thus promote wear.

Cutting ceramics are not subject to these influences and retain their strength, wear resistance and toughness even at high temperatures.

The high cutting parameters allow large depths of cut, high feed rates and cutting speeds, with good tool life. Solid ceramic end mills thus increase economic efficiency and process reliability in the machining of nickel-based alloys.



Dimensions of Rods

Dimensions (mm)			Grade	Ref.-No.
D	L	Tolerance h6		
6	60	+0/-0,008	LSM 800	70.91.557.57.0
8	60	+0/-0,009	LSM 800	70.91.557.58.0
10	65	+0/-0,009	LSM 800	70.91.557.59.0
12	70	+0/-0,011	LSM 800	70.91.557.60.0
16	83	+0/-0,011	LSM 800	70.91.557.61.0
20	93	+0/-0,013	LSM 800	70.91.557.62.0

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