

crazy about

milling

CRAZYMILL COOL Z4

- SQUARE
- CORNER RADIUS



NEW

CrazyMill Cool Square / Corner radius - Z4



NEW**CRAZYMILL™**
by Mikron Tool
Cool**MILLING TOOL FOR PRE-MACHINING AND FINISHING DIFFICULT MATERIALS**

CrazyMill Cool Square / Corner radius with four flutes is an innovative end mill, developed by Mikron Tool, for machining stainless steels, titanium alloys, CrCo and super alloys. It is available in the diameter range from .039" to .315" (1 mm to 8 mm) and a maximal milling depth of 5 x d.

**Integrated cooling**

Constant and massive cooling of the cutting edges

New chip-splitting concept

Optimized to guarantee short chips and a perfect evacuation

Performance features

- Highest speed and feed
- Integrated cooling
- Pre-machining and finishing with one tool
- New chip-splitting concept

**Your advantages**

- Time and cost saving
- Excellent surface quality
- Reliable process
- Perfect chip control

NEW

Maximum performance and surface quality

SQUARE / CORNER RADIUS ENDMILL WITH INTEGRATED COOLING

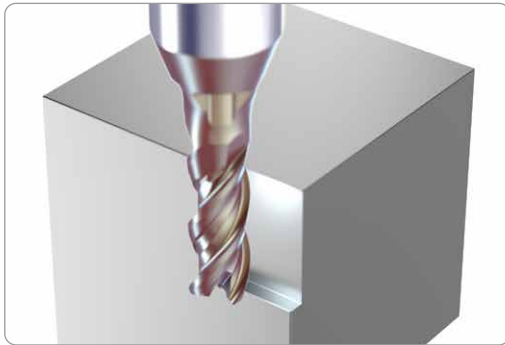
With CrazyMill Cool Square / Corner radius – Z4, Mikron Tool expands the range of milling cutters for difficult-to-machine materials. Four versions of square respectively corner radius endmills with four teeth and shank integrated cooling are available in the diameter range from .039" to .315" (1 mm to 8 mm) and a maximal milling depth of 5 x d.

-
- CrazyMill Cool Square, Type A – milling depth 2 x d, cutting length 2 x d, through shank coolant, Z = 4
 - CrazyMill Cool Square, Type C – milling depth 5 x d, cutting length 2 x d, through shank coolant, Z = 4
 - CrazyMill Cool Square, Type M – milling depth 3 x d, cutting length 3 x d, through shank coolant, Z = 4
 - CrazyMill Cool Square, Type N – milling depth 4 x d, cutting length 4 x d, through shank coolant, Z = 4
-
- CrazyMill Cool Corner radius, Type A – milling depth 2 x d, cutting length 2 x d, through shank coolant, Z = 4
 - CrazyMill Cool Corner radius, Type C – milling depth 5 x d, cutting length 2 x d, through shank coolant, Z = 4
 - CrazyMill Cool Corner radius, Type M – milling depth 3 x d, cutting length 3 x d, through shank coolant, Z = 4
 - CrazyMill Cool Corner radius, Type N – milling depth 4 x d, cutting length 4 x d, through shank coolant, Z = 4
-

One tool for many applications

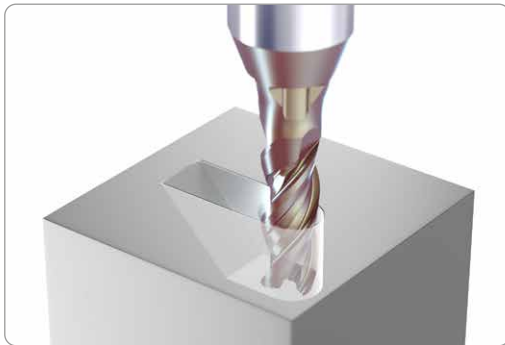
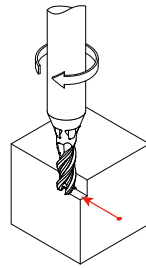
FOR DIFFICULT TO MACHINE MATERIALS

■ CrazyMill Cool Square / Corner radius - Z4 for:



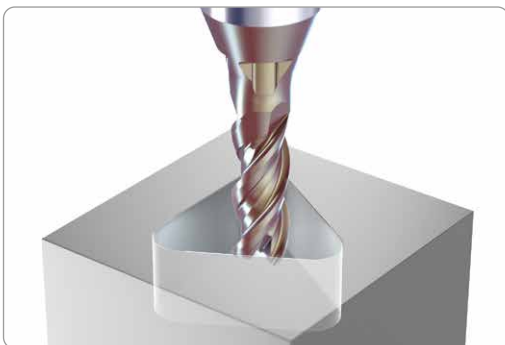
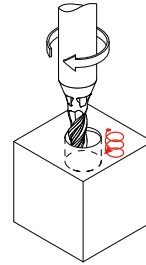
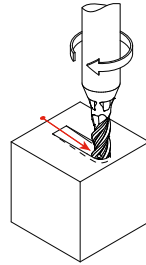
1. Side milling: Pre-machining and Finishing

$$a_p = 2 \times d / 3 \times d / 4 \times d$$

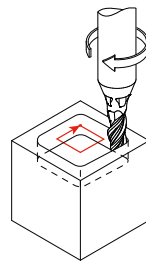


2. Linear ramp or helical interpolation milling

Angle depending on material



3. Pocket milling



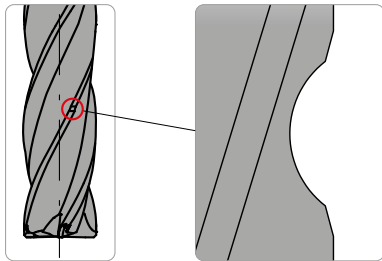
NEW

Important features

FOR BEST PERFORMANCE ON SURFACE QUALITY

■ Optimized chip-splitting for short chips and perfect surface quality

Chip-splitting design



Optimized chip-splitting geometry for short chips and a perfect chip evacuation. The result is a perfect surface quality.

Short chips



Due the chip-splitting the chips are short and easily evacuated. The result is long tool life.

Surface quality

CrazyMill Cool

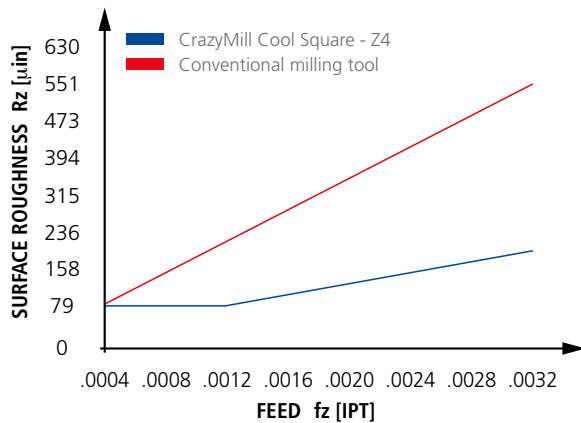


Conventional endmill



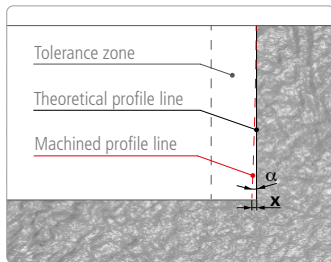
Due the new design of chip-splitting there is no visible mark as happens when using a conventional milling tool. The result is an excellent surface quality.

■ **Surface roughness Rz**



Material: X2CrNiMo17-12-2 / 1.4404 / AISI 316L
 Diameter: .315" (8 mm); Milling depth: .630" (16 mm);
 Coolant: cutting oil; Cutting data: $v_c = 853$ SFM (260 m/min);
 $a_p = .630$ " (16 mm); $a_e = .006$ " (0.16 mm)








■ **Perpendicularity**



Perpendicularity precision	
x	.0008" (0.02 mm)
α	- 0.05°

Material: X2CrNiMo17-12-2 / 1.4404 / AISI 316L
 Diameter: .236" (6 mm); Milling depth: .945" (24 mm);
 Coolant: cutting oil; Cutting data: $v_c = 723$ SFM (220 m/min);
 $f_z = .0012$ IPT (0.03 mm); $a_p = .945$ " (24 mm);
 $a_e = .0047$ " (0.12 mm)

Thanks to the profile of the flute and the size of the core, greater stability is achieved. The result is high perpendicularity precision, in particularly for long tool versions.

PATENTED	2 x d	5 x d	3 x d	4 x d	
	Type A	Type C	Type M	Type N	
<p>l_1 = Effective length l_2 = Cutting length</p> <ul style="list-style-type: none"> ■ Coated ■ Integ. cooling ■ l_1: 2xd, l_2: 2xd 	<ul style="list-style-type: none"> ■ Coated ■ Integ. cooling ■ l_1: 5xd, l_2: 2xd 	<ul style="list-style-type: none"> ■ Coated ■ Integ. cooling ■ l_1: 3xd, l_2: 3xd 	<ul style="list-style-type: none"> ■ Coated ■ Integ. cooling ■ l_1: 4xd, l_2: 4xd 		
					
					
	page 14	page 20	page 26	page 32	

Regrinding: This product is not suitable for regrinding.

NEW

1 | SHANK

The robust solid carbide shank guarantees stable and vibration-free milling. High precision and extraordinary surface quality are reached.

2 | INTEGRATED COOLING - PATENTED

The integrated cooling channels guarantee constant and maximal cooling of the cutting edges and optimal chip removal. The result is higher cutting speed and depth a_p as well as an excellent surface quality.

3 | CARBIDE

The specially developed micro-grain carbide meets all requirements in terms of mechanical properties.

4 | COATING

The high-performance eXedur SNP coating is heat and wear resistant, prevents buildup edges and guarantees optimum chip flushing. The result is a long tool life.

5 | CUTTING GEOMETRY OF END FACE - LINEAR RAMP AND HELICAL INTERPOLATION MILLING

The frontal cutting geometry with the specially designed expanded chip collection has been optimized for linear ramp and helical interpolation milling by high ramp angles.

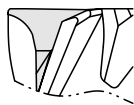
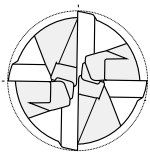
6 | LATERAL CUTTING GEOMETRY

The long and robust lateral cutting edge of versions M and N allows to obtain high tool rigidity. The result is higher machining force resistance that leads to high perpendicularity precision and high surface quality.

7 | CHIP-SPLITTING

An optimized chip-splitting guarantees short chips and highest surface quality. The chip-splitting is implemented in version M for $\varnothing d_1 \geq 4$ mm and N for $\varnothing d_1 \geq 3$ mm.

Mill tip

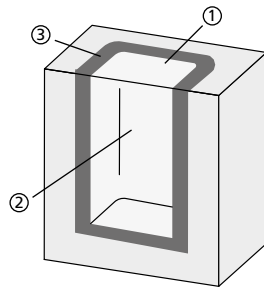


4 - Flute

NEW

Benefits and applications

PRE-MACHINING AND FINISHING CUTTER WITH INTEGRATED COOLING



COMPONENT

Pocket milling

MATERIAL

X2CrNiMo17-12-2 / 1.4404 / AISI 316L

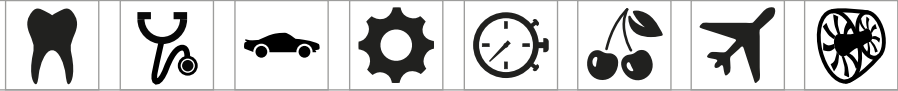
MACHINING

- ① Helical ramp
- ② Pre-machining
- ③ Finishing
- Diameter endmill = .315" (8 mm)
- Pocket depth = .630" (16 mm)

MILLING TOOL

Mikron Tool - CrazyMill Cool Square - Z4
 Type A

DATA	MIKRON TOOL
Tool type	CrazyMill Cool Square - Z4 - Carbide - Coated - Integrated cooling
Item number	2.CMC42.A1Z4.800.1
Cutting data	<p>① Helical ramp $v_c = 160 \text{ m/min}$ 525 SFM $f_z = 0.03 \text{ mm}$.00012 IPT $a_{p,max} = 1 \times d$ $a_e = 7.5 \text{ mm}$.295" $\alpha = 20^\circ$ $Q = 22.9 \text{ cm}^3/\text{min}$.006 gpm $\Delta t = 4 \text{ s}$</p> <p>② Pre-machining $v_c = 180 \text{ m/min}$ 591 SFM $f_z = 0.048 \text{ mm}$.0019 IPT $a_{p,max} = 2 \times d$ $a_e = 1.6 \text{ mm}$.063" $Q = 35.2 \text{ cm}^3/\text{min}$.009 gpm $\Delta t = 1 \text{ min } 40 \text{ s}$</p> <p>③ Finishing $v_c = 260 \text{ m/min}$ 853 SFM $f_z = 0.04 \text{ mm}$.0016 IPT $a_{p,max} = 2 \times d$ $a_e = 0.16 \text{ mm}$.0063" $Q = 4.2 \text{ cm}^3/\text{min}$.001 gpm $\Delta t = 9 \text{ s}$</p>



APPLICATION DOMAINS	COMPONENTS EXAMPLES	MATERIALS GROUPS	EXAMPLES		
			Mat. no.	DIN	AISI / ASTM / UNS
Dental	Tooth crown	Group P Unalloyed and alloyed steel	1.0401	C15	1015
Medical technology	Component for endoscope		1.3505	100Cr6	52100
Automotive industry	Components for injection system		1.2436	X210CrW12	D4 / D6
Mechanical engineering	Machine components	Group M Stainless steel	1.4105	X6CrMoS17	430F
			1.4112	X90CrMoV18	440B
			1.4301	X5CrNi 18-10	304
Watches	Watch housing	Group K Cast iron	0.7040	GGG40	60-40-18
Food industry	Nozzle		Group N Non ferrous metals	3.2315	AlMgSi1
Aerospace industry	Engine parts	3.2163		GD-ALSi9Cu3	A380
		2.004		Cu-OF / CW008A	C10100
Power industry	Blade	2.0321		CuZn37 CW508L	C27400
		2.102		CuSn6	C51900
		2.096		CuAl9Mn2	C63200
Power industry	Blade	Group S1 Super alloys		2.4856	
			2.4665	NiCr22Fe18Mo	HASTELLOY X
Power industry	Blade	Group S2 Titanium (pure and alloyed)	3.7035	Gr.2	B348 / F67
			3.7165	TiAl6V4	B348 / F136
Power industry	Blade	Group S3 CrCo alloys	2.4964	CoCr20W15Ni	HAYNES 25

NEW

CrazyMill Cool Square / Corner radius - Z4

MILLING WITH INTEGRATED COOLING



Square



2 x d
page 14



5 x d
page 20



3 x d
page 26



4 x d
page 32



Corner radius



2 x d
page 15



5 x d
page 21



3 x d
page 27



4 x d
page 33

CrazyMill Cool is setting new standards for the milling of pockets and walls with regard to cutting speeds, feed, performance, tool life, and surface quality. The new features of this pre-machining and finishing cutter include not only the solid carbide, coating, and geometry, but especially the unique cooling system with cooling channels integrated in the shaft, which achieve constant and extensive cooling of the cutting edges, thus enabling the highest cutting speeds and maximum feed.

The milling tools have three to five integrated cooling channels depending on the shaft diameter.

Mikron Tool developed two different variants:

- **Variant square** - sharp-edged with small, defined protection phase of 45°, for a maximum machining depth of 5 x d.
- **Variant corner radius** - sharp-edged with a corner radius for a maximum machining depth of 5 x d.

Coolant type, pressure and filtration

Detailed recommendations for coolant type, pressure and filtration are on page "milling process".

Please note

You couldn't find your suitable version of the CrazyMill Cool Square / Corner radius - Z4 (diameter, length, cutting direction...)? Ask us about our customized versions!

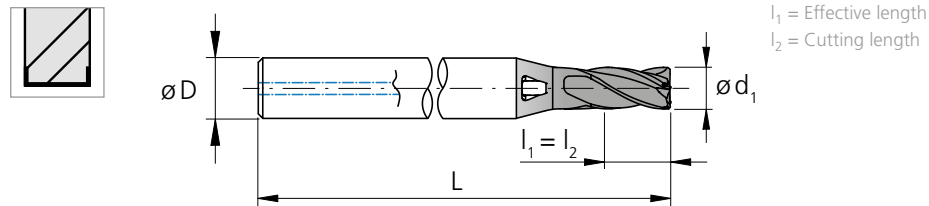
Regrinding: This product is not suitable for regrinding.

NEW

Type A - 2 x d - Square / Corner radius - Z4











MILLING WITH INTEGRATED COOLING

Square

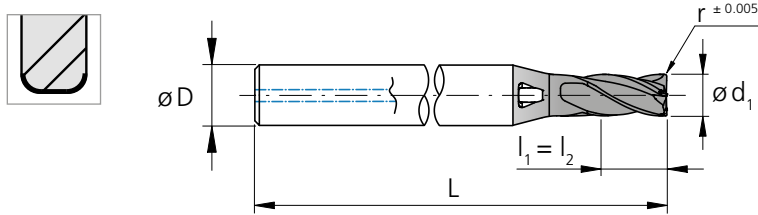


d_1	d_1	d_1	l_1	l_1	l_2	D (h6)	L	L	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]		
	.039	1.0	.079	2.0	2.0	4	1.57	40	2.CMC42.A1Z4.100.1	■
	.047	1.2	.094	2.4	2.4	4	1.57	40	2.CMC42.A1Z4.120.1	■
	.059	1.5	.118	3.0	3.0	4	1.57	40	2.CMC42.A1Z4.150.1	■
1/16	.0625	1.587	.122	3.1	3.1	4	1.57	40	2.CMC.SAZ4.F116	■
	.071	1.8	.142	3.6	3.6	4	1.57	40	2.CMC42.A1Z4.180.1	■
	.079	2.0	.157	4.0	4.0	4	1.57	40	2.CMC42.A1Z4.200.1	■
3/32	.0937	2.381	.185	4.7	4.7	4	1.57	40	2.CMC.SAZ4.F332	■
	.098	2.5	.197	5.0	5.0	6	1.97	50	2.CMC42.A1Z4.250.1	■
	.118	3.0	.236	6.0	6.0	6	1.97	50	2.CMC42.A1Z4.300.1	■
1/8	.1250	3.175	.252	6.4	6.4	6	1.97	50	2.CMC.SAZ4.F18	■
	.138	3.5	.276	7.0	7.0	6	1.97	50	2.CMC42.A1Z4.350.1	■
5/32	.1562	3.968	.312	7.9	7.9	6	1.97	50	2.CMC.SAZ4.F532	■
	.157	4.0	.315	8.0	8.0	6	1.97	50	2.CMC42.A1Z4.400.1	■
	.177	4.5	.354	9.0	9.0	8	2.36	60	2.CMC42.A1Z4.450.1	■
3/16	.1875	4.762	.375	9.5	9.5	8	2.36	60	2.CMC.SAZ4.F316	■
	.197	5.0	.394	10.0	10.0	8	2.36	60	2.CMC42.A1Z4.500.1	■
7/32	.2189	5.560	.438	11.1	11.1	10	2.36	60	2.CMC.SAZ4.F732	■
	.236	6.0	.472	12.0	12.0	10	2.36	60	2.CMC42.A1Z4.600.1	■
1/4	.2500	6.350	.500	12.7	12.7	10	2.36	60	2.CMC.SAZ4.F14	■
	.315	8.0	.630	16.0	16.0	12	2.76	70	2.CMC42.A1Z4.800.1	■

■ Stock item

Carbide		Z4													
		$\varnothing d_1$.004" - .118" (0.1 - 3.0 mm)		.122" - .236" (3.1 - 6.0 mm)		.240" - .394" (6.1 - 10.0 mm)							
		Tolerance		- .00055" - .00110"		- 0.014 mm - 0.028 mm		- .00079" - .00150"		- 0.020 mm - 0.038 mm		- .00098" - .00185"		- 0.025 mm - 0.047 mm	

Corner radius



l_1 = Effective length
 l_2 = Cutting length

d_1	d_1	d_1	l_1	l_1	l_2	D	L	L	r	r	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	(h6) [mm]	[inch]	[mm]	[inch]	[mm]		
	.039	1.0	.079	2.0	2.0	4	1.57	40	.0039	0.10	2.CMC42.A2Z4.100.1	■
	.039	1.0	.079	2.0	2.0	4	1.57	40	.0079	0.20	2.CMC42.A3Z4.100.1	■
	.047	1.2	.094	2.4	2.4	4	1.57	40	.0039	0.10	2.CMC42.A2Z4.120.1	■
	.047	1.2	.094	2.4	2.4	4	1.57	40	.0079	0.20	2.CMC42.A3Z4.120.1	■
	.059	1.5	.118	3.0	3.0	4	1.57	40	.0039	0.10	2.CMC42.A2Z4.150.1	■
	.059	1.5	.118	3.0	3.0	4	1.57	40	.0118	0.30	2.CMC42.A3Z4.150.1	■
1/16	.0625	1.587	.122	3.1	3.1	4	1.57	40	.0050	0.127	2.CMC.RA2Z4.F116	■
1/16	.0625	1.587	.122	3.1	3.1	4	1.57	40	.0100	0.254	2.CMC.RA3Z4.F116	■
	.071	1.8	.142	3.6	3.6	4	1.57	40	.0039	0.10	2.CMC42.A2Z4.180.1	■
	.071	1.8	.142	3.6	3.6	4	1.57	40	.0118	0.30	2.CMC42.A3Z4.180.1	■
	.079	2.0	.157	4.0	4.0	4	1.57	40	.0039	0.10	2.CMC42.A2Z4.200.1	■
	.079	2.0	.157	4.0	4.0	4	1.57	40	.0079	0.20	2.CMC42.A3Z4.200.1	■
	.079	2.0	.157	4.0	4.0	4	1.57	40	.0197	0.50	2.CMC42.A4Z4.200.1	■
3/32	.0937	2.381	.185	4.7	4.7	4	1.57	40	.0050	0.127	2.CMC.RA2Z4.F332	■
3/32	.0937	2.381	.185	4.7	4.7	4	1.57	40	.0100	0.254	2.CMC.RA3Z4.F332	■
3/32	.0937	2.381	.185	4.7	4.7	4	1.57	40	.0150	0.381	2.CMC.RA4Z4.F332	■
	.098	2.5	.197	5.0	5.0	6	1.97	50	.0079	0.20	2.CMC42.A2Z4.250.1	■
	.098	2.5	.197	5.0	5.0	6	1.97	50	.0197	0.50	2.CMC42.A3Z4.250.1	■
	.118	3.0	.236	6.0	6.0	6	1.97	50	.0079	0.20	2.CMC42.A2Z4.300.1	■
	.118	3.0	.236	6.0	6.0	6	1.97	50	.0197	0.50	2.CMC42.A3Z4.300.1	■
1/8	.1250	3.175	.250	6.4	6.4	6	1.97	50	.0100	0.254	2.CMC.RA2Z4.F18	■
1/8	.1250	3.175	.250	6.4	6.4	6	1.97	50	.0150	0.381	2.CMC.RA3Z4.F18	■
	.138	3.5	.276	7.0	7.0	6	1.97	50	.0079	0.20	2.CMC42.A2Z4.350.1	■
	.138	3.5	.276	7.0	7.0	6	1.97	50	.0197	0.50	2.CMC42.A3Z4.350.1	■
5/32	.1562	3.968	.312	7.9	7.9	6	1.97	50	.0100	0.254	2.CMC.RA2Z4.F532	■
5/32	.1562	3.968	.312	7.9	7.9	6	1.97	50	.0150	0.381	2.CMC.RA3Z4.F532	■
	.157	4.0	.315	8.0	8.0	6	1.97	50	.0079	0.20	2.CMC42.A2Z4.400.1	■
	.157	4.0	.315	8.0	8.0	6	1.97	50	.0197	0.50	2.CMC42.A3Z4.400.1	■
	.177	4.5	.354	9.0	9.0	8	2.36	60	.0079	0.20	2.CMC42.A2Z4.450.1	■
	.177	4.5	.354	9.0	9.0	8	2.36	60	.0197	0.50	2.CMC42.A3Z4.450.1	■
3/16	.1875	4.762	.375	9.5	9.5	8	2.36	60	.0100	0.254	2.CMC.RA2Z4.F316	■
3/16	.1875	4.762	.375	9.5	9.5	8	2.36	60	.0150	0.381	2.CMC.RA3Z4.F316	■
	.197	5.0	.394	10.0	10.0	8	2.36	60	.0079	0.20	2.CMC42.A2Z4.500.1	■
	.197	5.0	.394	10.0	10.0	8	2.36	60	.0197	0.50	2.CMC42.A3Z4.500.1	■
7/32	.2189	5.560	.438	11.1	11.1	10	2.36	60	.0150	0.381	2.CMC.RA2Z4.F732	■
7/32	.2189	5.560	.438	11.1	11.1	10	2.36	60	.0300	0.762	2.CMC.RA3Z4.F732	■
	.236	6.0	.472	12.0	12.0	10	2.36	60	.0079	0.20	2.CMC42.A2Z4.600.1	■
	.236	6.0	.472	12.0	12.0	10	2.36	60	.0197	0.50	2.CMC42.A3Z4.600.1	■
	.236	6.0	.472	12.0	12.0	10	2.36	60	.0394	1.00	2.CMC42.A4Z4.600.1	■
1/4	.2500	6.350	.500	12.7	12.7	10	2.36	60	.0150	0.381	2.CMC.RA2Z4.F14	■
1/4	.2500	6.350	.500	12.7	12.7	10	2.36	60	.0300	0.762	2.CMC.RA3Z4.F14	■
1/4	.2500	6.350	.500	12.7	12.7	10	2.36	60	.0600	1.524	2.CMC.RA4Z4.F14	■
	.315	8.0	.630	16.0	16.0	12	2.76	70	.0079	0.20	2.CMC42.A2Z4.800.1	■
	.315	8.0	.630	16.0	16.0	12	2.76	70	.0197	0.50	2.CMC42.A3Z4.800.1	■
	.315	8.0	.630	16.0	16.0	12	2.76	70	.0591	1.50	2.CMC42.A4Z4.800.1	■

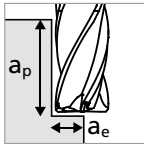
■ Stock item

NEW

Type A - Pre-machining

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Pre-machining

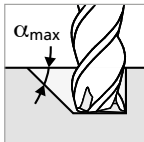


①

- $a_p = 1.5 \times d_1$
- $a_e = 0.3 \times d_1$

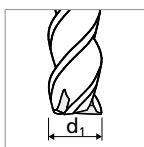
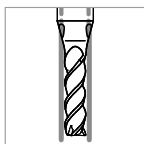
②

- $a_p = 2 \times d_1$
- $a_e = 0.2 \times d_1$



Note:

In case of linear ramp or helical interpolation milling reduce f_z by 35%

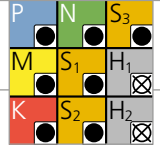


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"		1.5 mm .059"		1/16"				
					v_c	f_z		v_c	f_z		v_c	f_z	
						①	②		①	②		①	②
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	140 459	0.011 .00043	0.013 .00051	200 656	0.024 .00094	0.017 .00067			
		1.0401	C15	AISI 1015									
		1.1191	C45E/CK45	AISI 1045									
		1.0044	S275JR	AISI 1020									
	Low alloyed steel Rm > 900 N/mm ²	1.0715	11SMn30	AISI 1215	140 459	0.010 .00039	0.012 .00047	200 656	0.022 .00087	0.015 .00059			
		1.5752	15NiCr13	ASTM 3415 / AISI 3310									
		1.7131	16MnCr5	AISI 5115									
		1.3505	100Cr6	AISI 52100									
		1.7225	42CrMo4	AISI 4140									
	High alloyed tool steel Rm < 1200 N/mm ²	1.2842	90MnCrV8	AISI O2	140 459	0.008 .00032	0.009 .00035	200 656	0.019 .00075	0.013 .00051			
		1.2379	X153CrMoV12	AISI D2									
		1.2436	X210CrW12	AISI D4/D6									
1.3343		H56-5-2C	AISI M2 / UNS T11302										
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140 459	0.012 .00047	0.014 .00055	180 591	0.021 .00083	0.016 .00063			
		1.4105	X6CrMoS17	AISI 430F									
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140 459	0.011 .00043	0.013 .00051	180 591	0.021 .00083	0.016 .00063			
		1.4112	X90CrMoV18	AISI 440B									
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140 459	0.011 .00043	0.013 .00051	180 591	0.021 .00083	0.016 .00063			
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH									
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140 459	0.009 .00035	0.011 .00043	180 591	0.018 .00071	0.014 .00055			
		1.4435	X2CrNiMo18-14-3	AISI 316L									
1.4441		X2CrNiMo18-15-3	AISI 316LM										
K	Cast iron	0.6020	GG20	ASTM 30	120 394	0.008 .00032	0.010 .00039	160 525	0.019 .00075	0.016 .00063			
		0.6030	GG30	ASTM 40B									
		0.7040	GGG40	ASTM 60-40-18									
		0.7060	GGG60	ASTM 80-60-03									
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	160 525	0.013 .00051	0.015 .00059	200 656	0.026 .00102	0.018 .00071			
		3.4365	AlZnMgCu1.5	ASTM 7075									
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	160 525	0.013 .00051	0.015 .00059	220 722	0.026 .00102	0.018 .00071			
		3.2381	GD-AlSi10Mg	UNS A03590									
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	160 525	0.013 .00051	0.015 .00059	220 722	0.026 .00102	0.018 .00071			
		2.0065	Cu-ETP / CW004A	UNS C11000									
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	160 525	0.013 .00051	0.015 .00059	220 722	0.026 .00102	0.018 .00071			
		2.0360	CuZn40 CW509L	UNS C28000									
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	160 525	0.013 .00051	0.015 .00059	220 722	0.026 .00102	0.018 .00071			
		2.1020	CuSn6	UNS C51900									
Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	160 525	0.013 .00051	0.015 .00059	220 722	0.026 .00102	0.018 .00071				
	2.0960	CuAl9Mn2	UNS C63200										
S₁	Super alloys	2.4856		Inconel 625	80 262	-	0.006 .00024	100 328	-	0.008 .00030			
		2.4668		Inconel 718									
		2.4617	NiMo28	Hastelloy B-2									
		2.4665	NiCr22Fe18Mo	Hastelloy X									
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	100 328	0.010 .00039	0.012 .00047	100 328	0.017 .00067	0.014 .00055			
		3.7065	Gr.4	ASTM B348 / F68									
S₂	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	100 328	0.010 .00039	0.012 .00047	100 328	0.017 .00067	0.014 .00055			
		9.9367	TiAl6Nb7	ASTM F1295									
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	80 262	-	0.006 .00024	100 328	-	0.008 .00030			
			CrCoMo28	ASTM F1537									
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1									
		1.2379	X153CrMoV12	AISI D2									
H₂	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2									

V_c [m/min] | [SFM]
f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



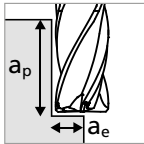
	3/32" 2.0 mm .079"			1/8" 3.0 mm .118"			Ød ₁ 5/32" 4.0 mm .157"			3/16" - 7/32" 5.0 mm .197"			1/4" 6.0 mm .236"			8.0 mm .315"		
	V _c	f _z		V _c	f _z		V _c	f _z		V _c	f _z		V _c	f _z		V _c	f _z	
		①	②		①	②		①	②		①	②		①	②		①	②
220 722	0.024 .00094	0.027 .00106	240 787	0.033 .00130	0.038 .00150	260 853	0.035 .00138	0.040 .00157	260 853	0.035 .00138	0.040 .00157	260 853	0.046 .00181	0.052 .00205	260 853	0.054 .00213	0.064 .00252	
220 722	0.022 .00087	0.025 .00098	240 787	0.031 .00122	0.035 .00139	260 853	0.033 .00130	0.038 .00151	260 853	0.033 .00130	0.038 .00151	260 853	0.044 .00173	0.050 .00197	260 853	0.052 .00205	0.060 .00236	
220 722	0.019 .00075	0.022 .00087	240 787	0.028 .00110	0.032 .00126	260 853	0.030 .00118	0.034 .00134	260 853	0.030 .00118	0.034 .00134	260 853	0.042 .00165	0.048 .00189	260 853	0.050 .00197	0.057 .00224	
180 591	0.021 .00083	0.024 .00094	200 656	0.030 .00118	0.034 .00134	220 722	0.033 .00130	0.038 .00151	220 722	0.033 .00130	0.038 .00151	220 722	0.040 .00157	0.045 .00177	260 853	0.048 .00189	0.055 .00217	
180 591	0.021 .00083	0.024 .00094	200 656	0.030 .00118	0.034 .00134	220 722	0.032 .00126	0.037 .00145	220 722	0.032 .00126	0.037 .00145	220 722	0.037 .00145	0.043 .00169	260 853	0.045 .00177	0.052 .00205	
180 591	0.021 .00083	0.024 .00094	200 656	0.030 .00118	0.034 .00134	220 722	0.032 .00126	0.037 .00145	220 722	0.032 .00126	0.037 .00145	220 722	0.037 .00145	0.043 .00169	260 853	0.045 .00177	0.052 .00205	
180 591	0.018 .00071	0.020 .00079	200 656	0.026 .00102	0.030 .00118	220 722	0.031 .00122	0.035 .00138	220 722	0.031 .00122	0.035 .00139	220 722	0.035 .00139	0.040 .00157	260 853	0.042 .00165	0.048 .00189	
200 656	0.019 .00075	0.022 .00087	220 722	0.030 .00118	0.034 .00135	240 787	0.042 .00165	0.048 .00189	240 787	0.042 .00165	0.048 .00189	240 787	0.044 .00173	0.050 .00197	240 787	0.052 .00205	0.057 .00224	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
240 787	0.026 .00102	0.030 .00118	260 853	0.040 .00157	0.046 .00183	300 984	0.051 .00201	0.058 .00228	320 1050	0.051 .00201	0.058 .00228	320 1050	0.052 .00205	0.060 .00236	350 1148	0.060 .00236	0.069 .00272	
100 328	-	0.010 .00039	100 328	-	0.014 .00055	120 394	-	0.016 .00063	120 394	-	0.018 .00071	120 394	-	0.020 .00079	120 394	-	0.020 .00079	
110 361	0.017 .00067	0.020 .00079	110 361	0.028 .00110	0.032 .00126	130 427	0.028 .00110	0.035 .00139	130 427	0.031 .00122	0.035 .00139	130 427	0.032 .00126	0.037 .00147	140 459	0.035 .00138	0.040 .00157	
110 361	0.017 .00067	0.020 .00079	110 361	0.028 .00110	0.032 .00126	130 427	0.028 .00110	0.035 .00139	130 427	0.031 .00122	0.035 .00139	130 427	0.032 .00126	0.037 .00147	140 459	0.035 .00138	0.040 .00157	
100 328	-	0.010 .00039	100 328	-	0.014 .00055	120 394	-	0.016 .00063	120 394	-	0.018 .00071	120 394	-	0.020 .00079	120 394	-	0.025 .00098	

NEW

Type A - Finishing

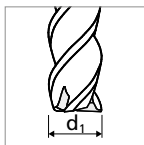
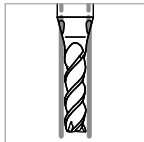
MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Finishing



- ①
 ■ $a_p = 2 \times d_1$
 ■ $a_e = 0.04 \times d_1$

- ②
 ■ $a_p = 2 \times d_1$
 ■ $a_e = 0.02 \times d_1$

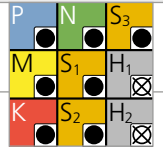


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"		1/16"		1.5 mm .059"	
					v _c	f _z		v _c	f _z	
						①	②		①	②
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	130 427	0.008 .00032	0.009 .00035	180 591	0.012 .00047	0.014 .00055
		1.0401	C15	AISI 1015						
		1.1191	C45E/CK45	AISI 1045						
		1.0044	S275JR	AISI 1020						
		1.0715	11SMn30	AISI 1215						
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130 427	0.007 .00028	0.008 .00032	180 591	0.011 .00043	0.013 .00051
		1.7131	16MnCr5	AISI 5115						
		1.3505	100Cr6	AISI 52100						
		1.7225	42CrMo4	AISI 4140						
		1.2842	90MnCrV8	AISI O2						
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	130 427	0.006 .00024	0.007 .00028	180 591	0.010 .00039	0.012 .00047
		1.2436	X210CrW12	AISI D4/D6						
1.3343		H56-5-2C	AISI M2 / UNS T11302							
		1.3355	HS18-0-1	AISI T1 / UNS T12001						
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130 427	0.008 .00032	0.009 .00035	180 591	0.012 .00047	0.014 .00055
		1.4105	X6CrMoS17	AISI 430F						
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	130 427	0.008 .00032	0.009 .00035	180 591	0.011 .00043	0.013 .00051
		1.4112	X90CrMoV18	AISI 440B						
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130 427	0.008 .00032	0.009 .00035	180 591	0.011 .00043	0.013 .00051
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH						
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	130 427	0.006 .00024	0.007 .00028	180 591	0.008 .00032	0.009 .00035
1.4435		X2CrNiMo18-14-3	AISI 316L							
1.4441		X2CrNiMo18-15-3	AISI 316LM							
		1.4539	X1NiCrMoCu25-20-5	AISI 904L						
K	Cast iron	0.6020	GG20	ASTM 30	110 361	0.006 .00024	0.007 .00028	130 427	0.012 .00047	0.014 .00055
		0.6030	GG30	ASTM 40B						
		0.7040	GGG40	ASTM 60-40-18						
		0.7060	GGG60	ASTM 80-60-03						
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130 427	0.009 .00035	0.010 .00039	180 591	0.013 .00051	0.015 .00060
		3.4365	AlZnMgCu1.5	ASTM 7075						
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130 427	0.009 .00035	0.010 .00039	180 591	0.013 .00051	0.015 .00060
		3.2381	GD-AlSi10Mg	UNS A03590						
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	130 427	0.010 .00039	0.012 .00047	180 591	0.013 .00051	0.015 .00060
		2.0065	Cu-ETP / CW004A	UNS C11000						
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130 427	0.010 .00039	0.012 .00047	180 591	0.013 .00051	0.015 .00060
		2.0360	CuZn40 CW509L	UNS C28000						
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130 427	0.010 .00039	0.012 .00047	180 591	0.013 .00051	0.015 .00060
		2.1020	CuSn6	UNS C51900						
	Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	130 427	0.009 .00035	0.010 .00039	180 591	0.013 .00051	0.015 .00060
2.0960		CuAl9Mn2	UNS C63200							
S₁	Super alloys	2.4856		Inconel 625	110 361	0.004 .00016	0.005 .00020	120 394	0.005 .00020	0.006 .00024
		2.4668		Inconel 718						
		2.4617	NiMo28	Hastelloy B-2						
		2.4665	NiCr22Fe18Mo	Hastelloy X						
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	110 361	0.008 .00032	0.009 .00035	120 394	0.010 .00039	0.012 .00047
		3.7065	Gr.4	ASTM B348 / F68						
S₂	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	110 361	0.008 .00032	0.009 .00035	120 394	0.010 .00039	0.012 .00047
		9.9367	TiAl6Nb7	ASTM F1295						
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	110 361	0.004 .00016	0.005 .00020	120 394	0.005 .00020	0.006 .00024
			CrCoMo28	ASTM F1537						
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1						
		1.2379	X153CrMoV12	AISI D2						

V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



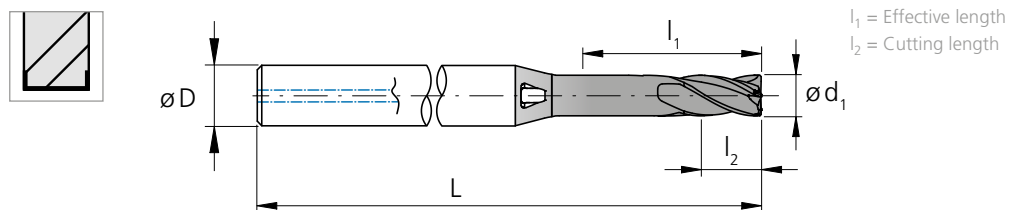
	3/32" 2.0 mm .079"			1/8" 3.0 mm .118"			Ød ₁ 5/32" 4.0 mm .157"			3/16" - 7/32" 5.0 mm .197"			1/4" 6.0 mm .236"			8.0 mm .315"		
	V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z	
		①	②		①	②		①	②		①	②		①	②		①	②
200 656	0.017 .00067	0.020 .00079	210 689	0.023 .00091	0.026 .00103	220 722	0.025 .00098	0.029 .00114	220 722	0.028 .00110	0.032 .00126	220 722	0.033 .00130	0.038 .00150	220 722	0.038 .00150	0.044 .00173	
200 656	0.016 .00063	0.018 .00071	210 689	0.022 .00087	0.025 .00098	220 722	0.024 .00094	0.028 .00110	220 722	0.026 .00102	0.030 .00118	220 722	0.029 .00114	0.033 .00130	220 722	0.034 .00134	0.040 .00157	
200 656	0.015 .00059	0.017 .00067	210 689	0.020 .00079	0.023 .00091	220 722	0.021 .00083	0.024 .00094	220 722	0.023 .00091	0.026 .00102	220 722	0.025 .00098	0.029 .00114	220 722	0.030 .00118	0.035 .00138	
200 656	0.017 .00067	0.020 .00079	210 689	0.022 .00087	0.025 .00098	220 722	0.024 .00094	0.028 .00110	220 722	0.026 .00102	0.030 .00118	220 722	0.029 .00114	0.033 .00130	260 853	0.034 .00134	0.040 .00157	
200 656	0.016 .00063	0.018 .00071	210 689	0.022 .00087	0.025 .00098	220 722	0.023 .00091	0.027 .00106	220 722	0.025 .00098	0.029 .00114	220 722	0.028 .00110	0.032 .00126	260 853	0.033 .00130	0.038 .00150	
200 656	0.016 .00063	0.018 .00071	210 689	0.022 .00087	0.025 .00098	220 722	0.023 .00091	0.027 .00106	220 722	0.025 .00098	0.029 .00114	220 722	0.028 .00110	0.032 .00126	260 853	0.033 .00130	0.038 .00150	
200 656	0.015 .00059	0.017 .00067	210 689	0.020 .00079	0.023 .00091	220 722	0.022 .00087	0.025 .00098	220 722	0.024 .00094	0.028 .00110	220 722	0.026 .00102	0.030 .00118	260 853	0.032 .00126	0.037 .00146	
150 492	0.014 .00055	0.016 .00063	160 525	0.022 .00087	0.025 .00098	170 558	0.025 .00098	0.029 .00114	170 558	0.029 .00114	0.033 .00130	170 558	0.031 .00122	0.036 .00142	200 656	0.036 .00142	0.042 .00165	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
200 656	0.018 .00071	0.021 .00083	210 689	0.029 .00114	0.033 .00130	220 722	0.030 .00118	0.035 .00138	220 722	0.033 .00130	0.038 .00150	220 722	0.036 .00142	0.041 .00161	270 886	0.041 .00161	0.047 .00185	
130 427	0.005 .00020	0.006 .00024	130 427	0.008 .00032	0.009 .00035	140 459	0.010 .00039	0.012 .00047	140 459	0.011 .00043	0.013 .00051	150 492	0.012 .00047	0.014 .00055	160 525	0.017 .00067	0.020 .00079	
130 427	0.014 .00055	0.016 .00063	130 427	0.020 .00079	0.023 .00091	140 459	0.022 .00087	0.025 .00098	140 459	0.024 .00094	0.028 .00110	150 492	0.026 .00102	0.030 .00118	160 525	0.031 .00122	0.036 .00142	
130 427	0.014 .00055	0.016 .00063	130 427	0.020 .00079	0.023 .00091	140 459	0.022 .00087	0.025 .00098	140 459	0.024 .00094	0.028 .00110	150 492	0.026 .00102	0.030 .00118	160 525	0.031 .00122	0.036 .00142	
130 427	0.005 .00020	0.006 .00024	130 427	0.008 .00032	0.009 .00035	140 459	0.010 .00039	0.012 .00047	140 459	0.011 .00043	0.013 .00051	150 492	0.012 .00047	0.014 .00055	160 525	0.017 .00067	0.020 .00079	

NEW

Type C - 5 x d - Square / Corner radius - Z4










MILLING WITH INTEGRATED COOLING

Square

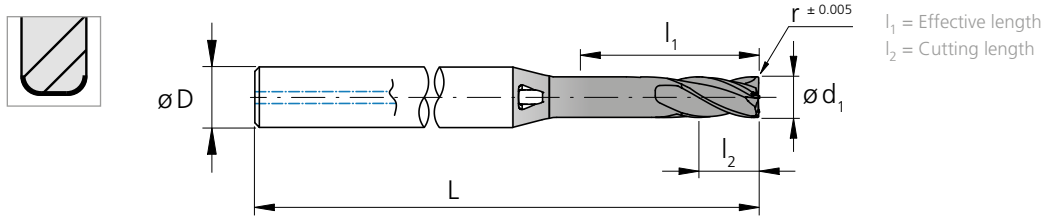


d_1	d_1	d_1	l_1	l_1	l_2	D (h6)	L	L	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]		
.039	1.0	.197	5.00	2.00	4	1.57	40	2.CMC42.C1Z4.100.1	■	
.047	1.2	.236	6.00	2.40	4	1.57	40	2.CMC42.C1Z4.120.1	■	
.059	1.5	.295	7.50	3.00	4	1.57	40	2.CMC42.C1Z4.150.1	■	
1/16	.0625	1.587	.312	7.94	3.10	4	1.77	45	2.CMC.SCZ4.F116	■
.071	1.8	.354	9.00	3.60	4	1.77	45	2.CMC42.C1Z4.180.1	■	
.079	2.0	.394	10.00	4.00	4	1.73	44	2.CMC42.C1Z4.200.1	■	
3/32	.0937	2.381	.469	11.91	4.70	4	1.73	44	2.CMC.SCZ4.F332	■
.098	2.5	.492	12.50	5.00	6	2.17	55	2.CMC42.C1Z4.250.1	■	
.118	3.0	.591	15.00	6.00	6	2.17	55	2.CMC42.C1Z4.300.1	■	
1/8	.1250	3.175	.625	15.88	6.40	6	2.36	60	2.CMC.SCZ4.F18	■
.138	3.5	.689	17.50	7.00	6	2.36	60	2.CMC42.C1Z4.350.1	■	
5/32	.1562	3.968	.781	19.84	7.94	6	2.36	60	2.CMC.SCZ4.F532	■
.157	4.0	.787	20.00	8.00	6	2.36	60	2.CMC42.C1Z4.400.1	■	
.177	4.5	.886	22.50	9.00	8	2.76	70	2.CMC42.C1Z4.450.1	■	
3/16	.1875	4.762	.937	23.81	9.52	8	2.76	70	2.CMC.SCZ4.F316	■
.197	5.0	.984	25.00	10.00	8	2.76	70	2.CMC42.C1Z4.500.1	■	
7/32	.2189	5.560	1.09	27.80	11.12	10	2.76	70	2.CMC.SCZ4.F732	■
.236	6.0	1.18	30.00	12.00	10	2.76	70	2.CMC42.C1Z4.600.1	■	
1/4	.2500	6.350	1.25	31.70	12.70	10	2.76	70	2.CMC.SCZ4.F14	■
.315	8.0	1.57	40.00	16.00	12	3.54	90	2.CMC42.C1Z4.800.1	■	

■ Stock item

Carbide		Z4											
Ø d ₁		.004" - .118" (0.1 - 3.0 mm)		.122" - .236" (3.1 - 6.0 mm)		.240" - .394" (6.1 - 10.0 mm)							
Tolerance		- .00055" - .00110"		- 0.014 mm - 0.028 mm		- .00079" - .00150"		- 0.020 mm - 0.038 mm		- .00098" - .00185"		- 0.025 mm - 0.047 mm	

Corner radius



d ₁	d ₁	d ₁	l ₁	l ₁	l ₂	D (h6)	L	L	r	r	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]	[inch]	[mm]		
	.039	1.0	.197	5.00	2.00	4	1.57	40	.0039	0.10	2.CMC42.C2Z4.100.1	■
	.039	1.0	.197	5.00	2.00	4	1.57	40	.0079	0.20	2.CMC42.C3Z4.100.1	■
	.047	1.2	.236	6.00	2.40	4	1.57	40	.0039	0.10	2.CMC42.C2Z4.120.1	■
	.047	1.2	.236	6.00	2.40	4	1.57	40	.0079	0.20	2.CMC42.C3Z4.120.1	■
	.059	1.5	.295	7.50	3.00	4	1.57	40	.0039	0.10	2.CMC42.C2Z4.150.1	■
	.059	1.5	.295	7.50	3.00	4	1.57	40	.0118	0.30	2.CMC42.C3Z4.150.1	■
1/16	.0625	1.587	.312	7.94	3.10	4	1.77	45	.0050	0.127	2.CMC.RC2Z4.F116	■
1/16	.0625	1.587	.312	7.94	3.10	4	1.77	45	.0100	0.254	2.CMC.RC3Z4.F116	■
	.071	1.8	.354	9.00	3.60	4	1.77	45	.0039	0.10	2.CMC42.C2Z4.180.1	■
	.071	1.8	.354	9.00	3.60	4	1.77	45	.0118	0.30	2.CMC42.C3Z4.180.1	■
	.079	2.0	.394	10.00	4.00	4	1.73	44	.0039	0.10	2.CMC42.C2Z4.200.1	■
	.079	2.0	.394	10.00	4.00	4	1.73	44	.0079	0.20	2.CMC42.C3Z4.200.1	■
	.079	2.0	.394	10.00	4.00	4	1.73	44	.0197	0.50	2.CMC42.C4Z4.200.1	■
3/32	.0937	2.381	.469	11.91	4.70	4	1.73	44	.0050	0.127	2.CMC.RC2Z4.F332	■
3/32	.0937	2.381	.469	11.91	4.70	4	1.73	44	.0100	0.254	2.CMC.RC3Z4.F332	■
3/32	.0937	2.381	.469	11.91	4.70	4	1.73	44	.0150	0.381	2.CMC.RC4Z4.F332	■
	.098	2.5	.492	12.50	5.00	6	2.17	55	.0079	0.20	2.CMC42.C2Z4.250.1	■
	.098	2.5	.492	12.50	5.00	6	2.17	55	.0197	0.50	2.CMC42.C3Z4.250.1	■
	.118	3.0	.591	15.00	6.00	6	2.17	55	.0079	0.20	2.CMC42.C2Z4.300.1	■
	.118	3.0	.591	15.00	6.00	6	2.17	55	.0197	0.50	2.CMC42.C3Z4.300.1	■
1/8	.1250	3.175	.625	15.88	6.35	6	2.36	60	.0100	0.254	2.CMC.RC2Z4.F18	■
1/8	.1250	3.175	.625	15.88	6.35	6	2.36	60	.0150	0.381	2.CMC.RC3Z4.F18	■
	.138	3.5	.689	17.50	7.00	6	2.36	60	.0079	0.20	2.CMC42.C2Z4.350.1	■
	.138	3.5	.689	17.50	7.00	6	2.36	60	.0197	0.50	2.CMC42.C3Z4.350.1	■
5/32	.1562	3.968	.781	19.84	7.94	6	2.36	60	.0100	0.254	2.CMC.RC2Z4.F532	■
5/32	.1562	3.968	.781	19.84	7.94	6	2.36	60	.0150	0.381	2.CMC.RC3Z4.F532	■
	.157	4.0	.787	20.00	8.00	6	2.36	60	.0079	0.20	2.CMC42.C2Z4.400.1	■
	.157	4.0	.787	20.00	8.00	6	2.36	60	.0197	0.50	2.CMC42.C3Z4.400.1	■
	.177	4.5	.886	22.50	9.00	8	2.76	70	.0079	0.20	2.CMC42.C2Z4.450.1	■
	.177	4.5	.886	22.50	9.00	8	2.76	70	.0197	0.50	2.CMC42.C3Z4.450.1	■
3/16	.1875	4.762	.937	23.81	9.52	8	2.76	70	.0100	0.254	2.CMC.RC2Z4.F316	■
3/16	.1875	4.762	.937	23.81	9.52	8	2.76	70	.0150	0.381	2.CMC.RC3Z4.F316	■
	.197	5.0	.984	25.00	10.00	8	2.76	70	.0079	0.20	2.CMC42.C2Z4.500.1	■
	.197	5.0	.984	25.00	10.00	8	2.76	70	.0197	0.50	2.CMC42.C3Z4.500.1	■
7/32	.2189	5.560	1.09	27.80	11.12	10	2.76	70	.0150	0.381	2.CMC.RC2Z4.F732	■
7/32	.2189	5.560	1.09	27.80	11.12	10	2.76	70	.0300	0.762	2.CMC.RC3Z4.F732	■
	.236	6.0	1.18	30.00	12.00	10	2.76	70	.0079	0.20	2.CMC42.C2Z4.600.1	■
	.236	6.0	1.18	30.00	12.00	10	2.76	70	.0197	0.50	2.CMC42.C3Z4.600.1	■
	.236	6.0	1.18	30.00	12.00	10	2.76	70	.0394	1.00	2.CMC42.C4Z4.600.1	■
1/4	.2500	6.350	1.25	31.70	12.70	10	2.76	70	.0150	0.381	2.CMC.RC2Z4.F14	■
1/4	.2500	6.350	1.25	31.70	12.70	10	2.76	70	.0300	0.762	2.CMC.RC3Z4.F14	■
1/4	.2500	6.350	1.25	31.70	12.70	10	2.76	70	.0600	1.524	2.CMC.RC4Z4.F14	■
	.315	8.0	1.57	40.00	16.00	12	3.54	90	.0079	0.20	2.CMC42.C2Z4.800.1	■
	.315	8.0	1.57	40.00	16.00	12	3.54	90	.0197	0.50	2.CMC42.C3Z4.800.1	■
	.315	8.0	1.57	40.00	16.00	12	3.54	90	.0591	1.50	2.CMC42.C4Z4.800.1	■

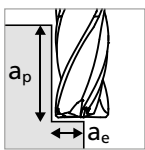
■ Stock item

NEW

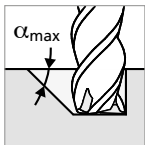
Type C - Pre-machining

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

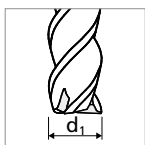
Pre-machining



- $a_p = 2 \times d_1$
- $a_e = 0.1 \times d_1$



Note:
In case of linear ramp or helical interpolation milling reduce f_z by 35%

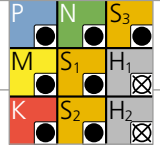


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"	
					v_c	f_z
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	120 394	0.017 .00067
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	120 394	0.016 .00063
		1.7131	16MnCr5	AISI 5115		
		1.3505	100Cr6	AISI 52100		
		1.7225	42CrMo4	AISI 4140		
		1.2842	90MnCrV8	AISI O2		
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	120 394	0.012 .00047
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	120 394	0.018 .00071
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C		
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	120 394	0.017 .00067
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH		
	Stainless steel martensitic - PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	120 394	0.017 .00067
		1.4301	X5CrNi18-10	AISI 304		
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	120 394	0.013 .00051
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
K	Cast iron	0.6020	GG20	ASTM 30	100 328	0.012 .00047
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	170 558	0.020 .00079
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	170 558	0.020 .00079
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	170 558	0.022 .00087
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	170 558	0.022 .00087
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	170 558	0.022 .00087
		2.1020	CuSn6	UNS C51900		
Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	170 558	0.020 .00079	
	2.0960	CuAl9Mn2	UNS C63200			
S₁	Super alloys	2.4856		Inconel 625	100 328	0.008 .00032
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	100 328	0.018 .00071
		3.7065	Gr.4	ASTM B348 / F68		
S₃	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	100 328	0.018 .00071
		9.9367	TiAl6Nb7	ASTM F1295		
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	100 328	0.008 .00032
			CrCoMo28	ASTM F1537		
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1		
H₂	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2		

V_c [m/min] | [SFM]
f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended

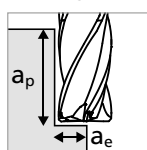


	1/16" 1.5 mm .059"		3/32" 2.0 mm .079"		1/8" 3.0 mm .118"		Ød ₁ 5/32" 4.0 mm .157"		3/16" - 7/32" 5.0 mm .197"		1/4" 6.0 mm .236"		8.0 mm .315"	
	V _c	f _z	V _c	f _z	V _c	f _z	V _c	f _z	V _c	f _z	V _c	f _z	V _c	f _z
	140 459	0.026 .00102	160 525	0.038 .00150	180 591	0.048 .00189	200 656	0.050 .00197	220 722	0.052 .00205	220 722	0.056 .00220	220 722	0.068 .00268
	140 459	0.025 .00098	160 525	0.036 .00142	180 591	0.044 .00173	200 656	0.048 .00189	220 722	0.050 .00197	220 722	0.054 .00213	220 722	0.066 .00260
	140 459	0.022 .00087	160 525	0.035 .00138	180 591	0.042 .00165	200 656	0.043 .00169	220 722	0.045 .00177	220 722	0.048 .00189	220 722	0.058 .00228
	140 459	0.026 .00102	160 525	0.038 .00150	180 591	0.046 .00181	200 656	0.048 .00189	220 722	0.050 .00197	220 722	0.055 .00217	260 853	0.062 .00244
	140 459	0.025 .00098	160 525	0.036 .00142	180 591	0.044 .00173	200 656	0.046 .00181	220 722	0.048 .00189	220 722	0.052 .00205	260 853	0.060 .00236
	140 459	0.025 .00098	160 525	0.036 .00142	180 591	0.044 .00173	200 656	0.046 .00181	220 722	0.048 .00189	220 722	0.052 .00205	260 853	0.060 .00236
	140 459	0.016 .00063	160 525	0.034 .00134	180 591	0.042 .00165	200 656	0.044 .00173	220 722	0.046 .00181	220 722	0.049 .00193	260 853	0.058 .00228
	120 394	0.026 .00102	140 459	0.032 .00126	160 525	0.043 .00169	180 591	0.054 .00213	200 656	0.056 .00220	200 656	0.058 .00228	200 656	0.070 .00276
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	190 623	0.029 .00114	210 689	0.040 .00157	230 755	0.060 .00236	250 820	0.062 .00244	270 886	0.064 .00252	270 886	0.068 .00268	270 886	0.084 .00331
	100 328	0.010 .00039	120 394	0.012 .00047	120 394	0.016 .00063	140 459	0.018 .00071	140 459	0.020 .00079	160 525	0.022 .00087	160 525	0.024 .00094
	100 328	0.022 .00087	120 394	0.032 .00126	120 394	0.042 .00165	140 459	0.044 .00173	140 459	0.046 .00181	160 525	0.048 .00189	160 525	0.054 .00213
	100 328	0.022 .00087	120 394	0.032 .00126	120 394	0.042 .00165	140 459	0.044 .00173	140 459	0.046 .00181	160 525	0.048 .00189	160 525	0.054 .00213
	100 328	0.010 .00039	120 394	0.012 .00047	120 394	0.016 .00063	140 459	0.018 .00071	140 459	0.020 .00079	160 525	0.022 .00087	160 525	0.024 .00094

NEW

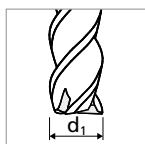
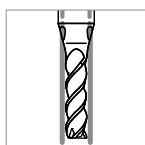
Type C - Finishing

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Finishing


$$a_p = 2 \times d_1$$

$$a_e = 0.02 \times d_1$$

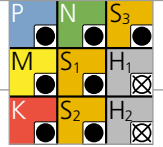


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"	
					v_c	f_z
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	130 425	0.008 .00032
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130 425	0.007 .00028
		1.7131	16MnCr5	AISI 5115		
		1.3505	100Cr6	AISI 52100		
		1.7225	42CrMo4	AISI 4140		
		1.2842	90MnCrV8	AISI O2		
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	130 425	0.006 .00024
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130 425	0.008 .00032
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C	130 425	0.008 .00032
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	130 425	0.008 .00032
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130 425	0.008 .00032
	Stainless steel martensitic - PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH		
		1.4301	X5CrNi18-10	AISI 304		
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	130 425	0.006 .00024
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
K	Cast iron	0.6020	GG20	ASTM 30	110 361	0.006 .00024
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130 425	0.009 .00035
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130 425	0.009 .00035
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	130 425	0.010 .00039
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130 425	0.010 .00039
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130 425	0.010 .00039
		2.1020	CuSn6	UNS C51900		
	Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	130 425	0.009 .00035
2.0960		CuAl9Mn2	UNS C63200			
S₁	Super alloys	2.4856		Inconel 625	110 361	0.004 .00016
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	110 361	0.008 .00032
		3.7065	Gr.4	ASTM B348 / F68		
S₃	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	110 361	0.008 .00032
		9.9367	TiAl6Nb7	ASTM F1295		
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	110 361	0.004 .00016
			CrCoMo28	ASTM F1537		
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1		
H₂	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2		

V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



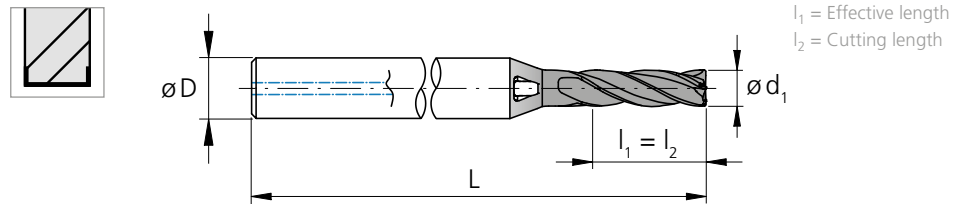
	1/16" 1.5 mm .059"		3/32" 2.0 mm .079"		1/8" 3.0 mm .118"		Ød ₁ 5/32" 4.0 mm .157"		3/16" - 7/32" 5.0 mm .197"		1/4" 6.0 mm .236"		8.0 mm .315"	
	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z
	180 591	0.012 .00047	200 656	0.017 .00067	210 688	0.023 .00091	220 722	0.025 .00098	220 722	0.028 .00110	220 722	0.033 .00130	220 722	0.042 .00165
	180 591	0.011 .00043	200 656	0.016 .00063	210 688	0.022 .00087	220 722	0.024 .00094	220 722	0.026 .00102	220 722	0.029 .00114	220 722	0.038 .00150
	180 591	0.010 .00039	200 656	0.015 .00059	210 688	0.020 .00079	220 722	0.021 .00083	220 722	0.023 .00091	220 722	0.025 .00098	220 722	0.034 .00134
	180 591	0.012 .00047	200 656	0.017 .00067	210 688	0.022 .00087	220 722	0.024 .00094	220 722	0.026 .00102	220 722	0.029 .00114	260 853	0.036 .00142
	180 591	0.011 .00043	200 656	0.016 .00063	210 688	0.022 .00087	220 722	0.023 .00091	220 722	0.025 .00098	220 722	0.028 .00110	260 853	0.037 .00146
	180 591	0.011 .00043	200 656	0.016 .00063	210 688	0.022 .00087	220 722	0.023 .00091	220 722	0.025 .00098	220 722	0.028 .00110	260 853	0.037 .00146
	180 591	0.008 .00032	200 656	0.015 .00059	210 688	0.020 .00079	220 722	0.022 .00087	220 722	0.024 .00094	220 722	0.026 .00102	260 853	0.035 .00138
	130 427	0.012 .00047	150 492	0.014 .00055	160 525	0.022 .00087	170 558	0.025 .00098	170 558	0.029 .00114	170 558	0.031 .00122	200 656	0.040 .00154
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.029 .00114	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.036 .00142	270 886	0.045 .00177
	120 394	0.005 .00020	130 427	0.005 .00020	130 427	0.008 .00032	140 459	0.010 .00039	140 459	0.011 .00043	150 492	0.012 .00047	160 525	0.021 .00083
	120 394	0.010 .00039	130 427	0.014 .00055	130 427	0.020 .00079	140 459	0.022 .00087	140 459	0.024 .00094	150 492	0.026 .00102	160 525	0.035 .00138
	120 394	0.010 .00039	130 427	0.014 .00055	130 427	0.020 .00079	140 459	0.022 .00087	140 459	0.024 .00094	150 492	0.026 .00102	160 525	0.035 .00138
	120 394	0.005 .00020	130 427	0.005 .00020	130 427	0.008 .00032	140 459	0.010 .00039	140 459	0.011 .00043	150 492	0.012 .00047	160 525	0.021 .00083

NEW

Type M - 3 x d - Square / Corner radius - Z4










MILLING WITH INTEGRATED COOLING

Square

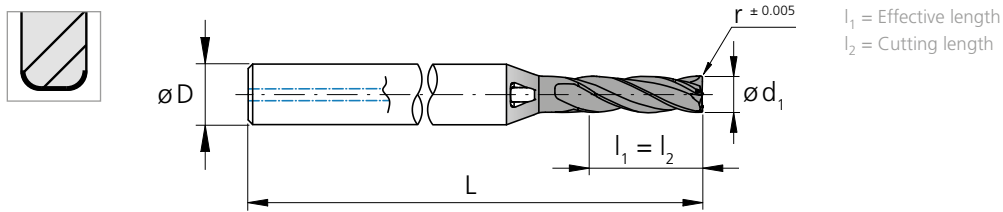


d_1	d_1	d_1	l_1	l_1	l_2	D (h6)	L	L	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]		
.039	1.0	.118	3.0	3.0	4	1.57	40	2.CMC42.M1Z4.100.1	■	
.047	1.2	.142	3.6	3.6	4	1.57	40	2.CMC42.M1Z4.120.1	■	
.059	1.5	.177	4.5	4.5	4	1.57	40	2.CMC42.M1Z4.150.1	■	
1/16	.0625	1.587	.185	4.7	4.7	4	1.57	40	2.CMC.SMZ4.F116	■
.071	1.8	.213	5.4	5.4	4	1.57	40	2.CMC42.M1Z4.180.1	■	
.079	2.0	.236	6.0	6.0	4	1.57	40	2.CMC42.M1Z4.200.1	■	
3/32	.0937	2.381	.281	7.1	7.1	4	1.57	40	2.CMC.SMZ4.F332	■
.098	2.5	.295	7.5	7.5	6	1.97	50	2.CMC42.M1Z4.250.1	■	
.118	3.0	.354	9.0	9.0	6	1.97	50	2.CMC42.M1Z4.300.1	■	
1/8	.1250	3.175	.375	9.5	9.5	6	2.17	55	2.CMC.SMZ4.F18	■
.138	3.5	.413	10.5	10.5	6	2.17	55	2.CMC42.M1Z4.350.1	■	
5/32	.1562	3.968	.469	11.9	11.9	6	2.17	55	2.CMC.SMZ4.F532	■
.157	4.0	.472	12.0	12.0	6	2.17	55	2.CMC42.M1Z4.400.1	■	
.177	4.5	.531	13.5	13.5	8	2.56	65	2.CMC42.M1Z4.450.1	■	
3/16	.1875	4.762	.562	14.3	14.3	8	2.56	65	2.CMC.SMZ4.F316	■
.197	5.0	.591	15.0	15.0	8	2.56	65	2.CMC42.M1Z4.500.1	■	
7/32	.2189	5.560	.657	16.7	16.7	10	2.56	65	2.CMC.SMZ4.F732	■
.236	6.0	.709	18.0	18.0	10	2.56	65	2.CMC42.M1Z4.600.1	■	
1/4	.2500	6.350	.748	19.0	19.0	10	2.56	65	2.CMC.SMZ4.F14	■
.315	8.0	.945	24.0	24.0	12	3.15	80	2.CMC42.M1Z4.800.1	■	

■ Stock item

Carbide		Z4								
Ø d ₁		.004" - .118" (0.1 - 3.0 mm)	.122" - .236" (3.1 - 6.0 mm)	.240" - .394" (6.1 - 10.0 mm)						
Tolerance		-.00055" -.00110"	-0.014 mm -0.028 mm	-.00079" -.00150"	-0.020 mm -0.038 mm	-.00098" -.00185"	-0.025 mm -0.047 mm			

Corner radius



d ₁	d ₁	d ₁	l ₁	l ₁	l ₂	D (h6)	L	L	r	r	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]	[inch]	[mm]		
	.039	1.0	.118	3.00	3.00	4	1.57	40	.0039	0.10	2.CMC42.M2Z4.100.1	■
	.039	1.0	.118	3.00	3.00	4	1.57	40	.0079	0.20	2.CMC42.M3Z4.100.1	■
	.047	1.2	.142	3.60	3.60	4	1.57	40	.0039	0.10	2.CMC42.M2Z4.120.1	■
	.047	1.2	.142	3.60	3.60	4	1.57	40	.0079	0.20	2.CMC42.M3Z4.120.1	■
	.059	1.5	.177	4.50	4.50	4	1.57	40	.0039	0.10	2.CMC42.M2Z4.150.1	■
	.059	1.5	.177	4.50	4.50	4	1.57	40	.0118	0.30	2.CMC42.M3Z4.150.1	■
1/16	.0625	1.587	.187	4.76	4.70	4	1.57	40	.0050	0.127	2.CMC.RM2Z4.F116	■
1/16	.0625	1.587	.187	4.76	4.70	4	1.57	40	.0100	0.254	2.CMC.RM3Z4.F116	■
	.071	1.8	.213	5.40	5.40	4	1.57	40	.0039	0.10	2.CMC42.M2Z4.180.1	■
	.071	1.8	.213	5.40	5.40	4	1.57	40	.0118	0.30	2.CMC42.M3Z4.180.1	■
	.079	2.0	.236	6.00	6.00	4	1.57	40	.0039	0.10	2.CMC42.M2Z4.200.1	■
	.079	2.0	.236	6.00	6.00	4	1.57	40	.0079	0.20	2.CMC42.M3Z4.200.1	■
	.079	2.0	.236	6.00	6.00	4	1.57	40	.0197	0.50	2.CMC42.M4Z4.200.1	■
3/32	.0937	2.381	.281	7.14	7.14	4	1.57	40	.0050	0.127	2.CMC.RM2Z4.F332	■
3/32	.0937	2.381	.281	7.14	7.14	4	1.57	40	.0100	0.254	2.CMC.RM3Z4.F332	■
3/32	.0937	2.381	.281	7.14	7.14	4	1.57	40	.0150	0.381	2.CMC.RM4Z4.F332	■
	.098	2.5	.295	7.50	7.50	6	1.97	50	.0079	0.20	2.CMC42.M2Z4.250.1	■
	.098	2.5	.295	7.50	7.50	6	1.97	50	.0197	0.50	2.CMC42.M3Z4.250.1	■
	.118	3.0	.354	9.00	9.00	6	1.97	50	.0079	0.20	2.CMC42.M2Z4.300.1	■
	.118	3.0	.354	9.00	9.00	6	1.97	50	.0197	0.50	2.CMC42.M3Z4.300.1	■
1/8	.1250	3.175	.375	9.53	9.53	6	2.17	55	.0100	0.254	2.CMC.RM2Z4.F18	■
1/8	.1250	3.175	.375	9.53	9.53	6	2.17	55	.0150	0.381	2.CMC.RM3Z4.F18	■
	.138	3.5	.413	10.50	10.50	6	2.17	55	.0079	0.20	2.CMC42.M2Z4.350.1	■
	.138	3.5	.413	10.50	10.50	6	2.17	55	.0197	0.50	2.CMC42.M3Z4.350.1	■
5/32	.1562	3.968	.469	11.90	11.90	6	2.17	55	.0100	0.254	2.CMC.RM2Z4.F532	■
5/32	.1562	3.968	.469	11.90	11.90	6	2.17	55	.0150	0.381	2.CMC.RM3Z4.F532	■
	.157	4.0	.472	12.00	12.00	6	2.17	55	.0079	0.20	2.CMC42.M2Z4.400.1	■
	.157	4.0	.472	12.00	12.00	6	2.17	55	.0197	0.50	2.CMC42.M3Z4.400.1	■
	.177	4.5	.531	13.50	13.50	8	2.56	65	.0079	0.20	2.CMC42.M2Z4.450.1	■
	.177	4.5	.531	13.50	13.50	8	2.56	65	.0197	0.50	2.CMC42.M3Z4.450.1	■
3/16	.1875	4.762	.563	14.29	14.29	8	2.56	65	.0100	0.254	2.CMC.RM2Z4.F316	■
3/16	.1875	4.762	.563	14.29	14.29	8	2.56	65	.0150	0.381	2.CMC.RM3Z4.F316	■
	.197	5.0	.591	15.00	15.00	8	2.56	65	.0079	0.20	2.CMC42.M2Z4.500.1	■
	.197	5.0	.591	15.00	15.00	8	2.56	65	.0197	0.50	2.CMC42.M3Z4.500.1	■
7/32	.2189	5.560	.657	16.68	16.68	10	2.56	65	.0150	0.381	2.CMC.RM2Z4.F732	■
7/32	.2189	5.560	.657	16.68	16.68	10	2.56	65	.0300	0.762	2.CMC.RM3Z4.F732	■
	.236	6.0	.709	18.00	18.00	10	2.56	65	.0079	0.20	2.CMC42.M2Z4.600.1	■
	.236	6.0	.709	18.00	18.00	10	2.56	65	.0197	0.50	2.CMC42.M3Z4.600.1	■
	.236	6.0	.709	18.00	18.00	10	2.56	65	.0394	1.00	2.CMC42.M4Z4.600.1	■
1/4	.2500	6.350	.750	19.05	19.00	10	2.56	65	.0150	0.381	2.CMC.RM2Z4.F14	■
1/4	.2500	6.350	.750	19.05	19.00	10	2.56	65	.0300	0.762	2.CMC.RM3Z4.F14	■
1/4	.2500	6.350	.750	19.05	19.00	10	2.56	65	.0600	1.524	2.CMC.RM4Z4.F14	■
	.315	8.0	.945	24.00	24.00	12	3.15	80	.0079	0.20	2.CMC42.M2Z4.800.1	■
	.315	8.0	.945	24.00	24.00	12	3.15	80	.0197	0.50	2.CMC42.M3Z4.800.1	■
	.315	8.0	.945	24.00	24.00	12	3.15	80	.0591	1.50	2.CMC42.M4Z4.800.1	■

■ Stock item

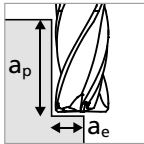
NEW

Type M - Pre-machining

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"			1/16" .0625"				
					v _c	f _z		v _c	f _z			
						①	②		③	①	②	③
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	140 459	0.011 .00043	0.015 .00059	0.020 .00079	200 656	0.015 .00059	0.020 .00079	0.028 .00110
		1.0401	C15	AISI 1015								
		1.1191	C45E/CK45	AISI 1045								
		1.0044	S275JR	AISI 1020								
		1.0715	11SMn30	AISI 1215								
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140 459	0.010 .00039	0.013 .00051	0.018 .00071	200 656	0.013 .00051	0.017 .00067	0.024 .00094
		1.7131	16MnCr5	AISI 5115								
		1.3505	100Cr6	AISI 52100								
		1.7225	42CrMo4	AISI 4140								
		1.2842	90MnCrV8	AISI O2								
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	140 459	0.008 .00032	0.011 .00043	0.015 .00059	200 656	0.011 .00043	0.015 .00059	0.020 .00079
		1.2436	X210CrW12	AISI D4/D6								
1.3343		HS6-5-2C	AISI M2 / UNS T11302									
		1.3355	HS18-0-1	AISI T1 / UNS T12001								
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140 459	0.012 .00047	0.016 .00063	0.022 .00087	180 591	0.015 .00059	0.020 .00079	0.028 .00110
		1.4105	X6CrMoS17	AISI 430F								
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140 459	0.011 .00043	0.015 .00059	0.020 .00079	180 591	0.014 .00055	0.019 .00075	0.026 .00102
		1.4112	X90CrMoV18	AISI 440B								
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140 459	0.011 .00043	0.015 .00059	0.020 .00079	180 591	0.014 .00055	0.019 .00075	0.026 .00102
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH								
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140 459	0.009 .00035	0.012 .00047	0.017 .00067	180 591	0.012 .00047	0.016 .00063	0.022 .00087
		1.4435	X2CrNiMo18-14-3	AISI 316L								
1.4441		X2CrNiMo18-15-3	AISI 316LM									
		1.4539	X1NiCrMoCu25-20-5	AISI 904L								
K	Cast iron	0.6020	GG20	ASTM 30	120 394	0.008 .00032	0.016 .00063	0.022 .00087	160 525	0.014 .00055	0.019 .00075	0.026 .00102
		0.6030	GG30	ASTM 40B								
		0.7040	GGG40	ASTM 60-40-18								
		0.7060	GGG60	ASTM 80-60-03								
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	160 525	0.013 .00051	0.017 .00067	0.024 .00094	200 656	0.016 .00063	0.021 .00083	0.029 .00114
		3.4365	AlZnMgCu1.5	ASTM 7075								
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	160 525	0.013 .00051	0.017 .00067	0.024 .00094	220 722	0.016 .00063	0.021 .00083	0.029 .00114
		3.2381	GD-ALSi10Mg	UNS A03590								
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	160 525	0.013 .00051	0.017 .00067	0.024 .00094	220 722	0.016 .00063	0.021 .00083	0.029 .00114
		2.0065	Cu-ETP / CW004A	UNS C11000								
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	160 525	0.013 .00051	0.017 .00067	0.024 .00094	220 722	0.016 .00063	0.021 .00083	0.029 .00114
		2.0360	CuZn40 CW509L	UNS C28000								
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3/CW614N	UNS C38500	160 525	0.013 .00051	0.017 .00067	0.024 .00094	220 722	0.016 .00063	0.021 .00083	0.029 .00114
		2.1020	CuSn6	UNS C51900								
Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	160 525	0.013 .00051	0.017 .00067	0.024 .00094	220 722	0.016 .00063	0.021 .00083	0.029 .00114	
	2.0960	CuAl9Mn2	UNS C63200									
S₁	Super alloys	2.4856		Inconel 625	80 262	0.006 .00024	0.008 .00032	0.011 .00043	100 328	0.008 .00032	0.011 .00043	0.015 .00059
		2.4668		Inconel 718								
		2.4617	NiMo28	Hastelloy B-2								
		2.4665	NiCr22Fe18Mo	Hastelloy X								
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120 394	0.010 .00039	0.013 .00051	0.018 .00071	120 394	0.012 .00047	0.016 .00063	0.022 .00087
		3.7065	Gr.4	ASTM B348 / F68								
S₂	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120 394	0.010 .00039	0.013 .00051	0.018 .00071	120 394	0.012 .00047	0.016 .00063	0.022 .00087
		9.9367	TiAl6Nb7	ASTM F1295								
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	80 262	0.006 .00024	0.008 .00032	0.011 .00043	100 328	0.008 .00032	0.011 .00043	0.015 .00059
			CrCoMo28	ASTM F1537								
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1								
		1.2379	X153CrMoV12	AISI D2								
H₂	Hardened steel ≥ 55 HRC											

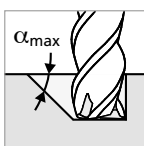
Pre-machining



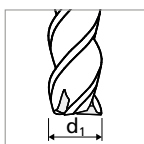
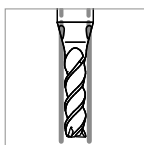
- ①
■ a_p = 1.5 x d₁
■ a_e = 0.2 x d₁

- ②
■ a_p = 3 x d₁
■ a_e = 0.1 x d₁

- ③
■ a_p = 3 x d₁
■ a_e = 0.05 x d₁



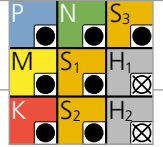
Note:
In case of linear ramp or helical interpolation milling reduce f_z by 35%



V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ☒ Not recommended



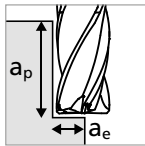
$\varnothing d_1$																							
3/32" 2.0 mm .079"				1/8" 3.0 mm .118"				5/32" 4.0 mm .157"				3/16" - 7/32" 5.0 mm .197"				1/4" 6.0 mm .236"				8.0 mm .315"			
V_c		f_z		V_c		f_z		V_c		f_z		V_c		f_z		V_c		f_z		V_c		f_z	
		①	②			③	①			②	③			①	②			③	①			②	③
220 722	0.024 .00094	0.032 .00126	0.044 .00173	240 787	0.033 .00130	0.044 .00173	0.061 .00240	260 853	0.034 .00134	0.045 .00177	0.062 .00244	260 853	0.035 .00138	0.047 .00185	0.064 .00252	260 853	0.046 .00181	0.061 .00240	0.084 .00331	260 853	0.054 .00213	0.072 .00283	0.100 .00394
220 722	0.022 .00087	0.029 .00114	0.040 .00157	240 787	0.031 .00122	0.041 .00161	0.057 .00224	260 853	0.032 .00126	0.043 .00169	0.059 .00232	260 853	0.033 .00130	0.044 .00173	0.061 .00240	260 853	0.044 .00173	0.059 .00232	0.081 .00319	260 853	0.052 .00205	0.069 .00272	0.095 .00374
220 722	0.019 .00075	0.025 .00098	0.035 .00138	240 787	0.028 .00110	0.037 .00146	0.051 .00201	260 853	0.029 .00114	0.039 .00154	0.053 .00209	260 853	0.030 .00118	0.040 .00157	0.055 .00217	260 853	0.042 .00165	0.056 .00220	0.077 .00303	260 853	0.050 .00197	0.067 .00264	0.092 .00362
180 591	0.021 .00083	0.028 .00110	0.039 .00154	200 656	0.030 .00118	0.040 .00157	0.055 .00217	220 722	0.032 .00126	0.043 .00169	0.059 .00232	220 722	0.033 .00130	0.044 .00173	0.061 .00240	220 722	0.040 .00157	0.053 .00209	0.073 .00287	260 853	0.048 .00189	0.064 .00252	0.088 .00346
180 591	0.020 .00079	0.027 .00106	0.037 .00146	200 656	0.028 .00110	0.037 .00146	0.051 .00201	220 722	0.031 .00122	0.041 .00161	0.057 .00224	220 722	0.032 .00126	0.043 .00169	0.059 .00232	220 722	0.037 .00145	0.049 .00193	0.068 .00268	260 853	0.045 .00177	0.060 .00236	0.083 .00327
180 591	0.020 .00079	0.027 .00106	0.037 .00146	200 656	0.028 .00110	0.037 .00146	0.051 .00201	220 722	0.031 .00122	0.041 .00161	0.057 .00224	220 722	0.032 .00126	0.043 .00169	0.059 .00232	220 722	0.037 .00145	0.049 .00193	0.068 .00268	260 853	0.045 .00177	0.060 .00236	0.083 .00327
180 591	0.018 .00071	0.024 .00094	0.034 .00134	200 656	0.026 .00102	0.035 .00138	0.048 .00189	220 722	0.030 .00118	0.040 .00157	0.055 .00217	220 722	0.031 .00122	0.041 .00161	0.057 .00224	220 722	0.035 .00139	0.047 .00185	0.064 .00252	260 853	0.042 .00165	0.056 .00220	0.077 .00303
200 656	0.024 .00094	0.032 .00126	0.044 .00173	220 722	0.032 .00126	0.043 .00169	0.059 .00232	240 787	0.038 .00150	0.051 .00201	0.070 .00276	240 787	0.042 .00165	0.056 .00220	0.077 .00303	240 787	0.044 .00173	0.059 .00232	0.081 .00319	240 787	0.052 .00205	0.069 .00272	0.095 .00374
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
240 787	0.026 .00102	0.035 .00138	0.048 .00189	260 853	0.040 .00157	0.053 .00209	0.073 .00287	300 984	0.048 .00189	0.064 .00252	0.088 .00346	300 984	0.051 .00201	0.068 .00268	0.094 .00370	320 1050	0.052 .00205	0.069 .00272	0.095 .00374	350 1148	0.060 .00236	0.080 .00315	0.110 .00433
100 328	0.010 .00039	0.013 .00051	0.018 .00071	100 328	0.014 .00055	0.019 .00075	0.026 .00102	120 394	0.016 .00063	0.021 .00083	0.029 .00114	120 394	0.018 .00071	0.024 .00094	0.033 .00130	120 394	0.020 .00079	0.027 .00106	0.037 .00146	120 394	0.025 .00098	0.033 .00130	0.046 .00181
130 427	0.017 .00067	0.023 .00091	0.031 .00122	130 427	0.028 .00110	0.037 .00146	0.051 .00201	150 492	0.030 .00118	0.040 .00157	0.055 .00217	150 492	0.031 .00122	0.041 .00161	0.057 .00224	150 492	0.032 .00126	0.043 .00169	0.059 .00232	170 558	0.035 .00138	0.047 .00185	0.064 .00252
130 427	0.017 .00067	0.023 .00091	0.031 .00122	130 427	0.028 .00110	0.037 .00146	0.051 .00201	150 492	0.030 .00118	0.040 .00157	0.055 .00217	150 492	0.031 .00122	0.041 .00161	0.057 .00224	150 492	0.032 .00126	0.043 .00169	0.059 .00232	170 558	0.035 .00138	0.047 .00185	0.064 .00252
100 328	0.010 .00039	0.013 .00051	0.018 .00071	100 328	0.014 .00055	0.019 .00075	0.026 .00102	120 394	0.016 .00063	0.021 .00083	0.029 .00114	120 394	0.018 .00071	0.024 .00094	0.033 .00130	120 394	0.020 .00079	0.027 .00106	0.037 .00146	120 394	0.025 .00098	0.033 .00130	0.046 .00181

NEW

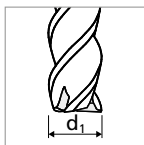
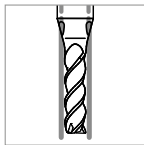
Type M - Finishing

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Finishing



- $a_p = 3 \times d_1$
- $a_e = 0.02 \times d_1$

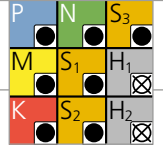


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"	
					v_c	f_z
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	130 425	0.009 .00035
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130 425	0.008 .00031
		1.7131	16MnCr5	AISI 5115		
		1.3505	100Cr6	AISI 52100		
		1.7225	42CrMo4	AISI 4140		
		1.2842	90MnCrV8	AISI O2		
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	130 425	0.007 .00028
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130 425	0.009 .00035
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C	130 425	0.009 .00035
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	130 425	0.009 .00035
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130 425	0.009 .00035
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH		
		1.4301	X5CrNi18-10	AISI 304		
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	130 425	0.007 .00028
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
K	Cast iron	0.6020	GG20	ASTM 30	110 361	0.007 .00028
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130 425	0.010 .00039
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130 425	0.010 .00039
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	130 425	0.012 .00047
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130 425	0.012 .00047
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130 425	0.012 .00047
		2.1020	CuSn6	UNS C51900		
Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	130 425	0.010 .00039	
	2.0960	CuAl9Mn2	UNS C63200			
S₁	Super alloys	2.4856		Inconel 625	110 361	0.005 .00020
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	110 361	0.009 .00035
		3.7065	Gr.4	ASTM B348 / F68		
S₃	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	110 361	0.009 .00035
		9.9367	TiAl6Nb7	ASTM F1295		
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	110 361	0.005 .00020
			CrCoMo28	ASTM F1537		
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1		
H₂	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2		

V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



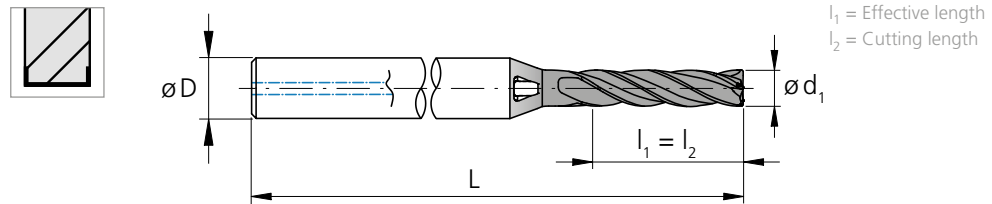
	1/16" 1.5 mm .059"		3/32" 2.0 mm .079"		1/8" 3.0 mm .118"		Ød ₁ 5/32" 4.0 mm .157"		3/16" - 7/32" 5.0 mm .197"		1/4" 6.0 mm .236"		8.0 mm .315"	
	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z
	180 591	0.014 .00055	200 656	0.020 .00079	210 688	0.026 .00102	220 722	0.029 .00114	220 722	0.032 .00126	220 722	0.038 .00150	220 722	0.044 .00173
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.040 .00157
	180 591	0.012 .00047	200 656	0.017 .00067	210 688	0.023 .00091	220 722	0.024 .00094	220 722	0.026 .00102	220 722	0.029 .00114	220 722	0.035 .00138
	180 591	0.014 .00055	200 656	0.020 .00079	210 688	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	220 722	0.033 .00130	260 853	0.040 .00157
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.027 .00106	220 722	0.029 .00114	220 722	0.032 .00126	260 853	0.038 .00150
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.027 .00106	220 722	0.029 .00114	220 722	0.032 .00126	260 853	0.038 .00150
	180 591	0.009 .00035	200 656	0.017 .00067	210 688	0.023 .00091	220 722	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	260 853	0.037 .00146
	130 427	0.014 .00055	150 492	0.016 .00063	160 525	0.025 .00098	170 558	0.029 .00114	170 558	0.033 .00130	170 558	0.036 .00142	200 656	0.042 .00165
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	120 394	0.006 .00024	130 427	0.006 .00024	130 427	0.009 .00035	140 459	0.012 .00047	140 459	0.013 .00051	150 492	0.014 .00055	160 525	0.020 .00079
	120 394	0.012 .00047	130 427	0.016 .00063	130 427	0.023 .00091	140 459	0.025 .00098	140 459	0.028 .00110	150 492	0.030 .00118	160 525	0.036 .00142
	120 394	0.012 .00047	130 427	0.016 .00063	130 427	0.023 .00091	140 459	0.025 .00098	140 459	0.028 .00110	150 492	0.030 .00118	160 525	0.036 .00142
	120 394	0.006 .00024	130 427	0.006 .00024	130 427	0.009 .00035	140 459	0.012 .00047	140 459	0.013 .00051	150 492	0.014 .00055	160 525	0.020 .00079

NEW

Type N - 4 x d - Square / Corner radius - Z4











MILLING WITH INTEGRATED COOLING

Square

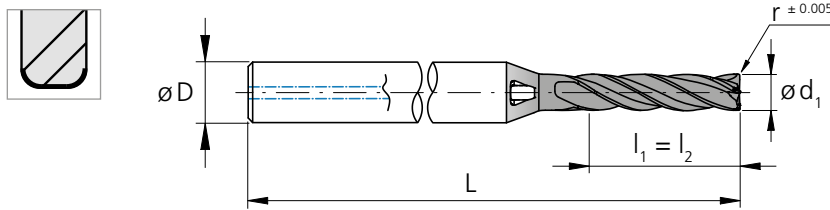


d_1	d_1	d_1	l_1	l_1	l_2	D (h6)	L	L	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]		
.039	1.0	.157	4.0	4.0	4	1.57	40	2.CMC42.N1Z4.100.1	■	
.047	1.2	.189	4.8	4.8	4	1.57	40	2.CMC42.N1Z4.120.1	■	
.059	1.5	.236	6.0	6.0	4	1.57	40	2.CMC42.N1Z4.150.1	■	
1/16	.0625	1.587	.250	6.3	6.3	4	1.77	45	2.CMC.SNZ4.F116	■
	.071	1.8	.283	7.2	7.2	4	1.77	45	2.CMC42.N1Z4.180.1	■
	.079	2.0	.315	8.0	8.0	4	1.73	44	2.CMC42.N1Z4.200.1	■
3/32	.0937	2.381	.375	9.5	9.5	4	1.73	44	2.CMC.SNZ4.F332	■
	.098	2.5	.394	10.0	10.0	6	2.17	55	2.CMC42.N1Z4.250.1	■
	.118	3.0	.472	12.0	12.0	6	2.17	55	2.CMC42.N1Z4.300.1	■
1/8	.1250	3.175	.500	12.7	12.7	6	2.36	60	2.CMC.SNZ4.F18	■
	.138	3.5	.551	14.0	14.0	6	2.36	60	2.CMC42.N1Z4.350.1	■
5/32	.1562	3.968	.625	15.9	15.9	6	2.36	60	2.CMC.SNZ4.F532	■
	.157	4.0	.630	16.0	16.0	6	2.36	60	2.CMC42.N1Z4.400.1	■
	.177	4.5	.709	18.0	18.0	8	2.76	70	2.CMC42.N1Z4.450.1	■
3/16	.1875	4.762	.750	19.0	19.0	8	2.76	70	2.CMC.SNZ4.F316	■
	.197	5.0	.787	20.0	20.0	8	2.76	70	2.CMC42.N1Z4.500.1	■
7/32	.2189	5.560	.876	22.2	22.2	10	2.76	70	2.CMC.SNZ4.F732	■
	.236	6.0	.945	24.0	24.0	10	2.76	70	2.CMC42.N1Z4.600.1	■
1/4	.2500	6.350	1.00	25.4	25.4	10	2.76	70	2.CMC.SNZ4.F14	■
	.315	8.0	1.26	32.0	32.0	12	3.54	90	2.CMC42.N1Z4.800.1	■

■ Stock item

Carbide		Z4									
Ø d ₁		.004" - .118" (0.1 - 3.0 mm)		.122" - .236" (3.1 - 6.0 mm)		.240" - .394" (6.1 - 10.0 mm)					
Tolerance		- .00055" - .00110"		- 0.014 mm - 0.028 mm		- .00079" - .00150"		- 0.020 mm - 0.038 mm		- .00098" - .00185" - 0.025 mm - 0.047 mm	

Corner radius



l₁ = Effective length
l₂ = Cutting length

d ₁	d ₁	d ₁	l ₁	l ₁	l ₂	D (h6)	L	L	r	r	Item number	Availability
[inch]	[inch]	[mm]	[inch]	[mm]	[mm]	[mm]	[inch]	[mm]	[inch]	[mm]		
	.039	1.0	.157	4.0	4.0	4	1.57	40	.0039	0.10	2.CMC42.N2Z4.100.1	■
	.039	1.0	.157	4.0	4.0	4	1.57	40	.0079	0.20	2.CMC42.N3Z4.100.1	■
	.047	1.2	.189	4.8	4.8	4	1.57	40	.0039	0.10	2.CMC42.N2Z4.120.1	■
	.047	1.2	.189	4.8	4.8	4	1.57	40	.0079	0.20	2.CMC42.N3Z4.120.1	■
	.059	1.5	.236	6.0	6.0	4	1.57	40	.0039	0.10	2.CMC42.N2Z4.150.1	■
	.059	1.5	.236	6.0	6.0	4	1.57	40	.0118	0.30	2.CMC42.N3Z4.150.1	■
1/16	.0625	1.587	.250	6.3	6.3	4	1.77	45	.0050	0.127	2.CMC.RN2Z4.F116	■
1/16	.0625	1.587	.250	6.3	6.3	4	1.77	45	.0100	0.254	2.CMC.RN3Z4.F116	■
	.071	1.8	.283	7.2	7.2	4	1.77	45	.0039	0.10	2.CMC42.N2Z4.180.1	■
	.071	1.8	.283	7.2	7.2	4	1.77	45	.0118	0.30	2.CMC42.N3Z4.180.1	■
	.079	2.0	.315	8.0	8.0	4	1.73	44	.0039	0.10	2.CMC42.N2Z4.200.1	■
	.079	2.0	.315	8.0	8.0	4	1.73	44	.0079	0.20	2.CMC42.N3Z4.200.1	■
	.079	2.0	.315	8.0	8.0	4	1.73	44	.0197	0.50	2.CMC42.N4Z4.200.1	■
3/32	.0937	2.381	.375	9.5	9.5	4	1.73	44	.0050	0.127	2.CMC.RN2Z4.F332	■
3/32	.0937	2.381	.375	9.5	9.5	4	1.73	44	.0100	0.254	2.CMC.RN3Z4.F332	■
3/32	.0937	2.381	.375	9.5	9.5	4	1.73	44	.0150	0.381	2.CMC.RN4Z4.F332	■
	.098	2.5	.394	10.0	10.0	6	2.17	55	.0079	0.20	2.CMC42.N2Z4.250.1	■
	.098	2.5	.394	10.0	10.0	6	2.17	55	.0197	0.50	2.CMC42.N3Z4.250.1	■
	.118	3.0	.472	12.0	12.0	6	2.17	55	.0079	0.20	2.CMC42.N2Z4.300.1	■
	.118	3.0	.472	12.0	12.0	6	2.17	55	.0197	0.50	2.CMC42.N3Z4.300.1	■
1/8	.1250	3.175	.500	12.7	12.7	6	2.36	60	.0100	0.254	2.CMC.RN2Z4.F18	■
1/8	.1250	3.175	.500	12.7	12.7	6	2.36	60	.0150	0.381	2.CMC.RN3Z4.F18	■
	.138	3.5	.551	14.0	14.0	6	2.36	60	.0079	0.20	2.CMC42.N2Z4.350.1	■
	.138	3.5	.551	14.0	14.0	6	2.36	60	.0197	0.50	2.CMC42.N3Z4.350.1	■
5/32	.1562	3.968	.625	15.9	15.9	6	2.36	60	.0100	0.254	2.CMC.RN2Z4.F532	■
5/32	.1562	3.968	.625	15.9	15.9	6	2.36	60	.0150	0.381	2.CMC.RN3Z4.F532	■
	.157	4.0	.630	16.0	16.0	6	2.36	60	.0079	0.20	2.CMC42.N2Z4.400.1	■
	.157	4.0	.630	16.0	16.0	6	2.36	60	.0197	0.50	2.CMC42.N3Z4.400.1	■
	.177	4.5	.709	18.0	18.0	8	2.76	70	.0079	0.20	2.CMC42.N2Z4.450.1	■
	.177	4.5	.709	18.0	18.0	8	2.76	70	.0197	0.50	2.CMC42.N3Z4.450.1	■
3/16	.1875	4.762	.750	19.0	19.0	8	2.76	70	.0100	0.254	2.CMC.RN2Z4.F316	■
3/16	.1875	4.762	.750	19.0	19.0	8	2.76	70	.0150	0.381	2.CMC.RN3Z4.F316	■
	.197	5.0	.787	20.0	20.0	8	2.76	70	.0079	0.20	2.CMC42.N2Z4.500.1	■
	.197	5.0	.787	20.0	20.0	8	2.76	70	.0197	0.50	2.CMC42.N3Z4.500.1	■
7/32	.2189	5.560	.876	22.2	22.2	10	2.76	70	.0150	0.381	2.CMC.RN2Z4.F732	■
7/32	.2189	5.560	.876	22.2	22.2	10	2.76	70	.0300	0.762	2.CMC.RN3Z4.F732	■
	.236	6.0	.945	24.0	24.0	10	2.76	70	.0079	0.20	2.CMC42.N2Z4.600.1	■
	.236	6.0	.945	24.0	24.0	10	2.76	70	.0197	0.50	2.CMC42.N3Z4.600.1	■
	.236	6.0	.945	24.0	24.0	10	2.76	70	.0394	1.00	2.CMC42.N4Z4.600.1	■
1/4	.2500	6.350	1.00	25.4	25.4	10	2.76	70	.0150	0.381	2.CMC.RN2Z4.F14	■
1/4	.2500	6.350	1.00	25.4	25.4	10	2.76	70	.0300	0.762	2.CMC.RN3Z4.F14	■
1/4	.2500	6.350	1.00	25.4	25.4	10	2.76	70	.0600	1.524	2.CMC.RN4Z4.F14	■
	.315	8.0	1.26	32.0	32.0	12	3.54	90	.0079	0.20	2.CMC42.N2Z4.800.1	■
	.315	8.0	1.26	32.0	32.0	12	3.54	90	.0197	0.50	2.CMC42.N3Z4.800.1	■
	.315	8.0	1.26	32.0	32.0	12	3.54	90	.0591	1.50	2.CMC42.N4Z4.800.1	■

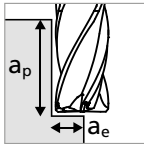
■ Stock item

NEW

Type N - Pre-machining

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Pre-machining

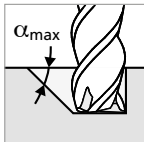


①

- $a_p = 2 \times d_1$
- $a_e = 0.1 \times d_1$

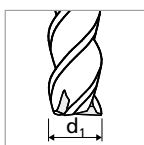
②

- $a_p = 4 \times d_1$
- $a_e = 0.05 \times d_1$



Note:

In case of linear ramp or helical interpolation milling reduce f_z by 35%

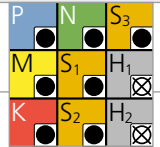


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"		1.5 mm .059"		1/16"				
					v_c	f_z		v_c	f_z		v_c	f_z	
						①	②		①	②		①	②
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	140 459	0.011 .00043	0.008 .00032	200 656	0.015 .00059	0.012 .00047			
		1.0401	C15	AISI 1015									
		1.1191	C45E/CK45	AISI 1045									
		1.0044	S275JR	AISI 1020									
	Low alloyed steel Rm > 900 N/mm ²	1.0715	11SMn30	AISI 1215	140 459	0.010 .00039	0.007 .00028	200 656	0.013 .00051	0.011 .00043			
		1.5752	15NiCr13	ASTM 3415 / AISI 3310									
		1.7131	16MnCr5	AISI 5115									
		1.3505	100Cr6	AISI 52100									
		1.7225	42CrMo4	AISI 4140									
		1.2842	90MnCrV8	AISI O2									
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	140 459	0.008 .00032	0.006 .00024	200 656	0.011 .00043	0.010 .00039			
		1.2436	X210CrW12	AISI D4/D6									
1.3343		H56-5-2C	AISI M2 / UNS T11302										
		1.3355	HS18-0-1	AISI T1 / UNS T12001									
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140 459	0.012 .00047	0.008 .00032	180 591	0.015 .00059	0.012 .00047			
		1.4105	X6CrMoS17	AISI 430F									
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140 459	0.011 .00043	0.008 .00032	180 591	0.014 .00055	0.011 .00043			
		1.4112	X90CrMoV18	AISI 440B									
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140 459	0.011 .00043	0.008 .00032	180 591	0.014 .00055	0.011 .00043			
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH									
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140 459	0.009 .00035	0.006 .00024	180 591	0.012 .00047	0.008 .00031			
1.4435		X2CrNiMo18-14-3	AISI 316L										
1.4441		X2CrNiMo18-15-3	AISI 316LM										
		1.4539	X1NiCrMoCu25-20-5	AISI 904L									
K	Cast iron	0.6020	GG20	ASTM 30	120 394	0.010 .00039	0.006 .00024	160 525	0.014 .00055	0.012 .00047			
		0.6030	GG30	ASTM 40B									
		0.7040	GGG40	ASTM 60-40-18									
		0.7060	GGG60	ASTM 80-60-03									
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	160 525	0.013 .00051	0.009 .00035	200 656	0.016 .00063	0.013 .00051			
		3.4365	AlZnMgCu1.5	ASTM 7075									
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	160 525	0.013 .00051	0.009 .00035	220 722	0.016 .00063	0.013 .00051			
		3.2381	GD-AlSi10Mg	UNS A03590									
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	160 525	0.013 .00051	0.010 .00039	220 722	0.016 .00063	0.013 .00051			
		2.0065	Cu-ETP / CW004A	UNS C11000									
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	160 525	0.013 .00051	0.010 .00039	220 722	0.016 .00063	0.013 .00051			
		2.0360	CuZn40 CW509L	UNS C28000									
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	160 525	0.013 .00051	0.010 .00039	220 722	0.016 .00063	0.013 .00051			
		2.1020	CuSn6	UNS C51900									
Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	160 525	0.013 .00051	0.009 .00035	220 722	0.016 .00063	0.013 .00051				
	2.0960	CuAl9Mn2	UNS C63200										
S₁	Super alloys	2.4856		Inconel 625	100 328	0.006 .00024	0.004 .00016	100 328	0.008 .00031	0.005 .00020			
		2.4668		Inconel 718									
		2.4617	NiMo28	Hastelloy B-2									
		2.4665	NiCr22Fe18Mo	Hastelloy X									
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120 394	0.010 .00039	0.008 .00032	120 394	0.012 .00047	0.010 .00039			
		3.7065	Gr.4	ASTM B348 / F68									
S₂	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120 394	0.010 .00039	0.008 .00032	120 394	0.012 .00047	0.010 .00039			
		9.9367	TiAl6Nb7	ASTM F1295									
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	100 328	0.006 .00024	0.004 .00016	140 459	0.008 .00031	0.005 .00018			
			CrCoMo28	ASTM F1537									
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1									
		1.2379	X153CrMoV12	AISI D2									
H₂	Hardened steel ≥ 55 HRC												

V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



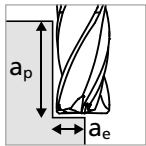
	3/32" 2.0 mm .079"			1/8" 3.0 mm .118"			Ød ₁ 5/32" 4.0 mm .157"			3/16" - 7/32" 5.0 mm .197"			1/4" 6.0 mm .236"			8.0 mm .315"		
	V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z		V_c	f_z	
		①	②		①	②		①	②		①	②		①	②		①	②
220 722	0.024 .00094	0.017 .00067	240 787	0.033 .00130	0.020 .00079	260 853	0.034 .00134	0.025 .00098	260 853	0.035 .00138	0.028 .00110	260 853	0.046 .00181	0.030 .00117	260 853	0.054 .00213	0.033 .00130	
220 722	0.022 .00087	0.016 .00063	240 787	0.031 .00122	0.019 .00075	260 853	0.032 .00126	0.024 .00094	260 853	0.033 .00130	0.026 .00102	260 853	0.044 .00173	0.028 .00110	260 853	0.052 .00205	0.031 .00122	
220 722	0.019 .00075	0.015 .00059	240 787	0.028 .00110	0.018 .00071	260 853	0.029 .00114	0.022 .00087	260 853	0.030 .00118	0.024 .00094	260 853	0.042 .00165	0.026 .00103	260 853	0.050 .00197	0.029 .00114	
180 591	0.021 .00083	0.017 .00067	200 656	0.030 .00118	0.034 .00134	220 722	0.032 .00126	0.024 .00094	220 722	0.033 .00130	0.026 .00102	220 722	0.040 .00157	0.028 .00110	260 853	0.048 .00189	0.031 .00122	
180 591	0.020 .00079	0.016 .00063	200 656	0.028 .00110	0.018 .00071	220 722	0.031 .00122	0.023 .00091	220 722	0.032 .00126	0.025 .00098	220 722	0.037 .00145	0.027 .00106	260 853	0.045 .00177	0.030 .00118	
180 591	0.020 .00079	0.016 .00063	200 656	0.028 .00110	0.018 .00071	220 722	0.031 .00122	0.023 .00091	220 722	0.032 .00126	0.025 .00098	220 722	0.037 .00145	0.027 .00106	260 853	0.045 .00177	0.030 .00118	
180 591	0.018 .00071	0.015 .00059	200 656	0.026 .00102	0.017 .00067	220 722	0.030 .00118	0.022 .00087	220 722	0.031 .00122	0.024 .00094	220 722	0.035 .00139	0.026 .00103	260 853	0.042 .00165	0.029 .00114	
200 656	0.024 .00094	0.014 .00055	220 722	0.032 .00126	0.021 .00083	240 787	0.038 .00150	0.026 .00102	240 787	0.042 .00165	0.029 .00114	240 787	0.044 .00173	0.031 .00120	240 787	0.052 .00205	0.034 .00134	
240 787	0.026 .00102	0.018 .00071	260 853	0.040 .00157	0.029 .00114	300 984	0.048 .00189	0.028 .00110	320 1050	0.051 .00201	0.030 .00118	320 1050	0.052 .00205	0.032 .00128	350 1148	0.060 .00236	0.036 .00142	
240 787	0.026 .00102	0.018 .00071	260 853	0.040 .00157	0.029 .00114	300 984	0.048 .00189	0.028 .00110	320 1050	0.051 .00201	0.030 .00118	320 1050	0.052 .00205	0.032 .00128	350 1148	0.060 .00236	0.036 .00142	
240 787	0.026 .00102	0.018 .00071	260 853	0.040 .00157	0.029 .00114	300 984	0.048 .00189	0.028 .00110	320 1050	0.051 .00201	0.030 .00118	320 1050	0.052 .00205	0.032 .00128	350 1148	0.060 .00236	0.036 .00142	
240 787	0.026 .00102	0.018 .00071	260 853	0.040 .00157	0.029 .00114	300 984	0.048 .00189	0.028 .00110	320 1050	0.051 .00201	0.030 .00118	320 1050	0.052 .00205	0.032 .00128	350 1148	0.060 .00236	0.036 .00142	
240 787	0.026 .00102	0.018 .00071	260 853	0.040 .00157	0.029 .00114	300 984	0.048 .00189	0.028 .00110	320 1050	0.051 .00201	0.030 .00118	320 1050	0.052 .00205	0.032 .00128	350 1148	0.060 .00236	0.036 .00142	
100 328	0.010 .00039	0.005 .00020	100 328	0.014 .00055	0.008 .00032	120 394	0.016 .00063	0.010 .00039	120 394	0.018 .00071	0.011 .00043	120 394	0.020 .00079	0.012 .00046	120 394	0.025 .00098	0.013 .00051	
130 427	0.017 .00067	0.014 .00055	130 427	0.028 .00110	0.017 .00067	150 492	0.030 .00118	0.021 .00083	150 492	0.031 .00122	0.023 .00091	150 492	0.032 .00126	0.024 .00096	170 558	0.035 .00138	0.027 .00106	
130 427	0.017 .00067	0.014 .00055	130 427	0.028 .00110	0.017 .00067	150 492	0.030 .00118	0.021 .00083	150 492	0.031 .00122	0.023 .00091	150 492	0.032 .00126	0.024 .00096	170 558	0.035 .00138	0.027 .00106	
100 328	0.010 .00039	0.005 .00020	100 328	0.014 .00055	0.008 .00032	120 394	0.016 .00063	0.010 .00039	120 394	0.018 .00071	0.011 .00043	120 394	0.020 .00079	0.012 .00046	120 394	0.025 .00098	0.013 .00051	

NEW

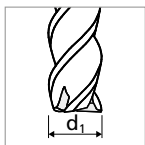
Type N - Finishing

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Finishing



- $a_p = 4 \times d_1$
- $a_e = 0.02 \times d_1$

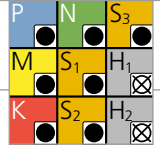


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	1.0 mm .039"	
					v_c	f_z
P	Unalloyed carbon steel Rm < 800 N/mm ²	1.0301	C10	AISI 1010	130 425	0.009 .00035
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel Rm > 900 N/mm ²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130 425	0.008 .00032
		1.7131	16MnCr5	AISI 5115		
		1.3505	100Cr6	AISI 52100		
		1.7225	42CrMo4	AISI 4140		
		1.2842	90MnCrV8	AISI O2		
	High alloyed tool steel Rm < 1200 N/mm ²	1.2379	X153CrMoV12	AISI D2	130 425	0.007 .00028
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130 425	0.009 .00035
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C	130 425	0.009 .00035
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	130 425	0.009 .00035
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130 425	0.009 .00035
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH		
		1.4301	X5CrNi18-10	AISI 304		
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	130 425	0.007 .00028
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
K	Cast iron	0.6020	GG20	ASTM 30	110 361	0.007 .00028
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130 425	0.010 .00039
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130 425	0.010 .00039
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	130 425	0.012 .00047
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130 425	0.012 .00047
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze Rm < 400 N/mm ²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130 425	0.012 .00047
		2.1020	CuSn6	UNS C51900		
	Bronze Rm < 600 N/mm ²	2.0966	CuAl10Ni5Fe4	UNS C63000	130 425	0.010 .00039
2.0960		CuAl9Mn2	UNS C63200			
S₁	Super alloys	2.4856		Inconel 625	110 361	0.005 .00020
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
S₂	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	110 361	0.009 .00035
		3.7065	Gr.4	ASTM B348 / F68		
S₃	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	110 361	0.009 .00035
		9.9367	TiAl6Nb7	ASTM F1295		
S₃	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	110 361	0.005 .00020
			CrCoMo28	ASTM F1537		
H₁	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1		
H₂	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2		

V_c [m/min] | [SFM]
 f_z [mm] | [IPT]

RECOMMENDATION FOR USE

● Excellent | ● Good | ○ Acceptable | ⊗ Not recommended



	1/16" 1.5 mm .059"		3/32" 2.0 mm .079"		1/8" 3.0 mm .118"		Ød ₁ 5/32" 4.0 mm .157"		3/16" - 7/32" 5.0 mm .197"		1/4" 6.0 mm .236"		8.0 mm .315"	
	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z	V_c	f_z
	180 591	0.014 .00055	200 656	0.020 .00079	210 688	0.026 .00102	220 722	0.029 .00114	220 722	0.032 .00126	220 722	0.038 .00150	220 722	0.044 .00173
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	220 722	0.033 .00130	220 722	0.040 .00157
	180 591	0.012 .00047	200 656	0.017 .00067	210 688	0.023 .00091	220 722	0.024 .00094	220 722	0.026 .00102	220 722	0.029 .00114	220 722	0.035 .00138
	180 591	0.014 .00055	200 656	0.020 .00079	210 688	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	220 722	0.033 .00130	260 853	0.040 .00157
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.027 .00106	220 722	0.029 .00114	220 722	0.032 .00126	260 853	0.038 .00150
	180 591	0.013 .00051	200 656	0.018 .00071	210 688	0.025 .00098	220 722	0.027 .00106	220 722	0.029 .00114	220 722	0.032 .00126	260 853	0.038 .00150
	180 591	0.009 .00035	200 656	0.017 .00067	210 688	0.023 .00091	220 722	0.025 .00098	220 722	0.028 .00110	220 722	0.030 .00118	260 853	0.037 .00146
	130 427	0.014 .00055	150 492	0.016 .00063	160 525	0.025 .00098	170 558	0.029 .00114	170 558	0.033 .00130	170 558	0.036 .00142	200 656	0.042 .00165
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	180 591	0.015 .00059	200 656	0.021 .00083	210 688	0.033 .00130	220 722	0.035 .00138	220 722	0.038 .00150	220 722	0.041 .00161	270 886	0.047 .00185
	120 394	0.006 .00024	130 427	0.006 .00024	130 427	0.009 .00035	140 459	0.012 .00047	140 459	0.013 .00051	150 492	0.014 .00055	160 525	0.020 .00079
	120 394	0.012 .00047	130 427	0.016 .00063	130 427	0.023 .00091	140 459	0.025 .00098	140 459	0.028 .00110	150 492	0.030 .00118	160 525	0.036 .00142
	120 394	0.012 .00047	130 427	0.016 .00063	130 427	0.023 .00091	140 459	0.025 .00098	140 459	0.028 .00110	150 492	0.030 .00118	160 525	0.036 .00142
	120 394	0.006 .00024	130 427	0.006 .00024	130 427	0.009 .00035	140 459	0.012 .00047	140 459	0.013 .00051	150 492	0.014 .00055	160 525	0.020 .00079

NEW

Process CrazyMill Cool Square / Corner radius - Z4

ACCURATE AND EFFICIENT MILLING

Coolant type, pressure and filtration

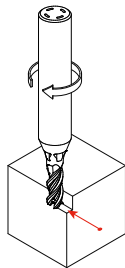
Coolant: for best results, Mikron Tool recommends the use of cutting oil as coolant. Alternatively, water base coolant with EP-Additives (Extreme-Pressure-Additives) can be used as well.

Filter: the large cooling channels permit the use of a standard filter with filter quality of $\leq .002$ " (0.05 mm).

Coolant pressure: at least 15 bar (218 psi) coolant pressure is required to achieve reliable milling. High pressure is generally better for the cooling and flushing effect.

Revolution	[rpm]	$\leq 10'000$	$> 10'000$
Minimal pressure	[bar]	15	30
	[psi]	218	435

Climb milling and conventional milling

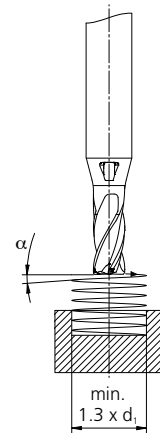


Mikron tool recommends climb milling for the machining of side and pocket milling. The chip thickness here is greater at the beginning and decreases continuously; the cutting forces remain low. With conventional milling, however, high cutting forces would push the milling tool away from the part. Thus surface quality decreases.

MILLING PROCESS

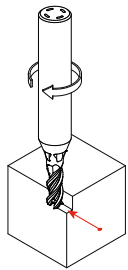
Maximum ramp angles in linear ramping or helical interpolation

	Material	α - Linear ramp	α - Helical interpolation
P	Unalloyed carbon steel	45°	47°
	Low alloyed steel	45°	47°
	High alloyed tool steel	27°	28°
M	Stainless steel ferritic	45°	47°
	Stainless steel martensitic	27°	28°
	Stainless steel martensitic - PH	27°	28°
	Stainless steel austenitic	45°	47°
K	Cast iron	45°	47°
	Aluminium alloy wrought	45°	47°
N	Aluminium alloy cast	45°	47°
	Copper	45°	47°
	Brass lead free	45°	47°
	Brass, Bronze Rm < 400 N/mm ²	45°	47°
	Bronze Rm < 600 N/mm ²	45°	47°
	S ₁ Super alloys	14°	15°
	S ₂ Titanium pure and titanium alloys	14°	15°
S ₃ CrCo alloys	27°	28°	



Note: In case of linear ramping or helical interpolation refer to cutting data for pre-machining with a reduction by 35% of f_z

Pre-machining

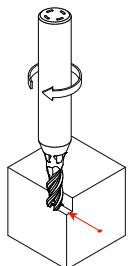


Recommended cutting parameters

v_c and f_z = as specified in the cutting data table

Strategy	Type A	Type C	Type M	Type N
①	$a_p = 1.5 \times d$ $a_e = 0.3 \times d$	$a_p = 2 \times d$ $a_e = 0.1 \times d$	$a_p = 1.5 \times d$ $a_e = 0.2 \times d$	$a_p = 2 \times d$ $a_e = 0.1 \times d$
②	$a_p = 2 \times d$ $a_e = 0.2 \times d$	-	$a_p = 3 \times d$ $a_e = 0.1 \times d$	$a_p = 4 \times d$ $a_e = 0.05 \times d$
③	-	-	$a_p = 3 \times d$ $a_e = 0.05 \times d$	-

Finishing



Recommended cutting parameters

v_c and f_z = as specified in the cutting data table

Strategy	Type A	Type C	Type M	Type N
①	$a_p = 2 \times d$ $a_e = 0.04 \times d$	$a_p = 2 \times d$ $a_e = 0.02 \times d$	$a_p = 3 \times d$ $a_e = 0.02 \times d$	$a_p = 4 \times d$ $a_e = 0.02 \times d$
②	$a_p = 2 \times d$ $a_e = 0.02 \times d$	-	-	-

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