



**crazy about** **new tools**

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**NEW PRODUCTS 2017 - 2018**

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3 NEW CUTTING TOOLS FOR  
DRILLING AND MILLING



**crazy about**

cool tools

## NEW SOLUTIONS FOR STAINLESS STEELS AND SUPER ALLOYS

Small dimensions are our speciality and difficult-to-machine materials are our challenge.

We are crazy about cool tools when drilling or milling in the diameter range of 0.3 mm to 8.0 mm.

Our goal is to machine stainless steels accurately, quickly and reliably!

With new geometries and unique cooling technologies.

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## Solutions for stainless steel, super alloys and titanium

### The challenge

Difficult-to-machine metals are a broad field and depending on the material comprise a wide variety of machining difficulties. These go from long chips and tough/elastic behavior to poor heat conduction and extreme hardness. This is a special challenge for cutting tool users in general and tool suppliers and machine operators in particular. In spite (or simply because) of such properties, these metals are readily used in demanding industries, that is, everywhere where the material is exposed to extreme conditions. This is therefore about properties such as heat resistance, corrosion and acid resistance, biocompatibility, low weight but high degree of strength, good formability or even high degree of hardness.

### The characteristics

- **Stainless steel (rustproof and acid-resistant steels):** corrosion and acid-resistant, high degree of toughness, low thermal conductivity (depending on composition), good formability.
- **Titanium:** high degree of stability at low density (hard like steel at approximately half the weight), corrosion and temperature-resistant, biocompatible, good tensile strength, high degree of toughness, low thermal conductivity.
- **Superalloys (HRSA = Heat Resistant Super Alloys):** high degree of strength and hardness even at high temperatures; corrosion, acid and heat-resistant. Low thermal conductivity.
- **CrCo alloys:** biocompatible, minor heat expansion (like ceramic), corrosion, acid and heat-resistant, high degree of hardness.

### The solution







To be able to offer an efficient solution for machining even in small diameters, a solution that actually earns the addendum "best suited for difficult-to-machine materials", Mikron Tool has incorporated different factors in tool development as geometry, cooling system, solid carbide, coating and a clearly defined machining process.



APPLICATION DOMAINS	COMPONENTS EXAMPLES	MATERIALS GROUPS	EXAMPLES		
			Mat. no.	DIN	AISI / ASTM / UNS
Dental	Dental crown mounting	<b>Group M</b> Stainless steel	1.4105	X6CrMoS17	430F
Aerospace industry	Engine parts		1.4112	X90CrMoV18	440B
Medical technology	Component for endoscope, Implant		1.4542	X5CrNiCuNb16-4	630
Automotive industry	Components for direct injection		1.4305	X8CrNiS18-9	303
Mechanical engineering	Locking bolt		1.4435	X2CrNiMo18-14-3	316L
Watches	Watch housing	<b>Group S1</b> Super alloys	2.4856		INCONEL 625
Hydraulics / Pneumatics	Hydraulic valve		2.4665	NiCr22Fe18Mo	HASTELLOY X
		<b>Group S2</b> Titanium (pure and alloyed)	3.7035	GR.2	B348 / F67
			3.7165	TiAl6V4	B348 / F136
		<b>Group S3</b> CrCo alloys	2.4964	CoCr20W15Ni	HAYNES 25

# Overview

## CUTTING TOOL SOLUTIONS

<b>NEW</b>	<b>CRAZYMILL™</b> by Mikron Tool Cool	 Plunge&Slot	
<b>NEW</b>	<b>CRAZYMILL™</b> by Mikron Tool Cool	 Ball Z4	
<b>NEW</b>	<b>CRAZYDRILL™</b> by Mikron Tool Cool SST-Inox		
	<b>CRAZYDRILL™</b> by Mikron Tool Coolpilot		

RECOMMENDATION FOR USE

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



Ø - range [mm]	max. depth	Cooling	P	M	K	N	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	H <sub>1</sub>	H <sub>2</sub>	Page
			Unalloyed and alloyed steel	Stainless steel	Cast iron	Non ferrous metals	Super alloys	Titanium (pure and alloyed)	CrCo alloys	Hardened steel <55 HRC	Hardened steel ≥55 HRC	
1.0 – 6.0	2.5 x d		●	●	●	●	●	●	●	⊗	⊗	8
1.0 – 8.0	2 x d 3 x d 3.5 x d 4.5 x d 5 x d		●	●	●	●	●	●	●	●	⊗	30
1.0 – 6.0	6 x d 10 x d 15 x d 20 x d		⊗	●	⊗	⊗	●	⊗	●	⊗	⊗	70
1.0 – 6.0	3 x d + Chamfer 90°		⊗	●	⊗	⊗	●	⊗	●	⊗	⊗	86

**NEW**

CrazyMill Cool P&S







NEW



**CRAZYMILL™**  
by Mikron Tool  
Cool

## PLUNGE MILL FOR SLOTS AND POCKETS IN MINIMAL SPACES



**What's new:** CrazyMill Cool P&S is a new 3-teeth milling cutter from Mikron Tool, specially developed for the rough and finish milling of many materials, with emphasis on stainless steels, titanium, super alloys and CrCo alloys. With the capacity to plunge perpendicular to the material, this tool is well adapted for the milling of slots, pockets and sides in minimal spaces. An example of these applications are the keyways that can be found in transmission shafts.

**The features:** A special edge geometry provides a stable and vibration-free "Drilling" (perpendicular plunging). A correction in the center stabilizes the web (no breakout), reduces penetration force and helps increase tool life. Due to the specially designed chip space in the head of the tool, chips are evacuated into the flutes when plunging. The design of the flutes creates enough space for perfect chip evacuation and simultaneously guarantees robust stability for the lateral milling process.

In the shank, integrated ducts provide a constant and massive coolant flow instrumental for an efficient chip evacuation from the milling area. This concept is ideally suited to machine grooves, slots and pockets since chips are flushed out even from tight and angled spaces. The surface quality improves significantly and reaches finishing quality when milling into solid material. Moreover, the cooling prevents an overheating of the cutting edges and thus guarantees long tool life and significantly higher chip removal compared to conventional milling.

The CrazyMill Cool P&S impresses with its speed, output, performance as well as tool life and surface quality.

Diameter range: 1 mm to 6 mm

Milling depth: 2.5 x d

Coating: eXedur SNP

Number of teeth: 3

**NEW**

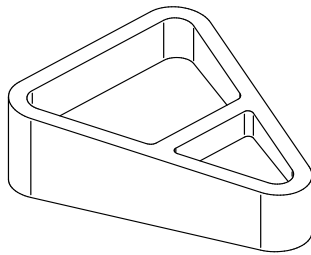


# Highest performance in smallest dimensions

## PLUNGE AND SLOT END MILL WITH INTEGRATED COOLING

With the CrazyMill Cool P&S Mikron Tool expands its range of milling cutters for difficult to machine materials. The three flute milling cutter allows perpendicular plunging with subsequent milling into solid material. Available with integrated cooling, in the diameter range from 1 to 6 mm and for maximal milling depth of  $2.5 \times d$ .

■ CrazyMill Cool P&S – milling depth  $2.5 \times d$ , through shaft cooling,  $Z = 3$



**COMPONENT**

Steering component

**MATERIAL**

X2CrNiMo18-14-3 / 1.4435 / AISI 316L

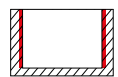
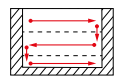
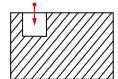
**MACHINING**

- ① Plunging
- ② Slotting
- ③ Finishing
- $d = 6 \text{ mm}$
- Milling depth = 14.4 mm

**MILLING TOOL**

Mikron Tool - CrazyMill Cool P&S

DATA	MIKRON TOOL
<b>Tool type</b>	CrazyMill Cool P&S - Carbide - Coated - Integrated cooling
<b>Item number</b>	2.CMC42.A8Z3.600.1
<b>Cutting data</b>	<p>① Plunging  <math>v_c = 160 \text{ m/min}</math>  <math>f_{z,p} = 0.005 \text{ mm}</math>  <math>a_p = 1 \times d</math></p> <p>② Slotting  <math>v_c = 160 \text{ m/min}</math>  <math>f_{z,s} = 0.025 \text{ mm}</math>  <math>a_p = 1 \times d</math></p> <p>③ Finishing  <math>v_c = 220 \text{ m/min}</math>  <math>f_z = 0.026 \text{ mm}</math>  <math>a_p = 2.5 \times d</math>  <math>a_e = 0.3 \text{ mm}</math></p>





# CrazyMill Cool P&S - Z3

- Coated
- Through-tool cooling

**NEW**



## 1 | SHANK

The robust carbide shank guarantees stable and vibration-free milling. A high degree of precision and excellent surface quality is achieved.

## 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 as well as improved 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 material build-up on cutting edges and guarantees optimum chip flushing. The result is long tool life.

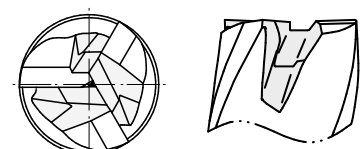
## 5 | FLUTE GEOMETRY

The specially designed flutes provide high stability and sufficient space for perfect chip evacuation.

## 6 | GEOMETRY OF THE END FACE

The specially designed expanded chip collection section in the end face guarantees good chip evacuation when plunging. A correction in the web prevents edge breakout, reduces the penetration force and increases tool life.

End face geometry - 3 Flutes



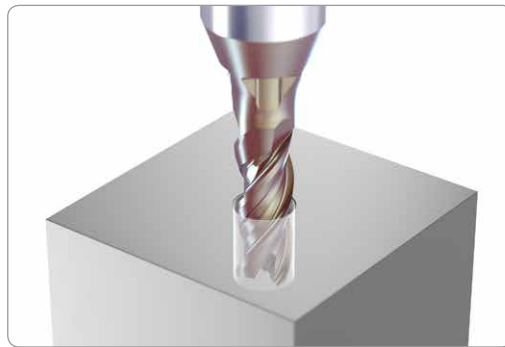
**NEW**

# One tool for many applications



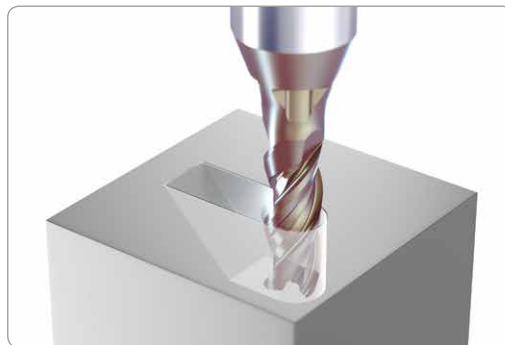
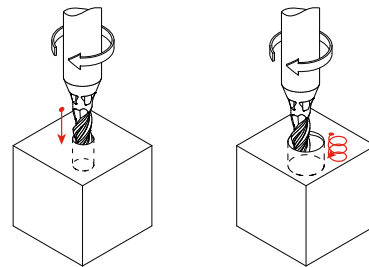
FOR DIFFICULT TO MACHINE MATERIALS

CrazyMill Cool P&S for:



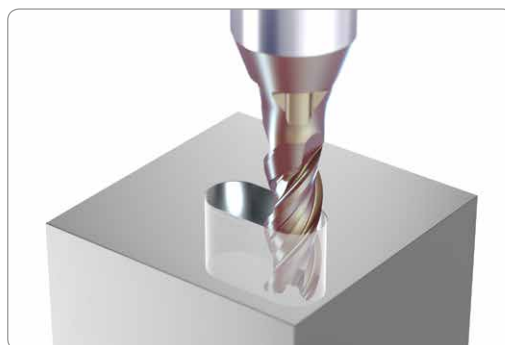
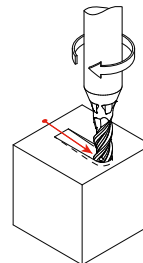
### 1. Plunge milling

Direct or with helical interpolation



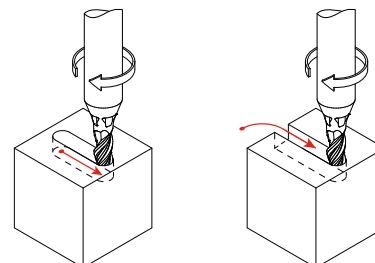
### 2. Linear ramp milling

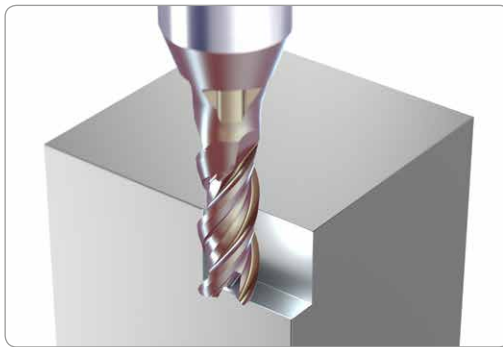
Angle depending on material



### 3. Slot milling

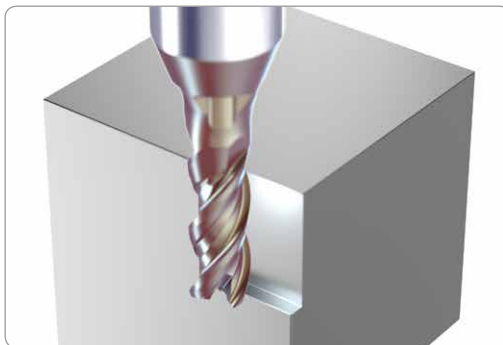
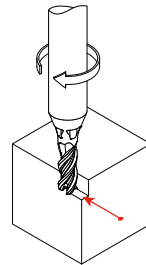
Pockets or through slots





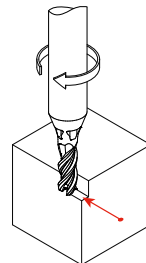
**4. Side milling - Semi-finishing**

$a_p = \max. 1 \times d$



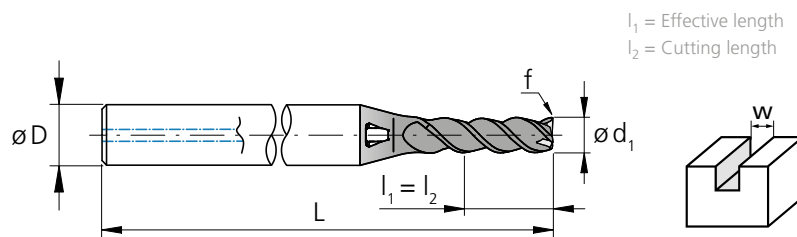
**5. Side milling - Finishing**

$a_p = 2.5 \times d$



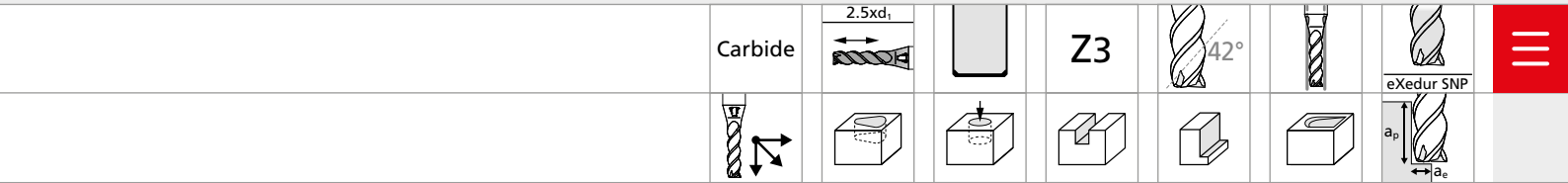
**NEW**

## CrazyMill Cool P&S - 2.5 x d



from stock	Item number	$d_1$ 0/-0.02 [mm]	$l_1$ [mm]	$l_2$ [mm]	D (h6) [mm]	L [mm]	f (45°) [mm]	$w_{min}$ [mm]	$w_{max}$ [mm]
■	2.CMC42.A8Z3.100.1	1.0	2.50	2.50	4	40	0.009	1.10	1.20
■	2.CMC42.A8Z3.110.1	1.1	2.75	2.75	4	40	0.010	1.20	1.32
■	2.CMC42.A8Z3.120.1	1.2	3.00	3.00	4	40	0.010	1.30	1.44
■	2.CMC42.A8Z3.130.1	1.3	3.25	3.25	4	40	0.011	1.40	1.56
■	2.CMC42.A8Z3.140.1	1.4	3.50	3.50	4	40	0.011	1.50	1.68
■	2.CMC42.A8Z3.150.1	1.5	3.75	3.75	4	40	0.012	1.60	1.80
■	2.CMC42.A8Z3.160.1	1.6	4.00	4.00	4	40	0.012	1.70	1.92
■	2.CMC42.A8Z3.170.1	1.7	4.25	4.25	4	40	0.013	1.90	2.04
■	2.CMC42.A8Z3.180.1	1.8	4.50	4.50	4	40	0.014	2.00	2.16
■	2.CMC42.A8Z3.190.1	1.9	4.75	4.75	4	40	0.014	2.10	2.28
■	2.CMC42.A8Z3.200.1	2.0	5.00	5.00	4	40	0.015	2.20	2.40
■	2.CMC42.A8Z3.210.1	2.1	5.25	5.25	4	40	0.015	2.30	2.52
■	2.CMC42.A8Z3.220.1	2.2	5.50	5.50	4	40	0.016	2.40	2.64
■	2.CMC42.A8Z3.230.1	2.3	5.75	5.75	4	40	0.016	2.50	2.76
■	2.CMC42.A8Z3.240.1	2.4	6.00	6.00	4	40	0.017	2.60	2.88
■	2.CMC42.A8Z3.250.1	2.5	6.25	6.25	6	50	0.018	2.70	3.00

**Regrinding:** This product is not suitable for regrinding.

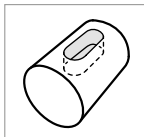
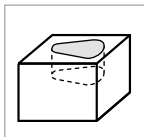
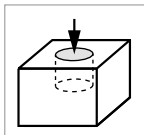

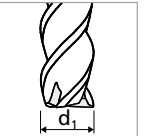
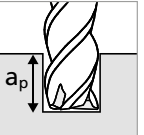
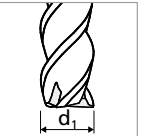
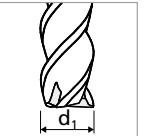
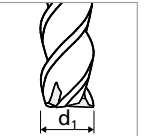
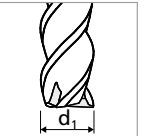
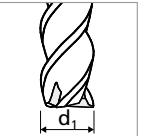


from stock	Item number	d <sub>1</sub> 0/-0.02 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]	f (45°) [mm]	w <sub>min</sub> [mm]	w <sub>max</sub> [mm]
■	2.CMC42.A8Z3.260.1	2.6	6.50	6.50	6	50	0.018	2.80	3.12
■	2.CMC42.A8Z3.270.1	2.7	6.75	6.75	6	50	0.019	2.90	3.24
■	2.CMC42.A8Z3.280.1	2.8	7.00	7.00	6	50	0.019	3.00	3.36
■	2.CMC42.A8Z3.290.1	2.9	7.25	7.25	6	50	0.020	3.10	3.48
■	2.CMC42.A8Z3.300.1	3.0	7.50	7.50	6	50	0.020	3.20	3.60
■	2.CMC42.A8Z3.310.1	3.1	7.75	7.75	6	50	0.021	3.30	3.72
■	2.CMC42.A8Z3.330.1	3.3	8.25	8.25	6	50	0.022	3.50	3.96
■	2.CMC42.A8Z3.370.1	3.7	9.25	9.25	6	50	0.024	3.90	4.44
■	2.CMC42.A8Z3.400.1	4.0	10.00	10.00	6	50	0.026	4.20	4.80
■	2.CMC42.A8Z3.430.1	4.3	10.75	10.75	6	50	0.028	4.50	5.16
■	2.CMC42.A8Z3.470.1	4.7	11.75	11.75	8	60	0.030	4.90	5.64
■	2.CMC42.A8Z3.480.1	4.8	12.00	12.00	8	60	0.031	5.00	5.76
■	2.CMC42.A8Z3.500.1	5.0	12.50	12.50	8	60	0.032	5.20	6.00
■	2.CMC42.A8Z3.530.1	5.3	13.25	13.25	10	65	0.034	5.50	6.36
■	2.CMC42.A8Z3.570.1	5.7	14.25	14.25	10	65	0.036	5.90	6.84
■	2.CMC42.A8Z3.600.1	6.0	15.00	15.00	10	65	0.038	6.20	7.20

**NEW**

# Keyways - Slots - Plunge milling

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

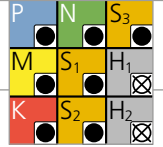
	Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm			
						v <sub>c</sub>	f <sub>z,p</sub>	f <sub>z,s</sub>	a <sub>p</sub>
<b>Keyway slot milling</b>  ■ f <sub>z,p</sub> : for plunge milling ■ f <sub>z,s</sub> : for slot milling	<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010	100	0.0013	0.0046	1xd1
			1.0401	C15	AISI 1015				
			1.1191	C45E/CK45	AISI 1045				
			1.0044	S275JR	AISI 1020				
			1.0715	11SMn30	AISI 1215				
			1.5752	15NiCr13	ASTM 3415 / AISI 3310				
	Low alloyed steel Rm > 900 N/mm <sup>2</sup>	1.7131	16MnCr5	AISI 5115	100	0.0014	0.0049	1xd1	
		1.3505	100Cr6	AISI 52100					
		1.7225	42CrMo4	AISI 4140					
		1.2842	90MnCrV8	AISI O2					
		1.2379	X153CrMoV12	AISI D2					
		1.2436	X210CrW12	AISI D4/D6					
High alloyed tool steel Rm < 1200 N/mm <sup>2</sup>	1.3343	H56-5-2C	AISI M2 / UNS T11302	100	0.0012	0.0042	0.5xd1		
	1.3355	HS18-0-1	AISI T1 / UNS T12001						
<b>Slot milling</b>  ■ f <sub>z,p</sub> : for plunge milling ■ f <sub>z,s</sub> : for slot milling	<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	100	0.0010	0.0035	1xd1
			1.4105	X6CrMoS17	AISI 430F				
			1.4034	X46Cr13	AISI 420C				
		Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	100	0.0010	0.0035	0.5xd1
			1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
		Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	100	0.0010	0.0035	0.5xd1
			1.4301	X5CrNi18-10	AISI 304				
		Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	100	0.0010	0.0035	1xd1
			1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539	X1NiCrMoCu25-20-5		AISI 904L						
<b>Plunge milling</b>  ■ f <sub>z,p</sub> : for plunge milling	<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	100	0.0013	0.0042	1xd1
			0.6030	GG30	ASTM 40B				
			0.7040	GGG40	ASTM 60-40-18				
			0.7060	GGG60	ASTM 80-60-03				
  	<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	100	0.0012	0.0100	1xd1
			3.4365	AlZnMgCu1.5	ASTM 7075				
		Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	100	0.0012	0.0100	1xd1
			3.2381	GD-ALSi10Mg	UNS A03590				
		Copper	2.0040	Cu-OF / CW008A	UNS C10100	100	0.0012	0.0100	1xd1
			2.0065	Cu-ETP / CW004A	UNS C11000				
		Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	100	0.0012	0.0100	1xd1
			2.0360	CuZn40 CW509L	UNS C28000				
		Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500	100	0.0012	0.0100	1xd1
			2.1020	CuSn6	UNS C51900				
		Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000	100	0.0012	0.0100	1xd1
2.0960	CuAl9Mn2		UNS C63200						
<b>S<sub>1</sub></b> 	Super alloys		2.4856		Inconel 625	40	0.0010	0.0035	0.25xd1
			2.4668		Inconel 718				
			2.4617	NiMo28	Hastelloy B-2				
			2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b> 	Titanium pure		3.7035	Gr.2	ASTM B348 / F67	100	0.0010	0.0032	0.25xd1
			3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>3</sub></b> 	Titanium alloys		3.7165	TiAl6V4	ASTM B348 / F136	100	0.0010	0.0032	0.25xd1
			9.9367	TiAl6Nb7	ASTM F1295				
<b>H<sub>1</sub></b> 	CrCo alloys		2.4964	CoCr20W15Ni	Haynes 25	80	0.0010	0.0035	0.5xd1
				CrCoMo28	ASTM F1537				
<b>H<sub>2</sub></b> 	Hardened steel < 55 HRC		1.2510	100MnCrMoW4	AISI O1				
			1.2379	X153CrMoV12	AISI D2				



$v_c$  [m/min]    $a_p$  [mm]  
 $f_{z,p}$  [mm]    $f_{z,s}$  [mm]

RECOMMENDATION FOR USE

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

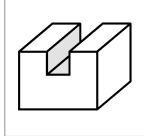

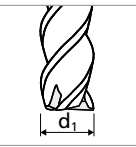
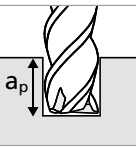


Ød1 1.5 mm				Ød1 2.0 mm				Ød1 3.0 mm				Ød1 4.0 mm				Ød1 5.0 mm				Ød1 6.0 mm			
$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$	$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$	$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$	$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$	$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$	$v_c$	$f_{z,p}$	$f_{z,s}$	$a_p$
120	0.0020	0.0065	1xd1	120	0.0026	0.0091	1xd1	140	0.004	0.013	1xd1	140	0.005	0.020	1xd1	150	0.005	0.026	1xd1	160	0.006	0.033	1xd1
120	0.0021	0.0070	1xd1	120	0.0028	0.0098	1xd1	140	0.004	0.014	1xd1	140	0.005	0.021	1xd1	150	0.006	0.027	1xd1	160	0.006	0.034	1xd1
120	0.0018	0.0060	0.5xd1	120	0.0024	0.0084	0.5xd1	140	0.003	0.012	0.5xd1	140	0.004	0.017	0.5xd1	150	0.004	0.022	0.5xd1	160	0.005	0.028	0.5xd1
120	0.0015	0.0050	1xd1	120	0.0020	0.0070	1xd1	140	0.003	0.010	1xd1	140	0.004	0.015	1xd1	150	0.004	0.020	1xd1	160	0.005	0.025	1xd1
120	0.0015	0.0050	0.5xd1	120	0.0020	0.0070	0.5xd1	140	0.003	0.010	0.5xd1	140	0.004	0.015	0.5xd1	150	0.004	0.020	0.5xd1	160	0.005	0.025	0.5xd1
120	0.0015	0.0050	0.5xd1	120	0.0020	0.0070	0.5xd1	140	0.003	0.010	0.5xd1	140	0.004	0.015	0.5xd1	150	0.004	0.020	0.5xd1	160	0.005	0.025	0.5xd1
120	0.0015	0.0050	1xd1	120	0.0020	0.0070	1xd1	140	0.003	0.010	1xd1	140	0.004	0.015	1xd1	150	0.004	0.020	1xd1	160	0.005	0.025	1xd1
120	0.0019	0.0060	1xd1	120	0.0024	0.0084	1xd1	140	0.004	0.012	1xd1	140	0.004	0.017	1xd1	150	0.005	0.022	1xd1	160	0.005	0.028	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
120	0.0018	0.0160	1xd1	120	0.0024	0.0210	1xd1	150	0.004	0.034	1xd1	160	0.004	0.035	1xd1	170	0.005	0.036	1xd1	180	0.005	0.037	1xd1
40	0.0015	0.0050	0.25xd1	50	0.0020	0.0070	0.25xd1	50	0.003	0.010	0.25xd1	60	0.004	0.014	0.25xd1	80	0.004	0.018	0.25xd1	80	0.005	0.021	0.25xd1
110	0.0014	0.0045	0.25xd1	120	0.0018	0.0063	0.25xd1	130	0.003	0.010	0.25xd1	140	0.004	0.013	0.25xd1	140	0.004	0.016	0.25xd1	140	0.005	0.019	0.25xd1
110	0.0014	0.0045	0.25xd1	120	0.0018	0.0063	0.25xd1	130	0.003	0.010	0.25xd1	140	0.004	0.013	0.25xd1	140	0.004	0.016	0.25xd1	140	0.005	0.019	0.25xd1
80	0.0015	0.0050	0.5xd1	100	0.0020	0.0070	0.5xd1	100	0.003	0.010	0.5xd1	120	0.004	0.014	0.5xd1	120	0.004	0.018	0.5xd1	140	0.005	0.021	0.5xd1

**NEW**

# Milling of through slots

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

	Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		
						v <sub>c</sub>	f <sub>z</sub>	a <sub>p</sub>
<p><b>Through slot milling</b></p>    	<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010	140	0.009	1xd1
			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 <sup>2</sup>	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.008	1xd1
			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 <sup>2</sup>	1.2379	X153CrMoV12	AISI D2	140	0.006	0.5xd1
			1.2436	X210CrW12	AISI D4/D6			
			1.3343	HS6-5-2C	AISI M2 / UNS T11302			
			1.3355	HS18-0-1	AISI T1 / UNS T12001			
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.009	1xd1	
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C				
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	140	0.009	1xd1	
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	140	0.009	1xd1	
		1.4301	X5CrNi18-10	AISI 304				
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	140	0.007	1xd1	
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.007	1xd1	
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.010	1xd1	
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	140	0.010	1xd1	
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	140	0.012	1xd1	
		2.0065	Cu-ETP / CW004A	UNS C11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.012	1xd1	
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.012	1xd1	
		2.1020	CuSn6	UNS C51900				
	Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.011	1xd1	
2.0960		CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	100	0.005	0.5xd1	
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	100	0.009	0.5xd1	
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>3</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	100	0.009	0.5xd1	
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	100	0.005	0.5xd1	
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1				
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]  
 $a_p$  [mm]

RECOMMENDATION FOR USE

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

P	N	S <sub>3</sub>
M	S <sub>1</sub>	H <sub>1</sub>
K	S <sub>2</sub>	H <sub>2</sub>



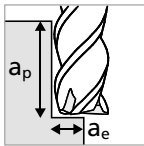
	Ød1 1.5 mm			Ød1 2.0 mm			Ød1 3.0 mm			Ød1 4.0 mm			Ød1 5.0 mm			Ød1 6.0 mm		
	$v_c$	$f_z$	$a_p$	$v_c$	$f_z$	$a_p$	$v_c$	$f_z$	$a_p$	$v_c$	$f_z$	$a_p$	$v_c$	$f_z$	$a_p$	$v_c$	$f_z$	$a_p$
	180	0.015	1xd1	200	0.020	1xd1	220	0.029	1xd1	230	0.031	1xd1	240	0.031	1xd1	260	0.032	1xd1
	180	0.013	1xd1	200	0.019	1xd1	220	0.028	1xd1	230	0.029	1xd1	240	0.030	1xd1	260	0.031	1xd1
	180	0.012	0.5xd1	200	0.017	0.5xd1	220	0.025	0.5xd1	230	0.026	0.5xd1	240	0.026	0.5xd1	260	0.027	0.5xd1
	180	0.015	1xd1	200	0.020	1xd1	220	0.028	1xd1	230	0.029	1xd1	240	0.030	1xd1	260	0.031	1xd1
	180	0.013	1xd1	200	0.019	1xd1	220	0.027	1xd1	230	0.028	1xd1	240	0.029	1xd1	260	0.029	1xd1
	180	0.013	1xd1	200	0.019	1xd1	220	0.027	1xd1	230	0.028	1xd1	240	0.029	1xd1	260	0.029	1xd1
	180	0.011	1xd1	200	0.017	1xd1	220	0.025	1xd1	230	0.027	1xd1	240	0.027	1xd1	260	0.028	1xd1
	140	0.015	1xd1	160	0.017	1xd1	180	0.025	1xd1	200	0.031	1xd1	200	0.031	1xd1	200	0.032	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.034	1xd1	260	0.035	1xd1	300	0.036	1xd1	340	0.037	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.032	1xd1	260	0.034	1xd1	300	0.034	1xd1	340	0.036	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.034	1xd1	260	0.035	1xd1	300	0.036	1xd1	340	0.037	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.034	1xd1	260	0.035	1xd1	300	0.036	1xd1	340	0.037	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.034	1xd1	260	0.035	1xd1	300	0.036	1xd1	340	0.037	1xd1
	180	0.016	1xd1	200	0.021	1xd1	220	0.034	1xd1	260	0.035	1xd1	300	0.036	1xd1	340	0.037	1xd1
	100	0.006	0.5xd1	120	0.007	0.5xd1	120	0.010	0.5xd1	140	0.013	0.5xd1	140	0.013	0.5xd1	140	0.013	0.5xd1
	100	0.012	0.5xd1	120	0.017	0.5xd1	120	0.027	0.5xd1	140	0.027	0.5xd1	140	0.027	0.5xd1	140	0.028	0.5xd1
	100	0.012	0.5xd1	120	0.017	0.5xd1	120	0.027	0.5xd1	140	0.027	0.5xd1	140	0.027	0.5xd1	140	0.028	0.5xd1
	100	0.006	0.5xd1	120	0.007	0.5xd1	120	0.010	0.5xd1	140	0.013	0.5xd1	140	0.013	0.5xd1	140	0.013	0.5xd1

**NEW**

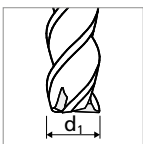
# Side milling - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Semi-finishing**



- $a_p = 1 \times d_1$
- $a_e = 0.2 \times d_1$

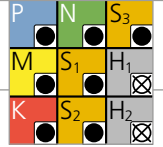


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm	
					$v_c$	$f_z$
<b>P</b>	Unalloyed carbon steel $R_m < 800 \text{ N/mm}^2$	1.0301	C10	AISI 1010	140	0.013
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel $R_m > 900 \text{ N/mm}^2$	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012
		1.7131	16MnCr5	AISI 5115		
		1.3505	100Cr6	AISI 52100		
		1.7225	42CrMo4	AISI 4140		
		1.2842	90MnCrV8	AISI O2		
	High alloyed tool steel $R_m < 1200 \text{ N/mm}^2$	1.2379	X153CrMoV12	AISI D2	140	0.009
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.014
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C	140	0.013
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B		
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.013
	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	140	0.010
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.009
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.015
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	140	0.015
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	140	0.017
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze $R_m < 400 \text{ N/mm}^2$	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017
		2.1020	CuSn6	UNS C51900		
Bronze $R_m < 600 \text{ N/mm}^2$	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	
	2.0960	CuAl9Mn2	UNS C63200			
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.006
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014
		3.7065	Gr.4	ASTM B348 / F68		
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014
		9.9367	TiAl6Nb7	ASTM F1295		
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006
			CrCoMo28	ASTM F1537		
<b>H<sub>1</sub></b>	Hardened steel $< 55 \text{ HRC}$	1.2510	100MnCrMoW4	AISI O1		
<b>H<sub>2</sub></b>	Hardened steel $\geq 55 \text{ HRC}$	1.2379	X153CrMoV12	AISI D2		

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



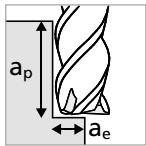
	Ød1 1.5 mm		Ød1 2.0 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	220	0.029	240	0.037	260	0.040	260	0.040	260	0.043
	200	0.019	220	0.027	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.017	220	0.026	240	0.032	260	0.034	260	0.034	260	0.036
	200	0.020	220	0.029	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.019	220	0.027	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.019	220	0.027	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.014	220	0.026	240	0.032	260	0.035	260	0.035	260	0.037
	140	0.020	160	0.024	180	0.034	200	0.040	200	0.042	200	0.044
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	220	0.031	240	0.046	260	0.048	260	0.048	260	0.051
	130	0.008	140	0.009	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	140	0.024	150	0.032	170	0.035	170	0.035	170	0.037
	130	0.017	140	0.024	150	0.032	170	0.035	170	0.035	170	0.037
	180	0.008	200	0.009	220	0.012	240	0.016	240	0.016	240	0.017

**NEW**

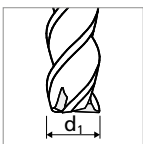
# Side milling - Finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Finishing**



- $a_p = 2.5 \times d_1$
- $a_e = 0.05 \times d_1$

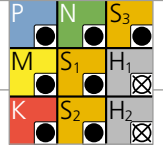


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm	
					$v_c$	$f_z$
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010	130	0.008
		1.0401	C15	AISI 1015		
		1.1191	C45E/CK45	AISI 1045		
		1.0044	S275JR	AISI 1020		
		1.0715	11SMn30	AISI 1215		
	Low alloyed steel Rm > 900 N/mm <sup>2</sup>	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130	0.007
		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 <sup>2</sup>	1.2379	X153CrMoV12	AISI D2	130	0.006
		1.2436	X210CrW12	AISI D4/D6		
		1.3343	HS6-5-2C	AISI M2 / UNS T11302		
		1.3355	HS18-0-1	AISI T1 / UNS T12001		
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130	0.008
		1.4105	X6CrMoS17	AISI 430F		
		1.4034	X46Cr13	AISI 420C		
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	130	0.008
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH		
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	130	0.008
		1.4301	X5CrNi18-10	AISI 304		
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	130	0.006
		1.4441	X2CrNiMo18-15-3	AISI 316LM		
1.4539		X1NiCrMoCu25-20-5	AISI 904L			
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	111	0.006
		0.6030	GG30	ASTM 40B		
		0.7040	GGG40	ASTM 60-40-18		
		0.7060	GGG60	ASTM 80-60-03		
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130	0.009
		3.4365	AlZnMgCu1.5	ASTM 7075		
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130	0.009
		3.2381	GD-AlSi10Mg	UNS A03590		
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	130	0.010
		2.0065	Cu-ETP / CW004A	UNS C11000		
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130	0.010
		2.0360	CuZn40 CW509L	UNS C28000		
	Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130	0.010
		2.1020	CuSn6	UNS C51900		
Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000	130	0.009	
	2.0960	CuAl9Mn2	UNS C63200			
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	110	0.004
		2.4668		Inconel 718		
		2.4617	NiMo28	Hastelloy B-2		
		2.4665	NiCr22Fe18Mo	Hastelloy X		
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	110	0.008
		3.7065	Gr.4	ASTM B348 / F68		
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	110	0.008
		9.9367	TiAl6Nb7	ASTM F1295		
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	130	0.004
			CrCoMo28	ASTM F1537		
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1		
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2		

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 2.0 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	180	0.012	200	0.017	210	0.023	220	0.025	220	0.028	220	0.033
	180	0.011	200	0.016	210	0.022	220	0.024	220	0.026	220	0.029
	180	0.010	200	0.015	210	0.020	220	0.021	220	0.023	220	0.025
	180	0.012	200	0.017	210	0.022	220	0.024	220	0.026	220	0.029
	180	0.011	200	0.016	210	0.022	220	0.023	220	0.025	220	0.028
	180	0.011	200	0.016	210	0.022	220	0.023	220	0.025	220	0.028
	180	0.008	200	0.015	210	0.020	220	0.022	220	0.024	220	0.026
	126	0.012	145	0.014	157	0.022	169	0.025	169	0.029	169	0.031
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	200	0.018	210	0.029	220	0.030	220	0.033	220	0.036
	120	0.005	130	0.005	130	0.008	140	0.010	140	0.011	150	0.012
	120	0.010	130	0.014	130	0.020	140	0.022	140	0.024	150	0.026
	120	0.010	130	0.014	130	0.020	140	0.022	140	0.024	150	0.026
	162	0.005	182	0.005	192	0.008	203	0.010	203	0.011	203	0.012

**NEW**

## Process CrazyMill Cool P&S

### 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  $\leq 0.05$  mm.

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

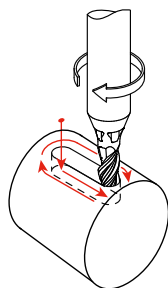
Revolution	[rpm]	$\leq 10'000$	$> 10'000$
Minimal pressure	[bar]	15	30
	[psi]	218	435

#### Tool holders

For optimal use of the tool, Mikron Tool recommends a shrink fit collet as per DIN 69871 or as an alternative a hydraulic tool holder. For additional information regarding tool holding refer to "Technical Information" in our main catalogue.

#### Milling process

##### A. Milling of keyways



Mikron Tool recommends a machining process in 3 steps to guarantee the tolerance of the slot:

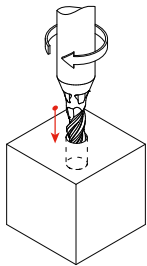
- 1. Plunge milling or plunging with a linear ramp
- 2. Slot milling
- 3. Side milling (finishing milling)

Mikron Tool generally recommends the time and space saving plunge milling (vertical). As an alternative, plunging with a linear ramp is also possible.

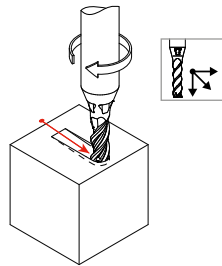


## MILLING PROCESS

### 1. Plunge milling or Linear ramp

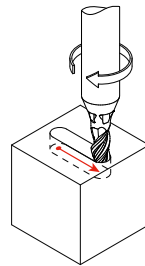


When plunge milling, an increase of the drilling diameter of approx. 0.05 mm respect to the tool diameter needs to be applied. The maximum milling depth is  $2.5 \times d_1$  ( $a_{p,max} = 1 \times d_1$ ). For data regarding feed  $f_{z,p}$  refer to cutting data for plunge milling (page 16).



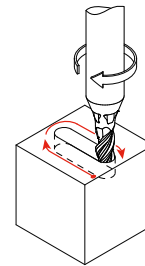
The maximum plunge angle  $\alpha$  depends on the material and cannot be overcut (see table below). For data regarding feed  $f_{z,s}$  refer to cutting data for keyway milling (page 16).

### 2. Slot milling



Attention: a finishing operation is provided after slot milling. For data regarding feed  $f_{z,s}$  refer to cutting data for slot milling (page 16). For the corresponding selection of tool (diameter) refer to the table "Tool selection" (page 28).

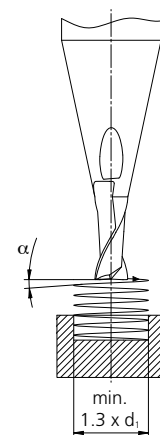
### 3. Side milling



A finishing operation is necessary to reach the required tolerance and highest squareness.

### Maximum plunge angles in linear ramp or helical interpolation

	Material	$\alpha$ - Linear ramp	$\alpha$ - 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, Rm < 400 N/mm <sup>2</sup>	45°	47°
	Bronze Rm < 600 N/mm <sup>2</sup>	45°	47°
	S <sub>1</sub>	Super alloys	14°
S <sub>2</sub>	Titanium pure and titanium alloys	14°	15°
S <sub>3</sub>	CrCo alloys	27°	28°

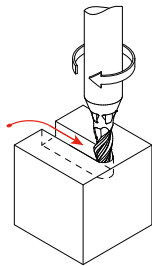


**NEW**

# Process CrazyMill Cool P&S

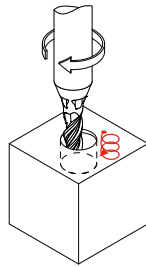
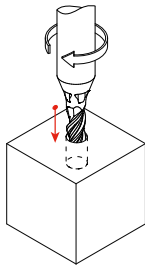
## MILLING PROCESS

### B. Milling of through slots



When milling through slots, the maximum cutting parameters can be applied. Refer to the cutting data page 18.

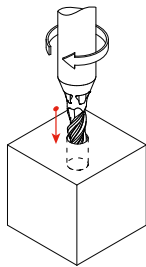
### C. Plunge milling



With CrazyMill Cool P&S, plunge milling (drilling) can be executed in two versions:

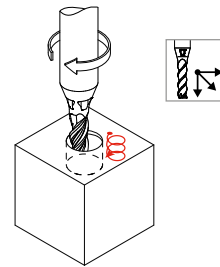
- 1. Direct plunge milling
- 2. Plunging with helical interpolation

#### 1. Direct plunge milling



When plunge milling, an increase of the drilling diameter of approx. 0.05 mm respect to the tool diameter needs to be applied. The maximum milling depth is  $2.5 \times d_1$  ( $a_{p,max} = 1 \times d_1$ ). For data regarding feed  $f_{z,p}$  refer to cutting data for plunge milling (page 16).

#### 2. Plunging with helical interpolation

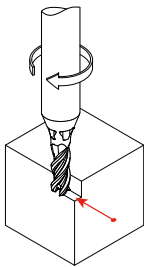


The maximum plunge angle  $\alpha$  depends on the material and cannot be overcut (see table page 25). For data regarding feed  $f_{z,s}$  refer to cutting data for keyway milling (page 16). Attention: the minimum diameter of the hole is  $d_{hole} = 1.3 \times d_{tool}$

## MILLING PROCESS

### D. Side milling

#### Semi-finishing



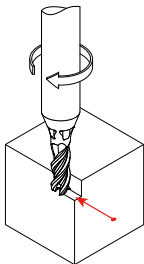
Recommended cutting parameters:

$v_c$  and  $f_z$  = as specified in the cutting data table

$a_p$  = max.  $1 \times d$

$a_e$  =  $0.2 \times d$

#### Finishing



Recommended cutting parameters:

$v_c$  and  $f_z$  = as specified in the cutting data table

$a_p$  =  $2.5 \times d$

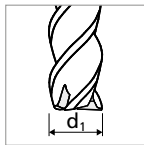
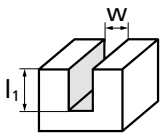
$a_e$  =  $0.05 - 0.1 \times d$  depending on required surface quality

**NEW**

# Process CrazyMill Cool P&S

## THE RIGHT TOOL FOR KEYWAY SLOTTING

### Tool selection



w slot [mm]	d <sub>1</sub> tool [mm]	l <sub>1, max</sub> [mm]	Item number
1.1	1.0	2.50	2.CMC42.A8Z3.100.1
	1.0	2.50	2.CMC42.A8Z3.100.1
1.2	1.1	2.75	2.CMC42.A8Z3.110.1
	1.1	2.75	2.CMC42.A8Z3.110.1
1.3	1.2	3.00	2.CMC42.A8Z3.120.1
	1.2	3.00	2.CMC42.A8Z3.120.1
1.4	1.3	3.25	2.CMC42.A8Z3.130.1
	1.3	3.25	2.CMC42.A8Z3.130.1
1.5	1.4	3.50	2.CMC42.A8Z3.140.1
	1.4	3.50	2.CMC42.A8Z3.140.1
1.6	1.5	3.75	2.CMC42.A8Z3.150.1
	1.5	3.75	2.CMC42.A8Z3.150.1
1.7	1.6	4.00	2.CMC42.A8Z3.160.1
	1.6	4.00	2.CMC42.A8Z3.160.1
1.8	1.7	4.25	2.CMC42.A8Z3.170.1
	1.7	4.25	2.CMC42.A8Z3.170.1
1.9	1.8	4.50	2.CMC42.A8Z3.180.1
	1.8	4.50	2.CMC42.A8Z3.180.1
2.0	1.9	4.75	2.CMC42.A8Z3.190.1
	1.9	4.75	2.CMC42.A8Z3.190.1
2.1	2.0	5.00	2.CMC42.A8Z3.200.1
	2.0	5.00	2.CMC42.A8Z3.200.1
2.2	2.1	5.25	2.CMC42.A8Z3.210.1
	2.1	5.25	2.CMC42.A8Z3.210.1
2.3	2.2	5.50	2.CMC42.A8Z3.220.1
	2.2	5.50	2.CMC42.A8Z3.220.1
2.4	2.3	5.75	2.CMC42.A8Z3.230.1
	2.3	5.75	2.CMC42.A8Z3.230.1
2.5	2.4	6.00	2.CMC42.A8Z3.240.1
	2.4	6.00	2.CMC42.A8Z3.240.1
2.6	2.5	6.25	2.CMC42.A8Z3.250.1
	2.5	6.25	2.CMC42.A8Z3.250.1
2.7	2.6	6.50	2.CMC42.A8Z3.260.1
	2.6	6.50	2.CMC42.A8Z3.260.1

w slot [mm]	d <sub>1</sub> tool [mm]	l <sub>1, max</sub> [mm]	Item number
2.9	2.5	6.25	2.CMC42.A8Z3.250.1
	2.6	6.50	2.CMC42.A8Z3.260.1
	2.7	6.75	2.CMC42.A8Z3.270.1
3.0	2.6	6.50	2.CMC42.A8Z3.260.1
	2.7	6.75	2.CMC42.A8Z3.270.1
	2.8	7.00	2.CMC42.A8Z3.280.1
3.1	2.6	6.50	2.CMC42.A8Z3.260.1
	2.7	6.75	2.CMC42.A8Z3.270.1
	2.8	7.00	2.CMC42.A8Z3.280.1
	2.9	7.25	2.CMC42.A8Z3.290.1
3.2	2.7	6.75	2.CMC42.A8Z3.270.1
	2.8	7.00	2.CMC42.A8Z3.280.1
	2.9	7.25	2.CMC42.A8Z3.290.1
	3.0	7.50	2.CMC42.A8Z3.300.1
3.3	2.8	7.00	2.CMC42.A8Z3.280.1
	2.9	7.25	2.CMC42.A8Z3.290.1
	3.0	7.50	2.CMC42.A8Z3.300.1
	3.1	7.75	2.CMC42.A8Z3.310.1
3.4	2.9	7.25	2.CMC42.A8Z3.290.1
	3.0	7.50	2.CMC42.A8Z3.300.1
	3.1	7.75	2.CMC42.A8Z3.310.1
3.5	3.0	7.50	2.CMC42.A8Z3.300.1
	3.1	7.75	2.CMC42.A8Z3.310.1
	3.3	8.25	2.CMC42.A8Z3.330.1
3.6	3.0	7.50	2.CMC42.A8Z3.300.1
	3.1	7.75	2.CMC42.A8Z3.310.1
	3.3	8.25	2.CMC42.A8Z3.330.1
3.7	3.1	7.75	2.CMC42.A8Z3.310.1
	3.3	8.25	2.CMC42.A8Z3.330.1
3.8	3.3	8.25	2.CMC42.A8Z3.330.1
3.9	3.3	8.25	2.CMC42.A8Z3.330.1
	3.7	9.25	2.CMC42.A8Z3.370.1
4.0	3.7	9.25	2.CMC42.A8Z3.370.1
4.1	3.7	9.25	2.CMC42.A8Z3.370.1
4.2	3.7	9.25	2.CMC42.A8Z3.370.1
	4.0	10.00	2.CMC42.A8Z3.400.1
4.3	3.7	9.25	2.CMC42.A8Z3.370.1
	4.0	10.00	2.CMC42.A8Z3.400.1
4.4	3.7	9.25	2.CMC42.A8Z3.370.1
	4.0	10.00	2.CMC42.A8Z3.400.1



w slot [mm]	d <sub>1</sub> tool [mm]	l <sub>1,max</sub> [mm]	Item number
4.5	4.0	10.00	2.CMC42.A8Z3.400.1
	4.3	10.75	2.CMC42.A8Z3.430.1
4.6	4.0	10.00	2.CMC42.A8Z3.400.1
	4.3	10.75	2.CMC42.A8Z3.430.1
4.7	4.0	10.00	2.CMC42.A8Z3.400.1
	4.3	10.75	2.CMC42.A8Z3.430.1
4.8	4.0	10.00	2.CMC42.A8Z3.400.1
	4.3	10.75	2.CMC42.A8Z3.430.1
4.9	4.3	10.75	2.CMC42.A8Z3.430.1
	4.7	11.75	2.CMC42.A8Z3.470.1
5.0	4.3	10.75	2.CMC42.A8Z3.430.1
	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
5.1	4.3	10.75	2.CMC42.A8Z3.430.1
	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
5.2	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
	5.0	12.50	2.CMC42.A8Z3.500.1
5.3	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
	5.0	12.50	2.CMC42.A8Z3.500.1
5.4	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
	5.0	12.50	2.CMC42.A8Z3.500.1
5.5	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1
	5.0	12.50	2.CMC42.A8Z3.500.1
5.6	5.3	13.25	2.CMC42.A8Z3.530.1
	4.7	11.75	2.CMC42.A8Z3.470.1
	4.8	12.00	2.CMC42.A8Z3.480.1

w slot [mm]	d <sub>1</sub> tool [mm]	l <sub>1,max</sub> [mm]	Item number
5.7	4.8	12.00	2.CMC42.A8Z3.480.1
	5.0	12.50	2.CMC42.A8Z3.500.1
5.8	5.3	13.25	2.CMC42.A8Z3.530.1
	5.0	12.50	2.CMC42.A8Z3.500.1
	5.3	13.25	2.CMC42.A8Z3.530.1
5.9	5.0	12.50	2.CMC42.A8Z3.500.1
	5.3	13.25	2.CMC42.A8Z3.530.1
	5.7	14.25	2.CMC42.A8Z3.570.1
6.0	5.0	12.50	2.CMC42.A8Z3.500.1
	5.3	13.25	2.CMC42.A8Z3.530.1
	5.7	14.25	2.CMC42.A8Z3.570.1
6.1	5.3	13.25	2.CMC42.A8Z3.530.1
	5.7	14.25	2.CMC42.A8Z3.570.1
6.2	5.3	13.25	2.CMC42.A8Z3.530.1
	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.3	5.3	13.25	2.CMC42.A8Z3.530.1
	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.4	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.5	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.6	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.7	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.8	5.7	14.25	2.CMC42.A8Z3.570.1
	6.0	15.00	2.CMC42.A8Z3.600.1
6.9	6.0	15.00	2.CMC42.A8Z3.600.1
7.0	6.0	15.00	2.CMC42.A8Z3.600.1
7.1	6.0	15.00	2.CMC42.A8Z3.600.1
7.2	6.0	15.00	2.CMC42.A8Z3.600.1

**Example:**

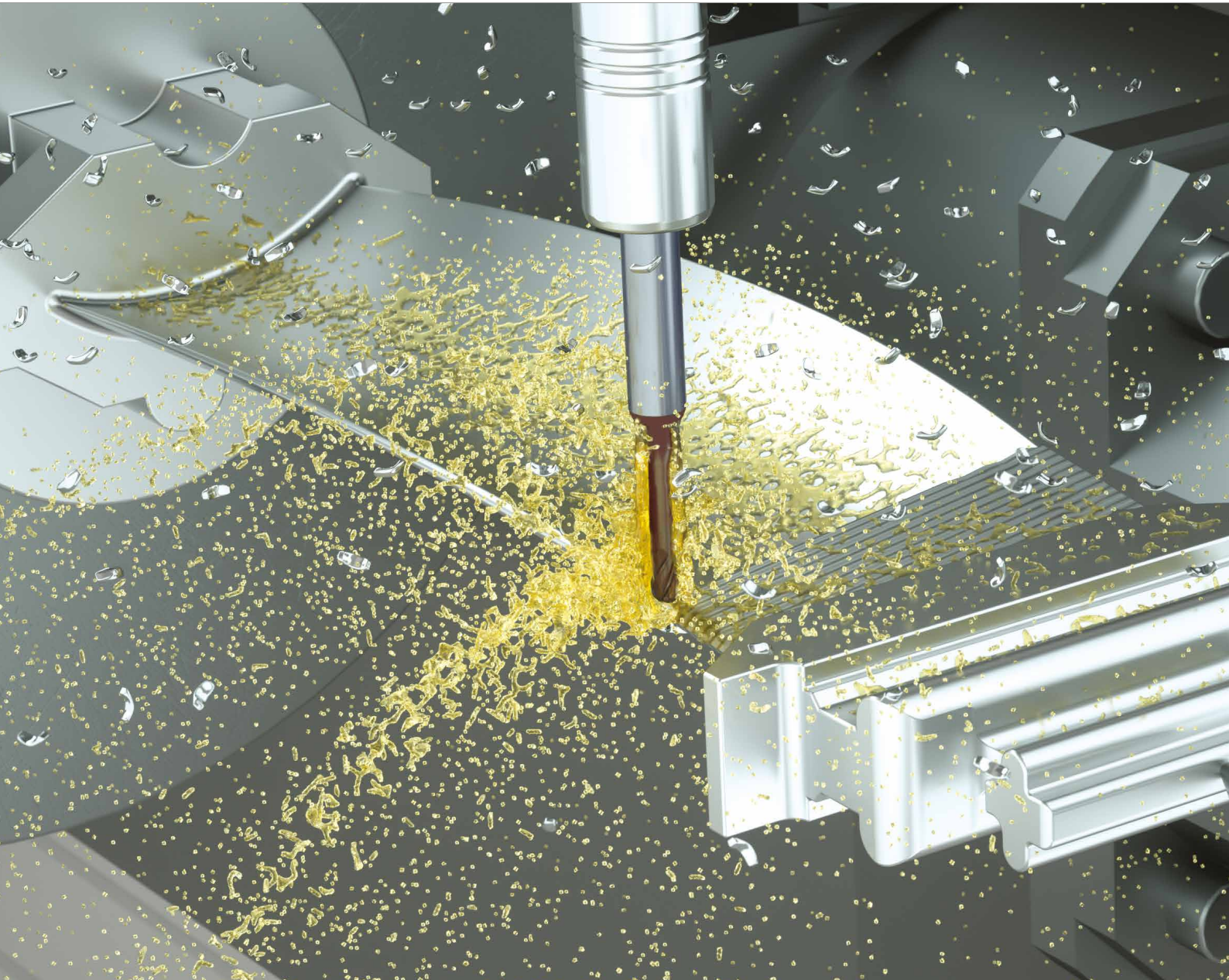
Milling of keyway slot 3x1.8 mm DIN 6885

Width of keyway: **w** = 3 mm; Depth of keyway: **l<sub>1</sub>** = 1.8 mm;

Mikron Tool recommends the following diameters: **d<sub>1</sub>** = 2.6 mm or **d<sub>1</sub>** = 2.7 mm or **d<sub>1</sub>** = 2.8 mm

**PATENTED**

## CrazyMill Cool Ball - Z4



NEW 

**CRAZYMILL™**  
by Mikron Tool  
Cool

## HSPC MILLING TOOL FOR DIFFICULT TO MACHINE MATERIALS



**What's new:** CrazyMill Cool Ball with four teeth is an innovative end mill, developed by Mikron Tool, for the finishing operations on stainless steels, titanium alloys, CrCo and super alloys. In the shank integrated coolant ducts guarantee a constant and massive cooling of the cutting edges. This technology allows to reach highest cutting speeds and provides high chip removal rates.

**The features:** The new edge geometry is specially designed to reduce vibrations and process time and also improve surface quality during the milling operation.

With progressive flutes in the versions M (3.5 x d) and N (4.5 x d) these characteristics are once more significantly increased. The cutting length of these two variants is extended in order to allow machining on the radius as well as the cylindrical section of the tool. The outcome is a very versatile milling cutter.

The new high performance coating, which is specially suitable for finishing operations, improves tool life and milling performance.

The end mill sets new benchmarks compared to conventional milling tools regarding side and copy milling with its high cutting speed and cutting depth  $a_p$ , increased tool life and improved surface quality.

Diameter range: 1 mm to 8 mm

Milling depth: Type A – 2 x d; Type B – 3 x d; Type C – 5 x d; Type M – 3.5 x d; Type N – 4.5 x d

Coating: eXedur SNP

Number of Teeth: 4

**NEW**

## Maximum performance and surface quality

### BALL ENDMILL WITH INTEGRATED COOLING FOR FINISHING OPERATIONS

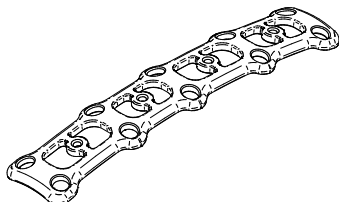
With CrazyMill Cool Ball – Z4, Mikron Tool expands the range of milling cutters for difficult-to-machine materials. Five versions of Full Radius Mills with four teeth and shank integrated cooling are available in the diameter range of 1 mm to 8 mm and a maximal milling depth of 5 x d.

- CrazyMill Cool Ball, Type A – milling depth 2 x d, cutting length 2 x d, through shank coolant, Z = 4
- CrazyMill Cool Ball, Type B – milling depth 3 x d, cutting length 2 x d, through shank coolant, Z = 4
- CrazyMill Cool Ball, Type C – milling depth 5 x d, cutting length 2 x d, through shank coolant, Z = 4
- CrazyMill Cool Ball, Type M – milling depth 3.5 x d, cutting length 3.5 x d, through shank coolant, Z = 4
- CrazyMill Cool Ball, Type N – milling depth 4.5 x d, cutting length 4.5 x d, through shank coolant, Z = 4





**NEW**



**COMPONENT**

Bone implant

**MATERIAL**

TiAl6V4 / 3.7165 / B348 (Grade 5)







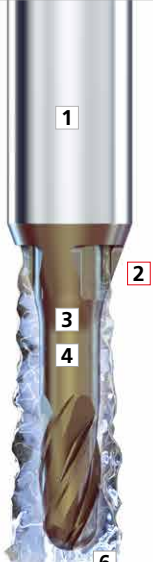



**MACHINING**

- ① Roughing
- ② Semi-finishing and finishing
- d = 6 mm

**MILLING TOOL**

Mikron Tool - CrazyMill Cool Ball - Type C

DATA	MIKRON TOOL
<b>Tool type</b>	① CrazyMill Cool Ball - Z2 ② CrazyMill Cool Ball - Z4 - Carbide - Coated - Integrated cooling
<b>Item number</b>	① 2.CMC30.C5Z2.600.1 ② 2.CMC30.C5Z4.600.1
<b>Cutting data</b>	① Roughing $v_c = 170 \text{ m/min}$ $f_z = 0.042 \text{ mm}$ $a_{p, \text{max}} = 1 \times d$ $a_w = 1 \text{ mm}$ $Z = 2$  ② Semi-finishing $v_c = 170 \text{ m/min}$ $f_z = 0.036 \text{ mm}$ $a_{p, \text{max}} = 0.5 \times d$ $a_w = 1 \text{ mm}$ $Z = 4$  Finishing $v_c = 170 \text{ m/min}$ $f_z = 0.039 \text{ mm}$ $a_{p, \text{max}} = 0.1 \times d$ $a_w = 0.3 \text{ mm}$ $Z = 4$

PATENTED	2 x d	3 x d	5 x d	3.5 x d	4.5 x d
	Type A	Type B	Type C	Type M	Type N
	<ul style="list-style-type: none"> <li>■ Coated</li> <li>■ Integ. cooling</li> <li>■ l<sub>1</sub>: 2xd, l<sub>2</sub>: 2xd</li> </ul>	<ul style="list-style-type: none"> <li>■ Coated</li> <li>■ Integ. cooling</li> <li>■ l<sub>1</sub>: 3xd, l<sub>2</sub>: 2xd</li> </ul>	<ul style="list-style-type: none"> <li>■ Coated</li> <li>■ Integ. cooling</li> <li>■ l<sub>1</sub>: 5xd, l<sub>2</sub>: 2xd</li> </ul>	<ul style="list-style-type: none"> <li>■ Coated</li> <li>■ Integ. cooling</li> <li>■ l<sub>1</sub>: 3.5xd, l<sub>2</sub>: 3.5xd</li> </ul>	<ul style="list-style-type: none"> <li>■ Coated</li> <li>■ Integ. cooling</li> <li>■ l<sub>1</sub>: 4.5xd, l<sub>2</sub>: 4.5xd</li> </ul>
					
					
	CrazyMill Cool Ball Type A	CrazyMill Cool Ball Type B	CrazyMill Cool Ball Type C	CrazyMill Cool Ball Type M	CrazyMill Cool Ball Type N

l<sub>1</sub> = Effective length  
 l<sub>2</sub> = Cutting length

NEW

### 1 | SHANK

The robust solid carbide shank guarantees stable and vibration less 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 results are 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 SNP coating is heat-resistant and wear-resistant, prevents build up edges and guarantees optimum chip flushing. The result is long tool life.

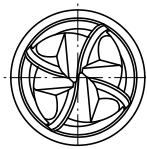
### 5 | PROGRESSIVE FLUTE

The new technology with progressive flute allows to machining with a soft cutting and without vibrations. The result is a maximal surface quality.

### 6 | CUTTING GEOMETRY ON RADIUS

Developed for difficult-to-machine materials such as stainless steels, titanium and super alloys. Allows finishing with high surface quality due to vibration less machining.

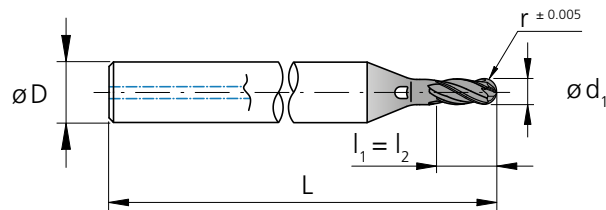
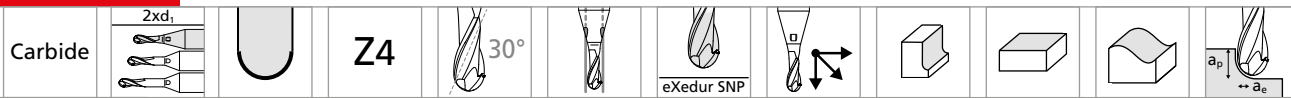
Mill tip



4 - Teeth

**NEW**

## Type A - 2 x d - Ball mill - Z4

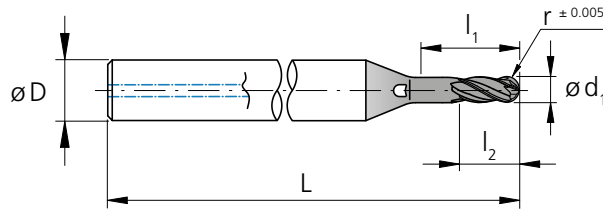


$l_1$  = Effective length  
 $l_2$  = Cutting length

from stock	Item number	$d_1$ -/+0.01 [mm]	$r$ [mm]	$l_1$ [mm]	$l_2$ [mm]	$D$ (h6) [mm]	$L$ [mm]	$Z$ [teeth]
■	2.CMC30.A5Z4.100.1	1.0	0.50	2.0	2.0	4	40	4
■	2.CMC30.A5Z4.120.1	1.2	0.60	2.4	2.4	4	40	4
■	2.CMC30.A5Z4.150.1	1.5	0.75	3.0	3.0	4	40	4
■	2.CMC30.A5Z4.180.1	1.8	0.90	3.6	3.6	4	40	4
■	2.CMC30.A5Z4.200.1	2.0	1.00	4.0	4.0	4	40	4
■	2.CMC30.A5Z4.250.1	2.5	1.25	5.0	5.0	6	50	4
■	2.CMC30.A5Z4.300.1	3.0	1.50	6.0	6.0	6	50	4
■	2.CMC30.A5Z4.400.1	4.0	2.00	8.0	8.0	6	50	4
■	2.CMC30.A5Z4.500.1	5.0	2.50	10.0	10.0	8	60	4
■	2.CMC30.A5Z4.600.1	6.0	3.00	12.0	12.0	10	60	4
■	2.CMC30.A5Z4.800.1	8.0	4.00	16.0	16.0	12	70	4

**Regrinding:** This product is not suitable for regrinding.

# Type B - 3 x d - Ball mill - Z4



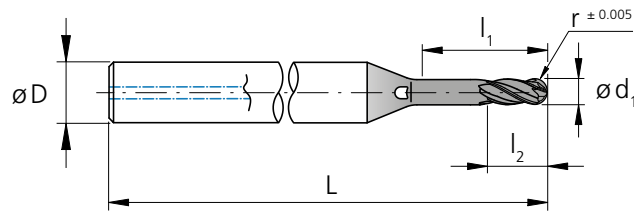
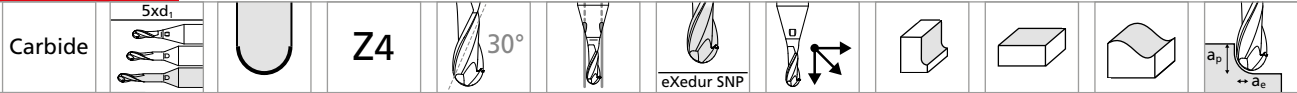
$l_1$  = Effective length  
 $l_2$  = Cutting length

from stock	Item number	$d_1$ -/+0.01 [mm]	$r$ [mm]	$l_1$ [mm]	$l_2$ [mm]	$D$ (h6) [mm]	$L$ [mm]	$Z$ [teeth]
■	2.CMC30.B5Z4.100.1	1.0	0.50	3.0	2.0	4	40	4
■	2.CMC30.B5Z4.120.1	1.2	0.60	3.6	2.4	4	40	4
■	2.CMC30.B5Z4.150.1	1.5	0.75	4.5	3.0	4	40	4
■	2.CMC30.B5Z4.180.1	1.8	0.90	5.4	3.6	4	40	4
■	2.CMC30.B5Z4.200.1	2.0	1.00	6.0	4.0	4	40	4
■	2.CMC30.B5Z4.250.1	2.5	1.25	7.5	5.0	6	50	4
■	2.CMC30.B5Z4.300.1	3.0	1.50	9.0	6.0	6	50	4
■	2.CMC30.B5Z4.400.1	4.0	2.00	12.0	8.0	6	55	4
■	2.CMC30.B5Z4.500.1	5.0	2.50	15.0	10.0	8	65	4
■	2.CMC30.B5Z4.600.1	6.0	3.00	18.0	12.0	10	65	4
■	2.CMC30.B5Z4.800.1	8.0	4.00	24.0	16.0	12	80	4

**Regrinding:** This product is not suitable for regrinding.

**NEW**

## Type C - 5 x d - Ball mill - Z4

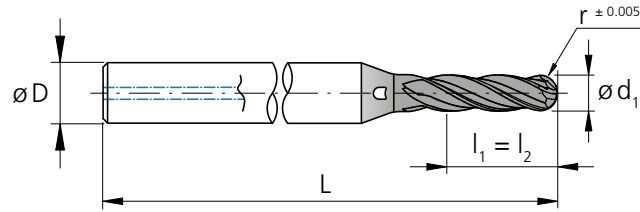
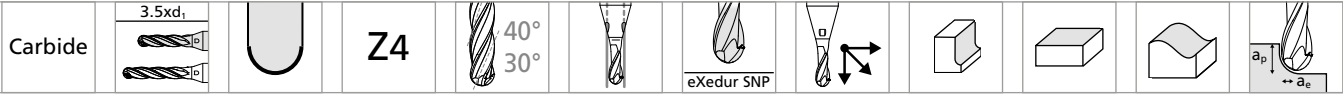


$l_1$  = Effective length  
 $l_2$  = Cutting length

from stock	Item number	$d_1$ -/+0.01 [mm]	$r$ [mm]	$l_1$ [mm]	$l_2$ [mm]	$D$ (h6) [mm]	$L$ [mm]	$Z$ [teeth]
■	2.CMC30.C5Z4.100.1	1.0	0.50	5.0	2.0	4	40	4
■	2.CMC30.C5Z4.120.1	1.2	0.60	6.0	2.4	4	40	4
■	2.CMC30.C5Z4.150.1	1.5	0.75	7.5	3.0	4	40	4
■	2.CMC30.C5Z4.180.1	1.8	0.90	9.0	3.6	4	45	4
■	2.CMC30.C5Z4.200.1	2.0	1.00	10.0	4.0	4	44	4
■	2.CMC30.C5Z4.250.1	2.5	1.25	12.5	5.0	6	55	4
■	2.CMC30.C5Z4.300.1	3.0	1.50	15.0	6.0	6	55	4
■	2.CMC30.C5Z4.400.1	4.0	2.00	20.0	8.0	6	60	4
■	2.CMC30.C5Z4.500.1	5.0	2.50	25.0	10.0	8	70	4
■	2.CMC30.C5Z4.600.1	6.0	3.00	30.0	12.0	10	70	4
■	2.CMC30.C5Z4.800.1	8.0	4.00	40.0	16.0	12	90	4

**Regrinding:** This product is not suitable for regrinding.

# Type M - 3.5 x d - Ball mill - Z4



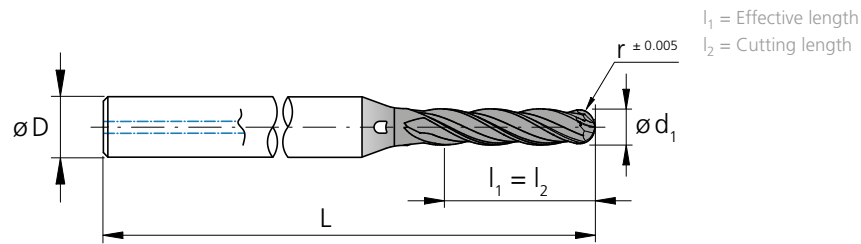
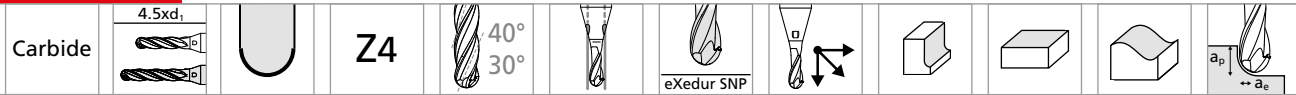
$l_1$  = Effective length  
 $l_2$  = Cutting length

from stock	Item number	$d_1$ -/+0.01 [mm]	$r$ [mm]	$l_1$ [mm]	$l_2$ [mm]	$D$ (h6) [mm]	$L$ [mm]	$Z$ [teeth]
■	2.CMC30.M5Z4.100.1	1.0	0.50	3.5	3.5	4	40	4
■	2.CMC30.M5Z4.120.1	1.2	0.60	4.2	4.2	4	40	4
■	2.CMC30.M5Z4.150.1	1.5	0.75	5.3	5.3	4	40	4
■	2.CMC30.M5Z4.180.1	1.8	0.90	6.3	6.3	4	40	4
■	2.CMC30.M5Z4.200.1	2.0	1.00	7.0	7.0	4	40	4
■	2.CMC30.M5Z4.250.1	2.5	1.25	8.8	8.8	6	50	4
■	2.CMC30.M5Z4.300.1	3.0	1.50	10.5	10.5	6	50	4
■	2.CMC30.M5Z4.400.1	4.0	2.00	14.0	14.0	6	55	4
■	2.CMC30.M5Z4.500.1	5.0	2.50	17.5	17.5	8	65	4
■	2.CMC30.M5Z4.600.1	6.0	3.00	21.0	21.0	10	65	4
■	2.CMC30.M5Z4.800.1	8.0	4.00	28.0	28.0	12	80	4

**Regrinding:** This product is not suitable for regrinding.

**NEW**

## Type N - 4.5 x d - Ball mill - Z4



from stock	Item number	$d_1$ -/+0.01 [mm]	$r$ [mm]	$l_1$ [mm]	$l_2$ [mm]	$D$ (h6) [mm]	$L$ [mm]	$Z$ [teeth]
■	2.CMC30.N5Z4.100.1	1.0	0.50	4.5	4.5	4	40	4
■	2.CMC30.N5Z4.120.1	1.2	0.60	5.4	5.4	4	40	4
■	2.CMC30.N5Z4.150.1	1.5	0.75	6.8	6.8	4	40	4
■	2.CMC30.N5Z4.180.1	1.8	0.90	8.1	8.1	4	45	4
■	2.CMC30.N5Z4.200.1	2.0	1.00	9.0	9.0	4	44	4
■	2.CMC30.N5Z4.250.1	2.5	1.25	11.3	11.3	6	55	4
■	2.CMC30.N5Z4.300.1	3.0	1.50	13.5	13.5	6	55	4
■	2.CMC30.N5Z4.400.1	4.0	2.00	18.0	18.0	6	60	4
■	2.CMC30.N5Z4.500.1	5.0	2.50	22.5	22.5	8	70	4
■	2.CMC30.N5Z4.600.1	6.0	3.00	27.0	27.0	10	70	4
■	2.CMC30.N5Z4.800.1	8.0	4.00	36.0	36.0	12	90	4

**Regrinding:** This product is not suitable for regrinding.





**NEW**

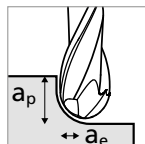
# Type A - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.013	140	0.014
		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/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012	140	0.014
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.009	140	0.011
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	HS6-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.014	140	0.015
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C				
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	140	0.013	140	0.014
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	140	0.013	140	0.014
		1.4301	X5CrNi18-10	AISI 304				
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	140	0.010	140	0.012
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.009	120	0.019
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.015	140	0.017
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	140	0.015	140	0.017
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.017	140	0.019
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017	140	0.019
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017	140	0.019
		2.1020	CuSn6	UNS C51900				
Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	140	0.017	
	2.0960	CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.006	120	0.007
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014	120	0.015
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014	120	0.015
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006	140	0.007
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.009	100	0.010
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

**Possibility 1**

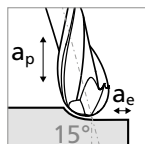
Inclination 0°



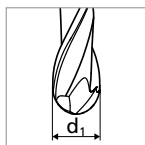
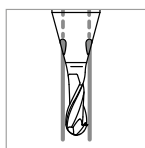
- a<sub>p</sub> = 1 x d<sub>1</sub>
- a<sub>e</sub> = 0.2 x d<sub>1</sub>

**Possibility 2**

Inclination 15°



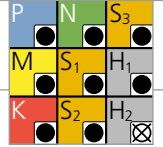
- a<sub>p</sub> = 0.5 x d<sub>1</sub>
- a<sub>e</sub> = 0.2 x d<sub>1</sub>



$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



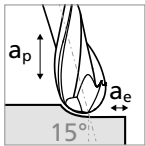
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.038	260	0.040	260	0.040	260	0.043
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.037	260	0.038	260	0.038	260	0.041
	200	0.017	200	0.019	220	0.026	220	0.027	240	0.034	260	0.035	260	0.035	260	0.037
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.037	260	0.038	260	0.038	260	0.041
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.014	200	0.015	220	0.026	220	0.027	240	0.034	260	0.035	260	0.035	260	0.037
	140	0.020	140	0.022	160	0.024	160	0.031	180	0.035	200	0.044	200	0.044	200	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	130	0.008	130	0.009	140	0.009	140	0.010	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.034	170	0.035	170	0.035	170	0.037
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.034	170	0.035	170	0.035	170	0.037
	180	0.008	180	0.009	200	0.009	200	0.010	220	0.012	240	0.016	240	0.016	240	0.017
	140	0.012	140	0.015	180	0.017	180	0.022	200	0.028	240	0.032	240	0.032	240	0.034

**NEW**

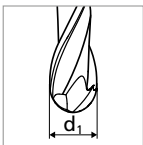
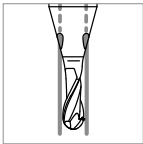
# Type A - Finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 15°



- $a_p = 0.1 \times d_1$
- $a_e = 0.05 - 0.1 \times d_1$
- $n_{max} = 60'000 \text{ rpm}$

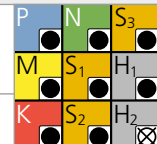


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
P	Unalloyed carbon steel $R_m < 800 \text{ N/mm}^2$	1.0301	C10	AISI 1010	140	0.015	140	0.017
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel $R_m > 900 \text{ N/mm}^2$	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.014	140	0.016
		1.7131	16MnCr5	AISI 5115				
		1.3505	100Cr6	AISI 52100				
		1.7225	42CrMo4	AISI 4140				
		1.2842	90MnCrV8	AISI O2				
	High alloyed tool steel $R_m < 1200 \text{ N/mm}^2$	1.2379	X153CrMoV12	AISI D2	140	0.011	140	0.013
		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	0.016	140	0.018
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.015	140	0.017
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic - PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.015	140	0.017
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.012	140	0.014
		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	0.011	120	0.022
		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	140	0.018	140	0.020
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.018	140	0.020
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.020	140	0.022
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.020	140	0.022
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze $R_m < 400 \text{ N/mm}^2$	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.020	140	0.022
		2.1020	CuSn6	UNS C51900				
Bronze $R_m < 600 \text{ N/mm}^2$	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.018	140	0.020	
	2.0960	CuAl9Mn2	UNS C63200					
S <sub>1</sub>	Super alloys	2.4856		Inconel 625	120	0.007	120	0.008
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
S <sub>2</sub>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.016	120	0.018
		3.7065	Gr.4	ASTM B348 / F68				
S <sub>2</sub>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.016	120	0.018
		9.9367	TiAl6Nb7	ASTM F1295				
S <sub>3</sub>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.007	140	0.008
			CrCoMo28	ASTM F1537				
H <sub>1</sub>	Hardened steel $< 55 \text{ HRC}$	1.2510	100MnCrMoW4	AISI O1	100	0.010	100	0.012
H <sub>2</sub>	Hardened steel $\geq 55 \text{ HRC}$	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.042	260	0.044	260	0.044	260	0.047
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.040	260	0.042	260	0.042	260	0.045
	200	0.020	200	0.022	220	0.030	220	0.032	240	0.037	260	0.039	260	0.039	260	0.041
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.040	260	0.042	260	0.042	260	0.045
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.016	200	0.018	220	0.030	220	0.032	240	0.037	260	0.039	260	0.039	260	0.041
	140	0.024	140	0.026	160	0.028	160	0.036	180	0.039	200	0.048	200	0.048	200	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	130	0.009	130	0.010	140	0.010	140	0.012	150	0.013	170	0.018	170	0.018	170	0.019
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.037	170	0.039	170	0.039	170	0.041
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.037	170	0.039	170	0.039	170	0.041
	180	0.009	180	0.010	200	0.010	200	0.012	220	0.013	240	0.018	240	0.018	240	0.019
	140	0.014	140	0.018	180	0.020	180	0.026	200	0.031	240	0.035	240	0.035	240	0.037

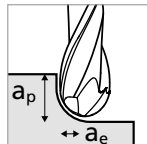
**NEW**

# Type B - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Possibility 1**

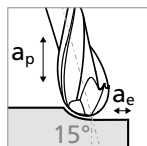
**Inclination 0°**



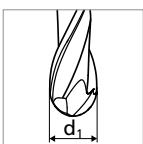
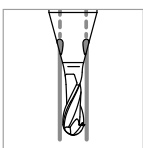
- $a_p = 1 \times d_1$
- $a_e = 0.2 \times d_1$

**Possibility 2**

**Inclination 15°**



- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

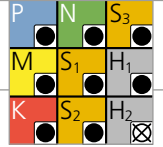


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.013	140	0.014
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012	140	0.014
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.009	140	0.011
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	HS6-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.014	140	0.015
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.013	140	0.014
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.013	140	0.014
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.010	140	0.012
		1.4435	X2CrNiMo18-14-3	AISI 316L				
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
		1.4539	X1NiCrMoCu25-20-5	AISI 904L				
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.009	120	0.019
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.015	140	0.017
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.015	140	0.017
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.017	140	0.019
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017	140	0.019
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017	140	0.019
		2.1020	CuSn6	UNS C51900				
Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	140	0.017	
	2.0960	CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.006	120	0.007
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014	120	0.015
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>3</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014	120	0.015
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006	140	0.007
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.009	100	0.010
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



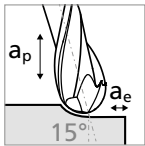
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.037	260	0.040	260	0.040	260	0.043
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.017	200	0.019	220	0.026	220	0.027	240	0.032	260	0.034	260	0.034	260	0.036
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.014	200	0.015	220	0.026	220	0.027	240	0.032	260	0.035	260	0.035	260	0.037
	140	0.020	140	0.022	160	0.024	160	0.031	180	0.034	200	0.040	200	0.042	200	0.044
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	130	0.008	130	0.009	140	0.009	140	0.010	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.032	170	0.035	170	0.035	170	0.037
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.032	170	0.035	170	0.035	170	0.037
	180	0.008	180	0.009	200	0.009	200	0.010	220	0.012	240	0.016	240	0.016	240	0.017
	140	0.012	140	0.015	180	0.017	180	0.022	200	0.026	240	0.032	240	0.032	240	0.034

**NEW**

## Type B - Finishing

### MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

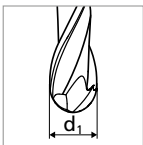
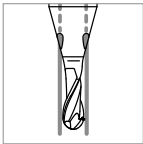
Inclination 15°



■  $a_p = 0.1 \times d_1$

■  $a_e = 0.05 - 0.1 \times d_1$

$n_{max} = 60'000 \text{ rpm}$



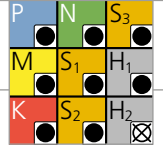
Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
P	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.015	140	0.017
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.014	140	0.016
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.011	140	0.013
		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	0.016	140	0.018
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.015	140	0.017
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic - PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.015	140	0.017
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.012	140	0.014
		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	0.011	120	0.022
		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	140	0.018	140	0.020
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.018	140	0.020
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.020	140	0.022
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.020	140	0.022
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.020	140	0.022
		2.1020	CuSn6	UNS C51900				
Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.018	140	0.020	
	2.0960	CuAl9Mn2	UNS C63200					
S <sub>1</sub>	Super alloys	2.4856		Inconel 625	120	0.007	120	0.008
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
S <sub>2</sub>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.016	120	0.018
		3.7065	Gr.4	ASTM B348 / F68				
S <sub>2</sub>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.016	120	0.018
		9.9367	TiAl6Nb7	ASTM F1295				
S <sub>3</sub>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.007	140	0.008
			CrCoMo28	ASTM F1537				
H <sub>1</sub>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.010	100	0.012
H <sub>2</sub>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				



$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.040	260	0.044	260	0.044	260	0.047
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.042	260	0.042	260	0.045
	200	0.020	200	0.022	220	0.030	220	0.032	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.039	260	0.042	260	0.042	260	0.045
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.016	200	0.018	220	0.030	220	0.032	240	0.035	260	0.039	260	0.039	260	0.041
	140	0.024	140	0.026	160	0.028	160	0.036	180	0.038	200	0.044	200	0.046	200	0.049
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	130	0.009	130	0.010	140	0.010	140	0.012	150	0.013	170	0.018	170	0.018	170	0.019
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.035	170	0.039	170	0.039	170	0.041
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.035	170	0.039	170	0.039	170	0.041
	180	0.009	180	0.010	200	0.010	200	0.012	220	0.013	240	0.018	240	0.018	240	0.019
	140	0.014	140	0.018	180	0.020	180	0.026	200	0.029	240	0.035	240	0.035	240	0.037

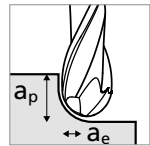
**NEW**

# Type C - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Possibility 1**

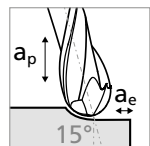
**Inclination 0°**



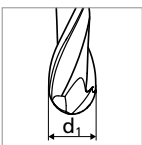
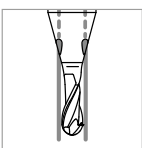
- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

**Possibility 2**

**Inclination 15°**



- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

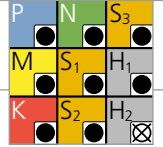


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.013	140	0.014
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012	140	0.014
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.009	140	0.011
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	HS6-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.014	140	0.015
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C				
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	140	0.013	140	0.014
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	140	0.013	140	0.014
		1.4301	X5CrNi18-10	AISI 304				
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	140	0.010	140	0.012
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.009	120	0.019
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.015	140	0.017
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.015	140	0.017
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.017	140	0.019
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017	140	0.019
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017	140	0.019
		2.1020	CuSn6	UNS C51900				
Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	140	0.017	
	2.0960	CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.006	120	0.007
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014	120	0.015
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>3</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014	120	0.015
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006	140	0.007
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.009	100	0.010
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.030	260	0.038	260	0.038	260	0.041
	200	0.017	200	0.019	220	0.026	220	0.027	240	0.028	260	0.035	260	0.034	260	0.037
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.032	260	0.038	260	0.038	260	0.041
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.029	260	0.037	260	0.037	260	0.039
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.029	260	0.037	260	0.037	260	0.039
	200	0.014	200	0.015	220	0.026	220	0.027	240	0.027	260	0.035	260	0.035	260	0.037
	140	0.020	140	0.022	160	0.024	160	0.031	180	0.034	200	0.042	200	0.042	200	0.044
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	130	0.008	130	0.009	140	0.009	140	0.010	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.027	170	0.034	170	0.035	170	0.036
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.027	170	0.034	170	0.035	170	0.036
	180	0.008	180	0.009	200	0.009	200	0.010	220	0.012	240	0.016	240	0.016	240	0.017
	140	0.012	140	0.015	180	0.017	180	0.022	200	0.024	240	0.026	240	0.032	240	0.027

**NEW**

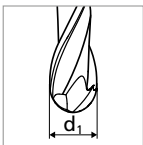
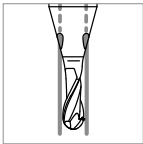
# Type C - Finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 15°



- $a_p = 0.1 \times d_1$
- $a_e = 0.05 - 0.1 \times d_1$
- $n_{max} = 60'000 \text{ rpm}$

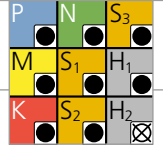


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
P	Unalloyed carbon steel $R_m < 800 \text{ N/mm}^2$	1.0301	C10	AISI 1010	140	0.015	140	0.017
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel $R_m > 900 \text{ N/mm}^2$	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.014	140	0.016
		1.7131	16MnCr5	AISI 5115				
		1.3505	100Cr6	AISI 52100				
		1.7225	42CrMo4	AISI 4140				
		1.2842	90MnCrV8	AISI O2				
	High alloyed tool steel $R_m < 1200 \text{ N/mm}^2$	1.2379	X153CrMoV12	AISI D2	140	0.011	140	0.013
		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	0.016	140	0.018
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.015	140	0.017
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic - PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.015	140	0.017
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.012	140	0.014
		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	0.011	120	0.022
		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	140	0.018	140	0.020
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	140	0.018	140	0.020
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.020	140	0.022
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.020	140	0.022
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze $R_m < 400 \text{ N/mm}^2$	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.020	140	0.022
		2.1020	CuSn6	UNS C51900				
Bronze $R_m < 600 \text{ N/mm}^2$	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.018	140	0.020	
	2.0960	CuAl9Mn2	UNS C63200					
S <sub>1</sub>	Super alloys	2.4856		Inconel 625	120	0.007	120	0.008
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
S <sub>2</sub>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.016	120	0.018
		3.7065	Gr.4	ASTM B348 / F68				
S <sub>2</sub>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.016	120	0.018
		9.9367	TiAl6Nb7	ASTM F1295				
S <sub>3</sub>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.007	140	0.008
			CrCoMo28	ASTM F1537				
H <sub>1</sub>	Hardened steel $< 55 \text{ HRC}$	1.2510	100MnCrMoW4	AISI O1	100	0.010	100	0.012
H <sub>2</sub>	Hardened steel $\geq 55 \text{ HRC}$	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.035	260	0.044	260	0.044	260	0.047
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.033	260	0.042	260	0.042	260	0.045
	200	0.020	200	0.022	220	0.030	220	0.032	240	0.031	260	0.039	260	0.037	260	0.041
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.035	260	0.042	260	0.042	260	0.045
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.016	200	0.018	220	0.030	220	0.032	240	0.030	260	0.039	260	0.039	260	0.041
	140	0.024	140	0.026	160	0.028	160	0.036	180	0.037	200	0.046	200	0.046	200	0.049
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	130	0.009	130	0.010	140	0.010	140	0.012	150	0.013	170	0.018	170	0.018	170	0.019
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.030	170	0.037	170	0.039	170	0.039
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.030	170	0.037	170	0.039	170	0.039
	180	0.009	180	0.010	200	0.010	200	0.012	220	0.013	240	0.018	240	0.018	240	0.019
	140	0.014	140	0.018	180	0.020	180	0.026	200	0.026	240	0.028	240	0.035	240	0.030

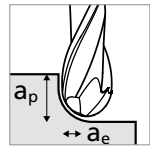
**NEW**

# Type M - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Possibility 1**

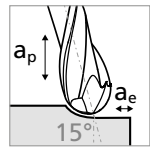
Inclination 0°



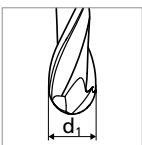
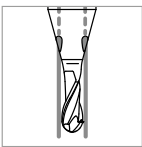
- $a_p = 1 \times d_1$
- $a_e = 0.2 \times d_1$

**Possibility 2**

Inclination 15°



- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

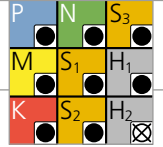


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
P	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.013	140	0.014
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012	140	0.014
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.009	140	0.011
		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	0.014	140	0.015
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C				
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	140	0.013	140	0.014
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	140	0.013	140	0.014
		1.4301	X5CrNi18-10	AISI 304				
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	140	0.010	140	0.012
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
K	Cast iron	0.6020	GG20	ASTM 30	120	0.009	120	0.019
		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	140	0.015	140	0.017
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.015	140	0.017
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.017	140	0.019
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017	140	0.019
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017	140	0.019
		2.1020	CuSn6	UNS C51900				
	Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	140	0.017
2.0960		CuAl9Mn2	UNS C63200					
S <sub>1</sub>	Super alloys	2.4856		Inconel 625	120	0.006	120	0.007
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
S <sub>2</sub>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014	120	0.015
		3.7065	Gr.4	ASTM B348 / F68				
S <sub>2</sub>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014	120	0.015
		9.9367	TiAl6Nb7	ASTM F1295				
S <sub>3</sub>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006	140	0.007
			CrCoMo28	ASTM F1537				
H <sub>1</sub>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.009	100	0.010
H <sub>2</sub>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



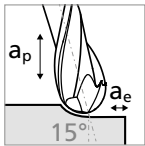
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.037	260	0.040	260	0.040	260	0.043
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.017	200	0.019	220	0.026	220	0.027	240	0.032	260	0.034	260	0.034	260	0.036
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.035	260	0.038	260	0.038	260	0.041
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.014	200	0.015	220	0.026	220	0.027	240	0.032	260	0.035	260	0.035	260	0.037
	140	0.020	140	0.022	160	0.024	160	0.031	180	0.034	200	0.040	200	0.042	200	0.044
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.048	260	0.048	260	0.051
	130	0.008	130	0.009	140	0.009	140	0.010	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.032	170	0.035	170	0.035	170	0.037
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.032	170	0.035	170	0.035	170	0.037
	180	0.008	180	0.009	200	0.009	200	0.010	220	0.012	240	0.016	240	0.016	240	0.017
	140	0.012	140	0.015	180	0.017	180	0.022	200	0.026	240	0.032	240	0.032	240	0.034

**NEW**

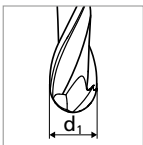
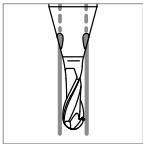
# Type M - Finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 15°



- $a_p = 0.1 \times d_1$
- $a_e = 0.05 - 0.1 \times d_1$
- $n_{max} = 60'000 \text{ rpm}$



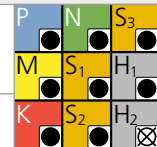
Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
P	Unalloyed carbon steel $R_m < 800 \text{ N/mm}^2$	1.0301	C10	AISI 1010	140	0.015	140	0.017
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel $R_m > 900 \text{ N/mm}^2$	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.014	140	0.016
		1.7131	16MnCr5	AISI 5115				
		1.3505	100Cr6	AISI 52100				
		1.7225	42CrMo4	AISI 4140				
		1.2842	90MnCrV8	AISI O2				
	High alloyed tool steel $R_m < 1200 \text{ N/mm}^2$	1.2379	X153CrMoV12	AISI D2	140	0.011	140	0.013
		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	0.016	140	0.018
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.015	140	0.017
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic - PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.015	140	0.017
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.012	140	0.014
		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	0.011	120	0.022
		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	140	0.018	140	0.020
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.018	140	0.020
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.020	140	0.022
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.020	140	0.022
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze $R_m < 400 \text{ N/mm}^2$	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.020	140	0.022
		2.1020	CuSn6	UNS C51900				
Bronze $R_m < 600 \text{ N/mm}^2$	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.018	140	0.020	
	2.0960	CuAl9Mn2	UNS C63200					
S <sub>1</sub>	Super alloys	2.4856		Inconel 625	120	0.007	120	0.008
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
S <sub>2</sub>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.016	120	0.018
		3.7065	Gr.4	ASTM B348 / F68				
S <sub>2</sub>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.016	120	0.018
		9.9367	TiAl6Nb7	ASTM F1295				
S <sub>3</sub>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.007	140	0.008
			CrCoMo28	ASTM F1537				
H <sub>1</sub>	Hardened steel $< 55 \text{ HRC}$	1.2510	100MnCrMoW4	AISI O1	100	0.010	100	0.012
H <sub>2</sub>	Hardened steel $\geq 55 \text{ HRC}$	1.2379	X153CrMoV12	AISI D2				



$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



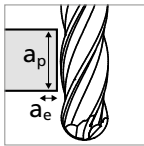
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.040	260	0.044	260	0.044	260	0.047
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.042	260	0.042	260	0.045
	200	0.020	200	0.022	220	0.030	220	0.032	240	0.035	260	0.037	260	0.037	260	0.039
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.039	260	0.042	260	0.042	260	0.045
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.039	260	0.040	260	0.040	260	0.043
	200	0.016	200	0.018	220	0.030	220	0.032	240	0.035	260	0.039	260	0.039	260	0.041
	140	0.024	140	0.026	160	0.028	160	0.036	180	0.038	200	0.044	200	0.046	200	0.049
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.053	260	0.053	260	0.056
	130	0.009	130	0.010	140	0.010	140	0.012	150	0.013	170	0.018	170	0.018	170	0.019
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.035	170	0.039	170	0.039	170	0.041
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.035	170	0.039	170	0.039	170	0.041
	180	0.009	180	0.010	200	0.010	200	0.012	220	0.013	240	0.018	240	0.018	240	0.019
	140	0.014	140	0.018	180	0.020	180	0.026	200	0.029	240	0.035	240	0.035	240	0.037

**NEW**

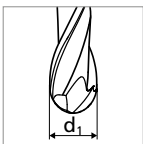
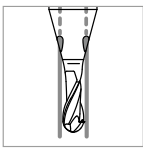
# Type M - Side-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 0°



- $a_p = 3 \times d_1$ ,
- $a_e = 0.02 - 0.1 \times d_1$ ,

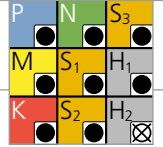


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010	130	0.008	130	0.009
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm <sup>2</sup>	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130	0.007	130	0.008
		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 <sup>2</sup>	1.2379	X153CrMoV12	AISI D2	130	0.006	130	0.007
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	H56-5-2C	AISI M2 / UNS T11302				
		1.3355	H518-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130	0.008	130	0.009
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	130	0.008	130	0.009
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130	0.008	130	0.009
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	130	0.006	130	0.007
		1.4435	X2CrNiMo18-14-3	AISI 316L				
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
	1.4539	X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	111	0.006	111	0.011
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130	0.009	130	0.010
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	130	0.009	130	0.010
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	130	0.010	130	0.011
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130	0.010	130	0.011
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130	0.010	130	0.011
		2.1020	CuSn6	UNS C51900				
Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000	130	0.009	130	0.010	
	2.0960	CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	111	0.004	111	0.004
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	111	0.008	111	0.009
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	111	0.008	111	0.009
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	130	0.004	130	0.004
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	93	0.005	93	0.006
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	180	0.012	180	0.013	200	0.017	200	0.018	210	0.023	220	0.025	220	0.028	220	0.033
	180	0.011	180	0.012	200	0.016	200	0.017	210	0.022	220	0.024	220	0.026	220	0.029
	180	0.010	180	0.011	200	0.015	200	0.016	210	0.020	220	0.021	220	0.023	220	0.025
	180	0.012	180	0.013	200	0.017	200	0.018	210	0.022	220	0.024	220	0.026	220	0.029
	180	0.011	180	0.012	200	0.016	200	0.017	210	0.022	220	0.023	220	0.025	220	0.028
	180	0.011	180	0.012	200	0.016	200	0.017	210	0.022	220	0.023	220	0.025	220	0.028
	180	0.008	180	0.009	200	0.015	200	0.016	210	0.020	220	0.022	220	0.024	220	0.026
	126	0.012	126	0.013	145	0.014	145	0.018	157	0.022	169	0.025	169	0.029	169	0.031
	180	0.013	180	0.014	200	0.018	200	0.020	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	180	0.014	200	0.018	200	0.020	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	180	0.014	200	0.018	200	0.020	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	180	0.014	200	0.018	200	0.020	210	0.029	220	0.030	220	0.033	220	0.036
	180	0.013	180	0.014	200	0.018	200	0.020	210	0.029	220	0.030	220	0.033	220	0.036
	117	0.005	117	0.005	127	0.005	127	0.006	131	0.008	144	0.010	144	0.011	144	0.012
	117	0.010	117	0.011	127	0.014	127	0.015	131	0.020	144	0.022	144	0.024	144	0.026
	117	0.010	117	0.011	127	0.014	127	0.015	131	0.020	144	0.022	144	0.024	144	0.026
	162	0.005	162	0.005	182	0.005	182	0.006	192	0.008	203	0.010	203	0.011	203	0.012
	126	0.007	126	0.009	164	0.010	164	0.013	175	0.017	203	0.020	203	0.022	203	0.024

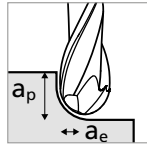
**NEW**

# Type N - Semi-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

**Possibility 1**

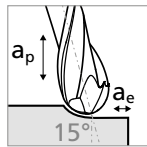
**Inclination 0°**



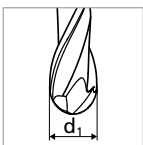
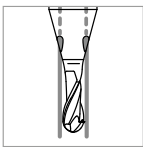
- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

**Possibility 2**

**Inclination 15°**



- $a_p = 0.5 \times d_1$
- $a_e = 0.2 \times d_1$

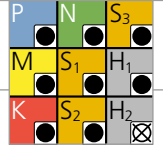


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	140	0.013	140	0.014
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.012	140	0.014
		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/mm²	1.2379	X153CrMoV12	AISI D2	140	0.009	140	0.011
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	HS6-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.014	140	0.015
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C				
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B	140	0.013	140	0.014
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH				
	Stainless steel martensitic – PH	1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH	140	0.013	140	0.014
		1.4301	X5CrNi18-10	AISI 304				
	Stainless steel austenitic	1.4435	X2CrNiMo18-14-3	AISI 316L	140	0.010	140	0.012
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.009	120	0.019
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.015	140	0.017
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	140	0.015	140	0.017
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.017	140	0.019
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.017	140	0.019
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.017	140	0.019
		2.1020	CuSn6	UNS C51900				
	Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.015	140	0.017
2.0960		CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.006	120	0.007
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.014	120	0.015
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.014	120	0.015
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.006	140	0.007
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	100	0.009	100	0.010
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



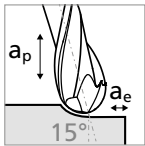
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.030	260	0.038	260	0.038	260	0.041
	200	0.017	200	0.019	220	0.026	220	0.027	240	0.028	260	0.035	260	0.034	260	0.037
	200	0.020	200	0.022	220	0.029	220	0.031	240	0.032	260	0.038	260	0.038	260	0.041
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.029	260	0.037	260	0.037	260	0.039
	200	0.019	200	0.020	220	0.027	220	0.029	240	0.029	260	0.037	260	0.037	260	0.039
	200	0.014	200	0.015	220	0.026	220	0.027	240	0.027	260	0.035	260	0.035	260	0.037
	140	0.020	140	0.022	160	0.024	160	0.031	180	0.034	200	0.042	200	0.042	200	0.044
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	200	0.022	200	0.024	220	0.031	220	0.034	240	0.046	260	0.044	260	0.048	260	0.047
	130	0.008	130	0.009	140	0.009	140	0.010	150	0.012	170	0.016	170	0.016	170	0.017
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.027	170	0.034	170	0.035	170	0.036
	130	0.017	130	0.019	140	0.024	140	0.026	150	0.027	170	0.034	170	0.035	170	0.036
	180	0.008	180	0.009	200	0.009	200	0.010	220	0.012	240	0.016	240	0.016	240	0.017
	140	0.012	140	0.015	180	0.017	180	0.022	200	0.024	240	0.026	240	0.032	240	0.027

**NEW**

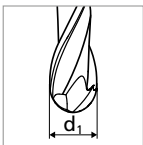
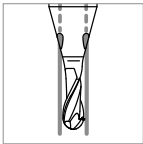
# Type N - Finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 15°



- $a_p = 0.1 \times d_1$
- $a_e = 0.05 - 0.1 \times d_1$
- $n_{max} = 60'000 \text{ rpm}$

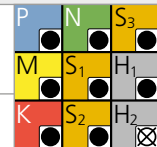


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					$v_c$	$f_z$	$v_c$	$f_z$
<b>P</b>	Unalloyed carbon steel $R_m < 800 \text{ N/mm}^2$	1.0301	C10	AISI 1010	140	0.015	140	0.017
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel $R_m > 900 \text{ N/mm}^2$	1.5752	15NiCr13	ASTM 3415 / AISI 3310	140	0.014	140	0.016
		1.7131	16MnCr5	AISI 5115				
		1.3505	100Cr6	AISI 52100				
		1.7225	42CrMo4	AISI 4140				
		1.2842	90MnCrV8	AISI O2				
	High alloyed tool steel $R_m < 1200 \text{ N/mm}^2$	1.2379	X153CrMoV12	AISI D2	140	0.011	140	0.013
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	HS6-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	140	0.016	140	0.018
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	140	0.015	140	0.017
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic - PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	140	0.015	140	0.017
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	140	0.012	140	0.014
		1.4435	X2CrNiMo18-14-3	AISI 316L				
1.4441		X2CrNiMo18-15-3	AISI 316LM					
		1.4539	X1NiCrMoCu25-20-5	AISI 904L				
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	120	0.011	120	0.022
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	140	0.018	140	0.020
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	140	0.018	140	0.020
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	140	0.020	140	0.022
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	140	0.020	140	0.022
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze $R_m < 400 \text{ N/mm}^2$	2.0401	CuZn39Pb3 / CW614N	UNS C38500	140	0.020	140	0.022
		2.1020	CuSn6	UNS C51900				
	Bronze $R_m < 600 \text{ N/mm}^2$	2.0966	CuAl10Ni5Fe4	UNS C63000	140	0.018	140	0.020
2.0960		CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	120	0.007	120	0.008
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	120	0.016	120	0.018
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	120	0.016	120	0.018
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	140	0.007	140	0.008
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel $< 55 \text{ HRC}$	1.2510	100MnCrMoW4	AISI O1	100	0.010	100	0.012
<b>H<sub>2</sub></b>	Hardened steel $\geq 55 \text{ HRC}$	1.2379	X153CrMoV12	AISI D2				

$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



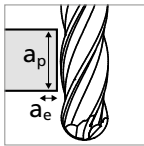
	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.035	260	0.044	260	0.044	260	0.047
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.033	260	0.042	260	0.042	260	0.045
	200	0.020	200	0.022	220	0.030	220	0.032	240	0.031	260	0.039	260	0.037	260	0.041
	200	0.024	200	0.026	220	0.034	220	0.036	240	0.035	260	0.042	260	0.042	260	0.045
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.022	200	0.024	220	0.032	220	0.034	240	0.032	260	0.040	260	0.040	260	0.043
	200	0.016	200	0.018	220	0.030	220	0.032	240	0.030	260	0.039	260	0.039	260	0.041
	140	0.024	140	0.026	160	0.028	160	0.036	180	0.037	200	0.046	200	0.046	200	0.049
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	200	0.026	200	0.028	220	0.036	220	0.040	240	0.051	260	0.048	260	0.053	260	0.051
	130	0.009	130	0.010	140	0.010	140	0.012	150	0.013	170	0.018	170	0.018	170	0.019
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.030	170	0.037	170	0.039	170	0.039
	130	0.020	130	0.022	140	0.028	140	0.030	150	0.030	170	0.037	170	0.039	170	0.039
	180	0.009	180	0.010	200	0.010	200	0.012	220	0.013	240	0.018	240	0.018	240	0.019
	140	0.014	140	0.018	180	0.020	180	0.026	200	0.026	240	0.028	240	0.035	240	0.030

**NEW**

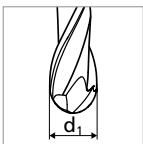
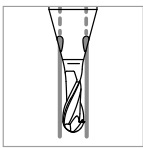
# Type N - Side-finishing

## MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Inclination 0°



- $a_p = 4 \times d_1$ ,
- $a_e = 0.02 - 0.1 \times d_1$ ,



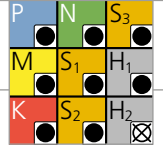
Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	Ød1 1.0 mm		Ød1 1.2 mm	
					v <sub>c</sub>	f <sub>z</sub>	v <sub>c</sub>	f <sub>z</sub>
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010	130	0.008	130	0.009
		1.0401	C15	AISI 1015				
		1.1191	C45E/CK45	AISI 1045				
		1.0044	S275JR	AISI 1020				
		1.0715	11SMn30	AISI 1215				
	Low alloyed steel Rm > 900 N/mm <sup>2</sup>	1.5752	15NiCr13	ASTM 3415 / AISI 3310	130	0.007	130	0.008
		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 <sup>2</sup>	1.2379	X153CrMoV12	AISI D2	130	0.006	130	0.007
		1.2436	X210CrW12	AISI D4/D6				
		1.3343	H56-5-2C	AISI M2 / UNS T11302				
		1.3355	HS18-0-1	AISI T1 / UNS T12001				
<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	130	0.008	130	0.009
		1.4105	X6CrMoS17	AISI 430F				
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C	130	0.008	130	0.009
		1.4112	X90CrMoV18	AISI 440B				
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	130	0.008	130	0.009
		1.4545	X5CrNiCuNb15-5	ASTM 15-5 PH				
	Stainless steel austenitic	1.4301	X5CrNi18-10	AISI 304	130	0.006	130	0.007
		1.4435	X2CrNiMo18-14-3	AISI 316L				
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
	1.4539	X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30	111	0.006	111	0.011
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	130	0.009	130	0.010
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-ALSi9Cu3	ASTM A380	130	0.009	130	0.010
		3.2381	GD-ALSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100	130	0.010	130	0.011
		2.0065	Cu-ETP / CW004A	UNS C 11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	130	0.010	130	0.011
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500	130	0.010	130	0.011
		2.1020	CuSn6	UNS C51900				
	Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000	130	0.009	130	0.010
2.0960		CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	111	0.004	111	0.004
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	111	0.008	111	0.009
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>2</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	111	0.008	111	0.009
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	130	0.004	130	0.004
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	93	0.005	93	0.006
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				



$v_c$  [m/min]  
 $f_z$  [mm]

RECOMMENDATION FOR USE

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



	Ød1 1.5 mm		Ød1 1.8 mm		Ød1 2.0 mm		Ød1 2.5 mm		Ød1 3.0 mm		Ød1 4.0 mm		Ød1 5.0 mm		Ød1 6.0 – 8.0 mm	
	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$	$v_c$	$f_z$
	185	0.012	185	0.013	204	0.017	204	0.018	222	0.020	241	0.025	241	0.028	241	0.033
	185	0.011	185	0.012	204	0.016	204	0.017	222	0.019	241	0.024	241	0.026	241	0.031
	185	0.010	185	0.011	204	0.015	204	0.016	222	0.018	241	0.022	241	0.024	241	0.029
	185	0.012	185	0.013	204	0.017	204	0.018	222	0.020	241	0.024	241	0.026	241	0.031
	185	0.011	185	0.012	204	0.016	204	0.017	222	0.018	241	0.023	241	0.025	241	0.030
	185	0.011	185	0.012	204	0.016	204	0.017	222	0.018	241	0.023	241	0.025	241	0.030
	185	0.008	185	0.009	204	0.015	204	0.016	222	0.017	241	0.022	241	0.024	241	0.029
	130	0.012	130	0.013	148	0.014	148	0.018	167	0.021	185	0.026	185	0.029	185	0.034
	185	0.013	185	0.014	204	0.018	204	0.020	222	0.029	241	0.028	241	0.030	241	0.036
	185	0.013	185	0.014	204	0.018	204	0.020	222	0.029	241	0.028	241	0.030	241	0.036
	185	0.013	185	0.014	204	0.018	204	0.020	222	0.029	241	0.028	241	0.030	241	0.036
	185	0.013	185	0.014	204	0.018	204	0.020	222	0.029	241	0.028	241	0.030	241	0.036
	185	0.013	185	0.014	204	0.018	204	0.020	222	0.029	241	0.028	241	0.030	241	0.036
	120	0.005	120	0.005	130	0.005	130	0.006	139	0.008	157	0.010	157	0.011	157	0.013
	120	0.010	120	0.011	130	0.014	130	0.015	139	0.017	157	0.021	157	0.023	157	0.027
	120	0.010	120	0.011	130	0.014	130	0.015	139	0.017	157	0.021	157	0.023	157	0.027
	167	0.005	167	0.005	185	0.005	185	0.006	204	0.008	222	0.010	222	0.011	222	0.013
	130	0.007	130	0.009	167	0.010	167	0.013	185	0.015	222	0.016	222	0.018	222	0.021

**NEW**

## Process CrazyMill Cool Ball

### ACCURATE AND EFFICIENT MILLING

#### Coolant type, pressure and filtration

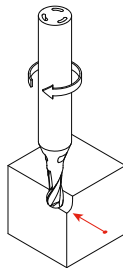
**Coolant:** for best results, Mikron Tool recommends the use of cutting oil as coolant. Alternatively, water base coolant with EP-Additives (Extreme-Pressure-Additives) can be used as well.

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

**Coolant pressure:** at least 15 bar 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

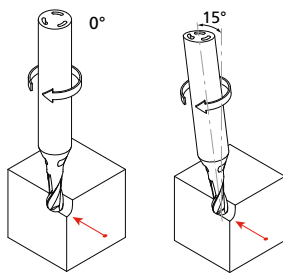
#### Climb milling and conventional milling



Mikron tool recommends climb milling for the machining of surfaces or edges. 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

### Semi-finishing



Mikron Tool recommends vertical machining with respect to the workpiece for semi-finishing with CrazyMill Cool Ball (machining angle 0°) or a machining angle of 15° or 75° with respect to the workpiece surface.

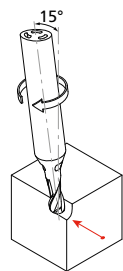
#### Recommended cutting parameters

$v_c$  and  $f_z$  = as specified in the cutting data table

End mill Type A, B and M:  $a_p = \max. 1 \times d$ ,  $a_e = 0.2 \times d$

End mill Type C and N:  $a_p = \max. 0.5 \times d$ ,  $a_e = 0.2 \times d$

### Finishing



Mikron Tool recommends machining at a machining angle of 15° or 75° with respect to the workpiece surface for finishing with CrazyMill Cool Ball. This shifts the milling contact away from the tool's axis center towards its external diameter, where the ideal cutting geometry takes effect and also the cutting speed increases (the cutting speed is zero at the tool's center).

An angle of 15° of the milling body with respect to the workpiece brings certain advantages:

- The cutting speed is higher
- Better surface quality
- Longer service life

#### Recommended cutting parameters

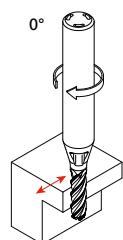
$v_c$  and  $f_z$  = as specified in the cutting data table

$a_p = 0.1 \times d$

$a_e = 0.05 - 0.1 \times d$  depending on the required surface quality

$a_e = f_z$  for maximum surface quality

### Side-finishing



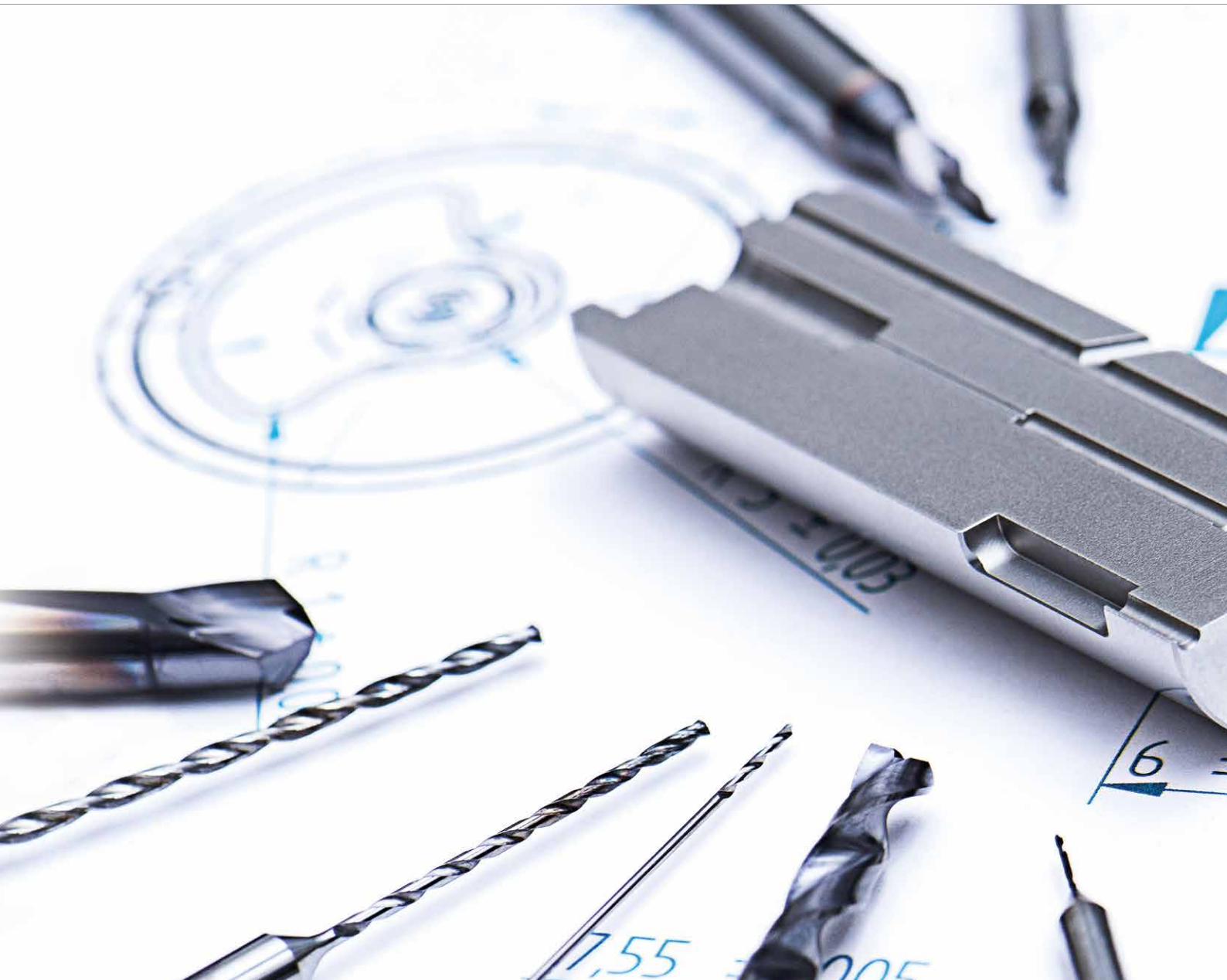
For side-finishing with CrazyMill Cool Ball, the machining must be executed vertically with respect to the workpiece (machining angle 0°).

#### Recommended cutting parameters

$v_c$  and  $f_z$  = as specified in the cutting data table

End mill Type M:  $a_p = 3 \times d$ ,  $a_e = 0.02 - 0.1 \times d$

End mill Type N:  $a_p = 4 \times d$ ,  $a_e = 0.02 - 0.1 \times d$





**NEW**

## CrazyDrill Cool SST-Inox



NEW



**CRAZYDRILL**  
by Mikron 544  
Cool SST-Inox

## DEEP HOLE DRILLING OF STAINLESS STEEL & CO. IN ONE STEP



**What's new:** CrazyDrill Cool SST-Inox is now also available for drilling depths of 15 x d and 20 x d. This drill has been specifically developed for rustproof, acid- and heat resistant steels as well as CrCo alloys. Previously unreached performance is now possible based on a new cutting edge geometry and a new coolant duct shape, which provide massive cooling of the cutting edges. The new high performance coating is wear resistant and assures continuous chip evacuation.

**The features:** The bore up to a maximum depth of 20 x d is performed in a single feed stroke. Thanks to the new cutting edge geometry and the flute profile optimal chip breaking and chip evacuation are guaranteed.

The newly conceived helical, drop shaped coolant ducts deliver the highest coolant effect (one to four times larger coolant quantity reaches the tip of the tool, compared to round shaped ducts). Hence better feed, speed and tool life are guaranteed.

Diameter range: 1 mm to 6 mm

Drilling depth: 6 x d, 10 x d, 15 x d and 20 x d

Coating: eXedur SNP

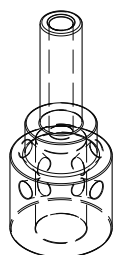
**NEW**

## Latest innovation for difficult-to-machine materials

### THE DRILL WITH THE REVOLUTIONARY GEOMETRY AND COOLING CONCEPT

With CrazyDrill Cool SST-Inox, Mikron Tool provides a twist drill for the deep hole drilling in one stroke for rust, acid and heat resistant steels as well as CrCo alloys in the diameter range of 1 mm to 6 mm and for drilling depth of up to 20 x d.

■ CrazyDrill Cool SST-Inox, drilling depths 6 x d, 10 x d, 15 x d or 20 x d with through tool cooling.



#### COMPONENT

Nozzle for food industry

#### MATERIAL

X5CrNi18-10 / 1.4301 / AISI 304

#### MACHINING

- Drilling
- d = 2.5 mm
- Drilling depth 26 mm

#### DRILLING TOOL

Mikron Tool - CrazyDrill Cool SST-Inox - 15 x d

DATA	MIKRON TOOL
Tool type	CrazyDrill Cool SST-Inox - Carbide - Coated - Internal cooling
Item number	2.CD.150250.IC
Cutting data	$v_c = 80$ m/min $f = 0.075$ mm/rev $Q_1 = 26$ mm





6 x d

10 x d

15 x d

20 x d

- Internal cooling
- Coated

- Internal cooling
- Coated

- Internal cooling
- Coated

- Internal cooling
- Coated

**NEW**



**1 | SHANK**

The reinforced solid carbide shank guarantees stability, high degree of concentricity and hence maximum drilling precision.

**2 | NEW GENERATION OF COOLING CHANNELS**

Due to a newly designed shape of helical cooling channels, up to four times more coolant volume reaches the drill tip. The result is continuous and efficient chip removal as well as constant and substantial cooling of cutting edges. A Powerchamber additionally guarantees sufficiently strong coolant flow for smaller diameters of up to Ø 2.95 mm.

**3 | CARBIDE**

A specially developed micro-grain solid carbide allows machining at high speeds.

**4 | NEW COATING**

The high-performance coating eXedur SNP is heat-resistant and wear-resistant, prevents build up edges and promotes uniform chip flushing. A very long tool life is given.

**5 | NEW CHIP FLUTE PROFILE**

Divided into two areas:

- **Front chip flute area:** a special chip breaker shape ensures compact, short and curved chips.
- **Rear chip flute area:** an extended flute shape ensures perfect chip removal.

**6 | POLISHED FLUTES**

The polished flutes in versions 15 x d and 20 x d promote uniform chip flushing.

**7 | DOUBLE GUIDING MARGIN**

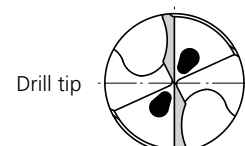
The narrow guiding chamfer ensures the highest degree of precision (straightness) and surface quality.

CrazyDrillCoolSST-Inox  
6 x d

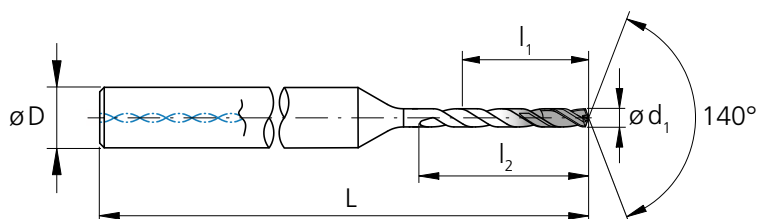
CrazyDrillCoolSST-Inox  
10 x d

CrazyDrillCoolSST-Inox  
15 x d

CrazyDrillCoolSST-Inox  
20 x d



## CrazyDrill Cool SST-Inox 6 x d



from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.060100.IC	1.00	6.0	9.0	4	55
■	2.CD.060105.IC	1.05	6.3	9.5	4	55
■	2.CD.060110.IC	1.10	6.6	9.9	4	55
■	2.CD.060115.IC	1.15	6.9	10.4	4	55
■	2.CD.060120.IC	1.20	7.2	10.8	4	57
■	2.CD.060125.IC	1.25	7.5	11.3	4	57
■	2.CD.060130.IC	1.30	7.8	11.7	4	57
■	2.CD.060135.IC	1.35	8.1	12.2	4	57
■	2.CD.060140.IC	1.40	8.4	12.6	4	57
■	2.CD.060145.IC	1.45	8.7	13.1	4	58
■	2.CD.060150.IC	1.50	9.0	13.5	4	58
■	2.CD.060155.IC	1.55	9.3	14.0	4	58
■	2.CD.060160.IC	1.60	9.6	14.4	4	58
■	2.CD.060165.IC	1.65	9.9	14.9	4	58
■	2.CD.060170.IC	1.70	10.2	15.3	4	60
■	2.CD.060175.IC	1.75	10.5	15.8	4	60
■	2.CD.060180.IC	1.80	10.8	16.2	4	60
■	2.CD.060185.IC	1.85	11.1	16.7	4	60
■	2.CD.060190.IC	1.90	11.4	17.1	4	60
■	2.CD.060195.IC	1.95	11.7	17.6	4	60
■	2.CD.060200.IC	2.00	12.0	18.0	4	63

from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.060205.IC	2.05	12.3	18.5	4	63
■	2.CD.060210.IC	2.10	12.6	18.9	4	63
■	2.CD.060215.IC	2.15	12.9	19.4	4	63
■	2.CD.060220.IC	2.20	13.2	19.8	4	63
■	2.CD.060225.IC	2.25	13.5	20.3	4	63
■	2.CD.060230.IC	2.30	13.8	20.7	4	65
■	2.CD.060235.IC	2.35	14.1	21.2	4	65
■	2.CD.060240.IC	2.40	14.4	21.6	4	65
■	2.CD.060245.IC	2.45	14.7	22.1	4	65
■	2.CD.060250.IC	2.50	15.0	22.5	4	65
■	2.CD.060255.IC	2.55	15.3	23.0	4	65
■	2.CD.060260.IC	2.60	15.6	23.4	4	68
■	2.CD.060265.IC	2.65	15.9	23.9	4	68
■	2.CD.060270.IC	2.70	16.2	24.3	4	68
■	2.CD.060275.IC	2.75	16.5	24.8	4	68
■	2.CD.060280.IC	2.80	16.8	25.2	4	68
■	2.CD.060285.IC	2.85	17.1	25.7	4	68
■	2.CD.060290.IC	2.90	17.4	26.1	4	68
■	2.CD.060295.IC	2.95	17.7	26.6	4	68
■	2.CD.060300.IC	3.00	18.0	27.0	6	74
■	2.CD.060305.IC	3.05	18.3	27.5	6	74

**Regrinding:** This product can be reground starting from Ø 1.4 mm.



from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.060310.IC	3.10	18.6	27.9	6	74
■	2.CD.060315.IC	3.15	18.9	28.4	6	74
■	2.CD.060320.IC	3.20	19.2	28.8	6	74
■	2.CD.060325.IC	3.25	19.5	29.3	6	74
■	2.CD.060330.IC	3.30	19.8	29.7	6	74
■	2.CD.060335.IC	3.35	20.1	30.2	6	74
■	2.CD.060340.IC	3.40	20.4	30.6	6	74
■	2.CD.060345.IC	3.45	20.7	31.1	6	74
■	2.CD.060350.IC	3.50	21.0	31.5	6	78
■	2.CD.060355.IC	3.55	21.3	32.0	6	78
■	2.CD.060360.IC	3.60	21.6	32.4	6	78
■	2.CD.060365.IC	3.65	21.9	32.9	6	78
■	2.CD.060370.IC	3.70	22.2	33.3	6	78
■	2.CD.060375.IC	3.75	22.5	33.8	6	78
■	2.CD.060380.IC	3.80	22.8	34.2	6	78
■	2.CD.060385.IC	3.85	23.1	34.7	6	78
■	2.CD.060390.IC	3.90	23.4	35.1	6	78
■	2.CD.060395.IC	3.95	23.7	35.6	6	78
■	2.CD.060400.IC	4.00	24.0	36.0	6	78
■	2.CD.060410.IC	4.10	24.6	36.9	6	80
■	2.CD.060420.IC	4.20	25.2	37.8	6	80

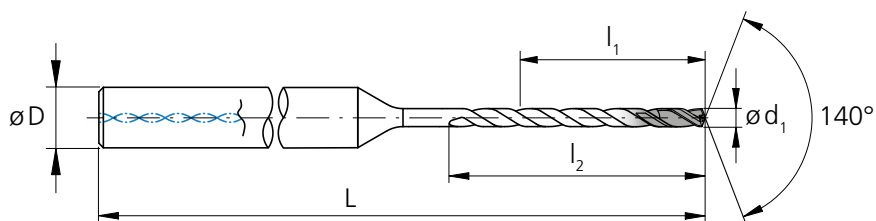
from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.060430.IC	4.30	25.8	38.7	6	80
■	2.CD.060440.IC	4.40	26.4	39.6	6	80
■	2.CD.060450.IC	4.50	27.0	40.5	6	80
■	2.CD.060460.IC	4.60	27.6	41.4	6	80
■	2.CD.060470.IC	4.70	28.2	42.3	6	84
■	2.CD.060480.IC	4.80	28.8	43.2	6	84
■	2.CD.060490.IC	4.90	29.4	44.1	6	84
■	2.CD.060500.IC	5.00	30.0	45.0	6	84
■	2.CD.060510.IC	5.10	30.6	45.9	6	84
■	2.CD.060520.IC	5.20	31.2	46.8	6	84
■	2.CD.060530.IC	5.30	31.8	47.7	6	84
■	2.CD.060540.IC	5.40	32.4	48.6	6	88
■	2.CD.060550.IC	5.50	33.0	49.5	6	88
■	2.CD.060560.IC	5.60	33.6	50.4	6	88
■	2.CD.060570.IC	5.70	34.2	51.3	6	88
■	2.CD.060580.IC	5.80	34.8	52.2	6	88
■	2.CD.060590.IC	5.90	35.4	53.1	6	88
■	2.CD.060600.IC	6.00	36.0	54.0	6	88

**Complementary products**

CrazyDrill Coolpilot

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## CrazyDrill Cool SST-Inox 10 x d



from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.100100.IC	1.00	10.0	13.0	4	59
■	2.CD.100105.IC	1.05	10.5	13.7	4	59
■	2.CD.100110.IC	1.10	11.0	14.3	4	59
■	2.CD.100115.IC	1.15	11.5	15.0	4	59
■	2.CD.100120.IC	1.20	12.0	15.6	4	62
■	2.CD.100125.IC	1.25	12.5	16.3	4	62
■	2.CD.100130.IC	1.30	13.0	16.9	4	62
■	2.CD.100135.IC	1.35	13.5	17.6	4	62
■	2.CD.100140.IC	1.40	14.0	18.2	4	62
■	2.CD.100145.IC	1.45	14.5	18.9	4	65
■	2.CD.100150.IC	1.50	15.0	19.5	4	65
■	2.CD.100155.IC	1.55	15.5	20.2	4	65
■	2.CD.100160.IC	1.60	16.0	20.8	4	65
■	2.CD.100165.IC	1.65	16.5	21.5	4	65
■	2.CD.100170.IC	1.70	17.0	22.1	4	67
■	2.CD.100175.IC	1.75	17.5	22.8	4	67
■	2.CD.100180.IC	1.80	18.0	23.4	4	67
■	2.CD.100185.IC	1.85	18.5	24.1	4	67
■	2.CD.100190.IC	1.90	19.0	24.7	4	67
■	2.CD.100195.IC	1.95	19.5	25.4	4	67
■	2.CD.100200.IC	2.00	20.0	26.0	4	70

from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.100205.IC	2.05	20.5	26.7	4	70
■	2.CD.100210.IC	2.10	21.0	27.3	4	70
■	2.CD.100215.IC	2.15	21.5	28.0	4	70
■	2.CD.100220.IC	2.20	22.0	28.6	4	70
■	2.CD.100225.IC	2.25	22.5	29.3	4	70
■	2.CD.100230.IC	2.30	23.0	29.9	4	75
■	2.CD.100235.IC	2.35	23.5	30.6	4	75
■	2.CD.100240.IC	2.40	24.0	31.2	4	75
■	2.CD.100245.IC	2.45	24.5	31.9	4	75
■	2.CD.100250.IC	2.50	25.0	32.5	4	75
■	2.CD.100255.IC	2.55	25.5	33.2	4	75
■	2.CD.100260.IC	2.60	26.0	33.8	4	80
■	2.CD.100265.IC	2.65	26.5	34.5	4	80
■	2.CD.100270.IC	2.70	27.0	35.1	4	80
■	2.CD.100275.IC	2.75	27.5	35.8	4	80
■	2.CD.100280.IC	2.80	28.0	36.4	4	80
■	2.CD.100285.IC	2.85	28.5	37.1	4	80
■	2.CD.100290.IC	2.90	29.0	37.7	4	80
■	2.CD.100295.IC	2.95	29.5	38.4	4	80
■	2.CD.100300.IC	3.00	30.0	39.0	6	87
■	2.CD.100305.IC	3.05	30.5	39.7	6	87

**Regrinding:** This product can be reground starting from Ø 1.4 mm.



from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.100310.IC	3.10	31.0	40.3	6	87
■	2.CD.100315.IC	3.15	31.5	41.0	6	87
■	2.CD.100320.IC	3.20	32.0	41.6	6	87
■	2.CD.100325.IC	3.25	32.5	42.3	6	87
■	2.CD.100330.IC	3.30	33.0	42.9	6	87
■	2.CD.100335.IC	3.35	33.5	43.6	6	87
■	2.CD.100340.IC	3.40	34.0	44.2	6	87
■	2.CD.100345.IC	3.45	34.5	44.9	6	87
■	2.CD.100350.IC	3.50	35.0	45.5	6	95
■	2.CD.100355.IC	3.55	35.5	46.2	6	95
■	2.CD.100360.IC	3.60	36.0	46.8	6	95
■	2.CD.100365.IC	3.65	36.5	47.5	6	95
■	2.CD.100370.IC	3.70	37.0	48.1	6	95
■	2.CD.100375.IC	3.75	37.5	48.8	6	95
■	2.CD.100380.IC	3.80	38.0	49.4	6	95
■	2.CD.100385.IC	3.85	38.5	50.1	6	95
■	2.CD.100390.IC	3.90	39.0	50.7	6	95
■	2.CD.100395.IC	3.95	39.5	51.4	6	95
■	2.CD.100400.IC	4.00	40.0	52.0	6	95
■	2.CD.100410.IC	4.10	41.0	53.3	6	100
■	2.CD.100420.IC	4.20	42.0	54.6	6	100

from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
■	2.CD.100430.IC	4.30	43.0	55.9	6	100
■	2.CD.100440.IC	4.40	44.0	57.2	6	100
■	2.CD.100450.IC	4.50	45.0	58.5	6	100
■	2.CD.100460.IC	4.60	46.0	59.8	6	100
■	2.CD.100470.IC	4.70	47.0	61.1	6	105
■	2.CD.100480.IC	4.80	48.0	62.4	6	105
■	2.CD.100490.IC	4.90	49.0	63.7	6	105
■	2.CD.100500.IC	5.00	50.0	65.0	6	105
■	2.CD.100510.IC	5.10	51.0	66.3	6	105
■	2.CD.100520.IC	5.20	52.0	67.6	6	105
■	2.CD.100530.IC	5.30	53.0	68.9	6	105
■	2.CD.100540.IC	5.40	54.0	70.2	6	112
■	2.CD.100550.IC	5.50	55.0	71.5	6	112
■	2.CD.100560.IC	5.60	56.0	72.8	6	112
■	2.CD.100570.IC	5.70	57.0	74.1	6	112
■	2.CD.100580.IC	5.80	58.0	75.4	6	112
■	2.CD.100590.IC	5.90	59.0	76.7	6	112
■	2.CD.100600.IC	6.00	60.0	78.0	6	112

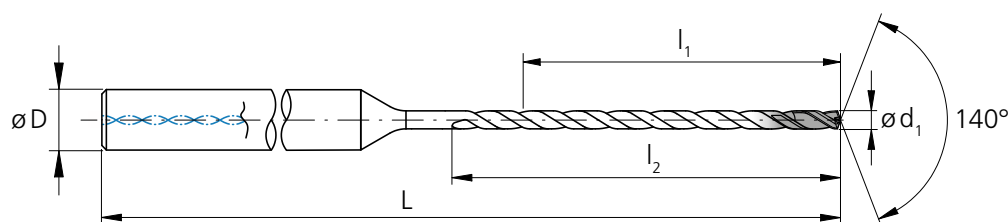
**Complementary products**

CrazyDrill Coolpilot

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**NEW**

## CrazyDrill Cool SST-Inox 15 x d



<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.150100.IC	1.00	15.00	18.5	4	62
<input type="checkbox"/>	2.CD.150105.IC	1.05	15.75	19.4	4	62
<input type="checkbox"/>	2.CD.150110.IC	1.10	16.50	20.4	4	62
<input type="checkbox"/>	2.CD.150115.IC	1.15	17.25	21.3	4	62
<input type="checkbox"/>	2.CD.150120.IC	1.20	18.00	22.2	4	64
<input type="checkbox"/>	2.CD.150125.IC	1.25	18.75	23.1	4	64
<input type="checkbox"/>	2.CD.150130.IC	1.30	19.50	24.1	4	66
<input type="checkbox"/>	2.CD.150135.IC	1.35	20.25	25.0	4	66
<input type="checkbox"/>	2.CD.150140.IC	1.40	21.00	25.9	4	68
<input type="checkbox"/>	2.CD.150145.IC	1.45	21.75	26.8	4	70
<input type="checkbox"/>	2.CD.150150.IC	1.50	22.50	27.8	4	70
<input type="checkbox"/>	2.CD.150155.IC	1.55	23.25	28.7	4	75
<input type="checkbox"/>	2.CD.150160.IC	1.60	24.00	29.6	4	75
<input type="checkbox"/>	2.CD.150165.IC	1.65	24.75	30.5	4	75
<input type="checkbox"/>	2.CD.150170.IC	1.70	25.50	31.5	4	76
<input type="checkbox"/>	2.CD.150175.IC	1.75	26.25	32.4	4	76
<input type="checkbox"/>	2.CD.150180.IC	1.80	27.00	33.3	4	76
<input type="checkbox"/>	2.CD.150185.IC	1.85	27.75	34.2	4	76
<input type="checkbox"/>	2.CD.150190.IC	1.90	28.50	35.2	4	80
<input type="checkbox"/>	2.CD.150195.IC	1.95	29.25	36.1	4	80
<input type="checkbox"/>	2.CD.150200.IC	2.00	30.00	37.0	4	80

<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.150205.IC	2.05	30.75	37.9	4	80
<input type="checkbox"/>	2.CD.150210.IC	2.10	31.50	38.9	4	80
<input type="checkbox"/>	2.CD.150215.IC	2.15	32.25	39.8	4	85
<input type="checkbox"/>	2.CD.150220.IC	2.20	33.00	40.7	4	85
<input type="checkbox"/>	2.CD.150225.IC	2.25	33.75	41.6	4	85
<input type="checkbox"/>	2.CD.150230.IC	2.30	34.50	42.6	4	86
<input type="checkbox"/>	2.CD.150235.IC	2.35	35.25	43.5	4	86
<input type="checkbox"/>	2.CD.150240.IC	2.40	36.00	44.4	4	86
<input type="checkbox"/>	2.CD.150245.IC	2.45	36.75	45.3	4	86
<input type="checkbox"/>	2.CD.150250.IC	2.50	37.50	46.3	4	90
<input type="checkbox"/>	2.CD.150255.IC	2.55	38.25	47.2	4	90
<input type="checkbox"/>	2.CD.150260.IC	2.60	39.00	48.1	4	90
<input type="checkbox"/>	2.CD.150265.IC	2.65	39.75	49.0	4	90
<input type="checkbox"/>	2.CD.150270.IC	2.70	40.50	50.0	4	92
<input type="checkbox"/>	2.CD.150275.IC	2.75	41.25	50.9	4	92
<input type="checkbox"/>	2.CD.150280.IC	2.80	42.00	51.8	4	94
<input type="checkbox"/>	2.CD.150285.IC	2.85	42.75	52.7	4	94
<input type="checkbox"/>	2.CD.150290.IC	2.90	43.50	53.7	4	98
<input type="checkbox"/>	2.CD.150295.IC	2.95	44.25	54.6	4	98
<input type="checkbox"/>	2.CD.150300.IC	3.00	45.00	55.5	6	100
<input type="checkbox"/>	2.CD.150305.IC	3.05	45.75	56.4	6	100

Article in stock from spring / summer 2018.

**Regrinding:** This product can be reground starting from Ø 1.4 mm.



<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.150310.IC	3.10	46.50	57.4	6	102
<input type="checkbox"/>	2.CD.150315.IC	3.15	47.25	58.3	6	102
<input type="checkbox"/>	2.CD.150320.IC	3.20	48.00	59.2	6	106
<input type="checkbox"/>	2.CD.150325.IC	3.25	48.75	60.1	6	106
<input type="checkbox"/>	2.CD.150330.IC	3.30	49.50	61.1	6	106
<input type="checkbox"/>	2.CD.150335.IC	3.35	50.25	62.0	6	106
<input type="checkbox"/>	2.CD.150340.IC	3.40	51.00	62.9	6	106
<input type="checkbox"/>	2.CD.150345.IC	3.45	51.75	63.8	6	106
<input type="checkbox"/>	2.CD.150350.IC	3.50	52.50	64.8	6	108
<input type="checkbox"/>	2.CD.150355.IC	3.55	53.25	65.7	6	108
<input type="checkbox"/>	2.CD.150360.IC	3.60	54.00	66.6	6	110
<input type="checkbox"/>	2.CD.150365.IC	3.65	54.75	67.5	6	110
<input type="checkbox"/>	2.CD.150370.IC	3.70	55.50	68.5	6	112
<input type="checkbox"/>	2.CD.150375.IC	3.75	56.25	69.4	6	112
<input type="checkbox"/>	2.CD.150380.IC	3.80	57.00	70.3	6	116
<input type="checkbox"/>	2.CD.150385.IC	3.85	57.75	71.2	6	116
<input type="checkbox"/>	2.CD.150390.IC	3.90	58.50	72.2	6	116
<input type="checkbox"/>	2.CD.150395.IC	3.95	59.25	73.1	6	116
<input type="checkbox"/>	2.CD.150400.IC	4.00	60.00	74.0	6	116
<input type="checkbox"/>	2.CD.150410.IC	4.10	61.50	75.9	6	118
<input type="checkbox"/>	2.CD.150420.IC	4.20	63.00	77.7	6	120

Article in stock from spring / summer 2018.

<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.150430.IC	4.30	64.50	79.6	6	122
<input type="checkbox"/>	2.CD.150440.IC	4.40	66.00	81.4	6	126
<input type="checkbox"/>	2.CD.150450.IC	4.50	67.50	83.3	6	126
<input type="checkbox"/>	2.CD.150460.IC	4.60	69.00	85.1	6	126
<input type="checkbox"/>	2.CD.150470.IC	4.70	70.50	87.0	6	129
<input type="checkbox"/>	2.CD.150480.IC	4.80	72.00	88.8	6	131
<input type="checkbox"/>	2.CD.150490.IC	4.90	73.50	90.7	6	133
<input type="checkbox"/>	2.CD.150500.IC	5.00	75.00	92.5	6	135
<input type="checkbox"/>	2.CD.150510.IC	5.10	76.50	94.4	6	137
<input type="checkbox"/>	2.CD.150520.IC	5.20	78.00	96.2	6	141
<input type="checkbox"/>	2.CD.150530.IC	5.30	79.50	98.1	6	141
<input type="checkbox"/>	2.CD.150540.IC	5.40	81.00	99.9	6	141
<input type="checkbox"/>	2.CD.150550.IC	5.50	82.50	101.8	6	143
<input type="checkbox"/>	2.CD.150560.IC	5.60	84.00	103.6	6	145
<input type="checkbox"/>	2.CD.150570.IC	5.70	85.50	105.5	6	147
<input type="checkbox"/>	2.CD.150580.IC	5.80	87.00	107.3	6	151
<input type="checkbox"/>	2.CD.150590.IC	5.90	88.50	109.2	6	151
<input type="checkbox"/>	2.CD.150600.IC	6.00	90.00	111.0	6	151

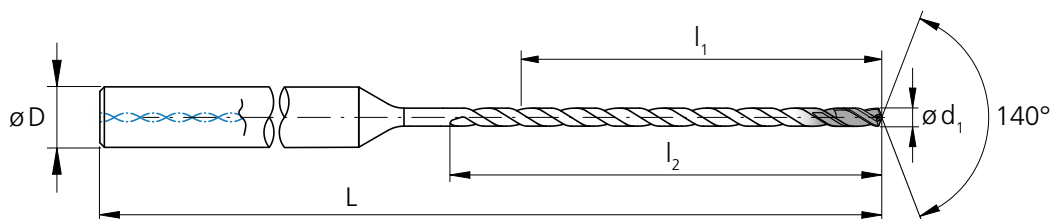
**Complementary products**

CrazyDrill Coolpilot

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**NEW**

## CrazyDrill Cool SST-Inox 20 x d



<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.200100.IC	1.00	20.0	23.5	4	70
<input type="checkbox"/>	2.CD.200105.IC	1.05	21.0	24.7	4	70
<input type="checkbox"/>	2.CD.200110.IC	1.10	22.0	25.9	4	70
<input type="checkbox"/>	2.CD.200115.IC	1.15	23.0	27.0	4	70
<input type="checkbox"/>	2.CD.200120.IC	1.20	24.0	28.2	4	70
<input type="checkbox"/>	2.CD.200125.IC	1.25	25.0	29.4	4	70
<input type="checkbox"/>	2.CD.200130.IC	1.30	26.0	30.6	4	75
<input type="checkbox"/>	2.CD.200135.IC	1.35	27.0	31.7	4	75
<input type="checkbox"/>	2.CD.200140.IC	1.40	28.0	32.9	4	75
<input type="checkbox"/>	2.CD.200145.IC	1.45	29.0	34.1	4	78
<input type="checkbox"/>	2.CD.200150.IC	1.50	30.0	35.3	4	78
<input type="checkbox"/>	2.CD.200155.IC	1.55	31.0	36.4	4	78
<input type="checkbox"/>	2.CD.200160.IC	1.60	32.0	37.6	4	82
<input type="checkbox"/>	2.CD.200165.IC	1.65	33.0	38.8	4	82
<input type="checkbox"/>	2.CD.200170.IC	1.70	34.0	40.0	4	85
<input type="checkbox"/>	2.CD.200175.IC	1.75	35.0	41.1	4	85
<input type="checkbox"/>	2.CD.200180.IC	1.80	36.0	42.3	4	85
<input type="checkbox"/>	2.CD.200185.IC	1.85	37.0	43.5	4	88
<input type="checkbox"/>	2.CD.200190.IC	1.90	38.0	44.7	4	88
<input type="checkbox"/>	2.CD.200195.IC	1.95	39.0	45.8	4	88
<input type="checkbox"/>	2.CD.200200.IC	2.00	40.0	47.0	4	90

<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.200205.IC	2.05	41.0	48.2	4	90
<input type="checkbox"/>	2.CD.200210.IC	2.10	42.0	49.4	4	93
<input type="checkbox"/>	2.CD.200215.IC	2.15	43.0	50.5	4	93
<input type="checkbox"/>	2.CD.200220.IC	2.20	44.0	51.7	4	95
<input type="checkbox"/>	2.CD.200225.IC	2.25	45.0	52.9	4	95
<input type="checkbox"/>	2.CD.200230.IC	2.30	46.0	54.1	4	98
<input type="checkbox"/>	2.CD.200235.IC	2.35	47.0	55.2	4	98
<input type="checkbox"/>	2.CD.200240.IC	2.40	48.0	56.4	4	98
<input type="checkbox"/>	2.CD.200245.IC	2.45	49.0	57.6	4	100
<input type="checkbox"/>	2.CD.200250.IC	2.50	50.0	58.8	4	100
<input type="checkbox"/>	2.CD.200255.IC	2.55	51.0	59.9	4	102
<input type="checkbox"/>	2.CD.200260.IC	2.60	52.0	61.1	4	104
<input type="checkbox"/>	2.CD.200265.IC	2.65	53.0	62.3	4	104
<input type="checkbox"/>	2.CD.200270.IC	2.70	54.0	63.5	4	104
<input type="checkbox"/>	2.CD.200275.IC	2.75	55.0	64.6	4	106
<input type="checkbox"/>	2.CD.200280.IC	2.80	56.0	65.8	4	106
<input type="checkbox"/>	2.CD.200285.IC	2.85	57.0	67.0	4	108
<input type="checkbox"/>	2.CD.200290.IC	2.90	58.0	68.2	4	108
<input type="checkbox"/>	2.CD.200295.IC	2.95	59.0	69.3	4	110
<input type="checkbox"/>	2.CD.200300.IC	3.00	60.0	70.5	6	116
<input type="checkbox"/>	2.CD.200305.IC	3.05	61.0	71.7	6	116

Article in stock from spring / summer 2018.

**Regrinding:** This product can be reground starting from Ø 1.4 mm.





<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.200310.IC	3.10	62.0	72.9	6	118
<input type="checkbox"/>	2.CD.200315.IC	3.15	63.0	74.0	6	118
<input type="checkbox"/>	2.CD.200320.IC	3.20	64.0	75.2	6	120
<input type="checkbox"/>	2.CD.200325.IC	3.25	65.0	76.4	6	120
<input type="checkbox"/>	2.CD.200330.IC	3.30	66.0	77.6	6	122
<input type="checkbox"/>	2.CD.200335.IC	3.35	67.0	78.7	6	122
<input type="checkbox"/>	2.CD.200340.IC	3.40	68.0	79.9	6	126
<input type="checkbox"/>	2.CD.200345.IC	3.45	69.0	81.1	6	126
<input type="checkbox"/>	2.CD.200350.IC	3.50	70.0	82.3	6	126
<input type="checkbox"/>	2.CD.200355.IC	3.55	71.0	83.4	6	126
<input type="checkbox"/>	2.CD.200360.IC	3.60	72.0	84.6	6	128
<input type="checkbox"/>	2.CD.200365.IC	3.65	73.0	85.8	6	128
<input type="checkbox"/>	2.CD.200370.IC	3.70	74.0	87.0	6	130
<input type="checkbox"/>	2.CD.200375.IC	3.75	75.0	88.1	6	130
<input type="checkbox"/>	2.CD.200380.IC	3.80	76.0	89.3	6	132
<input type="checkbox"/>	2.CD.200385.IC	3.85	77.0	90.5	6	132
<input type="checkbox"/>	2.CD.200390.IC	3.90	78.0	91.7	6	136
<input type="checkbox"/>	2.CD.200395.IC	3.95	79.0	92.8	6	136
<input type="checkbox"/>	2.CD.200400.IC	4.00	80.0	94.0	6	136
<input type="checkbox"/>	2.CD.200410.IC	4.10	82.0	96.4	6	141
<input type="checkbox"/>	2.CD.200420.IC	4.20	84.0	98.7	6	143

Article in stock from spring / summer 2018.

<input type="checkbox"/> from stock	Item number	d <sub>1</sub> k5 [mm]	l <sub>1</sub> [mm]	l <sub>2</sub> [mm]	D (h6) [mm]	L [mm]
<input type="checkbox"/>	2.CD.200430.IC	4.30	86.0	101.1	6	145
<input type="checkbox"/>	2.CD.200440.IC	4.40	88.0	103.4	6	147
<input type="checkbox"/>	2.CD.200450.IC	4.50	90.0	105.8	6	151
<input type="checkbox"/>	2.CD.200460.IC	4.60	92.0	108.1	6	151
<input type="checkbox"/>	2.CD.200470.IC	4.70	94.0	110.5	6	154
<input type="checkbox"/>	2.CD.200480.IC	4.80	96.0	112.8	6	156
<input type="checkbox"/>	2.CD.200490.IC	4.90	98.0	115.2	6	158
<input type="checkbox"/>	2.CD.200500.IC	5.00	100.0	117.5	6	160
<input type="checkbox"/>	2.CD.200510.IC	5.10	102.0	119.9	6	162
<input type="checkbox"/>	2.CD.200520.IC	5.20	104.0	122.2	6	166
<input type="checkbox"/>	2.CD.200530.IC	5.30	106.0	124.6	6	166
<input type="checkbox"/>	2.CD.200540.IC	5.40	108.0	126.9	6	171
<input type="checkbox"/>	2.CD.200550.IC	5.50	110.0	129.3	6	173
<input type="checkbox"/>	2.CD.200560.IC	5.60	112.0	131.6	6	175
<input type="checkbox"/>	2.CD.200570.IC	5.70	114.0	134.0	6	177
<input type="checkbox"/>	2.CD.200580.IC	5.80	116.0	136.3	6	181
<input type="checkbox"/>	2.CD.200590.IC	5.90	118.0	138.7	6	181
<input type="checkbox"/>	2.CD.200600.IC	6.00	120.0	141.0	6	181

**Complementary products**

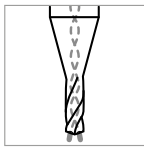
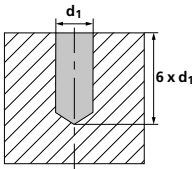
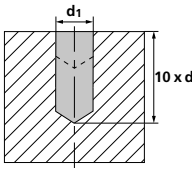
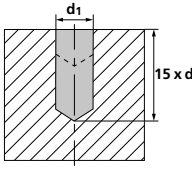
CrazyDrill Coolpilot

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**NEW**

6 x d - 10 x d - 15 x d - 20 x d

**DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW**

	Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v <sub>c</sub> [m/min]		
						Low	Mid	High
   	<b>P</b>	Unalloyed carbon steel R <sub>m</sub> < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010			
			1.0401	C15	AISI 1015			
			1.1191	C45E/CK45	AISI 1045			
			1.0044	S275JR	AISI 1020			
			1.0715	11SMn30	AISI 1215			
		Low alloyed steel R <sub>m</sub> > 900 N/mm <sup>2</sup>	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 R <sub>m</sub> < 1200 N/mm <sup>2</sup>	1.2379	X153CrMoV12	AISI D2			
			1.2436	X210CrW12	AISI D4/D6			
			1.3343	HS6-5-2C	AISI M2 / UNS T11302			
1.3355	HS18-0-1		AISI T1 / UNS T12001					
<b>M</b>	Stainless steel ferritic		1.4016	X6Cr17	AISI 430 / UNS S43000	60	80	100
		1.4105	X6CrMoS17	AISI 430F				
		1.4034	X46Cr13	AISI 420C	60	80	100	
	Stainless steel martensitic	1.4112	X90CrMoV18	AISI 440B				
		1.4542	X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	60	80	100	
	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	60	80	100	
		1.4441	X2CrNiMo18-15-3	AISI 316LM				
1.4539		X1NiCrMoCu25-20-5	AISI 904L					
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30				
		0.6030	GG30	ASTM 40B				
		0.7040	GGG40	ASTM 60-40-18				
		0.7060	GGG60	ASTM 80-60-03				
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351				
		3.4365	AlZnMgCu1.5	ASTM 7075				
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380				
		3.2381	GD-AlSi10Mg	UNS A03590				
	Copper	2.0040	Cu-OF / CW008A	UNS C10100				
		2.0065	Cu-ETP / CW004A	UNS C11000				
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400				
		2.0360	CuZn40 CW509L	UNS C28000				
	Brass, Bronze R <sub>m</sub> < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500				
		2.1020	CuSn6	UNS C51900				
Bronze R <sub>m</sub> < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000					
	2.0960	CuAl9Mn2	UNS C63200					
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	30	40	50	
		2.4668		Inconel 718				
		2.4617	NiMo28	Hastelloy B-2				
		2.4665	NiCr22Fe18Mo	Hastelloy X				
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67				
		3.7065	Gr.4	ASTM B348 / F68				
<b>S<sub>3</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136				
		9.9367	TiAl6Nb7	ASTM F1295				
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	50	70	90	
			CrCoMo28	ASTM F1537				
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1				
		1.2379	X153CrMoV12	AISI D2				
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2				



**NEW**

## Drilling process CrazyDrill Cool SST-Inox

### ACCURATE AND QUICK DRILLING UP TO 20 X D

#### Coolant type, pressure and filtration

##### Coolant type

For best results, Mikron Tool recommends the use of cutting oil as coolant fluid. Alternatively, emulsion with EP-Additives (Extreme-Pressure-Additives) can be used with good results as well.

**Filtration:** Good filter quality is very important when using through coolant drills. Dirt particles or residual chips can clog the coolant holes and consequently reduce dramatically the flowrate.

The following filter qualities must be adhered especially in small diameters:

- Drill with  $\varnothing < 2$  mm filter quality  $\leq 0.010$  mm.
- Drill with  $\varnothing < 3$  mm filter quality  $\leq 0.020$  mm.
- Drill with  $\varnothing < 6$  mm filter quality  $\leq 0.050$  mm.

**Coolant pressure:** At least the coolant pressure mentioned in the chart is required for the CrazyDrill Cool SST-Inox to achieve reliable drilling. High pressure is generally better for the cooling and flushing effect.

Ø d, Tool	[mm]	1.0 mm - 2.0 mm		2.0 mm - 4.0 mm		4.0 mm - 6.0 mm	
		6 - 10 x d	15 - 20 x d	6 - 10 x d	15 - 20 x d	6 - 10 x d	15 - 20 x d
Minimal pressure	[bar]	50	65	40	50	25	35

#### CrazyDrill Cool SST-Inox 6 x d

Because of the high degree of self-centering capability, CrazyDrill Cool SST-Inox can be used on regular and straight surfaces without a centering or pilot hole.

**Higher requirements:** For irregular, respectively rough or inclined surfaces or for the highest degree of position accuracy, Mikron Tool recommends:

- **CrazyDrill Coolpilot** as pilot drill
- **CrazyDrill Crosspilot** as pilot drill for inclined surfaces

#### CrazyDrill Cool SST-Inox versions 10 x d, 15 x d and 20 x d

We recommend pilot drilling with CrazyDrill Coolpilot or CrazyDrill Crosspilot on inclined surfaces.

#### Pilot drilling and drilling

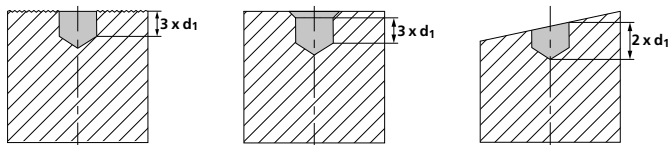
Pilot drilling with CrazyDrill Coolpilot or CrazyDrill Crosspilot (on inclined surfaces) is the perfect starting point for accurate drilling (position and alignment accuracy). The drilling quality (no measurable transition from pilot drilling to follow-up drilling) is guaranteed due to predetermined tool tolerances.



## DRILLING IN ONE STEP UP TO 20 X D

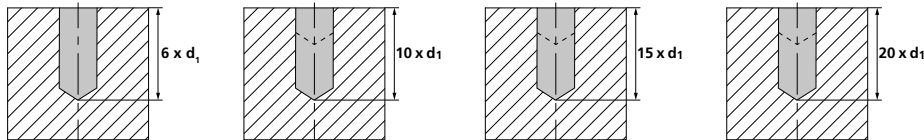
### 1 | PILOT DRILLING

- Turn on internal coolant.
- With CrazyDrill Coolpilot (irregular or rough surfaces) up to  $3 \times d$  with simultaneous chamfer of  $90^\circ$ .  
With CrazyDrill Crosspilot for all versions on inclined surfaces.



### 2 | DRILLING

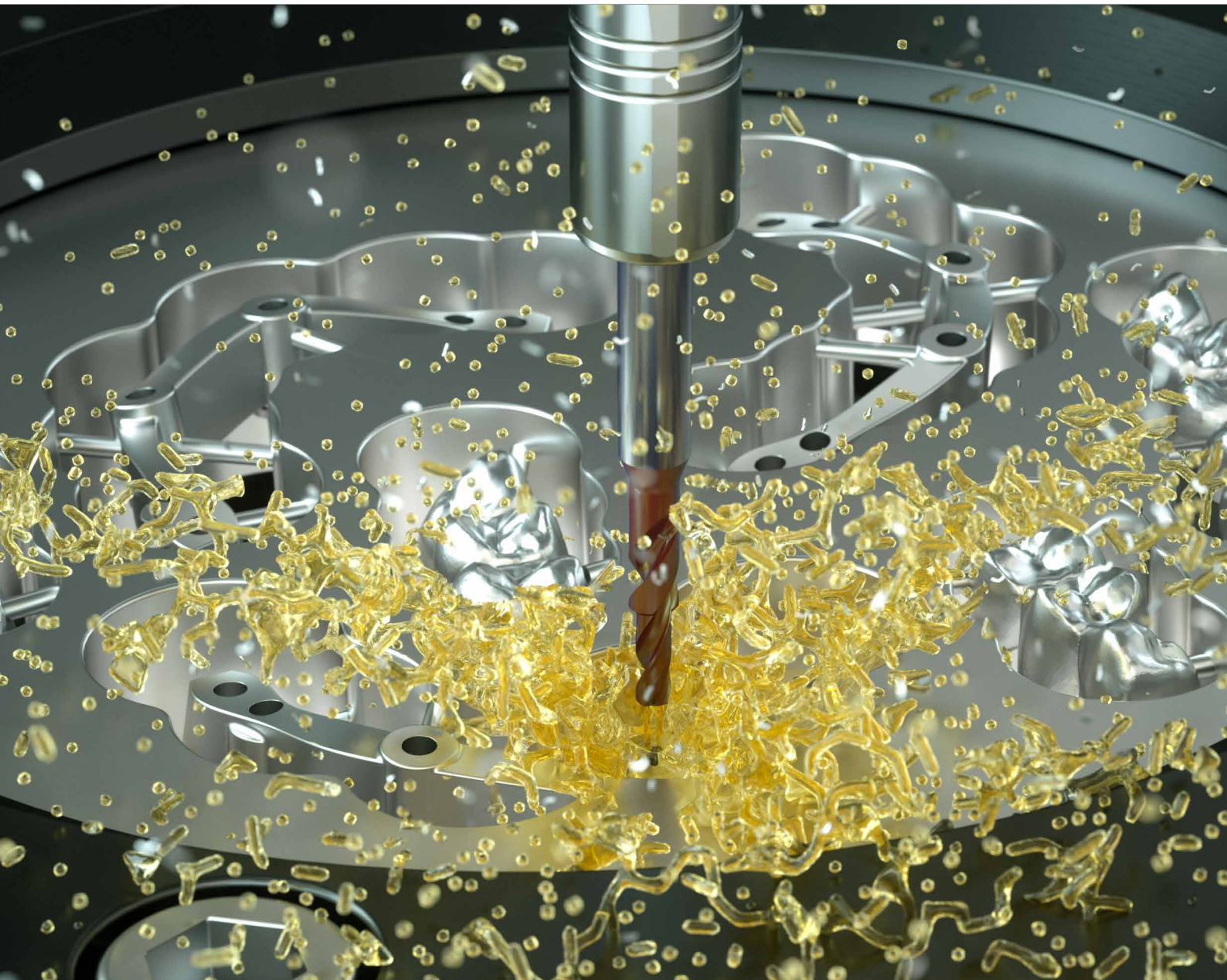
- Turn on internal coolant.
- Drill with CrazyDrill Cool SST-Inox in one step with recommended drilling speed and feed (see cutting data chart).



Note:

After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position. With CrazyDrill Cool SST-Inox is possible immediately get into the material and drill using the recommended cutting speed and feed.

## CrazyDrill Coolpilot





PILOT OR SHORT DRILL WITH INNOVATIVE THROUGH-TOOL COOLING



**What's new:** CrazyDrill Coolpilot was developed as a pilot and short drill with an integrated cutting edge for 90° chamfer for stainless steels, heat-resistant and CrCo alloys. This makes it the ideal complement to CrazyDrill Cool SST-Inox. Outstanding performance thanks to a new chip breaker flute profile and new drop-shaped cooling channels for massive cooling. The new, copper-red coating provides low adhesion to work materials and facilitates an efficient drilling process.

**The features:** Pilot drilling or short drilling up to 3 x d is executed in one step. The follow-up drill is optimally conducted through the pilot hole, thus guaranteeing a high degree of hole straightness. A 90° countersink can be added simultaneously due to the integrated cutting edge for chamfer. Reduced tool changes therefore result in shorter machining times.

Diameter range: 1 mm to 6 mm

Drilling depth: 3 x d

Countersink angle: 90°

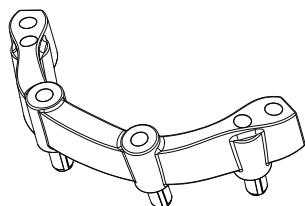
Coating: eXedur SNP

## Maximum precision even in difficult materials

### EFFICIENT PILOT AND SHORT DRILLING IN STAINLESS MATERIALS

With CrazyDrill Coolpilot, Mikron Tool introduces a pilot and short drill for stainless steels, heat-resistant and CrCo alloys in the diameter range of 1.0 mm to 6.0 mm and for a drilling depth of up to 3 x d.

- CrazyDrill Coolpilot, drilling depth 3 x d, with through-tool cooling, countersink 90°



**COMPONENT**

Pontic (dental)

**MATERIAL**

CrCoMo28 / ASTM F1537

**MACHINING**

- Short drilling and chamfering 90°
- d = 4 mm
- drilling depth 12.1 mm

**DRILLING TOOL**

Mikron Tool - CrazyDrill Coolpilot

DATA	MIKRON TOOL
Tool type	CrazyDrill Coolpilot - Carbide - Coated - Internal cooling
Item number	2.PD.04000.090.IC
Cutting data	$v_c = 70$ m/min $f = 0.12$ mm/rev



# CrazyDrill Coolpilot

- Coated
- Through-tool cooling



## 1 | SHANK

The reinforced solid carbide shank guarantees stability, high degree of concentricity and hence maximum drilling precision.

## 2 | NEW: WITH COOLING CHANNELS

Due to a newly designed shape of helical cooling channels, up to four times more coolant volume reaches the drill tip. The result is continuous and efficient chip removal as well as constant and substantial cooling of cutting edges. A Powerchamber additionally guarantees sufficiently strong coolant flow for smaller diameters of up to Ø 2.95 mm.

## 3 | CARBIDE

A specially developed micro-grain solid carbide allows machining at high speeds.

## 4 | NEW COATING

The high-performance coating eXedur SNP is heat-resistant and wear-resistant, prevents build up edges and promotes uniform chip flushing. The result is long tool life.

## 5 | 90° CHAMFER CUTTING EDGE

A 90° countersink can be placed simultaneously with the drilling.

## 6 | NEW CHIP FLUTE PROFILE

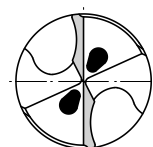
Divided into two areas:

- **Front chip flute area:** a special chip breaker shape ensures compact, short and curved chips.
- **Rear chip flute area:** an extended flute shape ensures perfect chip removal.

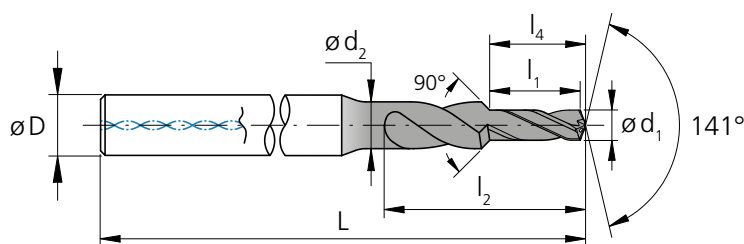
## 7 | DOUBLE GUIDING MARGIN

The narrow guiding chamfer ensures the highest degree of precision (straightness) and surface quality.

Drill tip



## CrazyDrill Coolpilot - 3 x d - 90° countersink



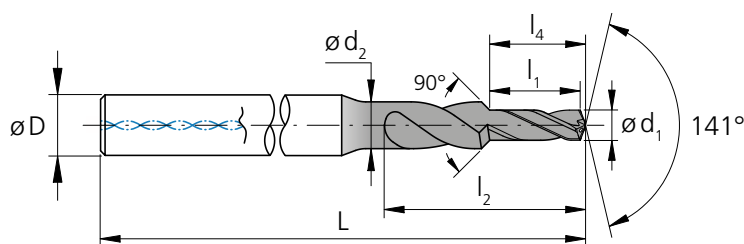
from stock	Item number	d <sub>1</sub> m5 [mm]	l <sub>1</sub> [mm]	d <sub>2</sub> [mm]	l <sub>2</sub> [mm]	l <sub>4</sub> [mm]	D (h6) [mm]	L [mm]
■	2.PD.01000.090.IC	1.00	3.00	1.60	6.5	3.20	4	50
■	2.PD.01050.090.IC	1.05	3.15	1.60	6.8	3.30	4	50
■	2.PD.01100.090.IC	1.10	3.30	1.60	7.1	3.50	4	50
■	2.PD.01150.090.IC	1.15	3.45	1.60	7.5	3.60	4	50
■	2.PD.01200.090.IC	1.20	3.60	1.90	7.8	3.80	4	50
■	2.PD.01250.090.IC	1.25	3.75	1.90	8.1	4.00	4	50
■	2.PD.01300.090.IC	1.30	3.90	1.90	8.4	4.10	4	50
■	2.PD.01350.090.IC	1.35	4.05	1.90	8.8	4.30	4	50
■	2.PD.01400.090.IC	1.40	4.20	1.90	9.1	4.40	4	50
■	2.PD.01450.090.IC	1.45	4.35	2.25	10.4	4.60	4	50
■	2.PD.01500.090.IC	1.50	4.50	2.25	10.7	4.70	4	50
■	2.PD.01550.090.IC	1.55	4.65	2.25	10.9	4.90	4	50
■	2.PD.01600.090.IC	1.60	4.80	2.25	11.2	5.10	4	50
■	2.PD.01650.090.IC	1.65	4.95	2.25	11.5	5.20	4	50
■	2.PD.01700.090.IC	1.70	5.10	2.60	11.8	5.40	4	53
■	2.PD.01750.090.IC	1.75	5.25	2.60	12.1	5.50	4	53
■	2.PD.01800.090.IC	1.80	5.40	2.60	12.3	5.70	4	53
■	2.PD.01850.090.IC	1.85	5.55	2.60	12.6	5.80	4	53
■	2.PD.01900.090.IC	1.90	5.70	2.60	12.8	6.00	4	53
■	2.PD.01950.090.IC	1.95	5.85	2.60	13.1	6.20	4	53

**Regrinding:** This product can be reground starting from Ø 1.4 mm.



■ from stock	Item number	<b>d<sub>1</sub></b>	<b>l<sub>1</sub></b>	<b>d<sub>2</sub></b>	<b>l<sub>2</sub></b>	<b>l<sub>4</sub></b>	<b>D</b>	<b>L</b>
		<b>m5</b> [mm]	[mm]	[mm]	[mm]	[mm]	<b>(h6)</b> [mm]	[mm]
■	2.PD.02000.090.IC	2.00	6.00	3.10	13.3	6.30	4	55
■	2.PD.02050.090.IC	2.05	6.15	3.10	13.6	6.50	4	55
■	2.PD.02100.090.IC	2.10	6.30	3.10	13.9	6.60	4	55
■	2.PD.02150.090.IC	2.15	6.45	3.10	14.1	6.80	4	55
■	2.PD.02200.090.IC	2.20	6.60	3.10	14.4	7.00	4	55
■	2.PD.02250.090.IC	2.25	6.75	3.10	14.7	7.10	4	55
■	2.PD.02300.090.IC	2.30	6.90	3.50	14.9	7.30	4	57
■	2.PD.02350.090.IC	2.35	7.05	3.50	15.2	7.40	4	57
■	2.PD.02400.090.IC	2.40	7.20	3.50	15.6	7.60	4	57
■	2.PD.02450.090.IC	2.45	7.35	3.50	15.9	7.70	4	57
■	2.PD.02500.090.IC	2.50	7.50	3.50	16.2	7.90	4	57
■	2.PD.02550.090.IC	2.55	7.65	3.50	16.5	8.10	4	57
■	2.PD.02600.090.IC	2.60	7.80	4.00	16.9	8.20	4	57
■	2.PD.02650.090.IC	2.65	7.95	4.00	17.2	8.40	4	57
■	2.PD.02700.090.IC	2.70	8.10	4.00	17.5	8.50	4	57
■	2.PD.02750.090.IC	2.75	8.25	4.00	17.8	8.70	4	57
■	2.PD.02800.090.IC	2.80	8.40	4.00	18.2	8.80	4	57
■	2.PD.02850.090.IC	2.85	8.55	4.00	18.5	9.00	4	57
■	2.PD.02900.090.IC	2.90	8.70	4.00	18.8	9.20	4	57
■	2.PD.02950.090.IC	2.95	8.85	4.00	19.1	9.30	4	57

## CrazyDrill Coolpilot - 3 x d - 90° countersink



from stock	Item number	$d_1$ m5 [mm]	$l_1$ [mm]	$d_2$ [mm]	$l_2$ [mm]	$l_4$ [mm]	$D$ (h6) [mm]	$L$ [mm]
■	2.PD.03000.090.IC	3.00	9.00	4.70	19.5	9.50	6	65
■	2.PD.03050.090.IC	3.05	9.15	4.70	19.8	9.60	6	65
■	2.PD.03100.090.IC	3.10	9.30	4.70	20.1	9.80	6	65
■	2.PD.03150.090.IC	3.15	9.45	4.70	20.4	10.00	6	65
■	2.PD.03200.090.IC	3.20	9.60	4.70	20.8	10.10	6	65
■	2.PD.03250.090.IC	3.25	9.75	4.70	21.1	10.30	6	65
■	2.PD.03300.090.IC	3.30	9.90	4.70	21.4	10.40	6	65
■	2.PD.03350.090.IC	3.35	10.05	4.70	21.7	10.60	6	65
■	2.PD.03400.090.IC	3.40	10.20	4.70	22.1	10.70	6	65
■	2.PD.03450.090.IC	3.45	10.35	4.70	22.4	10.90	6	65
■	2.PD.03500.090.IC	3.50	10.50	5.40	22.7	11.10	6	68
■	2.PD.03550.090.IC	3.55	10.65	5.40	23.0	11.20	6	68
■	2.PD.03600.090.IC	3.60	10.80	5.40	23.4	11.40	6	68
■	2.PD.03650.090.IC	3.65	10.95	5.40	23.7	11.50	6	68
■	2.PD.03700.090.IC	3.70	11.10	5.40	24.0	11.70	6	68
■	2.PD.03750.090.IC	3.75	11.25	5.40	24.3	11.80	6	68
■	2.PD.03800.090.IC	3.80	11.40	5.40	24.7	12.00	6	68
■	2.PD.03850.090.IC	3.85	11.55	5.40	25.0	12.20	6	68
■	2.PD.03900.090.IC	3.90	11.70	5.40	25.3	12.30	6	68
■	2.PD.03950.090.IC	3.95	11.85	5.40	25.6	12.50	6	68
■	2.PD.04000.090.IC	4.00	12.00	5.40	26.0	12.60	6	68

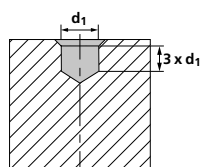
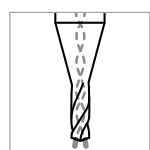
**Regrinding:** This product can be reground starting from  $\varnothing$  1.4 mm.



■ from stock	Item number	<b>d<sub>1</sub></b>	<b>l<sub>1</sub></b>	<b>d<sub>2</sub></b>	<b>l<sub>2</sub></b>	<b>l<sub>4</sub></b>	<b>D</b>	<b>L</b>
		<b>m5</b> [mm]	[mm]	[mm]	[mm]	[mm]	<b>(h6)</b> [mm]	[mm]
■	2.PD.04100.090.IC	4.10	12.30	6.00	26.6	12.90	6	72
■	2.PD.04200.090.IC	4.20	12.60	6.00	27.2	13.30	6	72
■	2.PD.04300.090.IC	4.30	12.90	6.00	27.9	13.60	6	72
■	2.PD.04400.090.IC	4.40	13.20	6.00	28.5	13.90	6	72
■	2.PD.04500.090.IC	4.50	13.50	6.00	29.2	14.20	6	72
■	2.PD.04600.090.IC	4.60	13.80	6.00	29.8	14.50	6	72
■	2.PD.04700.090.IC	4.70	14.10	7.00	30.5	14.80	8	75
■	2.PD.04800.090.IC	4.80	14.40	7.00	31.1	15.20	8	75
■	2.PD.04900.090.IC	4.90	14.70	7.00	31.8	15.50	8	75
■	2.PD.05000.090.IC	5.00	15.00	7.00	32.4	15.80	8	75
■	2.PD.05100.090.IC	5.10	15.30	7.50	33.1	16.10	8	75
■	2.PD.05200.090.IC	5.20	15.60	7.50	33.7	16.40	8	75
■	2.PD.05300.090.IC	5.30	15.90	7.50	34.4	16.70	8	75
■	2.PD.05400.090.IC	5.40	16.20	8.00	35.0	17.10	8	80
■	2.PD.05500.090.IC	5.50	16.50	8.00	35.7	17.40	8	80
■	2.PD.05600.090.IC	5.60	16.80	8.00	36.3	17.70	8	80
■	2.PD.05700.090.IC	5.70	17.10	8.00	37.0	18.00	8	80
■	2.PD.05800.090.IC	5.80	17.40	8.00	37.6	18.30	8	80
■	2.PD.05900.090.IC	5.90	17.70	8.00	38.3	18.60	8	80
■	2.PD.06000.090.IC	6.00	18.00	8.00	38.9	18.90	8	80

## 3 x d - 90° countersink

### DRILLING WITH THROUGH-TOOL COOLING | CUTTING DATA OVERVIEW



Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v <sub>c</sub> [m/min]		
					Low	Mid	High
<b>P</b>	Unalloyed carbon steel Rm < 800 N/mm <sup>2</sup>	1.0301	C10	AISI 1010			
		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 <sup>2</sup>	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 <sup>2</sup>	1.2379	X153CrMoV12	AISI D2			
		1.2436	X210CrW12	AISI D4/D6			
		1.3343	HS6-5-2C	AISI M2 / UNS T11302			
		1.3355	HS18-0-1	AISI T1 / UNS T12001			
		<b>M</b>	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000	60
1.4105	X6CrMoS17			AISI 430F			
Stainless steel martensitic	1.4034		X46Cr13	AISI 420C	60	80	100
	1.4112		X90CrMoV18	AISI 440B			
Stainless steel martensitic – PH	1.4542		X5CrNiCuNb16-4	AISI 630 / ASTM 17-4 PH	60	80	100
	1.4545		X5CrNiCuNb15-5	ASTM 15-5 PH			
Stainless steel austenitic	1.4301		X5CrNi18-10	AISI 304			
	1.4435		X2CrNiMo18-14-3	AISI 316L	60	80	100
	1.4441		X2CrNiMo18-15-3	AISI 316LM			
<b>K</b>	Cast iron	0.6020	GG20	ASTM 30			
		0.6030	GG30	ASTM 40B			
		0.7040	GGG40	ASTM 60-40-18			
		0.7060	GGG60	ASTM 80-60-03			
<b>N</b>	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351			
		3.4365	AlZnMgCu1.5	ASTM 7075			
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380			
		3.2381	GD-AlSi10Mg	UNS A03590			
	Copper	2.0040	Cu-OF / CW008A	UNS C 10100			
		2.0065	Cu-ETP / CW004A	UNS C 11000			
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400			
		2.0360	CuZn40 CW509L	UNS C28000			
	Brass, Bronze Rm < 400 N/mm <sup>2</sup>	2.0401	CuZn39Pb3 / CW614N	UNS C38500			
		2.1020	CuSn6	UNS C51900			
	Bronze Rm < 600 N/mm <sup>2</sup>	2.0966	CuAl10Ni5Fe4	UNS C63000			
2.0960		CuAl9Mn2	UNS C63200				
<b>S<sub>1</sub></b>	Super alloys	2.4856		Inconel 625	30	40	50
		2.4668		Inconel 718			
		2.4617	NiMo28	Hastelloy B-2			
		2.4665	NiCr22Fe18Mo	Hastelloy X			
<b>S<sub>2</sub></b>	Titanium pure	3.7035	Gr.2	ASTM B348 / F67			
		3.7065	Gr.4	ASTM B348 / F68			
<b>S<sub>3</sub></b>	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136			
		9.9367	TiAl6Nb7	ASTM F1295			
<b>S<sub>3</sub></b>	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	50	70	90
			CrCoMo28	ASTM F1537			
<b>H<sub>1</sub></b>	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1			
<b>H<sub>2</sub></b>	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2			

RECOMMENDATION FOR USE

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

P	N	S <sub>3</sub>
M	S <sub>1</sub>	H <sub>1</sub>
K	S <sub>2</sub>	H <sub>2</sub>



f [mm/rev]

Ød1 1.0 mm			Ød1 1.25 mm			Ød1 1.5 mm			Ød1 2.0 mm			Ød1 2.5 mm			Ød1 3.0 mm			Ød1 4.0 mm			Ød1 5.0 mm			Ød1 6.0 mm					
Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Tief	Mid	High
0.010	0.020	0.030	0.013	0.025	0.038	0.015	0.030	0.045	0.020	0.040	0.060	0.025	0.050	0.075	0.030	0.060	0.090	0.040	0.080	0.120	0.050	0.100	0.150	0.060	0.120	0.180			
0.030	0.040	0.050	0.038	0.050	0.063	0.045	0.060	0.075	0.060	0.080	0.100	0.075	0.100	0.125	0.090	0.120	0.150	0.120	0.160	0.200	0.150	0.200	0.250	0.180	0.240	0.300			
0.020	0.030	0.040	0.025	0.038	0.050	0.030	0.045	0.060	0.040	0.060	0.080	0.050	0.075	0.100	0.060	0.090	0.120	0.080	0.120	0.160	0.100	0.150	0.200	0.120	0.180	0.240			
0.020	0.030	0.040	0.025	0.038	0.050	0.030	0.045	0.060	0.040	0.060	0.080	0.050	0.075	0.100	0.060	0.090	0.120	0.080	0.120	0.160	0.100	0.150	0.200	0.120	0.180	0.240			
0.010	0.015	0.020	0.013	0.019	0.025	0.015	0.023	0.030	0.020	0.030	0.040	0.025	0.038	0.050	0.030	0.045	0.060	0.040	0.060	0.080	0.050	0.075	0.100	0.060	0.090	0.120			
0.020	0.030	0.040	0.025	0.038	0.050	0.030	0.045	0.060	0.040	0.060	0.080	0.050	0.075	0.100	0.060	0.090	0.120	0.080	0.120	0.160	0.100	0.150	0.200	0.120	0.180	0.240			

## Drilling process CrazyDrill Coolpilot

### SHORT DRILLING 3 X D AND 90° COUNTERSINK

#### Coolant type, pressure and filtration

##### Coolant type

For best results, Mikron Tool recommends the use of cutting oil as coolant fluid. Alternatively, emulsion with EP-Additives (Extreme-Pressure-Additives) can be used with good results as well.

**Filtration:** Good filter quality is very important when using through coolant drills. Dirt particles or residual chips can clog the coolant holes and consequently reduce dramatically the flowrate.

The following filter qualities must be adhered especially in small diameters:

- Drill with  $\varnothing < 2$  mm filter quality  $\leq 0.010$  mm.
- Drill with  $\varnothing < 3$  mm filter quality  $\leq 0.020$  mm.
- Drill with  $\varnothing < 6$  mm filter quality  $\leq 0.050$  mm.

**Coolant pressure:** At least the coolant pressure mentioned in the chart is required for the CrazyDrill Coolpilot to achieve reliable drilling. High pressure is generally better for the cooling and flushing effect.

$\varnothing$ d, Tool	[mm]	1.0 mm - 2.0 mm	2.0 mm - 4.0 mm	4.0 mm - 6.0 mm
Minimal pressure	[bar]	50	40	25

#### Pilot drilling and short drilling

Pilot drilling with CrazyDrill Coolpilot is the perfect preparation for accurate drilling (position and alignment accuracy) and stable machining process.

Drilling quality (position and alignment accuracy, no measurable transition from pilot to follow-up hole) and stable machining process are assured due to matched diameters of the tools.

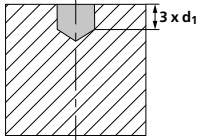
CrazyDrill Coolpilot not only is the perfect preparation of deep follow-up holes. Concurrently it is a short drill for highly precise and quick drilling up to 3 x d + 90° countersink.



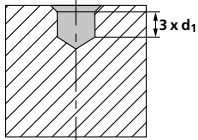
## DRILLING PROCESS

### 1 | PILOT DRILLING OR SHORT DRILLING

- Turn on internal coolant.
- Drilling in one step with recommended cutting speed and feed rate (see cutting data table).



- If needed, after the desired cutting depth of  $3 \times d$  is reached, a chamfer angle of  $90^\circ$  can be realized.



Note:

After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position.

**crazy about** cool tools



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## THIS IS WHAT MIKRON TOOL IS ALL ABOUT

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The manufacturing of innovative solid carbide tools with highest quality standards requires consistent dedication from the entire Mikron Tool team – from geometry definition, grinding and coating to the pre- and post-treatment of the tools.

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Our strength lies in the machining in the small diameter range, (drills from diameter 0.1 mm), focusing on difficult-to-machine materials.

### **REPEATED PRECISION IN THE $\mu\text{m}$ RANGE**

The most modern technology in manufacturing equipment and measuring instruments guarantees that tools are produced with a precision of  $\pm 0.0005$  mm.

### **MAXIMUM PERFORMANCE**

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