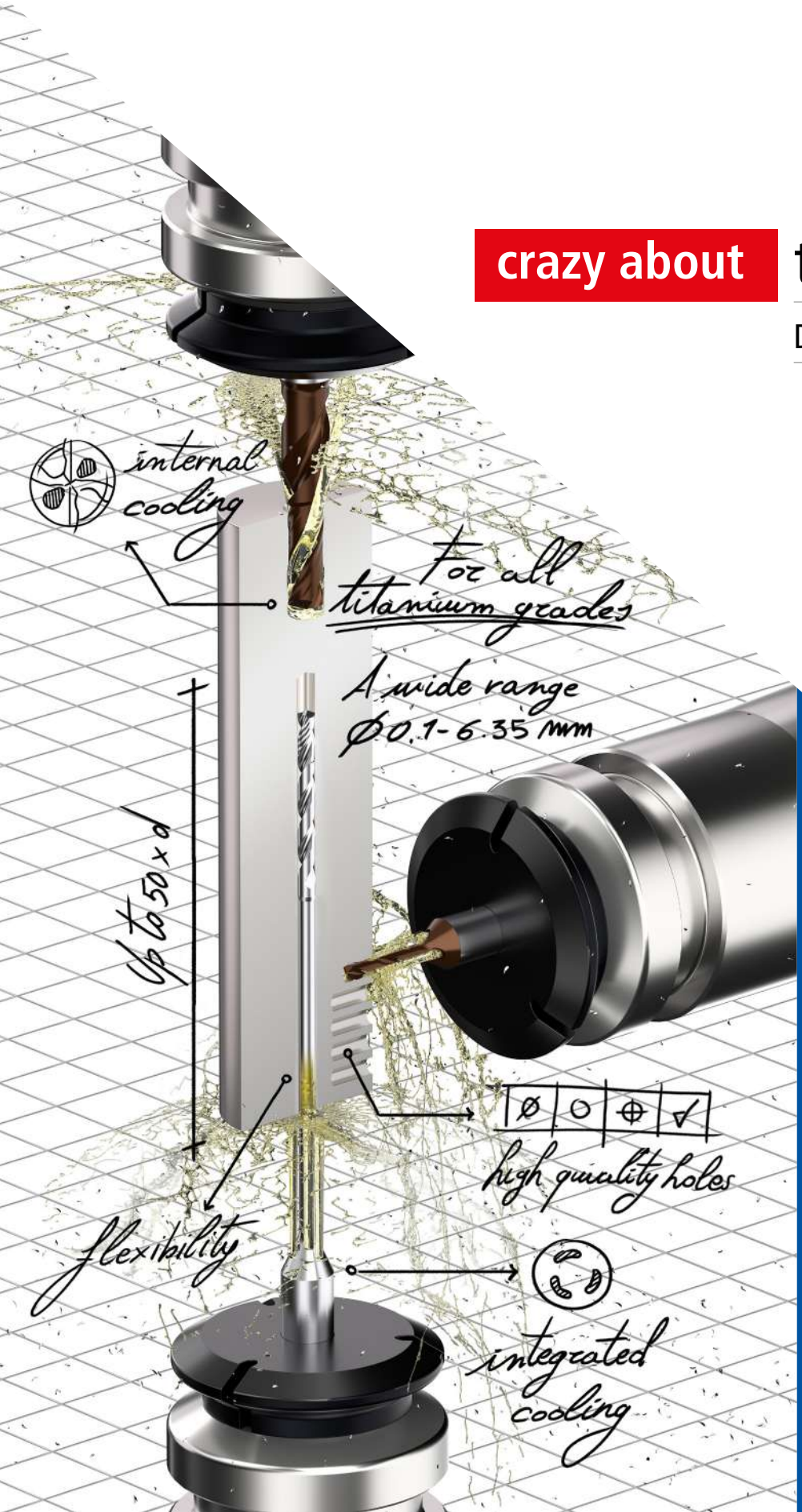
MIKRON TOOL

More than tools

crazy about titanium drilling

DRILLING UP TO 50 X D



NEW

English

DRILLING TITANIUM - CHALLENGES AND SOLUTIONS!

Machining titanium grades presents several unique challenges due to the material's distinctive properties. These materials are favored for their high strength, light weight, biocompatibility, and exceptional rust and corrosion resistance, making them an ideal choice for aerospace, medical, and various industrial applications. However, these beneficial attributes also pose significant difficulties in machining, particularly in drilling.

Mikron Tool's R&D department spent years in researching with our customers how to overcome those challenges.

Mikron Tool presents top notch high-end solid carbide drills:

- **CrazyDrill Titanium TK / TN:** A micro drill specifically developed for pure and alloyed titanium in the diameter range between 0.2 and 2.0 mm with a drilling depth up to 6 x d
- **CrazyDrill Flex Titanium:** A micro deep-hole drill specifically developed for pure titanium in the diameter range between 0.1 and 1.2 mm with a drilling depth up to 50 x d
- **CrazyDrill Flex Titanium ATK:** A micro deep-hole drill specifically developed for alloyed titanium in the diameter range between 0.3 and 2.0 mm with a drilling depth up to 50 x d

NEW

- **CrazyDrill Cool Titanium ATC / PTC:** Two specific drill geometries developed for pure titanium (PTC) and alloyed titanium (ATC) in the diameter range between 1.0 and 6.35 mm with drilling depth up to 10 x d in one shot

INDEX

NEW Overview of tools for titanium

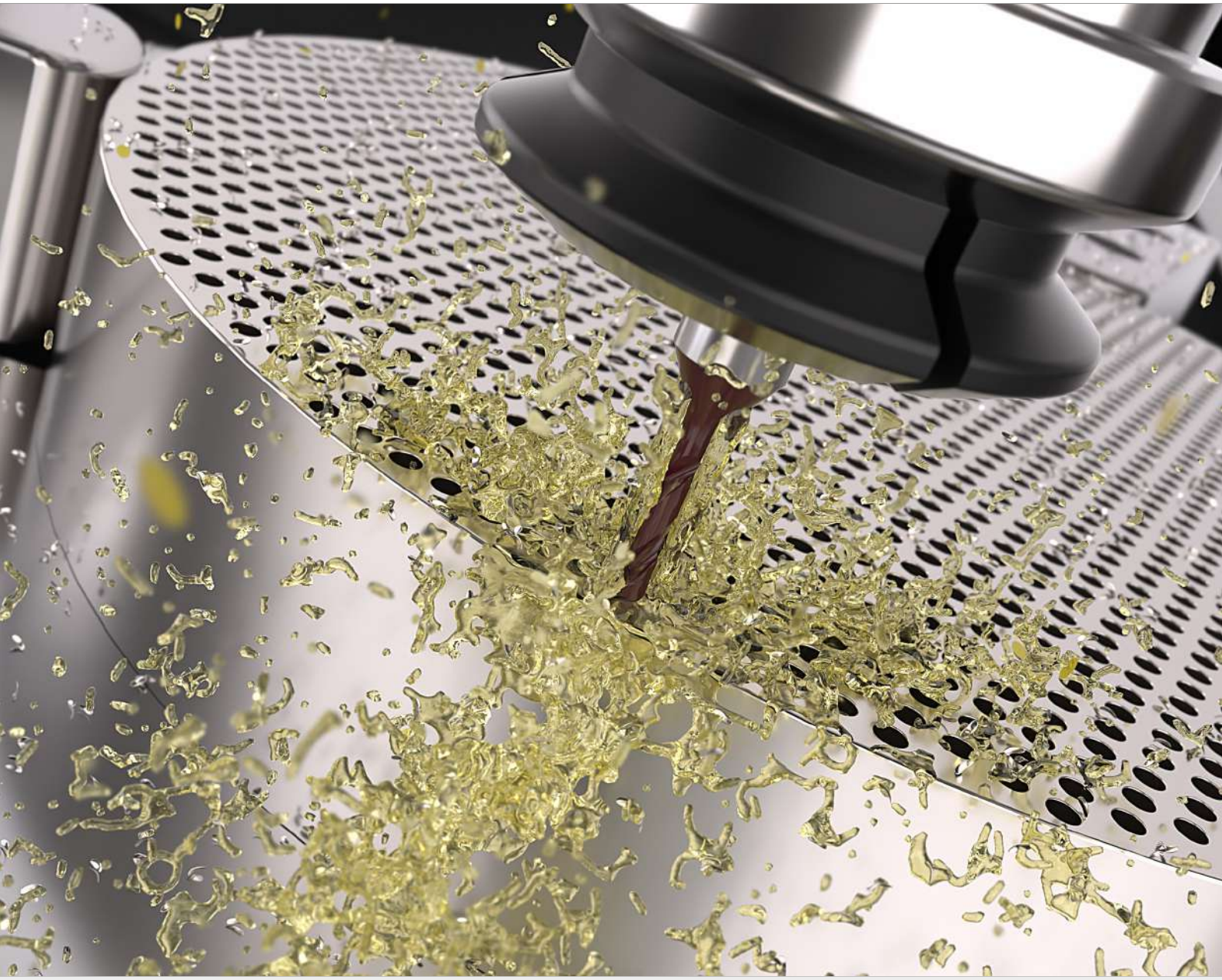
	CRAZYDRILL™ Titanium	
	CRAZYDRILL™ Flexpilot TITANIUM	
	CRAZYDRILL™ Flex TITANIUM	
NEW	CRAZYDRILL™ Flex TITANIUM ATK	
	CRAZYDRILL™ Coolpilot Titanium ATC	
	CRAZYDRILL™ Cool Titanium ATC	
	CRAZYDRILL™ Cool Titanium PTC	

RECOMMENDATION FOR USE

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

ø - range [mm]	max. depth	Cooling		P	M	K	N	S_1	S_2		S_3	H_1	H_2	Page
		Int.	Ext.	Unalloyed and alloyed steel	Stainless steel	Cast iron	Non ferrous metals	Super alloys	Pure titanium	Alloyed titanium	CoCr alloys	Hardened steel <55 HRC	Hardened steel ≥55 HRC	
0.2 – 2.0	3 x d 6 x d	✔	✔	⊠	⊠	⊠	⊠	⊠	●	●	⊠	⊠	⊠	**6**
0.1 – 1.2	3 x d	-	✔	⊠	⊠	⊠	◐	⊠	●	○	⊠	⊠	⊠	**26**
0.1 – 1.2	30 x d 50 x d	✔	✔	⊠	⊠	⊠	◐	⊠	●	○	⊠	⊠	⊠	**26**
0.3 – 2.0	30 x d 50 x d	✔	-	⊠	⊠	⊠	⊠	⊠	⊠	●	⊠	⊠	⊠	**26**
1.0 – 6.35	3 x d +90° counter-sink	✔	-	⊠	⊠	⊠	⊠	⊠	⊠	●	⊠	⊠	⊠	**54**
1.0 – 6.35	6 x d 10 x d	✔	-	⊠	⊠	⊠	⊠	⊠	⊠	●	⊠	⊠	⊠	**54**
1.0 – 6.35	3 x d 6 x d	✔	-	⊠	⊠	⊠	⊠	⊠	●	⊠	⊠	⊠	⊠	**54**

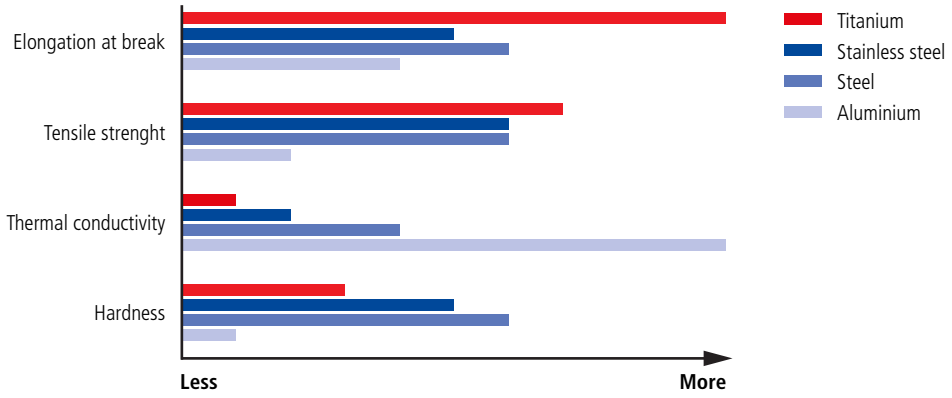
CrazyDrill Titanium TK / TN



CRAZYDRILL™ by Mikron Tool Titanium

MICRO-HIGH-PERFORMANCE DRILLING IN ALL GRADES OF TITANIUM

The trend towards miniaturization requires ever smaller high-performance tools that guarantee reliable processes and maximum precision. This applies in particular to the machining of titanium and its alloys, which are often very difficult to machine due to the specific material properties. The biggest machining challenges are:



With the CrazyDrill Titanium TK / TN high-performance titanium drills, Mikron Tool is expanding its titanium drill program (previously from 1.0 to 6.35 mm) with micro drills in the diameter range from 0.2 to 2.0 mm. These can also be used reliably in machining scenarios with low internal cooling pressure or with external cooling.

Regrinding: This product is not suitable for regrinding.

Please note: You couldn't find your suitable version of the CrazyDrill Titanium TK / TN (diameter, length, cutting direction…)? Ask us about our customized versions!

CrazyDrill Titanium TK / TN

MICRO-HIGH-PERFORMANCE DRILLING IN ALL GRADES OF TITANIUM

1. Challenge

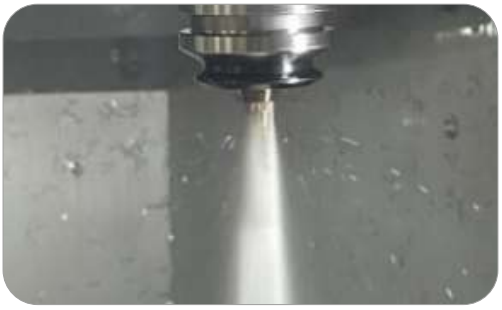
High thermal load

Material	Thermal conductivity
Aluminum	167 W/mK
Stainless steel	21 W/mK
Titanium alloy	**7 W/mK**

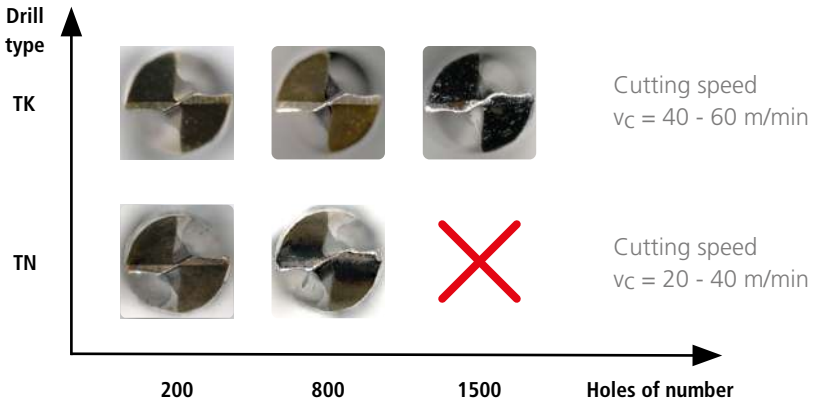
When drilling titanium, the high thermal load on the cutting edge poses a challenge. This leads to chipping of the cutting edge and increased tool wear. For drills larger than 1 mm and with a minimum coolant pressure of 40 bar, the most effective cooling technology involves twisted internal cooling channels that exit at the drill tip. However, for drill diameters starting from 0.2 to 1.0 mm, alternative cooling methods must be explored to ensure a stable and reliable drilling process.

Solution

Through shank coolant system



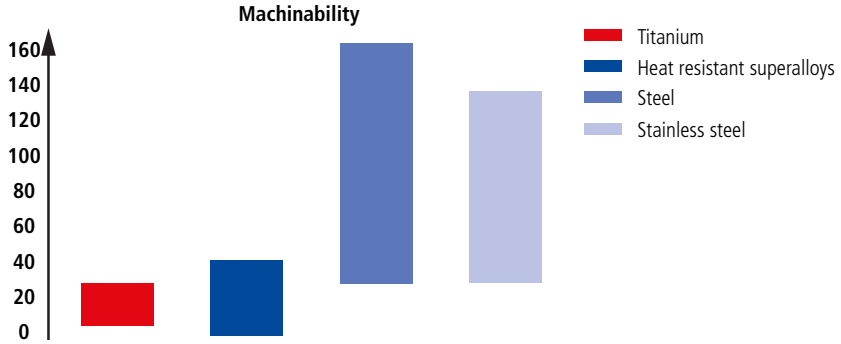
The patented coolant system integrated in the shank of the CrazyDrill Titanium TK enables reliable drilling with high feed rates at 15 bar coolant pressure. The tool life of the CrazyDrill Titanium TK also sets a new benchmark compared to its competitors. For applications without the option of internal cooling, Mikron Tool has developed the high-performance CrazyDrill Titanium TN micro drill, which has been consistently designed for external coolant supply.



2. Challenge

Low machinability of Titanium

High-performance drilling of titanium materials is highly demanding. The machining behavior of titanium materials is shown in the diagram below in comparison with other materials. In order to drill titanium materials efficiently and reliably, not only is a special cutting geometry required, but all the geometry features must be adapted and balanced to the specific properties of titanium grades.

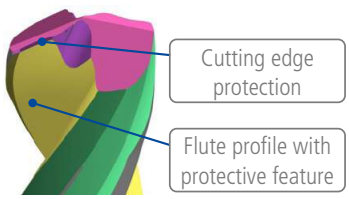


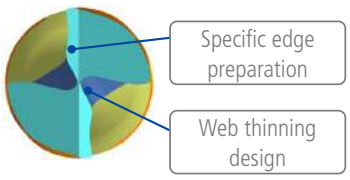
Solution

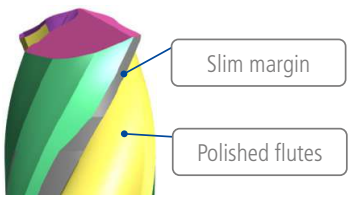
Specific cutting geometry for all grades of titanium

With the CrazyDrill Titanium, Mikron Tool has developed a high-performance drill that guarantees optimal drilling for both pure titanium and its alloys. This is made possible by a specifically designed cutting geometry and corresponding pecking drill processes, which keep chips short and enable a safe chip removal. The newly developed universal titanium drills CrazyDrill Titanium are suitable for all types of titanium and have the following advantages and properties:

- **Excellent self-centering**
- **Highest process reliability**
- **Perfect chip evacuation**
- **Prevention of built-up edges and reduced material adhesion**





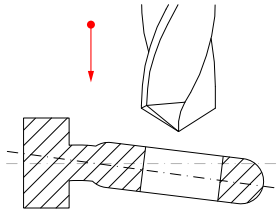


CrazyDrill Titanium TK / TN

MICRO-HIGH-PERFORMANCE DRILLING IN ALL GRADES OF TITANIUM

3. Challenge

Reduce high axial forces

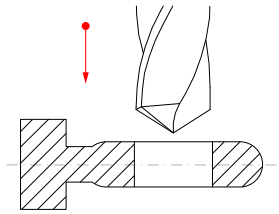


Bending effect

The cutting speed at the center of the drill is nearly zero, which leads to high axial forces. These forces have a stronger impact on process reliability in micro-drilling than in larger diameters or workpieces. The design of the cutting-tip geometry is therefore crucial in order to reduce the axial forces. A traditional cutting-tip geometry with a wide drill core generates high axial forces, which can lead to deformation during the drilling process on unstable, thin-walled workpieces. In addition, excessive axial force can cause undesirable deflection of the drill.

Solution

Specific titanium drill tip design



No bending effect

CrazyDrill Titanium TK / TN is provided with a specifically designed web thinning. In combination with a cutting geometry designed titanium grades, the axial forces are significantly reduced. The result is a force reduction of 25% to 45%.

Example

	Competitor Ø2 mm - 3 x d		CrazyDrill Titanium TK Ø2 mm - 3 x d	
	Mean	Peak	Mean	Peak
Axial force Fz [N]	100	270	75	150

4. Challenge

High hole quality

Requested diameter (i.e: Ø 2 mm)
Machined diameter (i.e: Ø 2.04 mm)

Titanium grades behave elastically during drilling. The material contracts again like rubber after the drill has entered it. This elastic behavior must be taken into account during drill development, because the drilled hole will adjust itself in the micrometer range immediately after the drilling process. The challenges are correspondingly high in terms of process reliability (jamming / breakage of the drill), accuracy in diameter, roundness and position, surface quality of the drill hole.

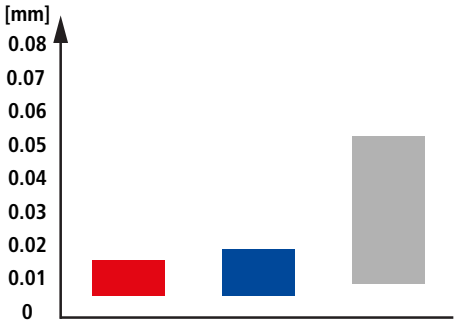
Solution

Titanium-specific drill design

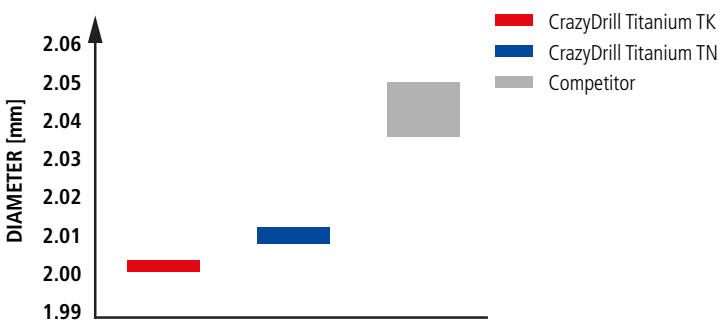
A perfect and complete geometry optimization that is specifically designed for pure titanium and titanium alloys and ensures the best drilling results:

- Drill tip / web thinning → Low axial force → Good positioning & low deviation
- Cutting edge with protection → Stable cutting edges (no breakage) → Precise hole diameter
- Slim margin → Avoiding of material adhesion → Good surface quality

Positioning error (Ti Gr.2)



Hole diameter for Ø 2 mm (Ti Gr.2)



Find out more!

Your benefits

The most important features

- Specially designed cutting geometry for all grades of titanium
- Specially designed for machining conditions with a maximum cooling lubricant pressure of 15 bar or external cooling
- CrazyDrill Titanium TK: Efficient cooling system, thanks to patented through shank cooling channels
- Polished flutes for process-reliable chip evacuation
- Micro diameters range from Ø 0.2 to 2.0 mm

Your advantages

- Perfect performance for any titanium grade
- Possibility to machine with low pressure by spindle: min. 15 bar (CrazyDrill Titanium TK) or external cooling (CrazyDrill Titanium TN)
- Low cutting forces (axial, torque and bending)
- Perfect, process-reliable chip evacuation
- Ideal heat dissipation

Your benefits

- Excellent drilling quality
- High process reliability
- Up to 3 times longer tool life compared to the best competitors in the market
- Up to 2 times faster machining time compared to the best competitors in the market

Maximum performance guaranteed

EXAMPLE OF TITANIUM MACHINING IN COMPARISON

■ Example

Faster machining time

Machining: Drilling with pecks
Number of holes: 1'000
Drilling depth: 3 mm;
Coolant: Emulsion 8%

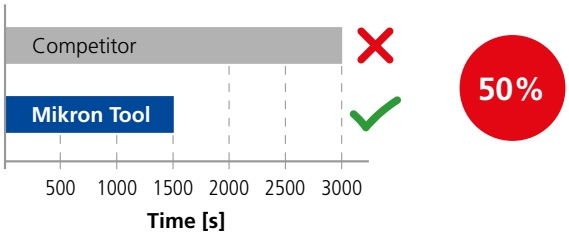
Pure titanium: 3.7035 / Ti Gr.2 / ASTM B348 S2

Tool: CrazyDrill Titanium TK
Diameter: 1.0 mm

Cutting data:

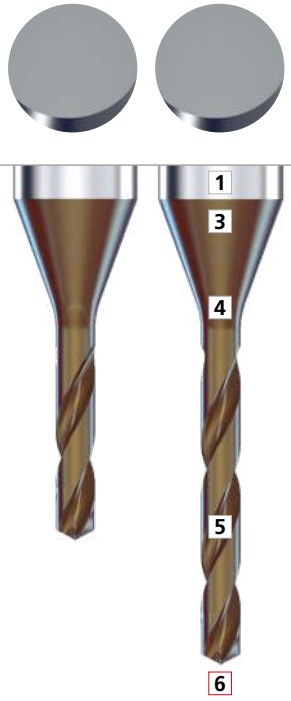
Conventional drill for titanium		**CrazyDrill Titanium TK**	
v_c = 25 m/min	f = 0.01 mm/rev	v_c = 60 m/min	f = 0.01 mm/rev
Q_1 = 0.5 mm	Q_x = 0.5 mm	Q_1 = 1.0 mm	Q_x = 1.0 mm

Results:



Type TN

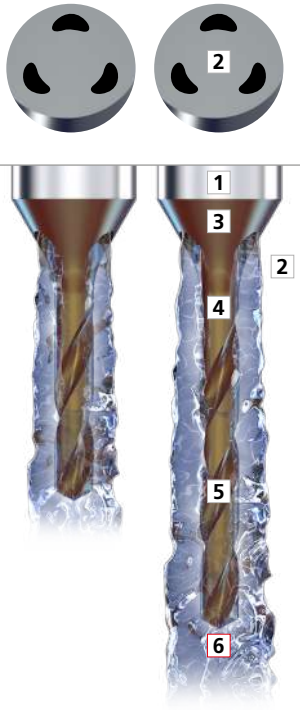
- External cooling
- Coated



Page 17

Type TK

- Integrated cooling
- Coated



Page 16

1 | SHAFT
The robust carbide shaft allows stable drilling without vibrations.

2 | NEW COOLING CONCEPT
The integrated coolant through the shank provides efficient cooling to the drill tip. The result is a reliable process and an increased productivity.

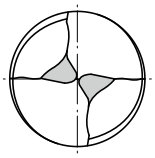
3 | CARBIDE
The carbide especially developed for CrazyDrill Titanium fulfills perfectly all requirements for the machining of titanium's grades.

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

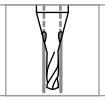
5 | POLISHED FLUTES
The polished flutes promote less friction and uniform chip evacuation.

6 | CUTTING GEOMETRY
The drill point and outer profile geometry is specially developed for all titanium grades to achieve:
- high cutting-edge stability
- self-centering
- less material adhesion and build-up edges

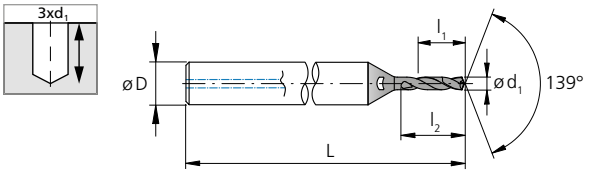
Drill tip



Type TK 3 x d / 6 x d



DRILLING WITH INTEGRATED COOLING



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0.35		1.05	1.7	3	38	2.CD.030035.TK	■
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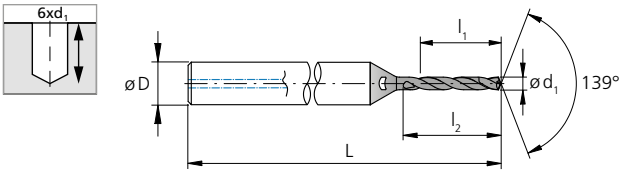

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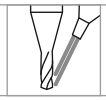
1.80		10.80	14.0	4	55	2.CD.060180.TK	■
1.85		11.10	14.4	4	55	2.CD.060185.TK	■
1.90		11.40	14.8	4	55	2.CD.060190.TK	■
1.95		11.70	15.2	4	55	2.CD.060195.TK	■
2.00		12.00	15.6	4	55	2.CD.060200.TK	■

■ Stock item

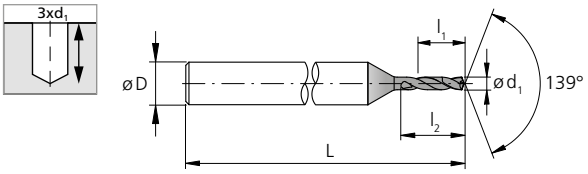
Type TN 3 x d / 6 x d

Carbide | 139° | Z2 | eXedur SNP

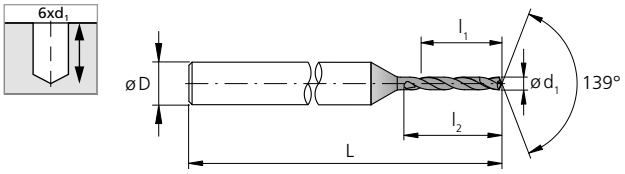


DRILLING WITH EXTERNAL COOLING

Ø d_1	0.1 - 3.0 mm
Tolerance	+ 0.006 mm 0



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.20		0.60	1.0	3	40	2.CD.030020.TN	Δ
0.25		0.75	1.2	3	40	2.CD.030025.TN	Δ
0.30		0.90	1.4	3	40	2.CD.030030.TN	Δ
0.35		1.05	1.7	3	40	2.CD.030035.TN	Δ
0.396	**1/64**	1.19	1.9	3	40	2.CD.030F164.TN	Δ
0.40		1.20	1.9	3	40	2.CD.030040.TN	Δ
0.45		1.35	2.2	3	45	2.CD.030045.TN	Δ
0.50		1.50	2.4	3	45	2.CD.030050.TN	Δ
0.55		1.65	2.6	3	45	2.CD.030055.TN	Δ
0.60		1.80	2.9	3	45	2.CD.030060.TN	Δ
0.65		1.95	3.1	3	45	2.CD.030065.TN	Δ
0.70		2.10	3.4	3	45	2.CD.030070.TN	Δ
0.75		2.25	3.6	3	45	2.CD.030075.TN	Δ
0.793	**1/32**	2.38	3.8	3	45	2.CD.030F132.TN	Δ
0.80		2.40	3.8	3	45	2.CD.030080.TN	Δ
0.85		2.55	4.1	3	45	2.CD.030085.TN	Δ
0.90		2.70	4.3	3	45	2.CD.030090.TN	Δ
0.95		2.85	4.6	3	50	2.CD.030095.TN	Δ
1.00		3.00	4.8	3	50	2.CD.030100.TN	Δ
1.05		3.15	5.0	3	50	2.CD.030105.TN	Δ
1.10		3.30	5.3	3	50	2.CD.030110.TN	Δ
1.15		3.45	5.5	3	50	2.CD.030115.TN	Δ
1.20		3.60	5.8	3	50	2.CD.030120.TN	Δ
1.25		3.75	6.0	3	50	2.CD.030125.TN	Δ
1.30		3.90	6.2	3	50	2.CD.030130.TN	Δ
1.35		4.05	6.5	3	50	2.CD.030135.TN	Δ
1.40		4.20	6.7	3	50	2.CD.030140.TN	Δ
1.45		4.35	7.0	3	50	2.CD.030145.TN	Δ
1.50		4.50	7.2	3	50	2.CD.030150.TN	Δ
1.55		4.65	7.4	3	50	2.CD.030155.TN	Δ
1.587	**1/16**	4.76	7.6	3	50	2.CD.030F116.TN	Δ
1.60		4.80	7.7	3	50	2.CD.030160.TN	Δ
1.65		4.95	7.9	3	50	2.CD.030165.TN	Δ
1.70		5.10	8.2	3	50	2.CD.030170.TN	Δ
1.75		5.25	8.4	3	50	2.CD.030175.TN	Δ
1.80		5.40	8.6	3	50	2.CD.030180.TN	Δ
1.85		5.55	8.9	3	50	2.CD.030185.TN	Δ
1.90		5.70	9.1	3	50	2.CD.030190.TN	Δ
1.95		5.85	9.4	3	50	2.CD.030195.TN	Δ
2.00		6.00	9.6	3	50	2.CD.030200.TN	Δ

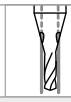


d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.20		1.20	1.6	3	40	2.CD.060020.TN	Δ
0.25		1.50	2.0	3	40	2.CD.060025.TN	Δ
0.30		1.80	2.3	3	40	2.CD.060030.TN	Δ
0.35		2.10	2.7	3	40	2.CD.060035.TN	Δ
0.396	**1/64**	2.38	3.1	3	40	2.CD.060F164.TN	Δ
0.40		2.40	3.1	3	40	2.CD.060040.TN	Δ
0.45		2.70	3.5	3	45	2.CD.060045.TN	Δ
0.50		3.00	3.9	3	45	2.CD.060050.TN	Δ
0.55		3.30	4.3	3	45	2.CD.060055.TN	Δ
0.60		3.60	4.7	3	45	2.CD.060060.TN	Δ
0.65		3.90	5.1	3	45	2.CD.060065.TN	Δ
0.70		4.20	5.5	3	45	2.CD.060070.TN	Δ
0.75		4.50	5.9	3	45	2.CD.060075.TN	Δ
0.793	**1/32**	4.76	6.2	3	45	2.CD.060F132.TN	Δ
0.80		4.80	6.2	3	45	2.CD.060080.TN	Δ
0.85		5.10	6.6	3	45	2.CD.060085.TN	Δ
0.90		5.40	7.0	3	45	2.CD.060090.TN	Δ
0.95		5.70	7.4	3	50	2.CD.060095.TN	Δ
1.00		6.00	7.8	3	50	2.CD.060100.TN	Δ
1.05		6.30	8.2	3	50	2.CD.060105.TN	Δ
1.10		6.60	8.6	3	50	2.CD.060110.TN	Δ
1.15		6.90	9.0	3	50	2.CD.060115.TN	Δ
1.20		7.20	9.4	3	50	2.CD.060120.TN	Δ
1.25		7.50	9.8	3	50	2.CD.060125.TN	Δ
1.30		7.80	10.1	3	50	2.CD.060130.TN	Δ
1.35		8.10	10.5	3	50	2.CD.060135.TN	Δ
1.40		8.40	10.9	3	50	2.CD.060140.TN	Δ
1.45		8.70	11.3	3	50	2.CD.060145.TN	Δ
1.50		9.00	11.7	3	50	2.CD.060150.TN	Δ
1.55		9.30	12.1	3	50	2.CD.060155.TN	Δ
1.587	**1/16**	9.52	12.4	3	50	2.CD.060F116.TN	Δ
1.60		9.60	12.5	3	50	2.CD.060160.TN	Δ
1.65		9.90	12.9	3	50	2.CD.060165.TN	Δ
1.70		10.20	13.3	3	50	2.CD.060170.TN	Δ
1.75		10.50	13.7	3	50	2.CD.060175.TN	Δ
1.80		10.80	14.0	3	50	2.CD.060180.TN	Δ
1.85		11.10	14.4	3	50	2.CD.060185.TN	Δ
1.90		11.40	14.8	3	50	2.CD.060190.TN	Δ
1.95		11.70	15.2	3	50	2.CD.060195.TN	Δ
2.00		12.00	15.6	3	50	2.CD.060200.TN	Δ

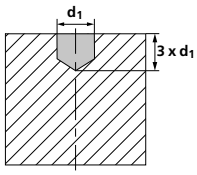
Δ Delivery term upon request, minumum purchase order quantity 3 pcs.

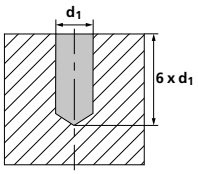
TK - 3 x d - 6 x d

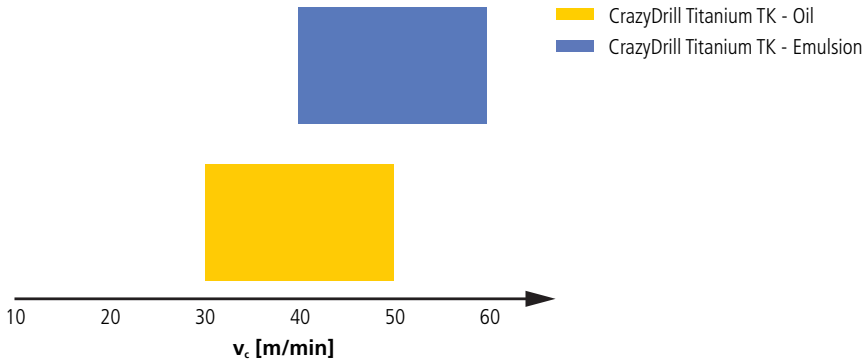
DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW



Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Mid	v_c [m/min] High
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	30	60
		3.7065	Gr.4	ASTM B348 / F68		
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136		
		9.9367	TiAl6Nb7	ASTM F1295		

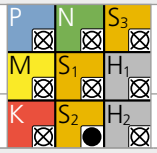






RECOMMENDATION FOR USE

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



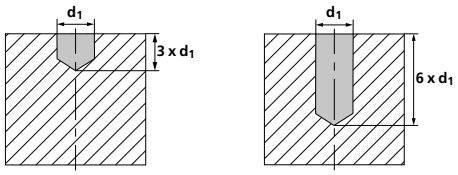
f [mm/rev]

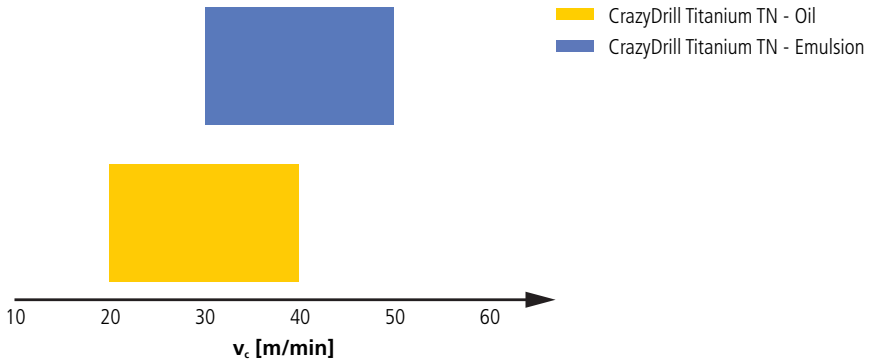
Ød1	0.2 - 0.4 mm 1/64"				0.5 - 0.9 mm 1/32"				1.0 - 1.2 mm				1.3 - 1.4 mm				1.5 - 1.8 mm 1/32"				1.9 - 2.0 mm			
	Mid	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x
	0.002	0.004	1.0xd1	0.5 - 1.0 xd1	0.005	0.009	1.5xd1	1.0xd1	0.010	0.012	2.0xd1	1.0xd1	0.013	0.014	2.0xd1	1.0xd1	0.015	0.018	3.0xd1	1.0xd1	0.019	0.020	3.0xd1	1.0xd1

TN - 3 x d - 6 x d

DRILLING WITH EXTERNAL COOLING | CUTTING DATA OVERVIEW

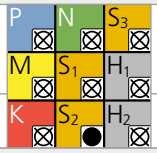
Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Mid	v_c [m/min] High
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	30	60
		3.7065	Gr.4	ASTM B348 / F68		
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136		
		9.9367	TiAl6Nb7	ASTM F1295		





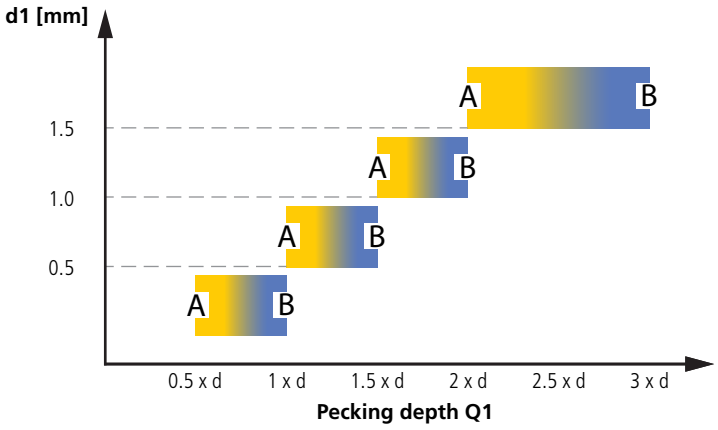
RECOMMENDATION FOR USE

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



f [mm/rev]

Ød1	0.2 - 0.4 mm 1/64"				0.5 - 0.9 mm 1/32"				1.0 - 1.2 mm				1.3 - 1.4 mm				1.5 - 1.8 mm 1/32"				1.9 - 2.0 mm			
	Mid	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x	**Mid**	High	Q_1	Q_x
	0.002	0.004	0.5 - 1.0 xd1	1.0xd1	0.005	0.009	1.0 - 1.5 xd1	1.0xd1	0.010	0.012	1.5 - 2.0 xd1	1.0xd1	0.013	0.014	1.5 - 2.0 xd1	1.0xd1	0.015	0.018	2.0 - 3.0 xd1	1.0xd1	0.019	0.020	2.0 - 3.0 xd1	1.0xd1



A: CrazyDrill Titanium TN - Oil
B: CrazyDrill Titanium TN - Emulsion

Drilling process CrazyDrill Titanium

PRECISE AND EFFICIENT DRILLING FROM Ø 0.2 MM

Coolant type, pressure and filtration

Coolant: For best results, Mikron Tool recommends the use of emulsion of 8% or more with EP-Additives (Extreme-Pressure-Additives) as coolant. Alternatively, cutting oil can be used as well.

Filter: The large cooling channels allow a standard filter with filter quality of ≤ 0.05 mm.

For tools with external cooling no filtration parameters have to be considered concerning filter.

Coolant pressure: To ensure a reliable drilling process using tools with through-tool cooling the following minimal pressures are needed (see chart). Higher pressures are needed for smaller drill size diameters. High pressure is generally better for the cooling and flushing effect.

Revolution	[rev/min]	≤ 10'000	> 10'000
Minimal pressure	[bar]	15	30

For tools with external cooling no specific parameters have to be considered concerning coolant pressure. But it must be ensured that the coolant is conducted directly to the drill tip, thus cooling and lubricating the drill perfectly and flushing away the chips.

Drilling process CrazyDrill Titanium

PRECISE AND EFFICIENT DRILLING FROM Ø 0.2 MM

CrazyDrill Titanium TK / TN 3 x d

Because of the high degree of self-centering capability, CrazyDrill Titanium TK / TN 3 x d can be used on on regular, irregular, straight and rough surfaces without an hole preparation.

CrazyDrill Titanium TK / TN 6 x d

Because of the high degree of self-centering capability, CrazyDrill Titanium TK / TN 6 x d can be used on on regular, irregular, straight and rough surfaces without an hole preparation.

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

- **CrazyDrill Twicenter** as center drill,
- **CrazyDrill Crosspilot** as pilot drill for inclined surfaces

Centering / pilot drilling and drilling

Centering with CrazyDrill Twicenter is the perfect combination for a precise hole in terms of position accuracy and a stable machining process.

Pilot drilling with CrazyDrill Titanium TK 3 x d is the perfect preparation for accurate drilling (position and alignment accuracy) and stable machining process for deep-hole drilling with CrazyDrill Flex Titanium ATK.

The pilot drill CrazyDrill Crosspilot does the same when drilling on inclined surfaces.
The drilling quality is also guaranteed due to predetermined tool tolerances.

DRILLING PROCESS

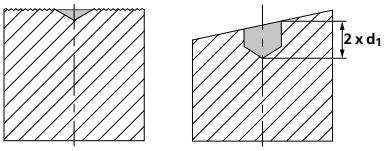
Drilling according DIN 66025 / PAL

G83 deep-drilling cycle with chip breaking and chip removal pecks

Q = depth of the respective peck

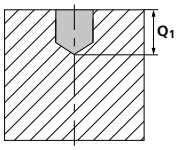
1 | CENTERING OR PILOT DRILLING

- With CrazyDrill Twicenter (irregular or rough surfaces) or CrazyDrill Crosspilot (inclined surfaces) for version 6 x d.

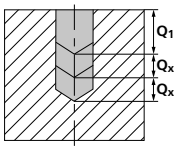


2 | DRILLING

- With CrazyDrill Titanium up to maximum drilling depth Q_1 in one step, followed by pecks to remove chips.



- Further pecks Q_X according to cutting data table, followed by pecks to remove chips.



Note:

Between pecks, take the drill completely out from the bore. After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position.

Mastercam **News: Tool libraries of all Mikron Tool catalog products are available on Mastercam's Tech Exchange, ready for download!**

PATENTED CrazyDrill Flex

NEW

CRAZYDRILL by Mikron Tool Flex

FLEXIBILITY AND SOLID CARBIDE: NO CONTRARIETY

With CrazyDrill Flex, Mikron Tool offers a solid carbide drill designed for deep-hole drilling up to 50 x d. Diameter range from 0.1 to 2.0 mm in two versions:

- **CrazyDrill Flex Titanium:** Specifically engineered cutting geometry for peck drilling in pure titanium and copper. The 30 x d variant uses external cooling, while the 50 x d variant features a through-coolant channel integrated into the shank.
- **CrazyDrill Flex Titanium ATK:** The new Mikron Tool high-performance drill ensures optimal deep-hole drilling in alloyed titanium. Its specially designed cutting geometry and peck drilling process keep chips short and allow safe chip evacuation. Both the 30 x d and 50 x d variants feature a through-coolant channel integrated into the shank.

We recommend for all verions a pilot drilling with:

- **CrazyDrill Flexpilot Titanium** for CrazyDrill Flex Titanium
- **CrazyDrill Titanium TK** for CrazyDrill Flex Titanium ATK
- **CrazyDrill Crosspilot** on inclined surfaces for both versions

Regrinding: This product is not suitable for regrinding.

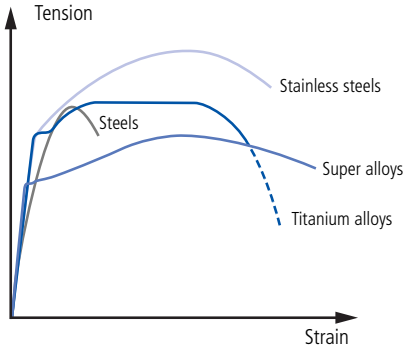
Please note: You couldn't find your suitable version of the CrazyDrill Flex (diameter, length, cutting direction…)? Ask us about our customized versions!

NEW CrazyDrill Flex

MICRO-HIGH-PERFORMANCE DRILLING IN ALL GRADES OF TITANIUM

1. Challenge

Poor chip formation

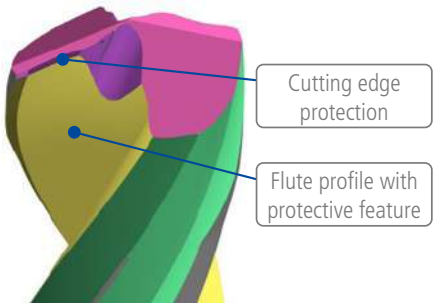


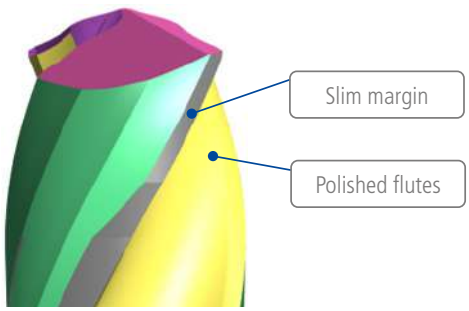
Titanium's ductility, or its ability to deform plastically without breaking, makes it a challenging material to machine. When drilling, titanium tends to bend and form continuous chips rather than breaking into smaller pieces. This can lead to poor chip control, clogging drill jamming, and increased cutting forces.

Solution

Special flute profile - example CrazyDrill Flex Titanium ATK

A special flute profile with protective feature ensures good chip breaking and efficent chip removal. Moreover, chips are quickly flushed away of the cutting zone thanks to the patented coolant system integrated in the shank. This enables reliable drilling with high feed rates at 15 bar coolant pressure. CrazyDrill Flex Titanium's tool life sets a new benchmark compared to the competition.

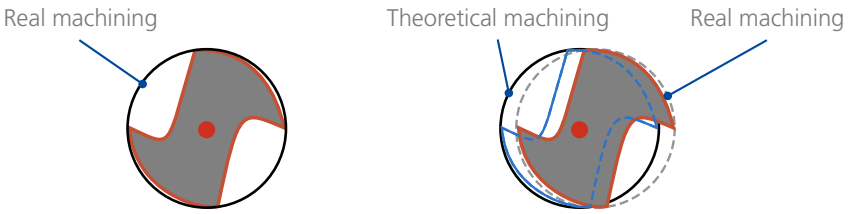




2. Challenge

Misalignment & runout

Misalignment and runout are common issues in deep-hole drilling operations with solid carbide drills. Even minimal alignment deviations between tool and guiding hole lead to uneven cutting forces and excessive wear. Runout further amplifies this by causing the drill to wobble during rotation, reducing precision and stability. These factors together compromise hole quality and increase mechanical stress on the tool. As a result, premature unexpected tool breakage is a common and costly consequence.



Solution

Patented drill center piece: flexibility and stability

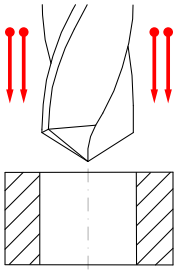
A flexible center piece with a reduced cross-section ensures elasticity (flection) and provides at the same time higher rigidity (torsion/compression) compared to drilling with a through flute. The micro deep-hole drill can easily compensate misalignment of up to 40% of its diameter and runout issues without breaking off. Until now, this was only possible with HSS tools.

NEW CrazyDrill Flex

MICRO-HIGH-PERFORMANCE DRILLING IN ALL GRADES OF TITANIUM

3. Challenge

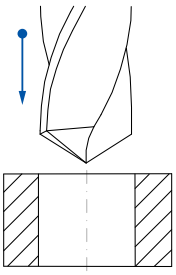
Drill breakage due to excessive axial forces



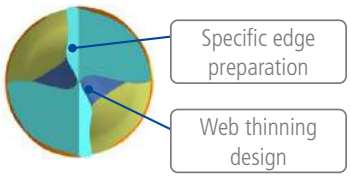
The cutting speed at the center of the drill is nearly zero, which leads to high axial forces. These forces have a stronger impact on process reliability in micro deep-hole drilling than in larger diameters or workpieces. The design of the cutting-tip geometry is therefore crucial in order to reduce the axial forces. A traditional cutting-tip geometry with a wide drill core generates high axial forces, which can lead to drill instability and deflection. This can lead to unexpected tool failure.

Solution

Specific titanium drill tip design to reduce axial forces



CrazyDrill Flex Titanium ATK is provided with a specifically designed web thinning that avoids drill jamming, material adhesion, and build-up edges. In combination with a cutting geometry designed for alloyed titanium, the axial forces are significantly reduced. The result is a force reduction of 25% to 45%.

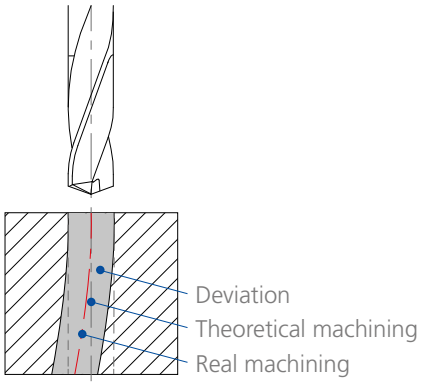


Example

	Competitor Ø2 mm		CrazyDrill Flex Titanium ATK Ø2 mm	
	Mean	Peak	Mean	Peak
Axial force Fz [N]	100	270	75	150

4. Challenge

Poor hole straightness & deviation



Poor hole straightness and deviation are common challenges in deep drilling of titanium with solid carbide drills. The high strength, elasticity of titanium, and inadequate guidance can cause the drill to wander, especially at greater depths. Deviation causes the hole to drift from its intended path, leading to dimensional inaccuracies. This not only affects the functionality of the final component but also increases the risk of tool breakage.

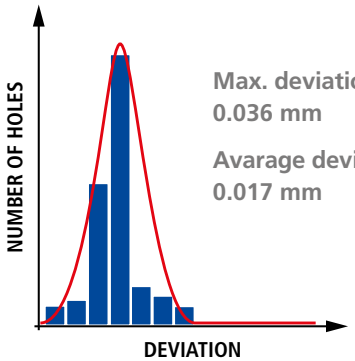
Solution

Specific titanium drill design

A perfect and complete geometry optimization that is specifically designed for pure titanium and titanium alloys and ensures the best drilling results:

- Drill tip / web thinning → Low axial forces → Good positioning & low deviation
- Cutting edge with protection → Stable cutting edges (no breakage) → Precise hole diameter
- Patented drill center → Offset & runout compensation → Low deviation

Deviation chart



Material: Ti Gr.5 / 3.7165 / ASTM F136;
Diameter: 0.5 mm;
Drilling depth: 50 x d;
Total number of holes: 50;
Coolant: cutting oil;
Cutting data: v_C = 20 m/min; f = 0.005 mm/rev; Q_1 = 1.5 mm; Q_X = 0.25mm;

Find out more!

Your benefits

The most important features

- Two specific geometries:
  - CrazyDrill Flex Titanium for pure titanium
  - CrazyDrill Flex Titanium ATK for titanium alloys
- Efficient cooling system, thanks to patented through shank cooling channels
- Micro diameters range from Ø 0.1 to 2.0 mm with drilling depth up to 50 x d

Your advantages

- Perfect performance for any titanium grade
- Possibility to machine with low pressure: min. 15 bar
- Low cutting forces (axial, torque and bending)
- Thanks to the flexible center piece, CrazyDrill Flex is just as flexible as HSS, yet with longer tool life
- Ideal heat dissipation

Your benefits

- Excellent drilling quality
- High process reliability: even with 40% x d misalignment or runout issue
- Up to 10 times faster than gun drill or EDM
- No need to invest in expensive deep-hole drilling machines

PATENTED

Titanium

3 x d	30 x d	50 x d

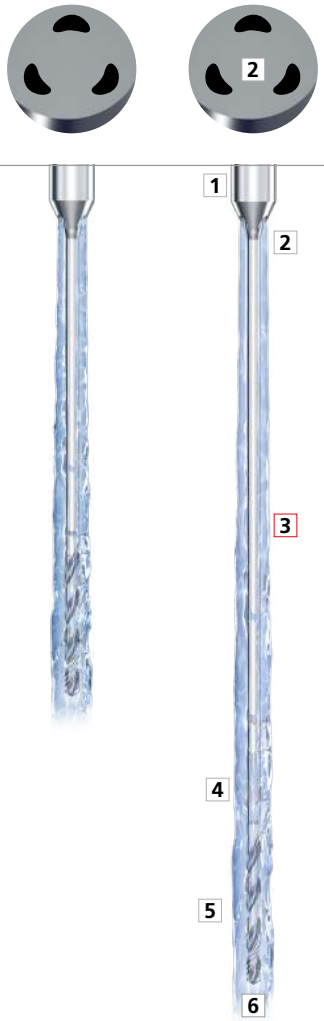
- Integrated / External cooling
- Uncoated
- Ø0.1 - 1.2 mm
- For pure titanium

Page 36 | Page 38 | Page 40

Titanium ATK

30 x d	50 x d

- Integrated cooling
- Uncoated
- Ø0.3 - 2.0 mm
- For titanium alloy



Page 42 | Page 44

NEW

1 | SHAFT

The sturdy carbide shaft guarantees high circular accuracy and thus top drilling precision.

2 | COOLING

All 50 x d versions as well as the 30 x d version for CrazyDrill Flex Titanium ATK have integrated coolant through the shank. These guarantee efficient cooling of the cutting edges from just 15 bar. The special design and shape produce a concentrated jet even at high speeds, which guarantees regular and significant cooling of the drill tip.

3 | CENTER PIECE: FLEXIBILITY AND STABILITY - PATENTED

A flexible center piece with a reduced cross-section ensures elasticity (flection) and provides at the same time higher rigidity (torsion/compression) compared to drilling with a through flute. The micro deep-hole drill can easily compensate center offsets of up to 40% of its diameter without breaking off. Until now, this was only possible with HSS tools.

4 | SOLID CARBIDE

The fine-grained solid carbide grade developed for the CrazyDrill Flex is very tough and resistant to heat shock, thus easily meeting the requirements for the machining of steels, titanium, and non-corrosive and heat-resistant alloys.

5 | FLUTES GEOMETRY

The flutes geometry is adapted to the materials machined. Good chip breaking and quick chip removal are guaranteed.

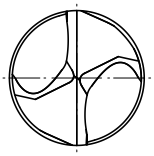
6 | CUTTING GEOMETRY

Two material specific tip geometries have been developed for:

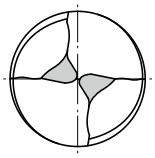
- Pure titanium
- Alloyed titanium

They guarantee high cutting stability, self-centering, short chips, less material adhesion and build-up edges. Thanks to the clever web thinning, less penetration force is required when drilling.

Drill tip



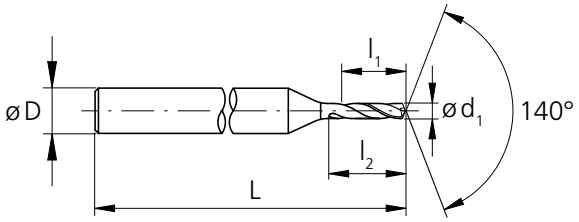
CrazyDrill Flex Titanium



CrazyDrill Flex Titanium ATK

Titanium - 3 x d

DRILLING WITH EXTERNAL COOLING



d_1 [mm]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.10	0.30	0.5	3	40	2.PFT.010.0	■
0.11	0.33	0.6	3	40	2.PFT.011.0	Δ
0.12	0.36	0.6	3	40	2.PFT.012.0	Δ
0.13	0.39	0.7	3	40	2.PFT.013.0	Δ
0.14	0.42	0.7	3	40	2.PFT.014.0	Δ
0.15	0.45	0.8	3	40	2.PFT.015.0	■
0.16	0.48	0.8	3	40	2.PFT.016.0	Δ
0.17	0.51	0.9	3	40	2.PFT.017.0	Δ
0.18	0.54	0.9	3	40	2.PFT.018.0	Δ
0.19	0.57	1.0	3	40	2.PFT.019.0	Δ
0.20	0.60	1.0	3	40	2.PFT.020.0	■
0.21	0.63	1.1	3	40	2.PFT.021.0	Δ
0.22	0.66	1.1	3	40	2.PFT.022.0	Δ
0.23	0.69	1.2	3	40	2.PFT.023.0	Δ
0.24	0.72	1.2	3	40	2.PFT.024.0	Δ
0.25	0.75	1.3	3	40	2.PFT.025.0	■
0.26	0.78	1.3	3	40	2.PFT.026.0	Δ
0.27	0.81	1.4	3	40	2.PFT.027.0	Δ
0.28	0.84	1.4	3	40	2.PFT.028.0	Δ
0.29	0.87	1.5	3	40	2.PFT.029.0	Δ
0.30	0.90	1.5	3	40	2.PFT.030.0	■
0.31	0.93	1.6	3	40	2.PFT.031.0	Δ
0.32	0.96	1.6	3	40	2.PFT.032.0	Δ
0.33	0.99	1.7	3	40	2.PFT.033.0	Δ
0.34	1.02	1.7	3	40	2.PFT.034.0	Δ
0.35	1.05	1.8	3	40	2.PFT.035.0	■
0.36	1.08	1.8	3	40	2.PFT.036.0	Δ
0.37	1.11	1.9	3	40	2.PFT.037.0	Δ
0.38	1.14	1.9	3	40	2.PFT.038.0	Δ
0.39	1.17	2.0	3	40	2.PFT.039.0	Δ
0.40	1.20	2.0	3	40	2.PFT.040.0	■
0.41	1.23	2.1	3	40	2.PFT.041.0	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.42	1.26	2.1	3	40	2.PFT.042.0	Δ
0.43	1.29	2.2	3	40	2.PFT.043.0	Δ
0.44	1.32	2.2	3	40	2.PFT.044.0	Δ
0.45	1.35	2.3	3	40	2.PFT.045.0	■
0.46	1.38	2.3	3	40	2.PFT.046.0	Δ
0.47	1.41	2.4	3	40	2.PFT.047.0	Δ
0.48	1.44	2.4	3	40	2.PFT.048.0	Δ
0.49	1.47	2.5	3	40	2.PFT.049.0	Δ
0.50	1.50	2.5	3	40	2.PFT.050.0	■
0.51	1.53	2.6	3	40	2.PFT.051.0	Δ
0.52	1.56	2.6	3	40	2.PFT.052.0	Δ
0.53	1.59	2.7	3	40	2.PFT.053.0	Δ
0.54	1.62	2.7	3	40	2.PFT.054.0	Δ
0.55	1.65	2.8	3	40	2.PFT.055.0	■
0.56	1.68	2.8	3	40	2.PFT.056.0	Δ
0.57	1.71	2.9	3	40	2.PFT.057.0	Δ
0.58	1.74	2.9	3	40	2.PFT.058.0	Δ
0.59	1.77	3.0	3	40	2.PFT.059.0	Δ
0.60	1.80	3.0	3	40	2.PFT.060.0	■
0.61	1.83	3.1	3	40	2.PFT.061.0	Δ
0.62	1.86	3.1	3	40	2.PFT.062.0	Δ
0.63	1.89	3.2	3	40	2.PFT.063.0	Δ
0.64	1.92	3.2	3	40	2.PFT.064.0	Δ
0.65	1.95	3.3	3	40	2.PFT.065.0	■
0.66	1.98	3.3	3	40	2.PFT.066.0	Δ
0.67	2.01	3.4	3	40	2.PFT.067.0	Δ
0.68	2.04	3.4	3	40	2.PFT.068.0	Δ
0.69	2.07	3.5	3	40	2.PFT.069.0	Δ
0.70	2.10	3.5	3	40	2.PFT.070.0	■
0.71	2.13	3.6	3	40	2.PFT.071.0	Δ
0.72	2.16	3.6	3	40	2.PFT.072.0	Δ
0.73	2.19	3.7	3	40	2.PFT.073.0	Δ

■ Stock item
Δ Delivery term upon request, minumum purchase order quantity 5 pcs.

For Pure Titanium	Carbide	30xd1	140°	Z2	Uncoated

Ø d_1	0.1 - 3.0 mm
Tolerance	+ 0.003 mm 0

d_1 [mm]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.74	2.22	3.7	3	40	2.PFT.074.0	Δ
0.75	2.25	3.8	3	40	2.PFT.075.0	■
0.76	2.28	3.8	3	40	2.PFT.076.0	Δ
0.77	2.31	3.9	3	40	2.PFT.077.0	Δ
0.78	2.34	3.9	3	40	2.PFT.078.0	Δ
0.79	2.37	4.0	3	40	2.PFT.079.0	Δ
0.80	2.40	4.0	3	40	2.PFT.080.0	■
0.81	2.43	4.1	3	40	2.PFT.081.0	Δ
0.82	2.46	4.1	3	40	2.PFT.082.0	Δ
0.83	2.49	4.2	3	40	2.PFT.083.0	Δ
0.84	2.52	4.2	3	40	2.PFT.084.0	Δ
0.85	2.55	4.3	3	40	2.PFT.085.0	■
0.86	2.58	4.3	3	40	2.PFT.086.0	Δ
0.87	2.61	4.4	3	40	2.PFT.087.0	Δ
0.88	2.64	4.4	3	40	2.PFT.088.0	Δ
0.89	2.67	4.5	3	40	2.PFT.089.0	Δ
0.90	2.70	4.5	3	40	2.PFT.090.0	■
0.91	2.73	4.6	3	40	2.PFT.091.0	Δ
0.92	2.76	4.6	3	40	2.PFT.092.0	Δ
0.93	2.79	4.7	3	40	2.PFT.093.0	Δ
0.94	2.82	4.7	3	40	2.PFT.094.0	Δ
0.95	2.85	4.8	3	40	2.PFT.095.0	■
0.96	2.88	4.8	3	40	2.PFT.096.0	Δ
0.97	2.91	4.9	3	40	2.PFT.097.0	Δ
0.98	2.94	4.9	3	40	2.PFT.098.0	Δ
0.99	2.97	5.0	3	40	2.PFT.099.0	Δ
1.00	3.00	5.0	3	40	2.PFT.100.0	■
1.01	3.03	5.1	3	40	2.PFT.101.0	Δ
1.02	3.06	5.1	3	40	2.PFT.102.0	Δ
1.03	3.09	5.2	3	40	2.PFT.103.0	Δ
1.04	3.12	5.2	3	40	2.PFT.104.0	Δ
1.05	3.15	5.3	3	40	2.PFT.105.0	■

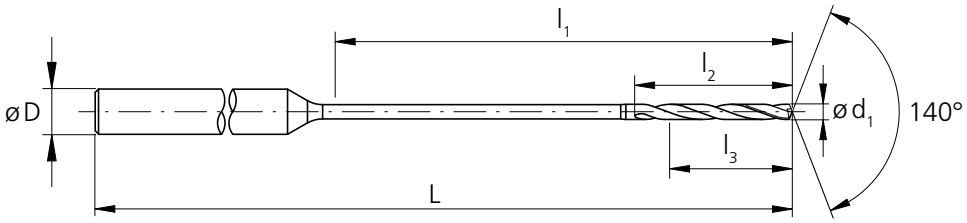
d_1 [mm]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.06	3.18	5.3	3	40	2.PFT.106.0	Δ
1.07	3.21	5.4	3	40	2.PFT.107.0	Δ
1.08	3.24	5.4	3	40	2.PFT.108.0	Δ
1.09	3.27	5.5	3	40	2.PFT.109.0	Δ
1.10	3.30	5.5	3	40	2.PFT.110.0	■
1.11	3.33	5.6	3	40	2.PFT.111.0	Δ
1.12	3.36	5.6	3	40	2.PFT.112.0	Δ
1.13	3.39	5.7	3	40	2.PFT.113.0	Δ
1.14	3.42	5.7	3	40	2.PFT.114.0	Δ
1.15	3.45	5.8	3	40	2.PFT.115.0	■
1.16	3.48	5.8	3	40	2.PFT.116.0	Δ
1.17	3.51	5.9	3	40	2.PFT.117.0	Δ
1.18	3.54	5.9	3	40	2.PFT.118.0	Δ
1.19	3.57	6.0	3	40	2.PFT.119.0	Δ
1.20	3.60	6.0	3	40	2.PFT.120.0	■

Complementary products

CrazyDrill Flex Titanium p.38

Titanium - 30 x d

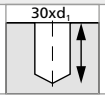
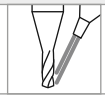
DRILLING WITH EXTERNAL COOLING



d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.10	3.0	1.1	0.8	3	45	2.CFT.30010.0	■
0.11	3.3	1.2	0.9	3	45	2.CFT.30011.0	Δ
0.12	3.6	1.3	1.0	3	45	2.CFT.30012.0	Δ
0.13	3.9	1.4	1.0	3	45	2.CFT.30013.0	Δ
0.14	4.2	1.5	1.1	3	45	2.CFT.30014.0	Δ
0.15	4.5	1.6	1.2	3	45	2.CFT.30015.0	■
0.16	4.8	1.7	1.3	3	45	2.CFT.30016.0	Δ
0.17	5.1	1.8	1.4	3	45	2.CFT.30017.0	Δ
0.18	5.4	1.9	1.4	3	45	2.CFT.30018.0	Δ
0.19	5.7	2.0	1.5	3	45	2.CFT.30019.0	Δ
0.20	6.0	2.1	1.6	3	45	2.CFT.30020.0	■
0.21	6.3	2.2	1.7	3	45	2.CFT.30021.0	Δ
0.22	6.6	2.3	1.8	3	45	2.CFT.30022.0	Δ
0.23	6.9	2.4	1.8	3	45	2.CFT.30023.0	Δ
0.24	7.2	2.5	1.9	3	45	2.CFT.30024.0	Δ
0.25	7.5	2.6	2.0	3	45	2.CFT.30025.0	■
0.26	7.8	2.7	2.1	3	45	2.CFT.30026.0	Δ
0.27	8.1	2.8	2.2	3	45	2.CFT.30027.0	Δ
0.28	8.4	2.9	2.2	3	45	2.CFT.30028.0	Δ
0.29	8.7	3.0	2.3	3	45	2.CFT.30029.0	Δ
0.30	9.0	3.2	2.4	3	50	2.CFT.30030.0	■
0.31	9.3	3.3	2.5	3	50	2.CFT.30031.0	Δ
0.32	9.6	3.4	2.6	3	50	2.CFT.30032.0	Δ
0.33	9.9	3.5	2.6	3	50	2.CFT.30033.0	Δ
0.34	10.2	3.6	2.7	3	50	2.CFT.30034.0	Δ
0.35	10.5	3.7	2.8	3	50	2.CFT.30035.0	■
0.36	10.8	3.8	2.9	3	50	2.CFT.30036.0	Δ
0.37	11.1	3.9	3.0	3	50	2.CFT.30037.0	Δ
0.38	11.4	4.0	3.0	3	50	2.CFT.30038.0	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.39	11.7	4.1	3.1	3	50	2.CFT.30039.0	Δ
0.40	12.0	4.2	3.2	3	50	2.CFT.30040.0	■
0.41	12.3	4.3	3.3	3	50	2.CFT.30041.0	Δ
0.42	12.6	4.4	3.4	3	50	2.CFT.30042.0	Δ
0.43	12.9	4.5	3.4	3	50	2.CFT.30043.0	Δ
0.44	13.2	4.6	3.5	3	50	2.CFT.30044.0	Δ
0.45	13.5	4.7	3.6	3	50	2.CFT.30045.0	■
0.46	13.8	4.8	3.7	3	50	2.CFT.30046.0	Δ
0.47	14.1	4.9	3.8	3	50	2.CFT.30047.0	Δ
0.48	14.4	5.0	3.8	3	50	2.CFT.30048.0	Δ
0.49	14.7	5.1	3.9	3	50	2.CFT.30049.0	Δ
0.50	15.0	5.3	4.0	3	53	2.CFT.30050.0	■
0.51	15.3	5.4	4.1	3	53	2.CFT.30051.0	Δ
0.52	15.6	5.5	4.2	3	53	2.CFT.30052.0	Δ
0.53	15.9	5.6	4.2	3	53	2.CFT.30053.0	Δ
0.54	16.2	5.7	4.3	3	53	2.CFT.30054.0	Δ
0.55	16.5	5.8	4.4	3	53	2.CFT.30055.0	■
0.56	16.8	5.9	4.5	3	53	2.CFT.30056.0	Δ
0.57	17.1	6.0	4.6	3	53	2.CFT.30057.0	Δ
0.58	17.4	6.1	4.6	3	53	2.CFT.30058.0	Δ
0.59	17.7	6.2	4.7	3	53	2.CFT.30059.0	Δ
0.60	18.0	6.3	4.8	3	53	2.CFT.30060.0	■
0.61	18.3	6.4	4.9	3	53	2.CFT.30061.0	Δ
0.62	18.6	6.5	5.0	3	53	2.CFT.30062.0	Δ
0.63	18.9	6.6	5.0	3	53	2.CFT.30063.0	Δ
0.64	19.2	6.7	5.1	3	53	2.CFT.30064.0	Δ
0.65	19.5	6.8	5.2	3	53	2.CFT.30065.0	■
0.66	19.8	6.9	5.3	3	53	2.CFT.30066.0	Δ
0.67	20.1	7.0	5.4	3	53	2.CFT.30067.0	Δ

■ Stock item
Δ Delivery term upon request, minumum purchase order quantity 5 pcs.

Carbide			Z2	Uncoated	

Ø d_1	0.1 - 1.2 mm
Tolerance	- 0.003 mm - 0.006 mm

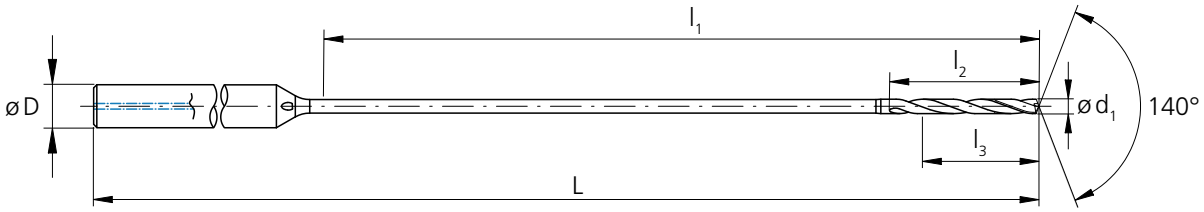
d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.68	20.4	7.1	5.4	3	53	2.CFT.30068.0	Δ
0.69	20.7	7.2	5.5	3	53	2.CFT.30069.0	Δ
0.70	21.0	7.4	5.6	3	60	2.CFT.30070.0	■
0.71	21.3	7.5	5.7	3	60	2.CFT.30071.0	Δ
0.72	21.6	7.6	5.8	3	60	2.CFT.30072.0	Δ
0.73	21.9	7.7	5.8	3	60	2.CFT.30073.0	Δ
0.74	22.2	7.8	5.9	3	60	2.CFT.30074.0	Δ
0.75	22.5	7.9	6.0	3	60	2.CFT.30075.0	■
0.76	22.8	8.0	6.1	3	60	2.CFT.30076.0	Δ
0.77	23.1	8.1	6.2	3	60	2.CFT.30077.0	Δ
0.78	23.4	8.2	6.2	3	60	2.CFT.30078.0	Δ
0.79	23.7	8.3	6.3	3	60	2.CFT.30079.0	Δ
0.80	24.0	8.4	6.4	3	60	2.CFT.30080.0	■
0.81	24.3	8.5	6.5	3	60	2.CFT.30081.0	Δ
0.82	24.6	8.6	6.6	3	60	2.CFT.30082.0	Δ
0.83	24.9	8.7	6.6	3	60	2.CFT.30083.0	Δ
0.84	25.2	8.8	6.7	3	60	2.CFT.30084.0	Δ
0.85	25.5	8.9	6.8	3	64	2.CFT.30085.0	■
0.86	25.8	9.0	6.9	3	64	2.CFT.30086.0	Δ
0.87	26.1	9.1	7.0	3	64	2.CFT.30087.0	Δ
0.88	26.4	9.2	7.0	3	64	2.CFT.30088.0	Δ
0.89	26.7	9.3	7.1	3	64	2.CFT.30089.0	Δ
0.90	27.0	9.5	7.2	3	64	2.CFT.30090.0	■
0.91	27.3	9.6	7.3	3	64	2.CFT.30091.0	Δ
0.92	27.6	9.7	7.4	3	64	2.CFT.30092.0	Δ
0.93	27.9	9.8	7.4	3	64	2.CFT.30093.0	Δ
0.94	28.2	9.9	7.5	3	64	2.CFT.30094.0	Δ
0.95	28.5	10.0	7.6	3	64	2.CFT.30095.0	■
0.96	28.8	10.1	7.7	3	64	2.CFT.30096.0	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.97	29.1	10.2	7.8	3	64	2.CFT.30097.0	Δ
0.98	29.4	10.3	7.8	3	64	2.CFT.30098.0	Δ
0.99	29.7	10.4	7.9	3	64	2.CFT.30099.0	Δ
1.00	30.0	10.5	8.0	3	70	2.CFT.30100.0	■
1.01	30.3	10.6	8.1	3	70	2.CFT.30101.0	Δ
1.02	30.6	10.7	8.2	3	70	2.CFT.30102.0	Δ
1.03	30.9	10.8	8.2	3	70	2.CFT.30103.0	Δ
1.04	31.2	10.9	8.3	3	70	2.CFT.30104.0	Δ
1.05	31.5	11.0	8.4	3	70	2.CFT.30105.0	■
1.06	31.8	11.1	8.5	3	70	2.CFT.30106.0	Δ
1.07	32.1	11.2	8.6	3	70	2.CFT.30107.0	Δ
1.08	32.4	11.3	8.6	3	70	2.CFT.30108.0	Δ
1.09	32.7	11.4	8.7	3	70	2.CFT.30109.0	Δ
1.10	33.0	11.6	8.8	3	70	2.CFT.30110.0	■
1.11	33.3	11.7	8.9	3	70	2.CFT.30111.0	Δ
1.12	33.6	11.8	9.0	3	70	2.CFT.30112.0	Δ
1.13	33.9	11.9	9.0	3	70	2.CFT.30113.0	Δ
1.14	34.2	12.0	9.1	3	70	2.CFT.30114.0	Δ
1.15	34.5	12.1	9.2	3	70	2.CFT.30115.0	■
1.16	34.8	12.2	9.3	3	70	2.CFT.30116.0	Δ
1.17	35.1	12.3	9.4	3	70	2.CFT.30117.0	Δ
1.18	35.4	12.4	9.4	3	70	2.CFT.30118.0	Δ
1.19	35.7	12.5	9.5	3	70	2.CFT.30119.0	Δ
1.20	36.0	12.6	9.6	3	70	2.CFT.30120.0	■

Complementary products	
CrazyDrill Flexpilot Titanium	p.36

Titanium - 50 x d

DRILLING WITH INTEGRATED COOLING

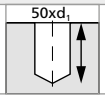


d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.30	15.0	3.2	2.4	3	53	2.CFT.50030.IK.0	■
0.31	15.5	3.3	2.5	3	53	2.CFT.50031.IK.0	Δ
0.32	16.0	3.4	2.6	3	53	2.CFT.50032.IK.0	Δ
0.33	16.5	3.5	2.6	3	53	2.CFT.50033.IK.0	Δ
0.34	17.0	3.6	2.7	3	53	2.CFT.50034.IK.0	Δ
0.35	17.5	3.7	2.8	3	60	2.CFT.50035.IK.0	■
0.36	18.0	3.8	2.9	3	60	2.CFT.50036.IK.0	Δ
0.37	18.5	3.9	3.0	3	60	2.CFT.50037.IK.0	Δ
0.38	19.0	4.0	3.0	3	60	2.CFT.50038.IK.0	Δ
0.39	19.5	4.1	3.1	3	60	2.CFT.50039.IK.0	Δ
0.40	20.0	4.2	3.2	3	60	2.CFT.50040.IK.0	■
0.41	20.5	4.3	3.3	3	60	2.CFT.50041.IK.0	Δ
0.42	21.0	4.4	3.4	3	60	2.CFT.50042.IK.0	Δ
0.43	21.5	4.5	3.4	3	60	2.CFT.50043.IK.0	Δ
0.44	22.0	4.6	3.5	3	60	2.CFT.50044.IK.0	Δ
0.45	22.5	4.7	3.6	3	60	2.CFT.50045.IK.0	■
0.46	23.0	4.8	3.7	3	60	2.CFT.50046.IK.0	Δ
0.47	23.5	4.9	3.8	3	60	2.CFT.50047.IK.0	Δ
0.48	24.0	5.0	3.8	3	60	2.CFT.50048.IK.0	Δ
0.49	24.5	5.1	3.9	3	60	2.CFT.50049.IK.0	Δ
0.50	25.0	5.3	4.0	3	64	2.CFT.50050.IK.0	■
0.51	25.5	5.4	4.1	3	64	2.CFT.50051.IK.0	Δ
0.52	26.0	5.5	4.2	3	64	2.CFT.50052.IK.0	Δ
0.53	26.5	5.6	4.2	3	64	2.CFT.50053.IK.0	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.54	27.0	5.7	4.3	3	64	2.CFT.50054.IK.0	Δ
0.55	27.5	5.8	4.4	3	64	2.CFT.50055.IK.0	■
0.56	28.0	5.9	4.5	3	64	2.CFT.50056.IK.0	Δ
0.57	28.5	6.0	4.6	3	64	2.CFT.50057.IK.0	Δ
0.58	29.0	6.1	4.6	3	64	2.CFT.50058.IK.0	Δ
0.59	29.5	6.2	4.7	3	64	2.CFT.50059.IK.0	Δ
0.60	30.0	6.3	4.8	3	70	2.CFT.50060.IK.0	■
0.61	30.5	6.4	4.9	3	70	2.CFT.50061.IK.0	Δ
0.62	31.0	6.5	5.0	3	70	2.CFT.50062.IK.0	Δ
0.63	31.5	6.6	5.0	3	70	2.CFT.50063.IK.0	Δ
0.64	32.0	6.7	5.1	3	70	2.CFT.50064.IK.0	Δ
0.65	32.5	6.8	5.2	3	70	2.CFT.50065.IK.0	■
0.66	33.0	6.9	5.3	3	70	2.CFT.50066.IK.0	Δ
0.67	33.5	7.0	5.4	3	70	2.CFT.50067.IK.0	Δ
0.68	34.0	7.1	5.4	3	70	2.CFT.50068.IK.0	Δ
0.69	34.5	7.2	5.5	3	70	2.CFT.50069.IK.0	Δ
0.70	35.0	7.4	5.6	3	75	2.CFT.50070.IK.0	■
0.71	35.5	7.5	5.7	3	75	2.CFT.50071.IK.0	Δ
0.72	36.0	7.6	5.8	3	75	2.CFT.50072.IK.0	Δ
0.73	36.5	7.7	5.8	3	75	2.CFT.50073.IK.0	Δ
0.74	37.0	7.8	5.9	3	75	2.CFT.50074.IK.0	Δ
0.75	37.5	7.9	6.0	3	75	2.CFT.50075.IK.0	■
0.76	38.0	8.0	6.1	3	75	2.CFT.50076.IK.0	Δ
0.77	38.5	8.1	6.2	3	75	2.CFT.50077.IK.0	Δ

■ Stock item

Δ Delivery term upon request, minumum purchase order quantity 5 pcs.

Carbide			Z2	Uncoated	

Ø d_1	0.3 - 1.2 mm
Tolerance	- 0.003 mm - 0.006 mm

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.78	39.0	8.2	6.2	3	75	2.CFT.50078.IK.0	Δ
0.79	39.5	8.3	6.3	3	75	2.CFT.50079.IK.0	Δ
0.80	40.0	8.4	6.4	3	80	2.CFT.50080.IK.0	■
0.81	40.5	8.5	6.5	3	80	2.CFT.50081.IK.0	Δ
0.82	41.0	8.6	6.6	3	80	2.CFT.50082.IK.0	Δ
0.83	41.5	8.7	6.6	3	80	2.CFT.50083.IK.0	Δ
0.84	42.0	8.8	6.7	3	80	2.CFT.50084.IK.0	Δ
0.85	42.5	8.9	6.8	3	80	2.CFT.50085.IK.0	■
0.86	43.0	9.0	6.9	3	80	2.CFT.50086.IK.0	Δ
0.87	43.5	9.1	7.0	3	80	2.CFT.50087.IK.0	Δ
0.88	44.0	9.2	7.0	3	80	2.CFT.50088.IK.0	Δ
0.89	44.5	9.3	7.1	3	80	2.CFT.50089.IK.0	Δ
0.90	45.0	9.5	7.2	3	85	2.CFT.50090.IK.0	■
0.91	45.5	9.6	7.3	3	80	2.CFT.50091.IK.0	Δ
0.92	46.0	9.7	7.4	3	80	2.CFT.50092.IK.0	Δ
0.93	46.5	9.8	7.4	3	85	2.CFT.50093.IK.0	Δ
0.94	47.0	9.9	7.5	3	70	2.CFT.50094.IK.0	Δ
0.95	47.5	10.0	7.6	3	70	2.CFT.50095.IK.0	■
0.96	48.0	10.1	7.7	3	70	2.CFT.50096.IK.0	Δ
0.97	48.5	10.2	7.8	3	85	2.CFT.50097.IK.0	Δ
0.98	49.0	10.3	7.8	3	85	2.CFT.50098.IK.0	Δ
0.99	49.5	10.4	7.9	3	85	2.CFT.50099.IK.0	Δ
1.00	50.0	10.5	8.0	3	90	2.CFT.50100.IK.0	■
1.01	50.5	10.6	8.1	3	90	2.CFT.50101.IK.0	Δ

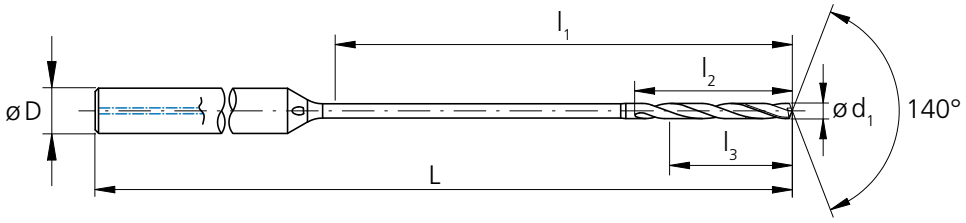
d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.02	51.0	10.7	8.2	3	90	2.CFT.50102.IK.0	Δ
1.03	51.5	10.8	8.2	3	90	2.CFT.50103.IK.0	Δ
1.04	52.0	10.9	8.3	3	90	2.CFT.50104.IK.0	Δ
1.05	52.5	11.0	8.4	3	90	2.CFT.50105.IK.0	■
1.06	53.0	11.1	8.5	3	90	2.CFT.50106.IK.0	Δ
1.07	53.5	11.2	8.6	3	90	2.CFT.50107.IK.0	Δ
1.08	54.0	11.3	8.6	3	90	2.CFT.50108.IK.0	Δ
1.09	54.5	11.4	8.7	3	90	2.CFT.50109.IK.0	Δ
1.10	55.0	11.6	8.8	3	95	2.CFT.50110.IK.0	■
1.11	55.5	11.7	8.9	3	95	2.CFT.50111.IK.0	Δ
1.12	56.0	11.8	9.0	3	95	2.CFT.50112.IK.0	Δ
1.13	56.5	11.9	9.0	3	95	2.CFT.50113.IK.0	Δ
1.14	57.0	12.0	9.1	3	95	2.CFT.50114.IK.0	Δ
1.15	57.5	12.1	9.2	3	95	2.CFT.50115.IK.0	■
1.16	58.0	12.2	9.3	3	95	2.CFT.50116.IK.0	Δ
1.17	58.5	12.3	9.4	3	95	2.CFT.50117.IK.0	Δ
1.18	59.0	12.4	9.4	3	95	2.CFT.50118.IK.0	Δ
1.19	59.5	12.5	9.5	3	95	2.CFT.50119.IK.0	Δ
1.20	60.0	12.6	9.6	3	95	2.CFT.50120.IK.0	■

Complementary products

CrazyDrill Flexpilot Titanium p.36

NEW Titanium ATK - 30 x d

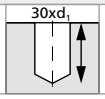
DRILLING WITH INTEGRATED COOLING



d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.30	9.0	3.2	2.4	3	50	2.CFT.30030.ATK	■
0.31	9.3	3.3	2.5	3	50	2.CFT.30031.ATK	Δ
0.32	9.6	3.4	2.6	3	50	2.CFT.30032.ATK	Δ
0.33	9.9	3.5	2.6	3	50	2.CFT.30033.ATK	Δ
0.34	10.2	3.6	2.7	3	50	2.CFT.30034.ATK	Δ
0.35	10.5	3.7	2.8	3	50	2.CFT.30035.ATK	■
0.36	10.8	3.8	2.9	3	50	2.CFT.30036.ATK	Δ
0.37	11.1	3.9	3.0	3	50	2.CFT.30037.ATK	Δ
0.38	11.4	4.0	3.0	3	50	2.CFT.30038.ATK	Δ
0.39	11.7	4.1	3.1	3	50	2.CFT.30039.ATK	Δ
0.40	12.0	4.2	3.2	3	50	2.CFT.30040.ATK	■
0.41	12.3	4.3	3.3	3	50	2.CFT.30041.ATK	Δ
0.42	12.6	4.4	3.4	3	50	2.CFT.30042.ATK	Δ
0.43	12.9	4.5	3.4	3	50	2.CFT.30043.ATK	Δ
0.44	13.2	4.6	3.5	3	50	2.CFT.30044.ATK	Δ
0.45	13.5	4.7	3.6	3	50	2.CFT.30045.ATK	■
0.46	13.8	4.8	3.7	3	50	2.CFT.30046.ATK	Δ
0.47	14.1	4.9	3.8	3	50	2.CFT.30047.ATK	Δ
0.48	14.4	5.0	3.8	3	50	2.CFT.30048.ATK	Δ
0.49	14.7	5.2	3.9	3	50	2.CFT.30049.ATK	Δ
0.50	15.0	5.3	4.0	3	53	2.CFT.30050.ATK	■
0.51	15.3	5.4	4.1	3	53	2.CFT.30051.ATK	Δ
0.52	15.6	5.5	4.2	3	53	2.CFT.30052.ATK	Δ
0.53	15.9	5.6	4.2	3	53	2.CFT.30053.ATK	Δ
0.54	16.2	5.7	4.3	3	53	2.CFT.30054.ATK	Δ
0.55	16.5	5.8	4.4	3	53	2.CFT.30055.ATK	■
0.56	16.8	5.9	4.5	3	53	2.CFT.30056.ATK	Δ
0.57	17.1	6.0	4.6	3	53	2.CFT.30057.ATK	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.58	17.4	6.1	4.6	3	53	2.CFT.30058.ATK	Δ
0.59	17.7	6.2	4.7	3	53	2.CFT.30059.ATK	Δ
0.60	18.0	6.3	4.8	3	53	2.CFT.30060.ATK	■
0.61	18.3	6.4	4.9	3	53	2.CFT.30061.ATK	Δ
0.62	18.6	6.5	5.0	3	53	2.CFT.30062.ATK	Δ
0.63	18.9	6.6	5.0	3	53	2.CFT.30063.ATK	Δ
0.64	19.2	6.7	5.1	3	53	2.CFT.30064.ATK	Δ
0.65	19.5	6.8	5.2	3	53	2.CFT.30065.ATK	■
0.66	19.8	6.9	5.3	3	53	2.CFT.30066.ATK	Δ
0.67	20.1	7.0	5.4	3	53	2.CFT.30067.ATK	Δ
0.68	20.4	7.1	5.4	3	53	2.CFT.30068.ATK	Δ
0.69	20.7	7.3	5.5	3	53	2.CFT.30069.ATK	Δ
0.70	21.0	7.4	5.6	3	60	2.CFT.30070.ATK	■
0.71	21.3	7.5	5.7	3	60	2.CFT.30071.ATK	Δ
0.72	21.6	7.6	5.8	3	60	2.CFT.30072.ATK	Δ
0.73	21.9	7.7	5.8	3	60	2.CFT.30073.ATK	Δ
0.74	22.2	7.8	5.9	3	60	2.CFT.30074.ATK	Δ
0.75	22.5	7.9	6.0	3	60	2.CFT.30075.ATK	■
0.76	22.8	8.0	6.1	3	60	2.CFT.30076.ATK	Δ
0.77	23.1	8.1	6.2	3	60	2.CFT.30077.ATK	Δ
0.78	23.4	8.2	6.2	3	60	2.CFT.30078.ATK	Δ
0.79	23.7	8.3	6.3	3	60	2.CFT.30079.ATK	Δ
0.80	24.0	8.4	6.4	3	60	2.CFT.30080.ATK	■
0.81	24.3	8.5	6.5	3	60	2.CFT.30081.ATK	Δ
0.82	24.6	8.6	6.6	3	60	2.CFT.30082.ATK	Δ
0.83	24.9	8.7	6.6	3	60	2.CFT.30083.ATK	Δ
0.84	25.2	8.8	6.7	3	60	2.CFT.30084.ATK	Δ
0.85	25.5	8.9	6.8	3	64	2.CFT.30085.ATK	■

■ Stock item
Δ Delivery term upon request, minumum purchase order quantity 5 pcs.

Carbide			Z2	Uncoated	

Ø d_1	0.1 - 1.2 mm
Tolerance	- 0.003 mm - 0.006 mm

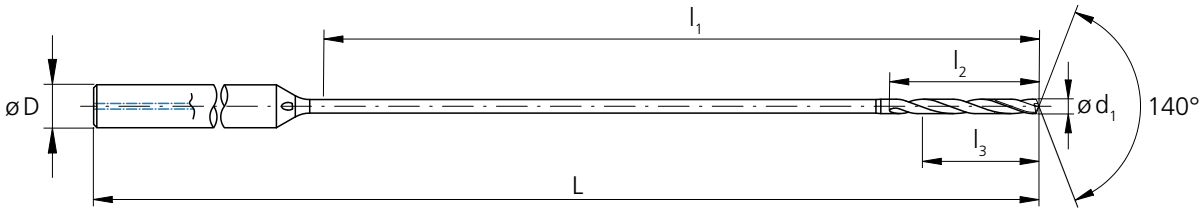
d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.86	25.8	9.0	6.9	3	64	2.CFT.30086.ATK	Δ
0.87	26.1	9.1	7.0	3	64	2.CFT.30087.ATK	Δ
0.88	26.4	9.2	7.0	3	64	2.CFT.30088.ATK	Δ
0.89	26.7	9.4	7.1	3	64	2.CFT.30089.ATK	Δ
0.90	27.0	9.5	7.2	3	64	2.CFT.30090.ATK	■
0.91	27.3	9.6	7.3	3	64	2.CFT.30091.ATK	Δ
0.92	27.6	9.7	7.4	3	64	2.CFT.30092.ATK	Δ
0.93	27.9	9.8	7.4	3	64	2.CFT.30093.ATK	Δ
0.94	28.2	9.9	7.5	3	64	2.CFT.30094.ATK	Δ
0.95	28.5	10.0	7.6	3	64	2.CFT.30095.ATK	■
0.96	28.8	10.1	7.7	3	64	2.CFT.30096.ATK	Δ
0.97	29.1	10.2	7.8	3	64	2.CFT.30097.ATK	Δ
0.98	29.4	10.3	7.8	3	64	2.CFT.30098.ATK	Δ
0.99	29.7	10.4	7.9	3	64	2.CFT.30099.ATK	Δ
1.00	30.0	10.5	8.0	3	70	2.CFT.30100.ATK	■
1.01	30.3	10.6	8.1	3	70	2.CFT.30101.ATK	Δ
1.02	30.6	10.7	8.2	3	70	2.CFT.30102.ATK	Δ
1.03	30.9	10.8	8.2	3	70	2.CFT.30103.ATK	Δ
1.04	31.2	10.9	8.3	3	70	2.CFT.30104.ATK	Δ
1.05	31.5	11.0	8.4	3	70	2.CFT.30105.ATK	■
1.06	31.8	11.1	8.5	3	70	2.CFT.30106.ATK	Δ
1.07	32.1	11.2	8.6	3	70	2.CFT.30107.ATK	Δ
1.08	32.4	11.3	8.6	3	70	2.CFT.30108.ATK	Δ
1.09	32.7	11.5	8.7	3	70	2.CFT.30109.ATK	Δ
1.10	33.0	11.6	8.8	3	70	2.CFT.30110.ATK	■
1.11	33.3	11.7	8.9	3	70	2.CFT.30111.ATK	Δ
1.12	33.6	11.8	9.0	3	70	2.CFT.30112.ATK	Δ
1.13	33.9	11.9	9.0	3	70	2.CFT.30113.ATK	Δ
1.14	34.2	12.0	9.1	3	70	2.CFT.30114.ATK	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.15	34.5	12.1	9.2	3	70	2.CFT.30115.ATK	■
1.16	34.8	12.2	9.3	3	70	2.CFT.30116.ATK	Δ
1.17	35.1	12.3	9.4	3	70	2.CFT.30117.ATK	Δ
1.18	35.4	12.4	9.4	3	70	2.CFT.30118.ATK	Δ
1.19	35.7	12.5	9.5	3	70	2.CFT.30119.ATK	Δ
1.20	36.0	12.6	9.6	3	70	2.CFT.30120.ATK	■
1.25	37.5	13.1	10.0	4	80	2.CFT.30125.ATK	■
1.30	39.0	13.7	10.4	4	80	2.CFT.30130.ATK	■
1.35	40.5	14.2	10.8	4	80	2.CFT.30135.ATK	■
1.40	42.0	14.7	11.2	4	80	2.CFT.30140.ATK	■
1.45	43.5	15.2	11.6	4	80	2.CFT.30145.ATK	■
1.50	45.0	15.8	12.0	4	80	2.CFT.30150.ATK	■
1.55	46.5	16.3	12.4	4	90	2.CFT.30155.ATK	■
1.60	48.0	16.8	12.8	4	90	2.CFT.30160.ATK	■
1.65	49.5	17.3	13.2	4	90	2.CFT.30165.ATK	■
1.70	51.0	17.9	13.6	4	90	2.CFT.30170.ATK	■
1.75	52.5	18.4	14.0	4	100	2.CFT.30175.ATK	■
1.80	54.0	18.9	14.4	4	100	2.CFT.30180.ATK	■
1.85	55.5	19.4	14.8	4	100	2.CFT.30185.ATK	■
1.90	57.0	20.0	15.2	4	100	2.CFT.30190.ATK	■
1.95	58.5	20.5	15.6	4	100	2.CFT.30195.ATK	■
2.00	60.0	21.0	16.0	4	100	2.CFT.30200.ATK	■

Complementary products	
CrazyDrill Titanium TK	p.16
CrazyDrill Coolpilot Titanium ATC	p.66

NEW Titanium ATK - 50 x d

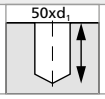
DRILLING WITH INTEGRATED COOLING



d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.30	15.0	3.2	2.4	3	53	2.CFT.50030.ATK	■
0.31	15.5	3.3	2.5	3	53	2.CFT.50031.ATK	Δ
0.32	16.0	3.4	2.6	3	53	2.CFT.50032.ATK	Δ
0.33	16.5	3.5	2.6	3	53	2.CFT.50033.ATK	Δ
0.34	17.0	3.6	2.7	3	53	2.CFT.50034.ATK	Δ
0.35	17.5	3.7	2.8	3	53	2.CFT.50035.ATK	■
0.36	18.0	3.8	2.9	3	53	2.CFT.50036.ATK	Δ
0.37	18.5	3.9	3.0	3	53	2.CFT.50037.ATK	Δ
0.38	19.0	4.0	3.0	3	53	2.CFT.50038.ATK	Δ
0.39	19.5	4.1	3.1	3	53	2.CFT.50039.ATK	Δ
0.40	20.0	4.2	3.2	3	53	2.CFT.50040.ATK	■
0.41	20.5	4.3	3.3	3	60	2.CFT.50041.ATK	Δ
0.42	21.0	4.4	3.4	3	60	2.CFT.50042.ATK	Δ
0.43	21.5	4.5	3.4	3	60	2.CFT.50043.ATK	Δ
0.44	22.0	4.6	3.5	3	60	2.CFT.50044.ATK	Δ
0.45	22.5	4.7	3.6	3	60	2.CFT.50045.ATK	■
0.46	23.0	4.8	3.7	3	60	2.CFT.50046.ATK	Δ
0.47	23.5	4.9	3.8	3	60	2.CFT.50047.ATK	Δ
0.48	24.0	5.0	3.8	3	60	2.CFT.50048.ATK	Δ
0.49	24.5	5.2	3.9	3	60	2.CFT.50049.ATK	Δ
0.50	25.0	5.3	4.0	3	64	2.CFT.50050.ATK	■
0.51	25.5	5.4	4.1	3	64	2.CFT.50051.ATK	Δ
0.52	26.0	5.5	4.2	3	64	2.CFT.50052.ATK	Δ
0.53	26.5	5.6	4.2	3	64	2.CFT.50053.ATK	Δ
0.54	27.0	5.7	4.3	3	64	2.CFT.50054.ATK	Δ
0.55	27.5	5.8	4.4	3	64	2.CFT.50055.ATK	■
0.56	28.0	5.9	4.5	3	64	2.CFT.50056.ATK	Δ
0.57	28.5	6.0	4.6	3	64	2.CFT.50057.ATK	Δ

d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.58	29.0	6.1	4.6	3	64	2.CFT.50058.ATK	Δ
0.59	29.5	6.2	4.7	3	64	2.CFT.50059.ATK	Δ
0.60	30.0	6.3	4.8	3	64	2.CFT.50060.ATK	■
0.61	30.5	6.4	4.9	3	70	2.CFT.50061.ATK	Δ
0.62	31.0	6.5	5.0	3	70	2.CFT.50062.ATK	Δ
0.63	31.5	6.6	5.0	3	70	2.CFT.50063.ATK	Δ
0.64	32.0	6.7	5.1	3	70	2.CFT.50064.ATK	Δ
0.65	32.5	6.8	5.2	3	70	2.CFT.50065.ATK	■
0.66	33.0	6.9	5.3	3	70	2.CFT.50066.ATK	Δ
0.67	33.5	7.0	5.4	3	70	2.CFT.50067.ATK	Δ
0.68	34.0	7.1	5.4	3	70	2.CFT.50068.ATK	Δ
0.69	34.5	7.3	5.5	3	70	2.CFT.50069.ATK	Δ
0.70	35.0	7.4	5.6	3	75	2.CFT.50070.ATK	■
0.71	35.5	7.5	5.7	3	75	2.CFT.50071.ATK	Δ
0.72	36.0	7.6	5.8	3	75	2.CFT.50072.ATK	Δ
0.73	36.5	7.7	5.8	3	75	2.CFT.50073.ATK	Δ
0.74	37.0	7.8	5.9	3	75	2.CFT.50074.ATK	Δ
0.75	37.5	7.9	6.0	3	75	2.CFT.50075.ATK	■
0.76	38.0	8.0	6.1	3	75	2.CFT.50076.ATK	Δ
0.77	38.5	8.1	6.2	3	75	2.CFT.50077.ATK	Δ
0.78	39.0	8.2	6.2	3	75	2.CFT.50078.ATK	Δ
0.79	39.5	8.3	6.3	3	75	2.CFT.50079.ATK	Δ
0.80	40.0	8.4	6.4	3	80	2.CFT.50080.ATK	■
0.81	40.5	8.5	6.5	3	80	2.CFT.50081.ATK	Δ
0.82	41.0	8.6	6.6	3	80	2.CFT.50082.ATK	Δ
0.83	41.5	8.7	6.6	3	80	2.CFT.50083.ATK	Δ
0.84	42.0	8.8	6.7	3	80	2.CFT.50084.ATK	Δ
0.85	42.5	8.9	6.8	3	80	2.CFT.50085.ATK	■

■ Stock item
Δ Delivery term upon request, minumum purchase order quantity 5 pcs.

Carbide			Z2	Uncoated	

Ø d_1	0.3 - 1.2 mm
Tolerance	- 0.003 mm - 0.006 mm

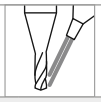
d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.86	43.0	9.0	6.9	3	80	2.CFT.50086.ATK	Δ
0.87	43.5	9.1	7.0	3	80	2.CFT.50087.ATK	Δ
0.88	44.0	9.2	7.0	3	80	2.CFT.50088.ATK	Δ
0.89	44.5	9.4	7.1	3	80	2.CFT.50089.ATK	Δ
0.90	45.0	9.5	7.2	3	80	2.CFT.50090.ATK	■
0.91	45.5	9.6	7.3	3	85	2.CFT.50091.ATK	Δ
0.92	46.0	9.7	7.4	3	85	2.CFT.50092.ATK	Δ
0.93	46.5	9.8	7.4	3	85	2.CFT.50093.ATK	Δ
0.94	47.0	9.9	7.5	3	85	2.CFT.50094.ATK	Δ
0.95	47.5	10.0	7.6	3	85	2.CFT.50095.ATK	■
0.96	48.0	10.1	7.7	3	85	2.CFT.50096.ATK	Δ
0.97	48.5	10.2	7.8	3	85	2.CFT.50097.ATK	Δ
0.98	49.0	10.3	7.8	3	85	2.CFT.50098.ATK	Δ
0.99	49.5	10.4	7.9	3	85	2.CFT.50099.ATK	Δ
1.00	50.0	10.5	8.0	3	90	2.CFT.50100.ATK	■
1.01	50.5	10.6	8.1	3	90	2.CFT.50101.ATK	Δ
1.02	51.0	10.7	8.2	3	90	2.CFT.50102.ATK	Δ
1.03	51.5	10.8	8.2	3	90	2.CFT.50103.ATK	Δ
1.04	52.0	10.9	8.3	3	90	2.CFT.50104.ATK	Δ
1.05	52.5	11.0	8.4	3	90	2.CFT.50105.ATK	■
1.06	53.0	11.1	8.5	3	90	2.CFT.50106.ATK	Δ
1.07	53.5	11.2	8.6	3	90	2.CFT.50107.ATK	Δ
1.08	54.0	11.3	8.6	3	90	2.CFT.50108.ATK	Δ
1.09	54.5	11.5	8.7	3	90	2.CFT.50109.ATK	Δ
1.10	55.0	11.6	8.8	3	95	2.CFT.50110.ATK	■
1.11	55.5	11.7	8.9	3	95	2.CFT.50111.ATK	Δ
1.12	56.0	11.8	9.0	3	95	2.CFT.50112.ATK	Δ
1.13	56.5	11.9	9.0	3	95	2.CFT.50113.ATK	Δ
1.14	57.0	12.0	9.1	3	95	2.CFT.50114.ATK	Δ

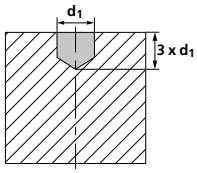
d_1 [mm]	l_1 [mm]	l_2 [mm]	l_3 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.15	57.5	12.1	9.2	3	95	2.CFT.50115.ATK	■
1.16	58.0	12.2	9.3	3	95	2.CFT.50116.ATK	Δ
1.17	58.5	12.3	9.4	3	95	2.CFT.50117.ATK	Δ
1.18	59.0	12.4	9.4	3	95	2.CFT.50118.ATK	Δ
1.19	59.5	12.5	9.5	3	95	2.CFT.50119.ATK	Δ
1.20	60.0	12.6	9.6	3	95	2.CFT.50120.ATK	■
1.25	62.5	13.1	10.0	4	115	2.CFT.50125.ATK	■
1.30	65.0	13.7	10.4	4	115	2.CFT.50130.ATK	■
1.35	67.5	14.2	10.8	4	115	2.CFT.50135.ATK	■
1.40	70.0	14.7	11.2	4	115	2.CFT.50140.ATK	■
1.45	72.5	15.2	11.6	4	115	2.CFT.50145.ATK	■
1.50	75.0	15.8	12.0	4	115	2.CFT.50150.ATK	■
1.55	77.5	16.3	12.4	4	130	2.CFT.50155.ATK	■
1.60	80.0	16.8	12.8	4	130	2.CFT.50160.ATK	■
1.65	82.5	17.3	13.2	4	130	2.CFT.50165.ATK	■
1.70	85.0	17.9	13.6	4	130	2.CFT.50170.ATK	■
1.75	87.5	18.4	14.0	4	140	2.CFT.50175.ATK	■
1.80	90.0	18.9	14.4	4	140	2.CFT.50180.ATK	■
1.85	92.5	19.4	14.8	4	140	2.CFT.50185.ATK	■
1.90	95.0	20.0	15.2	4	140	2.CFT.50190.ATK	■
1.95	97.5	20.5	15.6	4	140	2.CFT.50195.ATK	■
2.00	100.0	21.0	16.0	4	140	2.CFT.50200.ATK	■

Complementary products	
CrazyDrill Titanium TK	p.16
CrazyDrill Coolpilot Titanium ATC	p.66

Titanium - 3 x d

DRILLING WITH EXTERNAL COOLING | CUTTING DATA OVERVIEW

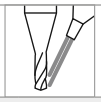


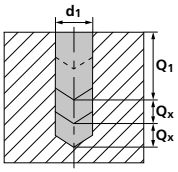


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Ød1 ≤ 0.4 Mid	Ød1 ≤ 0.4 High	Ød1 > 0.4 Mid	Ød1 > 0.4 High
N	Copper	2.0040	Cu-OF / CW008A	UNS C10100	5	40	20	40
		2.0065	Cu-ETP / CW004A	UNS C11000				
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	5	20	20	30
		3.7065	Gr.4	ASTM B348 / F68				
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	5	20	20	40

Titanium - 30 x d

DRILLING WITH EXTERNAL COOLING | CUTTING DATA OVERVIEW

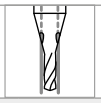


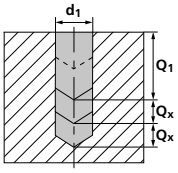


Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Ød1 ≤ 0.4 Mid	Ød1 ≤ 0.4 High	Ød1 > 0.4 Mid	Ød1 > 0.4 High
N	Copper	2.0040	Cu-OF / CW008A	UNS C10100	5	40	20	40
		2.0065	Cu-ETP / CW004A	UNS C11000				
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	5	20	20	30
		3.7065	Gr.4	ASTM B348 / F68				
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	5	20	20	40

Titanium - 50 x d

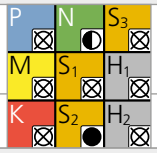
DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW





Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Ød1 ≤ 0.4 Mid	Ød1 ≤ 0.4 High	Ød1 > 0.4 Mid	Ød1 > 0.4 High
N	Copper	2.0040	Cu-OF / CW008A	UNS C10100	5	40	20	40
		2.0065	Cu-ETP / CW004A	UNS C11000				
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	5	20	20	30
		3.7065	Gr.4	ASTM B348 / F68				
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	5	20	20	40

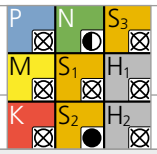
RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended



		f [mm/rev]						
	Q_1	Ød1						
		0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.6 mm	0.8 mm	1.0 mm – 1.2 mm
		f	f	f	f	f	f	f
	3xd1	0.005	0.010	0.015	0.020	0.030	0.040	0.060
	3xd1	0.001	0.002	0.003	0.004	0.006	0.008	0.012
	3xd1	0.002	0.003	0.005	0.006	0.009	0.012	0.018

Note: The cutting parameters for titanium alloys are only just acceptable. We recommend using the ***CrazyDrill Titanium TK*** for optimal performance.

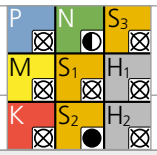
RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended



			f [mm/rev]						
	Q_1	Q_x	Ød1						
			0.1 mm	0.2 mm	0.3 mm	0.4 mm	0.6 mm	0.8 mm	1.0 mm – 1.2 mm
			f	f	f	f	f	f	f
	2xd1	0.5xd1	0.005	0.010	0.015	0.020	0.030	0.040	0.060
	2xd1	0.25xd1	0.001	0.002	0.003	0.004	0.006	0.008	0.012
	2xd1	0.25xd1	0.002	0.003	0.005	0.006	0.009	0.012	0.018

Note: The cutting parameters for titanium alloys are only just acceptable. We recommend using the ***CrazyDrill Flex Titanium ATK*** for optimal performance.

RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended

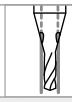


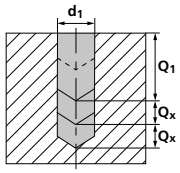
			f [mm/rev]				
Q_1	Q_x	Ød1					
		0.3 mm	0.4 mm	0.6 mm	0.8 mm	1.0 mm – 1.2 mm	
		f	f	f	f	f	
2xd1	0.5xd1	0.015	0.020	0.030	0.040	0.060	
2xd1	0.25xd1	0.003	0.004	0.006	0.008	0.012	
2xd1	0.25xd1	0.005	0.006	0.009	0.012	0.018	

Note: The cutting parameters for titanium alloys are only just acceptable. We recommend using the ***CrazyDrill Flex Titanium ATK*** for optimal performance.

NEW Titanium ATK - 30 x d / 50 x d

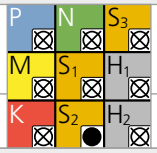
DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW





Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Ød1 ≤ 0.4 Mid	Ød1 ≤ 0.4 High	Ød1 > 0.4 Mid	Ød1 > 0.4 High
S_2	Titanium alloy	3.7165	TiAl6V4	ASTM B348 / F136	5	20	20	40
		9.9367	TiAl6Nb7	ASTM F1295				

RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended



f [mm/rev]

Q_1	Q_x		**Ød1**									
			0.3 mm	0.4 mm	0.6 mm	0.8 mm	1.0 mm	1.2 mm	1.4 mm	1.6 mm	1.8 mm	2.0 mm
	Ød1 < 0.5	Ød1 ≥ 0.5	**f**	**f**	**f**	**f**	**f**	**f**	**f**	**f**	**f**	**f**
2xd1	0.25 - 0.5 xd1	0.5 - 1.0 xd1	0.003	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.020

Drilling process CrazyDrill Flex

PRECISE AND EFFICIENT DRILLING FROM Ø 0.1 MM

Coolant type, pressure and filtration

Coolant type: For best results, Mikron Tool recommends the use of 8% emulsion with EP-Additives (Extreme-Pressure-Additives) as coolant fluid. Alternatively, cutting oil can be used with good results as well.

Filter: The large cooling channels allow standard filtration. Filter quality ≤ 0.050 mm.

For tools with external cooling no specific parameters have to be considered concerning filtration.

Coolant pressure: To ensure a reliable drilling process, the following minimal pressures are needed (see chart). Higher pressure is generally better for the cooling and flushing effect.

Revolution	[giri/min]	≤ 10'000	> 10'000
Minimal pressure	[bar]	15	30

For tools with external cooling no specific parameters have to be considered concerning coolant pressure. However, coolant must be directed to the drill tip cooling and lubricating the drill perfectly and flushing away the chips.

Drilling process CrazyDrill Flex

PRECISE AND EFFICIENT DRILLING FROM Ø 0.1 MM

CrazyDrill Flex Titanium and Titanium ATK 30 x d / 50 x d

Mikron Tool recommends pilot drilling for all types of CrazyDrill Flex:

CrazyDrill Flex Titanium

- **CrazyDrill Flexpilot Titanium** as pilot drill
- **CrazyDrill Crosspilot** as pilot drill on inclined surfaces

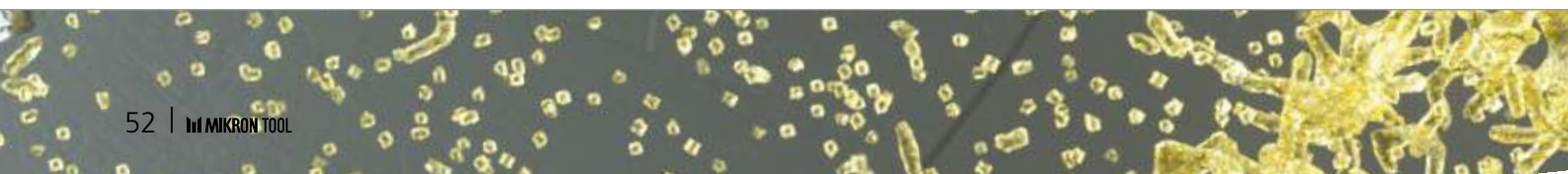
CrazyDrill Flex Titanium ATK

- **CrazyDrill Titanium TK 3 x d** as pilot drill
- **CrazyDrill Coolpilot Titanium ATC** as pilot drill for d ≥ 1mm
- **CrazyDrill Crosspilot** as pilot drill on inclined surfaces

Pilot drilling and drilling

Pilot drilling with CrazyDrill Flexpilot / CrazyDrill Titanium TK is the perfect starting point for accurate drilling (position and alignment accuracy) and a stable machining process. This is also valid for the pilot drill CrazyDrill Crosspilot on inclined surfaces.

The hole quality (position and alignment accuracy, no measurable transition from pilot hole to follow-up hole) and a stable machining process are guaranteed with the use of specific tools.



DRILLING PROCESS

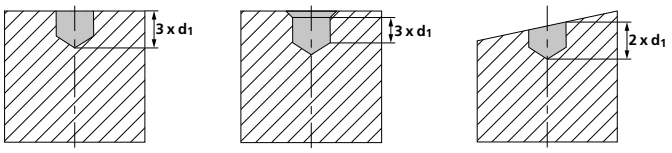
Drilling as per DIN 66025 / PAL

G83 deep-drilling cycle with chip breaking and chip removal pecks

Q = depth of the respective peck

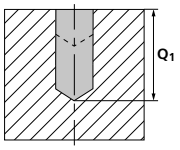
1 | PILOT DRILLING

- With CrazyDrill Flexpilot Titanium (straight surfaces) or CrazyDrill Crosspilot (inclined surfaces) when using CrazyDrill Flex Titanium.
- With CrazyDrill Titanium TK 3 x d or CrazyDrill Coolpilot Titanium ATC for d ≥ 1mm (straight surfaces) when using CrazyDrill Flex Titanium ATK.
- With CrazyDrill Crosspilot (inclined surfaces) when using CrazyDrill Flex Titanium ATK.

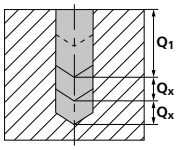


2 | DRILLING

- Drilling with CrazyDrill Flex Titanium / CrazyDrill Flex Titanium ATK up to maximum drilling depth Q_1 in one step (see cutting data table), with subsequent chip removal steps.



- Further drilling steps Q_X as per cutting data table, with subsequent chip removal steps.



Note:

Between the drilling steps, the drill may exit completely from the bore. Do not take the drill completely out from the bore in case of resonant vibration. After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position.

CrazyDrill Cool Titanium ATC / PTC

CRAZYDRILL Cool Titanium

FOR EACH TITANIUM ITS DRILL!

Mikron Tool introduces two new drills for titanium in the diameter range of 1.0 mm up to 6.35 mm:

- **CrazyDrill Cool Titanium ATC for titanium alloys**
- **CrazyDrill Cool Titanium PTC for pure titanium**

These drills, which perfectly match the respective titanium grades, achieve maximum drilling performance combined with high process reliability. It is now even possible to drill titanium alloys up to 10 x d in a single step without multiple pecking steps for chip removal.

Recommendations of Mikron Tool:

- **Version ATC - 6 x d / PTC - 3 x d and 6 x d** - centering is not necessary on straight surfaces. We recommend pilot drilling only on irregular, rough or inclined surfaces and if a high position accuracy is requested.
- **Version ATC - 10 x d** - we recommend pilot drilling with CrazyDrill Coolpilot Titanium or CrazyDrill Crosspilot on inclined surfaces.

Regrinding: This product can be reground starting from Ø 1.40 mm.

Please note: You couldn't find your suitable version of the CrazyDrill Cool Titanium (diameter, length, cutting direction…)? Ask us about our customized versions!

Geometry ATC

CRAZYDRILL™ by Mikron Tool Cool Titanium *ATC*

3 x d	6 x d	10 x d

page 66 | page 68 | page 70

Geometry PTC

CRAZYDRILL™ by Mikron Tool Cool Titanium *PTC*

3 x d	6 x d

page 72 | page 74

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 up to Ø 2.95 mm.

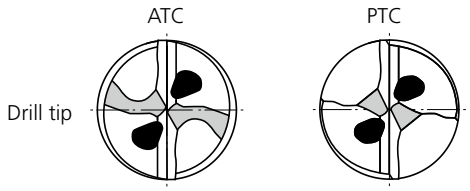
3 | CARBIDE
A specially developed micro-grain solid carbide grade allows machining at high speeds.

4 | 90° CHAMFER CUTTING EDGE
A 90° countersink can be placed simultaneously with the drilling.

5 | 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 achieved.

6 | POLISHED FLUTES
The polished flutes in versions ATC and PTC promote uniform chip flushing.

7 | SINGLE GUIDING MARGIN AND THE NEWLY DESIGNED CHIP BARRIER MARGIN
The particularly smooth surfaces of the guiding margin and the newly designed chip barrier margin on the PTC drill prevent material sticking and reduce the load on the tool. The result is to ensure the highest degree of precision (straightness) and surface quality.



Find out more!

Your benefits

The most important features

- Two specific geometries: PTC for pure titanium and ATC for titanium alloys
- Innovative flute and tip geometry
- New: Chip barrier margin for PTC drills
- Specially designed cooling concept

Your advantages

- Perfect performance for any titanium grade
- Low cutting pressure
- Prevention of chip jamming
- Excellent heat dissipation

Your benefits

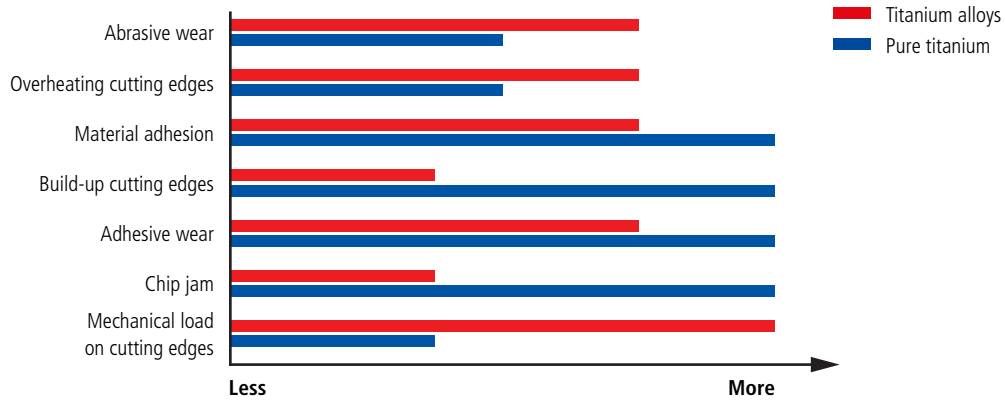
- Maximum drilling speed (e.g. 10 x d in one shot drilling with ATC)
- Excellent drilling quality
- Process reliability
- Up to 3 times longer tool life

Important features

THE NEW HIGH-PERFORMANCE DRILLS FOR TITANIUM

1. Challenge

Different properties of pure titanium and titanium alloys



The material properties of pure and alloyed titanium differ significantly, which is of utmost importance for their industrial machining. Especially for drilling, the demands on tools in terms of machinability are very high.

Solution

Material-specific cutting edge geometries

Mikron Tool's solution for drilling different types of titanium consists of two material-specific cutting edge geometries. This is the only way to achieve controlled chip evacuation, high drilling speeds and repeatable processes with excellent hole quality.

Geometry ATC S2
Titanium alloys
Ti Gr.5 / Ti Gr.5 ELI / Ti Gr.Nb

Geometry PTC S2
Pure Titan
Ti Gr.2 - Ti Gr.4

2. Challenge

High thermal load and chip jamming

When drilling titanium, the high thermal load on the cutting edge is a challenge. This can lead to micro-chipping and eventually chipping on the cutting edge.
Furthermore, titanium chips tend to compact in the drill tip area, preventing further chips from flowing out. The result is uncontrolled drill breakage.

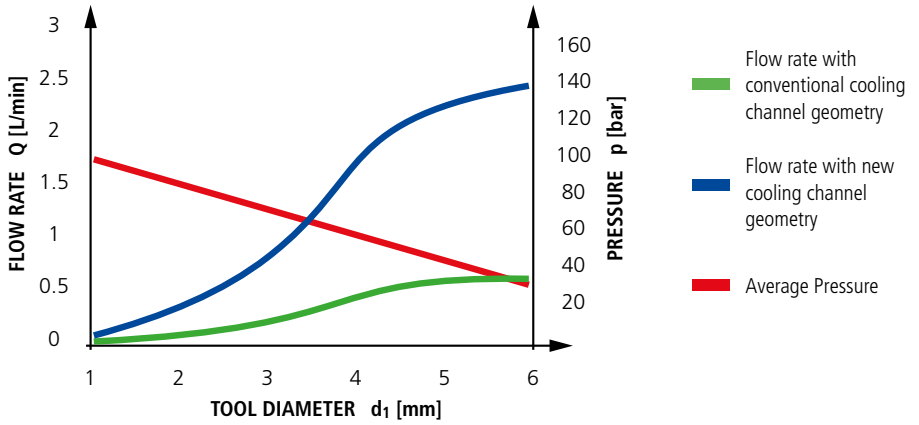
Material	Thermal conductivity
Aluminum	167 W/mK
Stainless steel	21 W/mK
Titanium alloy	**7 W/mK**

Solution

Innovative cooling concept

Conventional

New



Two specially designed cooling channels with a very large cross-section guide massive amounts of cooling lubricant to the drill tip to avoid excessive thermal loads on the cutting edges. The patented special shape of the cooling channels allows up to 4 times more coolant (compared to conventional cooling channels) at the same pressure. At the same time, the massive coolant jet flushes the chips through the flutes and prevents any form of chip jamming.

Important features

THE NEW HIGH-PERFORMANCE DRILLS FOR TITANIUM

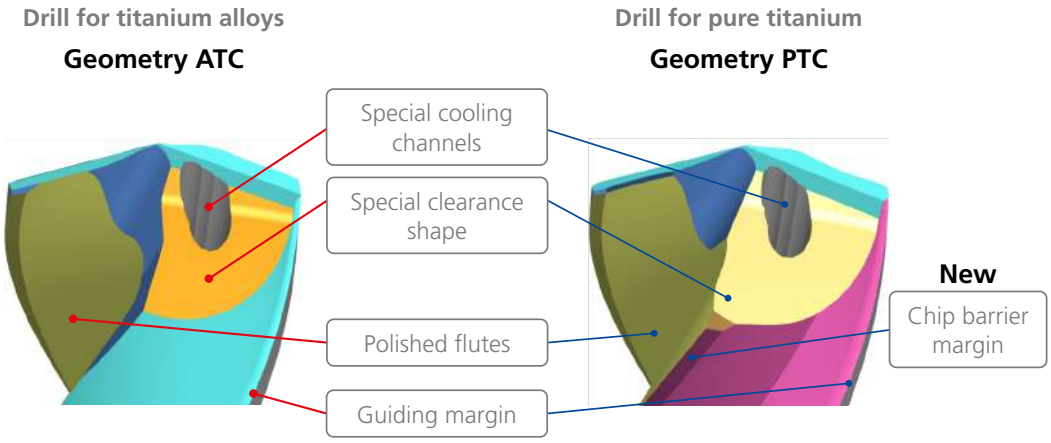
3. Challenge

Material adhesion

Material adhesions on guiding margin and the secondary margin have a negative effect on the hole quality.

Solution

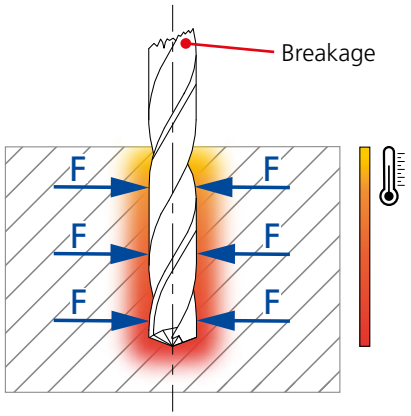
Guiding margin and the newly designed chip barrier margin



The particularly smooth surfaces of the guiding margin and the newly designed chip barrier margin on the PTC drill prevent material sticking and reduce the load on the tool.

4. Challenge

Tool jamming with increasing drilling depth



As the drilling depth increases, the extreme viscoplasticity of the titanium leads to drill jamming. This results in drill breakage

Solution

Special cutting edge geometry with optimum cutting performance and stability

Cutting edge geometry	Cutting performance	Cutting edge stability
Sharp	●	●
Rounded	●	●
CrazyDrill Cool Titanium	●	●

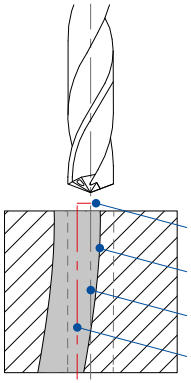
The solution is sharply ground cutting edges that must be stable at the same time - a contradiction in terms. A unique specific cutting edge geometry has been developed for titanium drills that masters this balance. As a result, cutting pressures and temperature are significantly reduced.

Important features

THE NEW HIGH-PERFORMANCE DRILLS FOR TITANIUM

5. Challenge

Position accuracy



Due to the viscoplastic properties of titanium, an accurate entry point and constant tool guidance during drilling cannot be guaranteed.

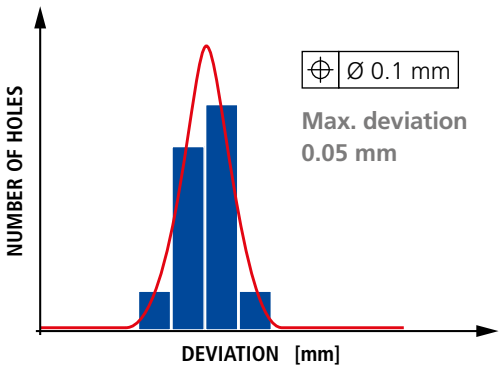
Solution

Specific pilot drill

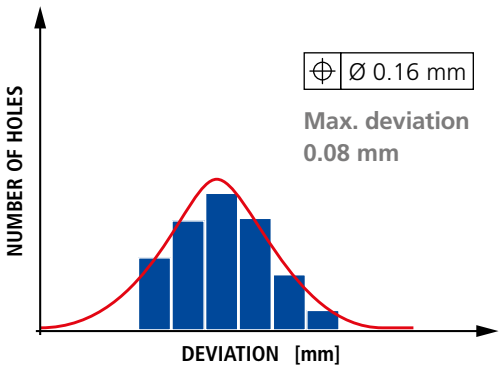
To achieve high position accuracy, the new pilot drill (with 90° chamfer) CrazyDrill Coolpilot Titanium ATC can be used.

Position accuracy

With pilot drill



Without pilot drill



Material: Ti Gr.5 / 3.7165 / ASTM F136; **Diameter:** 4 mm; **Drilling depth:** 10 x d; **Drill step:** 1;
Coolant: Emulsion 8%; **Cutting data:** vc = 60 m/min; f = 0.08 mm/rev

Maximum performance guaranteed

EXAMPLE IN TITANIUM MACHINING IN COMPARISON

■ Example

Longer tool life

Machining: Drilling in one shot
Drilling depth: 10 mm;
Coolant: Emulsion 8%

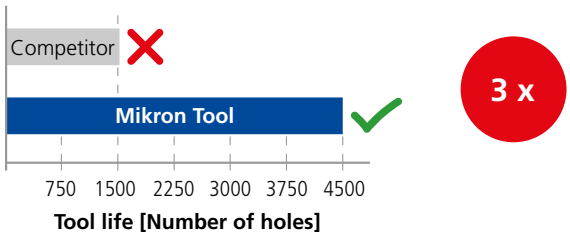
Titanium alloy: Ti Gr.5 / 3.7165 / TiAl6V4 / ASTM B348 S2

Tool: CrazyDrill Cool Titanium ATC
Diameter: 1.0 mm

Cutting data:

Conventional titanium drill		**CrazyDrill Cool Titanium ATC**	
v_c = 60 m/min	f = 0.020 mm/rev	v_c = 60 m/min	f = 0.020 mm/rev

Results:

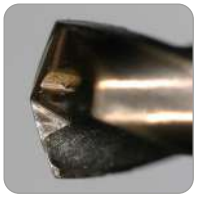


Competitor

Breakage

Mikron Tool

Front view

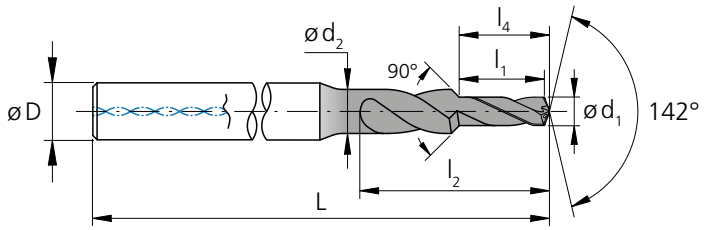


Flute view

Guiding margin view

CrazyDrill Coolpilot Titanium ATC - 3 x d

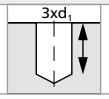
DRILLING WITH THROUGH-TOOL COOLING

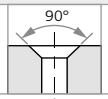


d_1 [mm]	d_1 [inch]	l_1 [mm]	d_2 [mm]	l_2 [mm]	l_4 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.00		3.00	1.60	6.5	3.20	4	50	2.PD.01000.ATC	■
1.05		3.15	1.60	6.8	3.30	4	50	2.PD.01050.ATC	■
1.10		3.30	1.60	7.1	3.50	4	50	2.PD.01100.ATC	■
1.15		3.45	1.60	7.5	3.60	4	50	2.PD.01150.ATC	■
1.20		3.60	1.90	7.8	3.80	4	50	2.PD.01200.ATC	■
1.25		3.75	1.90	8.1	4.00	4	50	2.PD.01250.ATC	■
1.30		3.90	1.90	8.4	4.10	4	50	2.PD.01300.ATC	■
1.35		4.05	1.90	8.8	4.30	4	50	2.PD.01350.ATC	■
1.40		4.20	1.90	9.1	4.40	4	50	2.PD.01400.ATC	■
1.45		4.35	2.25	10.4	4.60	4	50	2.PD.01450.ATC	■
1.50		4.50	2.25	10.7	4.70	4	50	2.PD.01500.ATC	■
1.55		4.65	2.25	10.9	4.90	4	50	2.PD.01550.ATC	■
1.587	**1/16**	4.76	2.25	11.2	5.00	4	50	2.PD.F116.ATC	■
1.60		4.80	2.25	11.2	5.10	4	50	2.PD.01600.ATC	■
1.65		4.95	2.25	11.5	5.20	4	50	2.PD.01650.ATC	■
1.70		5.10	2.60	11.8	5.40	4	53	2.PD.01700.ATC	■
1.75		5.25	2.60	12.1	5.50	4	53	2.PD.01750.ATC	■
1.80		5.40	2.60	12.3	5.70	4	53	2.PD.01800.ATC	■
1.85		5.55	2.60	12.6	5.80	4	53	2.PD.01850.ATC	■
1.90		5.70	2.60	12.8	6.00	4	53	2.PD.01900.ATC	■
1.95		5.85	2.60	13.1	6.20	4	53	2.PD.01950.ATC	■
2.00		6.00	3.10	13.3	6.30	4	55	2.PD.02000.ATC	■
2.05		6.15	3.10	13.6	6.50	4	55	2.PD.02050.ATC	■
2.10		6.30	3.10	13.9	6.60	4	55	2.PD.02100.ATC	■
2.15		6.45	3.10	14.1	6.80	4	55	2.PD.02150.ATC	■
2.20		6.60	3.10	14.4	7.00	4	55	2.PD.02200.ATC	■
2.25		6.75	3.10	14.7	7.10	4	55	2.PD.02250.ATC	■
2.30		6.90	3.50	14.9	7.30	4	57	2.PD.02300.ATC	■
2.35		7.05	3.50	15.2	7.40	4	57	2.PD.02350.ATC	■
2.381	**3/32**	7.14	3.50	15.5	7.49	4	57	2.PD.F332.ATC	■
2.40		7.20	3.50	15.6	7.60	4	57	2.PD.02400.ATC	■
2.45		7.35	3.50	15.9	7.70	4	57	2.PD.02450.ATC	■
2.50		7.50	3.50	16.2	7.90	4	57	2.PD.02500.ATC	■
2.55		7.65	3.50	16.5	8.10	4	57	2.PD.02550.ATC	■
2.60		7.80	4.00	16.9	8.20	4	57	2.PD.02600.ATC	■
2.65		7.95	4.00	17.2	8.40	4	57	2.PD.02650.ATC	■
2.70		8.10	4.00	17.5	8.50	4	57	2.PD.02700.ATC	■
2.75		8.25	4.00	17.8	8.70	4	57	2.PD.02750.ATC	■
2.80		8.40	4.00	18.2	8.80	4	57	2.PD.02800.ATC	■
2.85		8.55	4.00	18.5	9.00	4	57	2.PD.02850.ATC	■
2.90		8.70	4.00	18.8	9.20	4	57	2.PD.02900.ATC	■

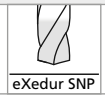
■ Stock item

Carbide





Z2

Ø d_1	0.1 - 3.0 mm	3.05 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.006 mm + 0.002 mm	+ 0.009 mm + 0.004 mm	+ 0.012 mm + 0.006 mm

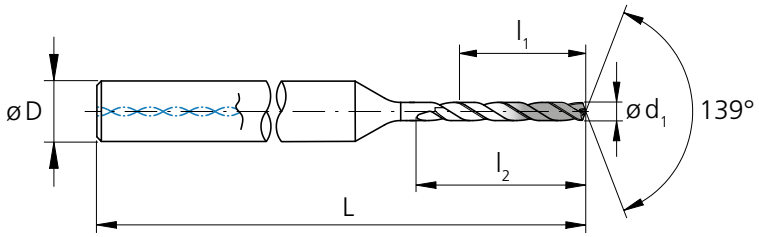
d_1 [mm]	d_1 [inch]	l_1 [mm]	d_2 [mm]	l_2 [mm]	l_4 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
2.95		8.85	4.00	19.1	9.30	4	57	2.PD.02950.ATC	■
3.00		9.00	4.70	19.5	9.50	6	65	2.PD.03000.ATC	■
3.05		9.15	4.70	19.8	9.60	6	65	2.PD.03050.ATC	■
3.10		9.30	4.70	20.1	9.80	6	65	2.PD.03100.ATC	■
3.15		9.45	4.70	20.4	10.00	6	65	2.PD.03150.ATC	■
3.175	**1/8**	9.53	4.70	20.6	10.00	6	65	2.PD.F18.ATC	■
3.20		9.60	4.70	20.8	10.10	6	65	2.PD.03200.ATC	■
3.25		9.75	4.70	21.1	10.30	6	65	2.PD.03250.ATC	■
3.30		9.90	4.70	21.4	10.40	6	65	2.PD.03300.ATC	■
3.35		10.05	4.70	21.7	10.60	6	65	2.PD.03350.ATC	■
3.40		10.20	4.70	22.1	10.70	6	65	2.PD.03400.ATC	■
3.45		10.35	4.70	22.4	10.90	6	65	2.PD.03450.ATC	■
3.50		10.50	5.40	22.7	11.10	6	68	2.PD.03500.ATC	■
3.55		10.65	5.40	23.0	11.20	6	68	2.PD.03550.ATC	■
3.60		10.80	5.40	23.4	11.40	6	68	2.PD.03600.ATC	■
3.65		10.95	5.40	23.7	11.50	6	68	2.PD.03650.ATC	■
3.70		11.10	5.40	24.0	11.70	6	68	2.PD.03700.ATC	■
3.75		11.25	5.40	24.3	11.80	6	68	2.PD.03750.ATC	■
3.80		11.40	5.40	24.7	12.00	6	68	2.PD.03800.ATC	■
3.85		11.55	5.40	25.0	12.20	6	68	2.PD.03850.ATC	■
3.90		11.70	5.40	25.3	12.30	6	68	2.PD.03900.ATC	■
3.95		11.85	5.40	25.6	12.50	6	68	2.PD.03950.ATC	■
3.968	**5/32**	11.90	5.40	25.7	12.50	6	68	2.PD.F532.ATC	■
4.00		12.00	5.40	26.0	12.60	6	68	2.PD.04000.ATC	■
4.10		12.30	6.00	26.6	12.90	6	72	2.PD.04100.ATC	■
4.20		12.60	6.00	27.2	13.30	6	72	2.PD.04200.ATC	■
4.30		12.90	6.00	27.9	13.60	6	72	2.PD.04300.ATC	■
4.40		13.20	6.00	28.5	13.90	6	72	2.PD.04400.ATC	■
4.50		13.50	6.00	29.2	14.20	6	72	2.PD.04500.ATC	■
4.60		13.80	6.00	29.8	14.50	6	72	2.PD.04600.ATC	■
4.70		14.10	7.00	30.5	14.80	8	75	2.PD.04700.ATC	■
4.762	**3/16**	14.29	7.00	30.8	15.00	8	75	2.PD.F316.ATC	■
4.80		14.40	7.00	31.1	15.20	8	75	2.PD.04800.ATC	■
4.90		14.70	7.00	31.8	15.50	8	75	2.PD.04900.ATC	■
5.00		15.00	7.00	32.4	15.80	8	75	2.PD.05000.ATC	■
5.10		15.30	7.50	33.1	16.10	8	75	2.PD.05100.ATC	■
5.20		15.60	7.50	33.7	16.40	8	75	2.PD.05200.ATC	■
5.30		15.90	7.50	34.4	16.70	8	75	2.PD.05300.ATC	■
5.40		16.20	8.00	35.0	17.10	8	80	2.PD.05400.ATC	■
5.50		16.50	8.00	35.7	17.40	8	80	2.PD.05500.ATC	■
5.560	**7/32**	16.68	8.00	36.0	17.52	8	80	2.PD.F732.ATC	■
5.60		16.80	8.00	36.3	17.70	8	80	2.PD.05600.ATC	■
5.70		17.10	8.00	37.0	18.00	8	80	2.PD.05700.ATC	■
5.80		17.40	8.00	37.6	18.30	8	80	2.PD.05800.ATC	■
5.90		17.70	8.00	38.3	18.60	8	80	2.PD.05900.ATC	■
6.00		18.00	8.00	38.9	18.90	8	80	2.PD.06000.ATC	■
6.350	**1/4**	19.05	8.00	41.1	20.02	8	80	2.PD.F14.ATC	■

Complementary products

CrazyDrill Cool Titanium ATC p.70

CrazyDrill Cool Titanium ATC - 6 x d

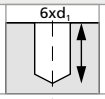
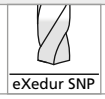
DRILLING WITH INTERNAL COOLING



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.00		6.0	9.0	4	55	2.CD.060100.ATC	■
1.05		6.3	9.5	4	55	2.CD.060105.ATC	■
1.10		6.6	9.9	4	55	2.CD.060110.ATC	■
1.15		6.9	10.4	4	55	2.CD.060115.ATC	■
1.20		7.2	10.8	4	57	2.CD.060120.ATC	■
1.25		7.5	11.3	4	57	2.CD.060125.ATC	■
1.30		7.8	11.7	4	57	2.CD.060130.ATC	■
1.35		8.1	12.2	4	57	2.CD.060135.ATC	■
1.40		8.4	12.6	4	57	2.CD.060140.ATC	■
1.45		8.7	13.1	4	58	2.CD.060145.ATC	■
1.50		9.0	13.5	4	58	2.CD.060150.ATC	■
1.55		9.3	14.0	4	58	2.CD.060155.ATC	■
1.587	**1/16**	9.5	14.3	4	58	2.CD.060F116.ATC	■
1.60		9.6	14.4	4	58	2.CD.060160.ATC	■
1.65		9.9	14.9	4	58	2.CD.060165.ATC	■
1.70		10.2	15.3	4	60	2.CD.060170.ATC	■
1.75		10.5	15.8	4	60	2.CD.060175.ATC	■
1.80		10.8	16.2	4	60	2.CD.060180.ATC	■
1.85		11.1	16.7	4	60	2.CD.060185.ATC	■
1.90		11.4	17.1	4	60	2.CD.060190.ATC	■
1.95		11.7	17.6	4	60	2.CD.060195.ATC	■
2.00		12.0	18.0	4	63	2.CD.060200.ATC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
2.05		12.3	18.5	4	63	2.CD.060205.ATC	■
2.10		12.6	18.9	4	63	2.CD.060210.ATC	■
2.15		12.9	19.4	4	63	2.CD.060215.ATC	■
2.20		13.2	19.8	4	63	2.CD.060220.ATC	■
2.25		13.5	20.3	4	63	2.CD.060225.ATC	■
2.30		13.8	20.7	4	65	2.CD.060230.ATC	■
2.35		14.1	21.2	4	65	2.CD.060235.ATC	■
2.381	**3/32**	14.3	21.4	4	65	2.CD.060F332.ATC	■
2.40		14.4	21.6	4	65	2.CD.060240.ATC	■
2.45		14.7	22.1	4	65	2.CD.060245.ATC	■
2.50		15.0	22.5	4	65	2.CD.060250.ATC	■
2.55		15.3	23.0	4	65	2.CD.060255.ATC	■
2.60		15.6	23.4	4	68	2.CD.060260.ATC	■
2.65		15.9	23.9	4	68	2.CD.060265.ATC	■
2.70		16.2	24.3	4	68	2.CD.060270.ATC	■
2.75		16.5	24.8	4	68	2.CD.060275.ATC	■
2.80		16.8	25.2	4	68	2.CD.060280.ATC	■
2.85		17.1	25.7	4	68	2.CD.060285.ATC	■
2.90		17.4	26.1	4	68	2.CD.060290.ATC	■
2.95		17.7	26.6	4	68	2.CD.060295.ATC	■
3.00		18.0	27.0	6	74	2.CD.060300.ATC	■
3.05		18.3	27.5	6	74	2.CD.060305.ATC	■

■ Stock item

Carbide |  |  | Z2 |  | 

Ø d_1	0.1 - 3.0 mm	3.05 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.006 mm 0	+ 0.009 mm + 0.001 mm	+ 0.010 mm + 0.001 mm

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
3.10		18.6	27.9	6	74	2.CD.060310.ATC	■
3.15		18.9	28.4	6	74	2.CD.060315.ATC	■
3.175	**1/8**	19.1	28.6	6	74	2.CD.060F18.ATC	■
3.20		19.2	28.8	6	74	2.CD.060320.ATC	■
3.25		19.5	29.3	6	74	2.CD.060325.ATC	■
3.30		19.8	29.7	6	74	2.CD.060330.ATC	■
3.35		20.1	30.2	6	74	2.CD.060335.ATC	■
3.40		20.4	30.6	6	74	2.CD.060340.ATC	■
3.45		20.7	31.1	6	74	2.CD.060345.ATC	■
3.50		21.0	31.5	6	78	2.CD.060350.ATC	■
3.55		21.3	32.0	6	78	2.CD.060355.ATC	■
3.60		21.6	32.4	6	78	2.CD.060360.ATC	■
3.65		21.9	32.9	6	78	2.CD.060365.ATC	■
3.70		22.2	33.3	6	78	2.CD.060370.ATC	■
3.75		22.5	33.8	6	78	2.CD.060375.ATC	■
3.80		22.8	34.2	6	78	2.CD.060380.ATC	■
3.85		23.1	34.7	6	78	2.CD.060385.ATC	■
3.90		23.4	35.1	6	78	2.CD.060390.ATC	■
3.95		23.7	35.6	6	78	2.CD.060395.ATC	■
3.968	**5/32**	23.8	35.7	6	78	2.CD.060F532.ATC	■
4.00		24.0	36.0	6	78	2.CD.060400.ATC	■
4.10		24.6	36.9	6	80	2.CD.060410.ATC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
4.20		25.2	37.8	6	80	2.CD.060420.ATC	■
4.30		25.8	38.7	6	80	2.CD.060430.ATC	■
4.40		26.4	39.6	6	80	2.CD.060440.ATC	■
4.50		27.0	40.5	6	80	2.CD.060450.ATC	■
4.60		27.6	41.4	6	80	2.CD.060460.ATC	■
4.70		28.2	42.3	6	84	2.CD.060470.ATC	■
4.762	**3/16**	28.6	42.9	6	84	2.CD.060F316.ATC	■
4.80		28.8	43.2	6	84	2.CD.060480.ATC	■
4.90		29.4	44.1	6	84	2.CD.060490.ATC	■
5.00		30.0	45.0	6	84	2.CD.060500.ATC	■
5.10		30.6	45.9	6	84	2.CD.060510.ATC	■
5.20		31.2	46.8	6	84	2.CD.060520.ATC	■
5.30		31.8	47.7	6	84	2.CD.060530.ATC	■
5.40		32.4	48.6	6	88	2.CD.060540.ATC	■
5.50		33.0	49.5	6	88	2.CD.060550.ATC	■
5.560	**7/32**	33.4	50.0	6	88	2.CD.060F732.ATC	■
5.60		33.6	50.4	6	88	2.CD.060560.ATC	■
5.70		34.2	51.3	6	88	2.CD.060570.ATC	■
5.80		34.8	52.2	6	88	2.CD.060580.ATC	■
5.90		35.4	53.1	6	88	2.CD.060590.ATC	■
6.00		36.0	54.0	6	88	2.CD.060600.ATC	■
6.350	**1/4**	38.1	57.2	8	98	2.CD.060F14.ATC	■

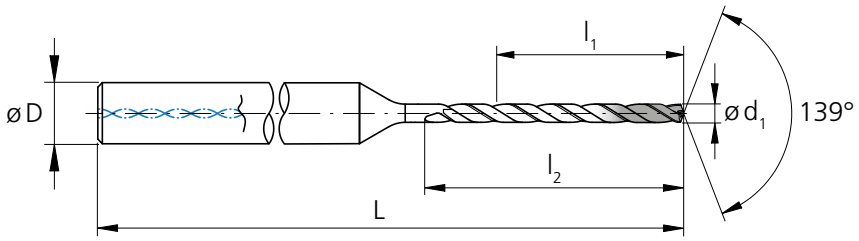
■ Stock item

Complementary products

CrazyDrill Coolpilot Titanium p.66

CrazyDrill Cool Titanium ATC - 10 x d

DRILLING WITH INTERNAL COOLING



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.00		10.0	13.0	4	59	2.CD.100100.ATC	■
1.05		10.5	13.7	4	59	2.CD.100105.ATC	■
1.10		11.0	14.3	4	59	2.CD.100110.ATC	■
1.15		11.5	15.0	4	59	2.CD.100115.ATC	■
1.20		12.0	15.6	4	62	2.CD.100120.ATC	■
1.25		12.5	16.3	4	62	2.CD.100125.ATC	■
1.30		13.0	16.9	4	62	2.CD.100130.ATC	■
1.35		13.5	17.6	4	62	2.CD.100135.ATC	■
1.40		14.0	18.2	4	62	2.CD.100140.ATC	■
1.45		14.5	18.9	4	65	2.CD.100145.ATC	■
1.50		15.0	19.5	4	65	2.CD.100150.ATC	■
1.55		15.5	20.2	4	65	2.CD.100155.ATC	■
1.587	**1/16**	15.9	20.6	4	65	2.CD.100F116.ATC	■
1.60		16.0	20.8	4	65	2.CD.100160.ATC	■
1.65		16.5	21.5	4	65	2.CD.100165.ATC	■
1.70		17.0	22.1	4	67	2.CD.100170.ATC	■
1.75		17.5	22.8	4	67	2.CD.100175.ATC	■
1.80		18.0	23.4	4	67	2.CD.100180.ATC	■
1.85		18.5	24.1	4	67	2.CD.100185.ATC	■
1.90		19.0	24.7	4	67	2.CD.100190.ATC	■
1.95		19.5	25.4	4	67	2.CD.100195.ATC	■
2.00		20.0	26.0	4	70	2.CD.100200.ATC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
2.05		20.5	26.7	4	70	2.CD.100205.ATC	■
2.10		21.0	27.3	4	70	2.CD.100210.ATC	■
2.15		21.5	28.0	4	70	2.CD.100215.ATC	■
2.20		22.0	28.6	4	70	2.CD.100220.ATC	■
2.25		22.5	29.3	4	70	2.CD.100225.ATC	■
2.30		23.0	29.9	4	75	2.CD.100230.ATC	■
2.35		23.5	30.6	4	75	2.CD.100235.ATC	■
2.381	**3/32**	23.8	31.0	4	75	2.CD.100F332.ATC	■
2.40		24.0	31.2	4	75	2.CD.100240.ATC	■
2.45		24.5	31.9	4	75	2.CD.100245.ATC	■
2.50		25.0	32.5	4	75	2.CD.100250.ATC	■
2.55		25.5	33.2	4	75	2.CD.100255.ATC	■
2.60		26.0	33.8	4	80	2.CD.100260.ATC	■
2.65		26.5	34.5	4	80	2.CD.100265.ATC	■
2.70		27.0	35.1	4	80	2.CD.100270.ATC	■
2.75		27.5	35.8	4	80	2.CD.100275.ATC	■
2.80		28.0	36.4	4	80	2.CD.100280.ATC	■
2.85		28.5	37.1	4	80	2.CD.100285.ATC	■
2.90		29.0	37.7	4	80	2.CD.100290.ATC	■
2.95		29.5	38.4	4	80	2.CD.100295.ATC	■
3.00		30.0	39.0	6	87	2.CD.100300.ATC	■
3.05		30.5	39.7	6	87	2.CD.100305.ATC	■

■ Stock item

Carbide | 10xd$_1$ | 139° | Z2 | eXedur SNP

Ø d$_1$	0.1 - 3.0 mm	3.05 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.006 mm 0	+ 0.009 mm + 0.001 mm	+ 0.010 mm + 0.001 mm

d$_1$ [mm]	d$_1$ [inch]	l$_1$ [mm]	l$_2$ [mm]	D (h6) [mm]	L [mm]	Item number	Availability
3.10		31.0	40.3	6	87	2.CD.100310.ATC	■
3.15		31.5	41.0	6	87	2.CD.100315.ATC	■
3.175	**1/8**	32.0	41.3	6	87	2.CD.100F18.ATC	■
3.20		32.0	41.6	6	87	2.CD.100320.ATC	■
3.25		32.5	42.3	6	87	2.CD.100325.ATC	■
3.30		33.0	42.9	6	87	2.CD.100330.ATC	■
3.35		33.5	43.6	6	87	2.CD.100335.ATC	■
3.40		34.0	44.2	6	87	2.CD.100340.ATC	■
3.45		34.5	44.9	6	87	2.CD.100345.ATC	■
3.50		35.0	45.5	6	95	2.CD.100350.ATC	■
3.55		35.5	46.2	6	95	2.CD.100355.ATC	■
3.60		36.0	46.8	6	95	2.CD.100360.ATC	■
3.65		36.5	47.5	6	95	2.CD.100365.ATC	■
3.70		37.0	48.1	6	95	2.CD.100370.ATC	■
3.75		37.5	48.8	6	95	2.CD.100375.ATC	■
3.80		38.0	49.4	6	95	2.CD.100380.ATC	■
3.85		38.5	50.1	6	95	2.CD.100385.ATC	■
3.90		39.0	50.7	6	95	2.CD.100390.ATC	■
3.95		39.5	51.4	6	95	2.CD.100395.ATC	■
3.968	**5/32**	40.0	51.6	6	95	2.CD.100F532.ATC	■
4.00		40.0	52.0	6	95	2.CD.100400.ATC	■
4.10		41.0	53.3	6	100	2.CD.100410.ATC	■

d$_1$ [mm]	d$_1$ [inch]	l$_1$ [mm]	l$_2$ [mm]	D (h6) [mm]	L [mm]	Item number	Availability
4.20		42.0	54.6	6	100	2.CD.100420.ATC	■
4.30		43.0	55.9	6	100	2.CD.100430.ATC	■
4.40		44.0	57.2	6	100	2.CD.100440.ATC	■
4.50		45.0	58.5	6	100	2.CD.100450.ATC	■
4.60		46.0	59.8	6	100	2.CD.100460.ATC	■
4.70		47.0	61.1	6	105	2.CD.100470.ATC	■
4.762	**3/16**	48.0	61.9	6	105	2.CD.100F316.ATC	■
4.80		48.0	62.4	6	105	2.CD.100480.ATC	■
4.90		49.0	63.7	6	105	2.CD.100490.ATC	■
5.00		50.0	65.0	6	105	2.CD.100500.ATC	■
5.10		51.0	66.3	6	105	2.CD.100510.ATC	■
5.20		52.0	67.6	6	105	2.CD.100520.ATC	■
5.30		53.0	68.9	6	105	2.CD.100530.ATC	■
5.40		54.0	70.2	6	112	2.CD.100540.ATC	■
5.50		55.0	71.5	6	112	2.CD.100550.ATC	■
5.560	**7/32**	56.0	72.3	6	112	2.CD.100F732.ATC	■
5.60		56.0	72.8	6	112	2.CD.100560.ATC	■
5.70		57.0	74.1	6	112	2.CD.100570.ATC	■
5.80		58.0	75.4	6	112	2.CD.100580.ATC	■
5.90		59.0	76.7	6	112	2.CD.100590.ATC	■
6.00		60.0	78.0	6	112	2.CD.100600.ATC	■
6.350	**1/4**	63.5	82.6	8	125	2.CD.100F14.ATC	■

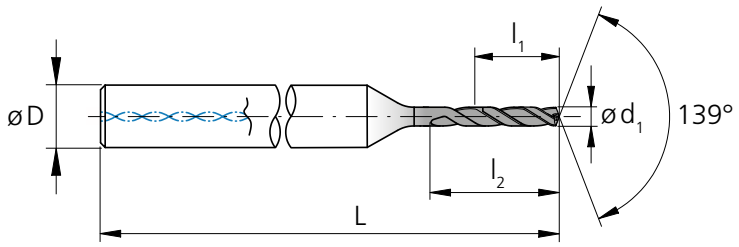
■ Stock item

Complementary products

CrazyDrill Coolpilot Titanium p.66

CrazyDrill Cool Titanium PTC - 3 x d

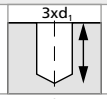
DRILLING WITH INTERNAL COOLING



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.00		3.00	6.0	4	50	2.CD.030100.PTC	■
1.05		3.15	6.3	4	50	2.CD.030105.PTC	■
1.10		3.30	6.6	4	50	2.CD.030110.PTC	■
1.15		3.45	6.9	4	50	2.CD.030115.PTC	■
1.20		3.60	7.2	4	50	2.CD.030120.PTC	■
1.25		3.75	7.5	4	50	2.CD.030125.PTC	■
1.30		3.90	7.8	4	50	2.CD.030130.PTC	■
1.35		4.05	8.1	4	50	2.CD.030135.PTC	■
1.40		4.20	8.4	4	50	2.CD.030140.PTC	■
1.45		4.35	8.7	4	50	2.CD.030145.PTC	■
1.50		4.50	9.0	4	50	2.CD.030150.PTC	■
1.55		4.65	9.3	4	50	2.CD.030155.PTC	■
1.587	**1/16**	4.76	9.5	4	50	2.CD.030F116.PTC	■
1.60		4.80	9.6	4	50	2.CD.030160.PTC	■
1.65		4.95	9.9	4	50	2.CD.030165.PTC	■
1.70		5.10	10.2	4	53	2.CD.030170.PTC	■
1.75		5.25	10.5	4	53	2.CD.030175.PTC	■
1.80		5.40	10.8	4	53	2.CD.030180.PTC	■
1.85		5.55	11.1	4	53	2.CD.030185.PTC	■
1.90		5.70	11.4	4	53	2.CD.030190.PTC	■
1.95		5.85	11.7	4	53	2.CD.030195.PTC	■
2.00		6.00	12.0	4	55	2.CD.030200.PTC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
2.05		6.15	12.3	4	55	2.CD.030205.PTC	■
2.10		6.30	12.6	4	55	2.CD.030210.PTC	■
2.15		6.45	12.9	4	55	2.CD.030215.PTC	■
2.20		6.60	13.2	4	55	2.CD.030220.PTC	■
2.25		6.75	13.5	4	55	2.CD.030225.PTC	■
2.30		6.90	13.8	4	57	2.CD.030230.PTC	■
2.35		7.05	14.1	4	57	2.CD.030235.PTC	■
2.381	**3/32**	7.14	14.3	4	57	2.CD.030F332.PTC	■
2.40		7.20	14.4	4	57	2.CD.030240.PTC	■
2.45		7.35	14.7	4	57	2.CD.030245.PTC	■
2.50		7.50	15.0	4	57	2.CD.030250.PTC	■
2.55		7.65	15.3	4	57	2.CD.030255.PTC	■
2.60		7.80	15.6	4	57	2.CD.030260.PTC	■
2.65		7.95	15.9	4	57	2.CD.030265.PTC	■
2.70		8.10	16.2	4	57	2.CD.030270.PTC	■
2.75		8.25	16.5	4	57	2.CD.030275.PTC	■
2.80		8.40	16.8	4	57	2.CD.030280.PTC	■
2.85		8.55	17.1	4	57	2.CD.030285.PTC	■
2.90		8.70	17.4	4	57	2.CD.030290.PTC	■
2.95		8.85	17.7	4	57	2.CD.030295.PTC	■
3.00		9.00	18.0	6	65	2.CD.030300.PTC	■
3.05		9.15	18.3	6	65	2.CD.030305.PTC	■

■ Stock item

Carbide |  |  | Z2 |  | 

Ø d_1	0.1 - 3.0 mm	3.05 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.006 mm 0	+ 0.009 mm + 0.001 mm	+ 0.010 mm + 0.001 mm

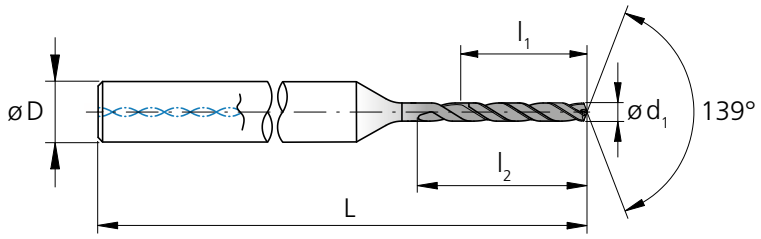
d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
3.10		9.30	18.6	6	65	2.CD.030310.PTC	■
3.15		9.45	18.9	6	65	2.CD.030315.PTC	■
3.175	**1/8**	9.53	19.1	6	65	2.CD.030F18.PTC	■
3.20		9.60	19.2	6	65	2.CD.030320.PTC	■
3.25		9.75	19.5	6	65	2.CD.030325.PTC	■
3.30		9.90	19.8	6	65	2.CD.030330.PTC	■
3.35		10.05	20.1	6	65	2.CD.030335.PTC	■
3.40		10.20	20.4	6	65	2.CD.030340.PTC	■
3.45		10.35	20.7	6	65	2.CD.030345.PTC	■
3.50		10.50	21.0	6	68	2.CD.030350.PTC	■
3.55		10.65	21.3	6	68	2.CD.030355.PTC	■
3.60		10.80	21.6	6	68	2.CD.030360.PTC	■
3.65		10.95	21.9	6	68	2.CD.030365.PTC	■
3.70		11.10	22.2	6	68	2.CD.030370.PTC	■
3.75		11.25	22.5	6	68	2.CD.030375.PTC	■
3.80		11.40	22.8	6	68	2.CD.030380.PTC	■
3.85		11.55	23.1	6	68	2.CD.030385.PTC	■
3.90		11.70	23.4	6	68	2.CD.030390.PTC	■
3.95		11.85	23.7	6	68	2.CD.030395.PTC	■
3.968	**5/32**	11.90	23.8	6	68	2.CD.030F532.PTC	■
4.00		12.00	24.0	6	68	2.CD.030400.PTC	■
4.10		12.30	24.6	6	72	2.CD.030410.PTC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
4.20		12.60	25.2	6	72	2.CD.030420.PTC	■
4.30		12.90	25.8	6	72	2.CD.030430.PTC	■
4.40		13.20	26.4	6	72	2.CD.030440.PTC	■
4.50		13.50	27.0	6	72	2.CD.030450.PTC	■
4.60		13.80	27.6	6	72	2.CD.030460.PTC	■
4.70		14.10	28.2	6	75	2.CD.030470.PTC	■
4.762	**3/16**	14.29	28.6	6	75	2.CD.030F316.PTC	■
4.80		14.40	28.8	6	75	2.CD.030480.PTC	■
4.90		14.70	29.4	6	75	2.CD.030490.PTC	■
5.00		15.00	30.0	6	75	2.CD.030500.PTC	■
5.10		15.30	30.6	6	75	2.CD.030510.PTC	■
5.20		15.60	31.2	6	75	2.CD.030520.PTC	■
5.30		15.90	31.8	6	75	2.CD.030530.PTC	■
5.40		16.20	32.4	6	80	2.CD.030540.PTC	■
5.50		16.50	33.0	6	80	2.CD.030550.PTC	■
5.560	**7/32**	16.68	33.4	6	80	2.CD.030F732.PTC	■
5.60		16.80	33.6	6	80	2.CD.030560.PTC	■
5.70		17.10	34.2	6	80	2.CD.030570.PTC	■
5.80		17.40	34.8	6	80	2.CD.030580.PTC	■
5.90		17.70	35.4	6	80	2.CD.030590.PTC	■
6.00		18.00	36.0	6	80	2.CD.030600.PTC	■
6.350	**1/4**	19.05	38.1	8	80	2.CD.030F14.PTC	■

■ Stock item

CrazyDrill Cool Titanium PTC - 6 x d

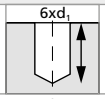
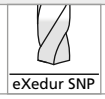
DRILLING WITH INTERNAL COOLING



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.00		6.0	9.0	4	55	2.CD.060100.PTC	■
1.05		6.3	9.5	4	55	2.CD.060105.PTC	■
1.10		6.6	9.9	4	55	2.CD.060110.PTC	■
1.15		6.9	10.4	4	55	2.CD.060115.PTC	■
1.20		7.2	10.8	4	57	2.CD.060120.PTC	■
1.25		7.5	11.3	4	57	2.CD.060125.PTC	■
1.30		7.8	11.7	4	57	2.CD.060130.PTC	■
1.35		8.1	12.2	4	57	2.CD.060135.PTC	■
1.40		8.4	12.6	4	57	2.CD.060140.PTC	■
1.45		8.7	13.1	4	58	2.CD.060145.PTC	■
1.50		9.0	13.5	4	58	2.CD.060150.PTC	■
1.55		9.3	14.0	4	58	2.CD.060155.PTC	■
1.587	**1/16**	9.5	14.3	4	58	2.CD.060F116.PTC	■
1.60		9.6	14.4	4	58	2.CD.060160.PTC	■
1.65		9.9	14.9	4	58	2.CD.060165.PTC	■
1.70		10.2	15.3	4	60	2.CD.060170.PTC	■
1.75		10.5	15.8	4	60	2.CD.060175.PTC	■
1.80		10.8	16.2	4	60	2.CD.060180.PTC	■
1.85		11.1	16.7	4	60	2.CD.060185.PTC	■
1.90		11.4	17.1	4	60	2.CD.060190.PTC	■
1.95		11.7	17.6	4	60	2.CD.060195.PTC	■
2.00		12.0	18.0	4	63	2.CD.060200.PTC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
2.05		12.3	18.5	4	63	2.CD.060205.PTC	■
2.10		12.6	18.9	4	63	2.CD.060210.PTC	■
2.15		12.9	19.4	4	63	2.CD.060215.PTC	■
2.20		13.2	19.8	4	63	2.CD.060220.PTC	■
2.25		13.5	20.3	4	63	2.CD.060225.PTC	■
2.30		13.8	20.7	4	65	2.CD.060230.PTC	■
2.35		14.1	21.2	4	65	2.CD.060235.PTC	■
2.381	**3/32**	14.3	21.4	4	65	2.CD.060F332.PTC	■
2.40		14.4	21.6	4	65	2.CD.060240.PTC	■
2.45		14.7	22.1	4	65	2.CD.060245.PTC	■
2.50		15.0	22.5	4	65	2.CD.060250.PTC	■
2.55		15.3	23.0	4	65	2.CD.060255.PTC	■
2.60		15.6	23.4	4	68	2.CD.060260.PTC	■
2.65		15.9	23.9	4	68	2.CD.060265.PTC	■
2.70		16.2	24.3	4	68	2.CD.060270.PTC	■
2.75		16.5	24.8	4	68	2.CD.060275.PTC	■
2.80		16.8	25.2	4	68	2.CD.060280.PTC	■
2.85		17.1	25.7	4	68	2.CD.060285.PTC	■
2.90		17.4	26.1	4	68	2.CD.060290.PTC	■
2.95		17.7	26.6	4	68	2.CD.060295.PTC	■
3.00		18.0	27.0	6	74	2.CD.060300.PTC	■
3.05		18.3	27.5	6	74	2.CD.060305.PTC	■

■ Stock item

Carbide |  |  | Z2 |  | 

Ø d_1	0.1 - 3.0 mm	3.05 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.006 mm 0	+ 0.009 mm + 0.001 mm	+ 0.010 mm + 0.001 mm

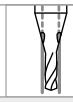
d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
3.10		18.6	27.9	6	74	2.CD.060310.PTC	■
3.15		18.9	28.4	6	74	2.CD.060315.PTC	■
3.175	**1/8**	19.1	28.6	6	74	2.CD.060F18.PTC	■
3.20		19.2	28.8	6	74	2.CD.060320.PTC	■
3.25		19.5	29.3	6	74	2.CD.060325.PTC	■
3.30		19.8	29.7	6	74	2.CD.060330.PTC	■
3.35		20.1	30.2	6	74	2.CD.060335.PTC	■
3.40		20.4	30.6	6	74	2.CD.060340.PTC	■
3.45		20.7	31.1	6	74	2.CD.060345.PTC	■
3.50		21.0	31.5	6	78	2.CD.060350.PTC	■
3.55		21.3	32.0	6	78	2.CD.060355.PTC	■
3.60		21.6	32.4	6	78	2.CD.060360.PTC	■
3.65		21.9	32.9	6	78	2.CD.060365.PTC	■
3.70		22.2	33.3	6	78	2.CD.060370.PTC	■
3.75		22.5	33.8	6	78	2.CD.060375.PTC	■
3.80		22.8	34.2	6	78	2.CD.060380.PTC	■
3.85		23.1	34.7	6	78	2.CD.060385.PTC	■
3.90		23.4	35.1	6	78	2.CD.060390.PTC	■
3.95		23.7	35.6	6	78	2.CD.060395.PTC	■
3.968	**5/32**	23.8	35.7	6	78	2.CD.060F532.PTC	■
4.00		24.0	36.0	6	78	2.CD.060400.PTC	■
4.10		24.6	36.9	6	80	2.CD.060410.PTC	■

d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
4.20		25.2	37.8	6	80	2.CD.060420.PTC	■
4.30		25.8	38.7	6	80	2.CD.060430.PTC	■
4.40		26.4	39.6	6	80	2.CD.060440.PTC	■
4.50		27.0	40.5	6	80	2.CD.060450.PTC	■
4.60		27.6	41.4	6	80	2.CD.060460.PTC	■
4.70		28.2	42.3	6	84	2.CD.060470.PTC	■
4.762	**3/16**	28.6	42.9	6	84	2.CD.060F316.PTC	■
4.80		28.8	43.2	6	84	2.CD.060480.PTC	■
4.90		29.4	44.1	6	84	2.CD.060490.PTC	■
5.00		30.0	45.0	6	84	2.CD.060500.PTC	■
5.10		30.6	45.9	6	84	2.CD.060510.PTC	■
5.20		31.2	46.8	6	84	2.CD.060520.PTC	■
5.30		31.8	47.7	6	84	2.CD.060530.PTC	■
5.40		32.4	48.6	6	88	2.CD.060540.PTC	■
5.50		33.0	49.5	6	88	2.CD.060550.PTC	■
5.560	**7/32**	33.4	50.0	6	88	2.CD.060F732.PTC	■
5.60		33.6	50.4	6	88	2.CD.060560.PTC	■
5.70		34.2	51.3	6	88	2.CD.060570.PTC	■
5.80		34.8	52.2	6	88	2.CD.060580.PTC	■
5.90		35.4	53.1	6	88	2.CD.060590.PTC	■
6.00		36.0	54.0	6	88	2.CD.060600.PTC	■
6.350	**1/4**	38.1	57.2	8	98	2.CD.060F14.PTC	■

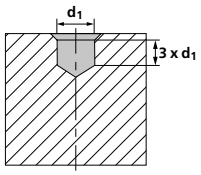
■ Stock item

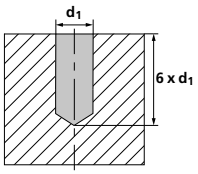
ATC - 3 x d / 6 x d / 10 x d

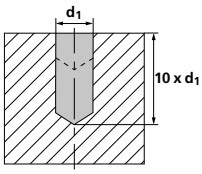
DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW



Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Mid	v_c [m/min] High
S_2	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	40	60
		9.9367	TiAl6Nb7	ASTM F1295		

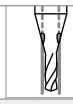






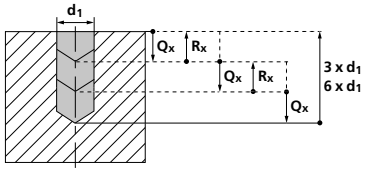
PTC - 3 x d / 6 x d

DRILLING WITH INTERNAL COOLING | CUTTING DATA OVERVIEW



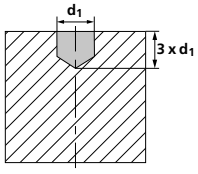
Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min] Mid	v_c [m/min] High	Q_x [mm]	R_x [mm]
S_2	Pure titanium	3.7035	Ti Gr.2	ASTM B348 / F67	30	60	0.2 - 0.5 x d1	0.2 - 0.5 x d1
		3.7065	Ti Gr.4	ASTM B348 / F68			-	-

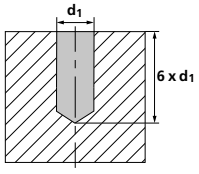
For Ti Gr.2



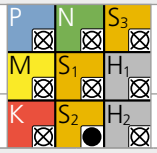
Chip breaking cycle (e.g.: G73)

For Ti Gr.4





RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended



f [mm/rev]

Ød1	1.0 mm		1.25 mm		1.5 mm 1/16"		2.0 mm		2.5 mm 3/32"		3.0 mm 1/8"		4.0 mm 5/32"		5.0 mm 3/16" - 7/32"		6.0 mm 1/4"	
	Mid	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High
	0.020	0.025	0.025	0.030	0.030	0.035	0.035	0.045	0.045	0.055	0.050	0.065	0.060	0.075	0.070	0.085	0.075	0.090

f [mm/rev]

Ød1	1.0 mm		1.25 mm		1.5 mm 1/16"		2.0 mm		2.5 mm 3/32"		3.0 mm 1/8"		4.0 mm 5/32"		5.0 mm 3/16" - 7/32"		6.0 mm 1/4"	
	Mid	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High	**Mid**	High
	0.010	0.020	0.013	0.025	0.015	0.030	0.020	0.040	0.025	0.050	0.030	0.055	0.040	0.070	0.050	0.080	0.060	0.090

Drilling process CrazyDrill Cool Titanium

PRECISE AND FAST DRILLING UP TO 10 X D IN TITANIUM ALLOYS

Coolant type, pressure and filtration

Coolant type

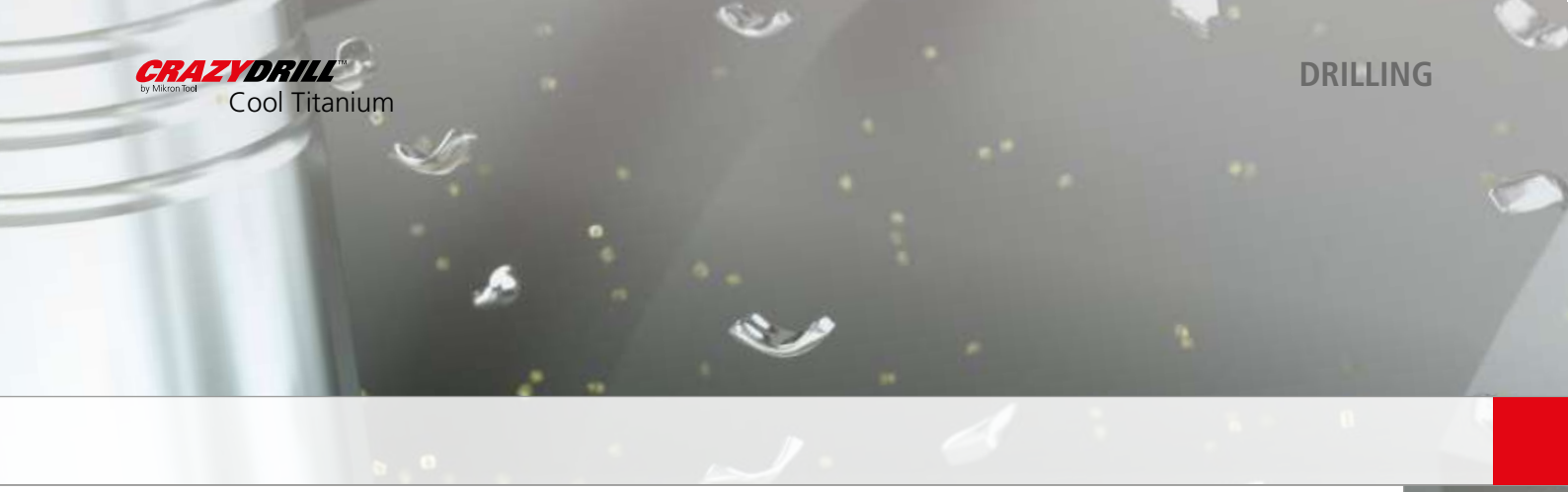
For best results, Mikron Tool recommends the use of 8% emulsion with EP-Additives (Extreme-Pressure-Additives) as coolant fluid. Alternatively, cutting oil can be used with good results as well.

Filtration: Good filter quality is very important when using through coolant drills. Dirt particles or residual chips can clog the coolant holes and consequently dramatically reduce the flowrate.
The following filter qualities must be adhered to, especially with small diameters:

- Drill with Ø < 2 mm filter quality ≤ 0.010 mm.
- Drill with Ø < 3 mm filter quality ≤ 0.020 mm.
- Drill with Ø < 6 mm filter quality ≤ 0.050 mm.

Coolant pressure: The minimum coolant pressure mentioned in the chart is required for the CrazyDrill Cool Titanium to achieve reliable drilling. Higher pressure is generally better for the cooling and flushing effect.

Ø d_1 Tool [mm]	1.0 mm - 2.0 mm	2.0 mm - 4.0 mm	4.0 mm - 6.35 mm
Version	**3 - 6 - 10 x d**	**3 - 6 - 10 x d**	**3 - 6 - 10 x d**
Minimal pressure [bar]	40	30	30



CrazyDrill Cool Titanium ATC 6 x d

Because of the high degree of self-centering capability, CrazyDrill Cool Titanium ATC 6 x d 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 Titanium ATC** as pilot drill
- **CrazyDrill Crosspilot** as pilot drill for inclined surfaces

CrazyDrill Cool Titanium ATC 10 x d

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

CrazyDrill Cool Titanium PTC 3 x d

Because of the high degree of self-centering capability, CrazyDrill Cool Titanium PTC 3 x d can be used on regular and straight surfaces without a centering or pilot hole.

CrazyDrill Cool Titanium PTC 6 x d

Because of the high degree of self-centering capability, CrazyDrill Cool Titanium PTC 6 x d 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 Cool Titanium PTC 3 x d** as pilot drill
- **CrazyDrill Crosspilot** as pilot drill for inclined surfaces

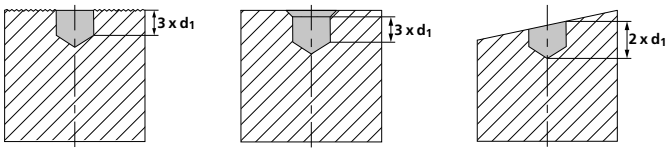
Pilot drilling and drilling

Pilot drilling with CrazyDrill Coolpilot Titanium ATC 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 process of titanium alloy Gr.5 / Gr.Nb

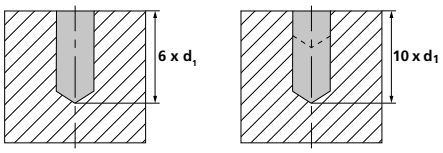
1 | PILOT DRILLING

- Turn on internal coolant.
- Drill with CrazyDrill Coolpilot Titanium ATC up to 3 x d, on irregular or rough surfaces.
  With simultaneous chamfer of 90°.
  Drill with CrazyDrill Crosspilot on inclined surfaces.



2 | DRILLING

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



Note:
After the drill has reached the desired cutting depth, return at increased feed rate to safety position. With CrazyDrill Cool Titanium ATC it is possible to enter the material and drill up to 10 x d using the recommended cutting speed and feed.

Drilling process of pure titanium Gr.2

Drilling as per DIN 66025 / PAL

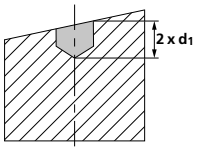
G73 chip breaking drilling cycle

Q_X = depth of the respective peck

R_X = retract value

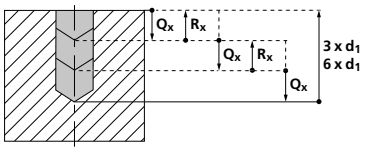
1 | PILOT DRILLING (ONLY ON INCLINED SURFACES)

- Drill with CrazyDrill Crosspilot on inclined surfaces.



2 | DRILLING

- Turn on internal coolant.
- Drill with CrazyDrill Cool Titanium PTC in a chip breaking drilling cycle with recommended drilling speed and feed (see cutting data chart).



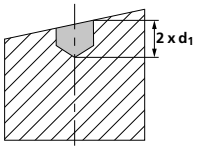
Note:

After the drill has reached the desired cutting depth, return at increased feed rate to safety position. With CrazyDrill Cool Titanium PTC it is possible enter the material and drill up to 6 x d using the recommended cutting speed and feed.

Drilling process of pure titanium Gr.4

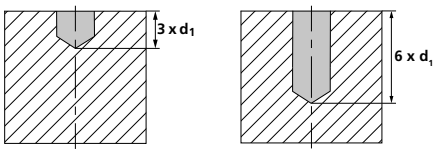
1 | PILOT DRILLING (ONLY ON INCLINED SURFACES)

- Drill with CrazyDrill Crosspilot on inclined surfaces.



2 | DRILLING

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



Note:
After the drill has reached the desired cutting depth, return at increased feed rate to safety position. With CrazyDrill Cool Titanium PTC it is possible enter the material and drill up to 6 x d using the recommended cutting speed and feed.

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