SELECTION

Micro drilling machining

The complete drill program for use in micro dimensions

CERATIZIT is a high-technology engineering group specialised in cutting tools and hard material solutions.

Tooling a Sustainable Future

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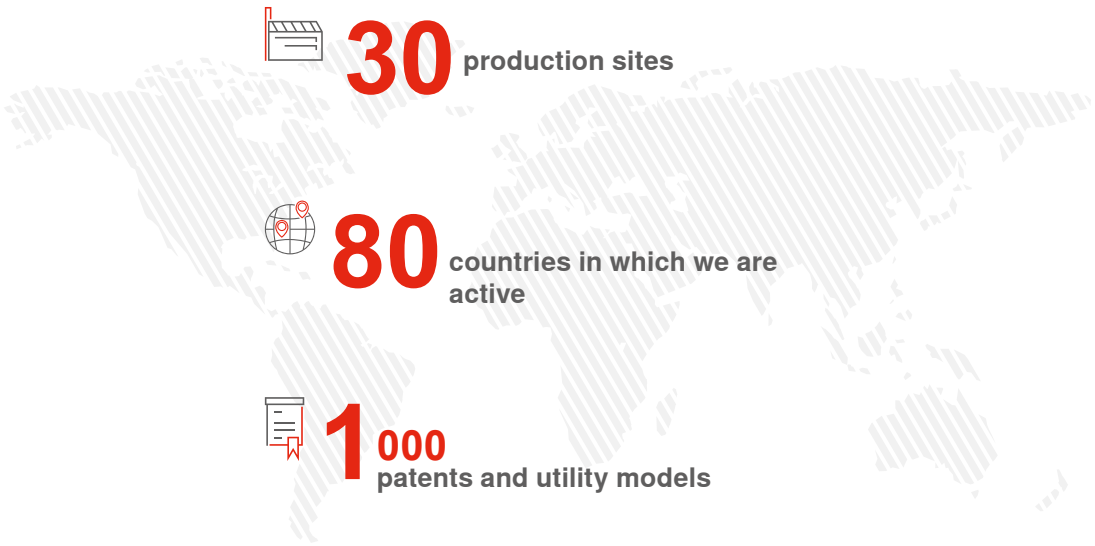
CERATIZIT: a specialist in sustainable cutting tools and hard material solutions.

Are you looking for a reliable partner for your tooling and machining-process needs?
Then look no further! CERATIZIT is not just a tool supplier. Our experts are also on hand to advise you with extensive industry knowledge and decades of experience.

What's more, anyone who wants to pay particular attention to their CO_2 balance, will find in us a sustainability-conscious partner with a concrete strategy and target set out in our vision of becoming the number 1 sustainable company in our industry.

For more than 100 years, CERATIZIT has been a pioneer in the field of ambitious hard material solutions for machining and protection against wear. This allows us to guarantee our customers the highest levels of quality and access to the latest developments in the carbide sector – all-round cutting tools expertise from a single source.



30 production sites

80 countries in which we are active

1 000 patents and utility models

Introduction

The trend towards producing increasingly delicate parts is bringing more focus to micro machining in industry. One key aspect of this is bore machining, which is resulting in a steadily growing market for micro drills. As the complexity and miniaturisation of parts rises, so too do the demands on the machining process, making precision, surface quality, repeatability, cost effectiveness, tool life and process security essential in this regard.

The complete range of drills for use in micro dimensions

CERATIZIT wants to provide its customers with solutions that enable them to meet this trend, which is why it is steadily growing its portfolio of micro tools.

When it comes to micro-dimension bore machining, the WTX – Micro from the Performance range is both a specialist for micro and deep hole drilling and suitable for universal use – it is anything but choosy when it comes to materials. This means it can be used for many different applications in a diverse range of industries, from general mechanical engineering, the automotive industry and medtech to the paper industry or the watch, clock and jewellery industry. Even when working in micro dimensions, the WTX – Micro produces the accustomed high WTX Performance drilling quality up to 30xD while maintaining maximum positioning accuracy.

The newly developed WTX – Micropilot, which can be used as a perfectly tailored pre-machining tool even under the most challenging conditions, completes the range. From spot drilling on surfaces with slopes or curves up to 50° to producing a chamfer at the bore entry, the WTX – Micropilot gets it done in a single machining operation.

Pilot drill

WTX – Micropilot

Our latest development, the WTX – Micropilot, makes the impossible possible. Whereas in the past, spot drilling on angled or curved surfaces would only have been possible with prior spot-facing for each milling cutter, now you only need one tool: the WTX – Micropilot. What if you want to produce a 90° countersink at the hole entrance, say? The WTX – Micropilot lets you do it in a single machining operation, saving tool changes, time and costs.

Perfectly matched to our WTX – Micro micro drill from 8xD to 30xD, the pilot drill is used at hole depths of up to 2.5xD. Its sophisticated end geometry with 160° point angle allows for clean plunging and avoids wandering by the main drill. The special Dragonskin coating ensures optimum chip evacuation and a longer tool life.

The advantages of the WTX – Micropilot:

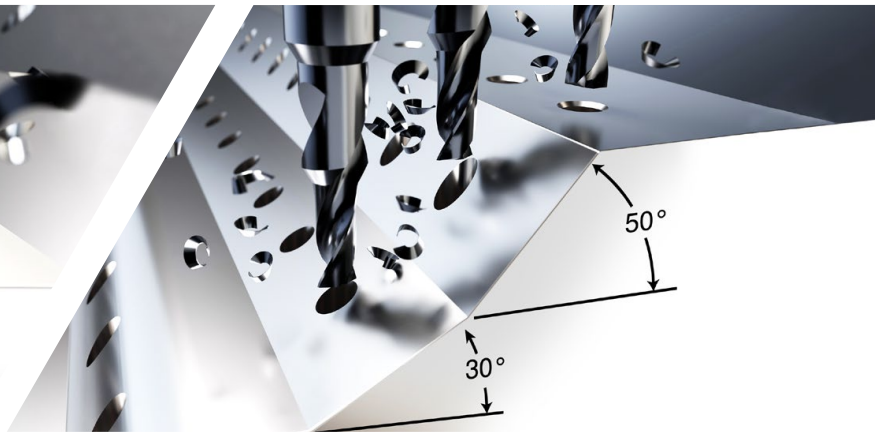
- ▲ State-of-the-art: substrate, geometry, coating
- ▲ WTX – Micropilot (pilot drill) and WTX – Micro (deep hole drill) are perfectly attuned to one another
- ▲ Extremely tight tolerances ensure the deep hole drill does not wander
- ▲ Optimum chip evacuation thanks to sophisticated end geometry and DPX74M Dragonskin coating
- ▲ 90° countersink at the hole entrance possible (with flat drilling application)

Maximum productivity and process security thanks to optimised geometry and high-performance coating

- ▲ Direct spot drilling of straight, angled and curved surfaces with an angle of inclination of up to 50°

Significant saving in time and money as there is no need for an additional tool – 2 instead of 3 process steps

Direct spot drilling of convex and concave surfaces possible



Direct spot drilling of angled surfaces up to 50° or 90° countersink with flat drilling application

cts.ceratizit.com/gb/en/wtx-micro

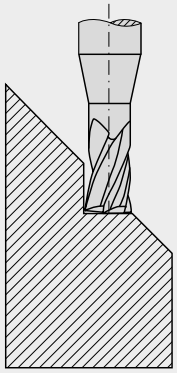
Process comparison

1. Spot drilling on angled or curved surfaces

Conventional drilling process

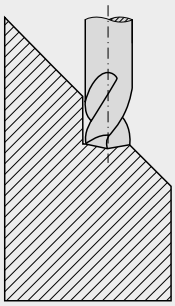
Spot-facing with milling cutter

Tool
Milling cutter



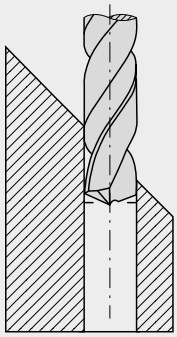
Producing the pilot hole

Tool
WTX – Micro 5xD



Completing the (deep) hole

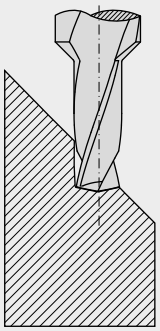
Tool
WTX – Micro deep hole drilling



Drilling process with WTX – Micropilot

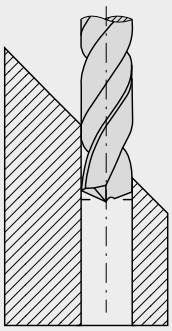
Spot drilling on angled/ curved surfaces

Tool
WTX – Micropilot pilot drill



Completing the (deep) hole

Tool
WTX – Micro deep hole drilling



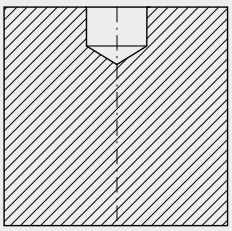
2. Hole with chamfer

Conventional drilling process

Producing the pilot hole

Tool
WTX – Micro 5xD

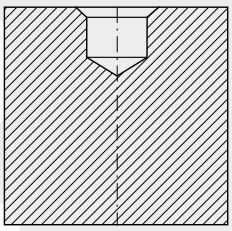
1



Countersinking at the hole entrance

Tool
Countersink

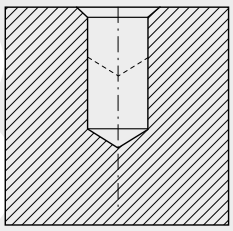
2



Completing the hole

Tool
WTX – Micro deep hole drilling

3

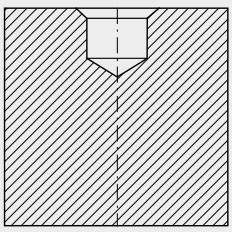


Drilling process with WTX – Micropilot

Producing the pilot hole incl. 90° countersink

Tool
WTX – Micropilot pilot drill

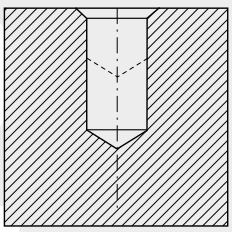
1



Completing the hole

Tool
WTX – Micro deep hole drilling

2



High-performance and deep hole drill

WTX – Micro

Even when working in micro dimensions, the WTX – Micro produces the accustomed high WTX Performance drilling quality up to 30xD while maintaining maximum positioning accuracy.

The 5xD version is designed as a pilot drill for the WTX – Micro deep hole drill, creating the ideal conditions for the micro deep hole drilling process. Thanks to its outstanding self-centring feature, there is no need for drilling a pilot hole/centring to be carried out for the micro drills up to and including 8xD.

The advantages of the WTX – Micro:

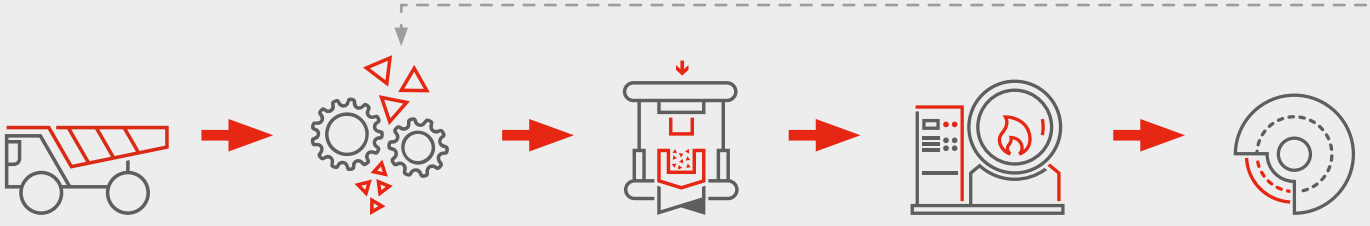
- **Special drill point**
  guarantees maximum positioning accuracy and outstanding centring properties
- **Lapped surfaces and patented chip space openings**
  ensure secure and quick chip removal
- **Innovative DPX74M Dragonskin**
  makes the WTX – Micro resistant to heat and wear
- **Spiral coolant channels and a Power chamber along the whole shank length**
  ensure optimum cooling of the cutting edges, significantly extending tool life
- **Process security and tight tolerances**
  are the priority in the performance specification – and the WTX – Micro has been successfully engineered for this very purpose
- **Ultra-fine grain carbide from CERATIZIT**
  ensures consistently outstanding tool quality

cts.ceratizit.com/gb/en/wtx-micro

From powder to cutting material

CERATIZIT – the carbide concept for success

Carbide has become indispensable in numerous industries and production processes. Complex products and modern materials place increasingly high demand on tools, materials and precision processing. Carbides are composite materials consisting of a hard material and a very tough binder metal. They are extremely hard, and are characterised by high wear resistance and high hot hardness. Carbide is used in various fields that require tools or components to be particularly wear-resistant, such as in the machining of hard materials. CERATIZIT composite carbides improve the quality of tools and components, give them a longer service life, reduce costs and ensure process reliability. Carbides from CERATIZIT are made of super-strong tungsten carbide and a relatively soft binder metal such as cobalt. The two materials are fused in powder form. CERATIZIT offers more than 100 different carbide grades with different compositions. We have the perfect solution for every application and industry. CERATIZIT masters the whole production process chain from powder production, moulding and sintering to finishing and surface treatment. We grind, polish or erode the blank and coat it with innovative wear-resistant coatings. This gives our product the properties required for industrial applications. To make a finished carbide blank from a powder mix, you first need to press it into a mould. The resulting green compact can then be machined. Once it has been sintered at a temperature of between 1,300 and 1,500 degrees Celsius and a pressure of up to 100 bar, it is turned into a homogeneous and dense cutting material.



Material extraction

- Global extraction of cobalt and tungsten with selected business partners to secure a responsible procurement of raw materials

Preparing and mixing the powder

- Powder and grade manufacturing

Forming/pressing

- Forming using a variety of technologies (extrusion moulding, direct pressing, isostatic pressing, manual forming)

Sintering

- Several decades of experience in the precise calculation of sinter shrinking, guaranteeing a high-quality end product

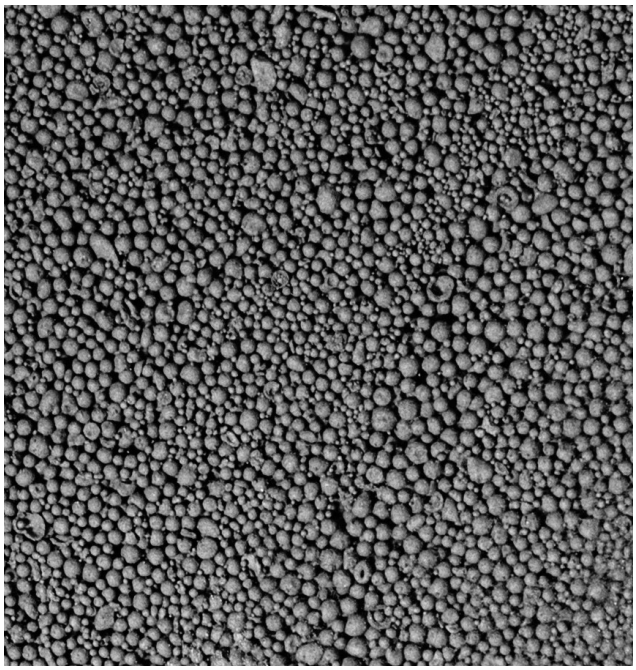
Grinding

- Peripheral grinding and chamfering; the drill is ready for use

Carbide – composite material with valuable properties

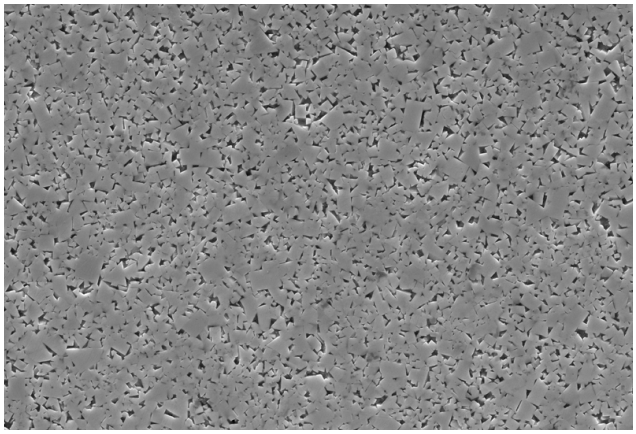
The amount of metal binder used and the grain size of the tungsten carbide both have an impact on the performance characteristics of the carbide. The specific composition determines the hardness, flexural strength and fracture toughness of the cutting material. The tungsten carbide grains have an average size of 0.5 to 20 micrometres (µm). The softer binder metal, cobalt, fills the space in between.

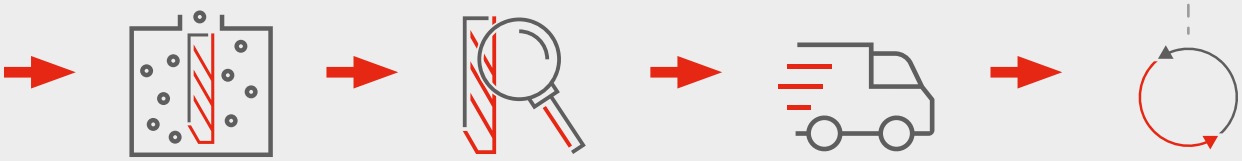
On the one hand, when extremely high toughness is required, the cobalt content can amount to as much as 30%. On the other, the cobalt content is reduced and the grain size decreased to the ultrafine range (e.g. 0.3 µm), in order to guarantee maximum wear resistance. CERATIZIT offers a customised solution for every one of your applications, particularly for the machining sector and wear parts.



The micro drills from the WTX – Micro series are made of a modern, high-performance carbide.

This makes the drilling tools very versatile. They have an ultra-fine grained substrate of 0.5-0.8 µm, a binder content of approx. 10% and a hardness of 1600 HV30.





Coating

- Coating using the PVD process, metals such as titanium and aluminium are heated under vacuum, vaporous and using electric voltage, they stick to the surface of the drill.

Quality assurance

- All products are subject to strict quality control tests by experienced specialists

Delivery/dispatch

- Automated high-tech shuttle warehouse, ensuring that your goods are ready for dispatch in next to no time.

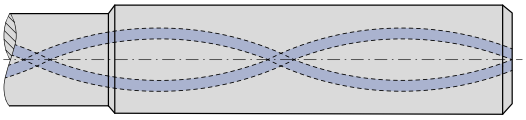
Recycling

- We organise the entire process for you and also provide free collection containers.

Innovative coolant channel design

With Power chamber

Without Power chamber



The carbide micro drills with thro' coolant from the WTX – Micro series all have an innovative coolant channel design with a Power chamber along the whole shank length. The cutting part of the tool also features helical coolant channels to maximise the coolant flow, resulting in optimal cooling of the cutting edge and higher cutting speeds. What's more, this has a positive effect on chip removal and the tool life.
When using our WTX – Micro drills with thro' coolant, we recommend a coolant pressure of at least 30 bar. The small bore diameters of the coolant channels also means sufficient filtration of the coolant is required:

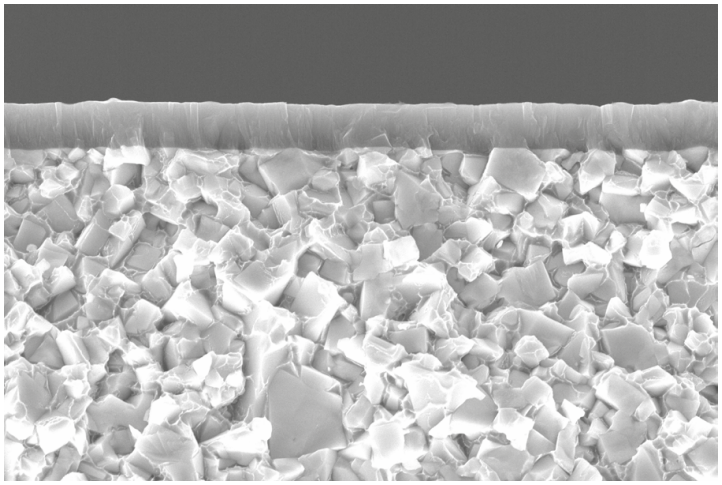
Drill < Ø 2.0 mm → filter ≤ 0.010 mm
Drill < Ø 3.0 mm → filter ≤ 0.020 mm

In addition, the longer the coolant is in the machine, suspended particles and particulate matter in the cooling medium prevent effective coolant flow. Regular replacement of the coolant is therefore recommended.

There are no specific coolant pressure or filter requirements for tools that do not have thro' coolant. However, you should make sure that the coolant for external cooling is aimed directly at the tool tip to achieve the best possible cooling effect.

Performance coating

All tools in the WTX – Micro series feature the innovative DPX74M Dragonskin coating, which has been specifically tailored to micro drill applications. This is an AlCrN-based PVD coating with an extremely smooth surface to achieve the best-possible chip flow and also reduce the formation of built-up edges and deposits. The coating‘s extremely high temperature-, oxidation- and wear resistance are also advantageous. The maximum application temperature is 1,100°C.



All versions with a possible hole depth greater than 5xD feature a head coating on the front part of the tool. In combination with the lapped chip spaces of the micro drills, this significantly improves chip removal.

Table of contents

Performance

Premium quality tools for high performance.

The premium quality tools from the **Performance** product line have been designed for specific applications and are distinguished by their outstanding performance. If you make high demands on the performance of your production and want to achieve the very best results, we recommend the Premium tools in this product line.

Symbol explanation

Shank

Plain cylindrical shank

Tool types

MICRO

Version

Int. coolant supply

self-centering

Pilot hole necessary

● = **Main Application**

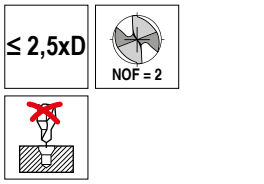
○ = Extended application

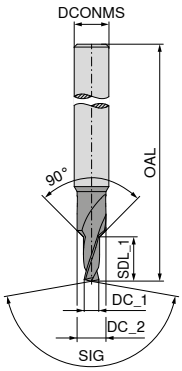
Overview

	Product name	Tool type	Boring depth	Diameter in mm Ø DC	Steel P	Stainless steel M	Cast iron K	Non-ferrous metals N	Heat-resistant S	Tempered steel H	Non metal materials O		coated ■	uncoated □	Performance Page No.
Mini-drill															
	WTX	MICRO PILOT	≤ 2,5xD	0,8 – 2,9	●	○	●		●				■		18
	WTX	MICRO	≤ 5xD	0,8 – 2,9	●	●	●		○			with thro' coolant	■		19
	WTX	MICRO	≤ 8xD	0,8 – 2,9	●	●	●		○			with thro' coolant	■		19
	WTX	MICRO	≤ 12xD	0,8 – 2,9	●	●	●		○			with thro' coolant	■		20
	WTX	MICRO	≤ 16xD	0,8 – 2,9	●	●	●					with thro' coolant	■		20
	WTX	MICRO	≤ 20xD	0,8 – 2,9	●	●	●					with thro' coolant	■		21
	WTX	MICRO	≤ 25xD	0,8 – 2,9	●	●	●					with thro' coolant	■		21
	WTX	MICRO	≤ 30xD	0,8 – 2,9	●	●	●					with thro' coolant	■		22
	WTX	MINI	≤ 5xD	0,1 – 2,9	○		●	●	○				■		23

WTX – Pilot drill 90°

- ▲ Specialised pilot drill for WTX – Micro deep hole drill (8xD–30xD)
- ▲ Direct spot drilling of angled and curved surfaces up to 50° angle of inclination possible
- ▲ 90° countersink at hole entrance can be achieved on flat spot drilling surface





NEW

MICRO PILOT

DPX74M

DRAGONSKIN

SIG 160°

Solid carbide

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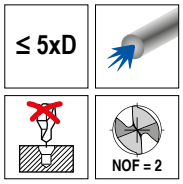
DC_1 m6 mm	DC_2 mm	DCONMS h6 mm	OAL mm	SDL_1 mm	£ T4/9F	
0.8	1.7	4	55	2.00	46.63	**00800**
0.9	1.7	4	55	2.25	46.63	**00900**
1.0	2.0	4	55	2.50	46.63	**01000**
1.1	2.0	4	55	2.75	46.63	**01100**
1.2	2.0	4	55	3.00	46.63	**01200**
1.3	2.5	4	55	3.25	46.63	**01300**
1.4	2.5	4	55	3.50	46.63	**01400**
1.5	3.0	4	55	3.75	46.63	**01500**
1.6	3.0	4	55	4.00	46.63	**01600**
1.7	3.0	4	55	4.25	46.63	**01700**
1.8	3.5	4	55	4.50	46.63	**01800**
1.9	3.5	4	55	4.75	46.63	**01900**
2.0	3.5	6	65	5.00	55.34	**02000**
2.1	3.5	6	65	5.25	55.34	**02100**
2.2	4.5	6	65	5.50	55.34	**02200**
2.3	4.5	6	65	5.75	55.34	**02300**
2.4	4.5	6	65	6.00	55.34	**02400**
2.5	4.5	6	65	6.25	55.34	**02500**
2.6	4.5	6	65	6.50	55.34	**02600**
2.7	5.0	6	65	6.75	55.34	**02700**
2.8	5.0	6	65	7.00	55.34	**02800**
2.9	5.0	6	65	7.25	55.34	**02900**

P	●
M	○
K	●
N	
S	●
H	
O	

→ v_c Page 25

WTX – High Performance Drills

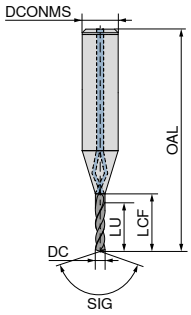
- ▲ Specialised micro drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Ideal as a pilot drill for WTX – Micro high-performance deep hole drills

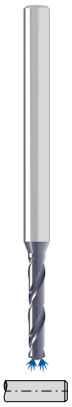


MICRO

DPX74M

DRAGONSKIN





SIG 135°

Solid carbide

10 693 ...

DC $_{m6}$ mm	DCONMS $_{h6}$ mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	39	5.6	4.0	121.81	**00800**
0.9	3	39	6.3	4.5	121.81	**00900**
1.0	3	40	7.0	5.0	108.13	**01000**
1.1	3	41	7.7	5.5	108.13	**01100**
1.2	3	41	8.4	6.0	108.13	**01200**
1.3	3	42	9.1	6.5	108.13	**01300**
1.4	3	42	9.8	7.0	108.13	**01400**
1.5	3	43	10.5	7.5	108.13	**01500**
1.6	3	44	11.2	8.0	113.84	**01600**
1.7	3	44	11.9	8.5	113.84	**01700**
1.8	3	45	12.6	9.0	113.84	**01800**
1.9	3	45	13.3	9.5	113.84	**01900**
2.0	3	46	14.0	10.0	113.84	**02000**
2.1	3	47	14.7	10.5	117.33	**02100**
2.2	3	47	15.4	11.0	117.33	**02200**
2.3	3	48	16.1	11.5	117.33	**02300**
2.4	3	48	16.8	12.0	117.33	**02400**
2.5	3	49	17.5	12.5	117.33	**02500**
2.6	3	50	18.2	13.0	123.53	**02600**
2.7	3	50	18.9	13.5	123.53	**02700**
2.8	3	51	19.6	14.0	123.53	**02800**
2.9	3	51	20.3	14.5	123.53	**02900**

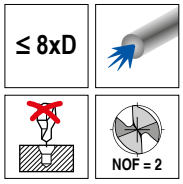
P	●
M	●
K	●
N	
S	○
H	
O	

→ v_c Page 26

Minimum coolant pressure: 30 bar

WTX – High Performance Drills

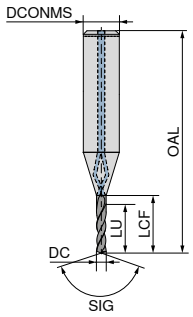
- ▲ Specialised micro drill
- ▲ Universal application
- ▲ Extremely high process security



MICRO

DPX74M

DRAGONSKIN



SIG 128°

Solid carbide

10 694 ...

DC $_{h6}$ mm	DCONMS $_{h6}$ mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	41	8	6.4	127.77	**00800**
0.9	3	42	9	7.2	127.77	**00900**
1.0	3	43	10	8.0	114.03	**01000**
1.1	3	44	11	8.8	114.03	**01100**
1.2	3	45	12	9.6	114.03	**01200**
1.3	3	46	13	10.4	114.03	**01300**
1.4	3	47	14	11.2	114.03	**01400**
1.5	3	47	15	12.0	114.03	**01500**
1.6	3	48	16	12.8	122.66	**01600**
1.7	3	49	17	13.6	122.66	**01700**
1.8	3	50	18	14.4	122.66	**01800**
1.9	3	51	19	15.2	122.66	**01900**
2.0	3	52	20	16.0	122.66	**02000**
2.1	3	53	21	16.8	124.61	**02100**
2.2	3	54	22	17.6	124.61	**02200**
2.3	3	55	23	18.4	124.61	**02300**
2.4	3	56	24	19.2	124.61	**02400**
2.5	3	56	25	20.0	124.61	**02500**
2.6	3	57	26	20.8	128.62	**02600**
2.7	3	58	27	21.6	128.62	**02700**
2.8	3	59	28	22.4	128.62	**02800**
2.9	3	60	29	23.2	128.62	**02900**

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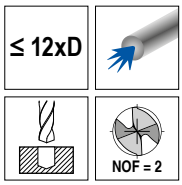
→ v_c Page 27

Minimum coolant pressure: 30 bar

WTX – High Performance Drills

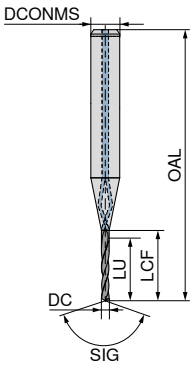
- ▲ Specialised micro drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Pilot drill: WTX – Micropilot or 5xD WTX – Micro



MICRO

DPX74M

DRAGONSKIN



SIG 128°

Solid carbide

10 695 ...

DC h6 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	44	11.2	9.6	142.30	**00800**
0.9	3	46	12.6	10.8	142.30	**00900**
1.0	3	47	14.0	12.0	128.62	**01000**
1.1	3	48	15.4	13.2	128.62	**01100**
1.2	3	50	16.8	14.4	128.62	**01200**
1.3	3	51	18.2	15.6	128.62	**01300**
1.4	3	52	19.6	16.8	128.62	**01400**
1.5	3	53	21.0	18.0	128.62	**01500**
1.6	3	55	22.4	19.2	135.39	**01600**
1.7	3	56	23.8	20.4	135.39	**01700**
1.8	3	57	25.2	21.6	135.39	**01800**
1.9	3	59	26.6	22.8	135.39	**01900**
2.0	3	60	28.0	24.0	135.39	**02000**
2.1	3	61	29.4	25.2	138.43	**02100**
2.2	3	63	30.8	26.4	138.43	**02200**
2.3	3	64	32.2	27.6	138.43	**02300**
2.4	3	65	33.6	28.8	138.43	**02400**
2.5	3	67	35.0	30.0	138.43	**02500**
2.6	3	68	36.4	31.2	141.31	**02600**
2.7	3	69	37.8	32.4	141.31	**02700**
2.8	3	70	39.2	33.6	141.31	**02800**
2.9	3	72	40.6	34.8	141.31	**02900**

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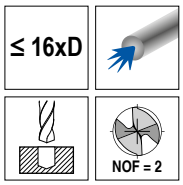
→ v_c Page 27

Minimum coolant pressure: 30 bar

WTX – High performance deep hole drills

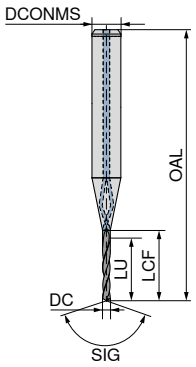
- ▲ Specialised micro deep hole drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Pilot drill: WTX – Micropilot or 5xD WTX – Micro



MICRO

DPX74M

DRAGONSKIN



SIG 128°

Solid carbide

10 696 ...

DC h6 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	48	14.4	12.8	180.92	**00800**
0.9	3	49	16.2	14.4	180.92	**00900**
1.0	3	51	18.0	16.0	167.24	**01000**
1.1	3	53	19.8	17.6	167.24	**01100**
1.2	3	54	21.6	19.2	167.24	**01200**
1.3	3	56	23.4	20.8	167.24	**01300**
1.4	3	58	25.2	22.4	167.24	**01400**
1.5	3	60	27.0	24.0	167.24	**01500**
1.6	3	61	28.8	25.6	176.07	**01600**
1.7	3	63	30.6	27.2	176.07	**01700**
1.8	3	65	32.4	28.8	176.07	**01800**
1.9	3	66	34.2	30.4	176.07	**01900**
2.0	3	68	36.0	32.0	176.07	**02000**
2.1	3	70	37.8	33.6	179.83	**02100**
2.2	3	71	39.6	35.2	179.83	**02200**
2.3	3	73	41.4	36.8	179.83	**02300**
2.4	3	75	43.2	38.4	179.83	**02400**
2.5	3	77	45.0	40.0	179.83	**02500**
2.6	3	78	46.8	41.6	183.71	**02600**
2.7	3	80	48.6	43.2	183.71	**02700**
2.8	3	82	50.4	44.8	183.71	**02800**
2.9	3	83	52.2	46.4	183.71	**02900**

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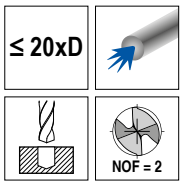
→ v_c Page 28

Minimum coolant pressure: 30 bar

WTX – High performance deep hole drills

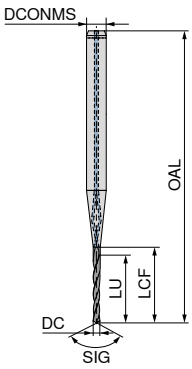
- ▲ Specialised micro deep hole drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Pilot drill: WTX – Micropilot or 5xD WTX – Micro



MICRO

DPX74M

DRAGONSKIN



SIG 128°

Solid carbide

10 697 ...

DC h6 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	51	17.6	16	198.84	**00800**
0.9	3	53	19.8	18	198.84	**00900**
1.0	3	55	22.0	20	185.16	**01000**
1.1	3	57	24.2	22	185.16	**01100**
1.2	3	59	26.4	24	185.16	**01200**
1.3	3	61	28.6	26	185.16	**01300**
1.4	3	63	30.8	28	185.16	**01400**
1.5	3	66	33.0	30	185.16	**01500**
1.6	3	68	35.2	32	194.97	**01600**
1.7	3	70	37.4	34	194.97	**01700**
1.8	3	72	39.6	36	194.97	**01800**
1.9	3	74	41.8	38	194.97	**01900**
2.0	3	76	44.0	40	194.97	**02000**
2.1	3	78	46.2	42	199.08	**02100**
2.2	3	80	48.4	44	199.08	**02200**
2.3	3	82	50.6	46	199.08	**02300**
2.4	3	85	52.8	48	199.08	**02400**
2.5	3	87	55.0	50	199.08	**02500**
2.6	3	89	57.2	52	203.45	**02600**
2.7	3	91	59.4	54	203.45	**02700**
2.8	3	93	61.6	56	203.45	**02800**
2.9	3	95	63.8	58	203.45	**02900**

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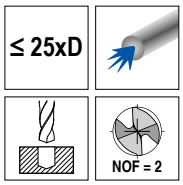
→ v_c Page 28

Minimum coolant pressure: 30 bar

WTX – High performance deep hole drills

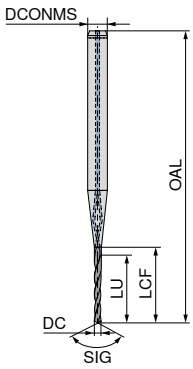
- ▲ Specialised micro deep hole drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Pilot drill: WTX – Micropilot or 5xD WTX – Micro



MICRO

DPX74M

DRAGONSKIN



SIG 128°

Solid carbide

10 698 ...

DC h6 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	54	21.6	16.0	227.85	**00800**
0.9	3	57	24.3	20.5	227.85	**00900**
1.0	3	60	27.0	25.0	204.90	**01000**
1.1	3	63	29.7	27.5	204.90	**01100**
1.2	3	65	32.4	30.0	204.90	**01200**
1.3	3	68	35.1	32.5	204.90	**01300**
1.4	3	71	37.8	35.0	204.90	**01400**
1.5	3	73	40.5	37.5	204.90	**01500**
1.6	3	76	43.2	40.0	215.80	**01600**
1.7	3	78	45.9	42.5	215.80	**01700**
1.8	3	81	48.6	45.0	215.80	**01800**
1.9	3	84	51.3	47.5	215.80	**01900**
2.0	3	86	54.0	50.0	215.80	**02000**
2.1	3	89	56.7	52.5	220.39	**02100**
2.2	3	91	59.4	55.0	220.39	**02200**
2.3	3	94	62.1	57.5	220.39	**02300**
2.4	3	97	64.8	60.0	220.39	**02400**
2.5	3	99	67.5	62.5	220.39	**02500**
2.6	3	102	70.2	65.0	225.12	**02600**
2.7	3	104	72.9	67.5	225.12	**02700**
2.8	3	107	75.6	70.0	225.12	**02800**
2.9	3	110	78.3	72.5	225.12	**02900**

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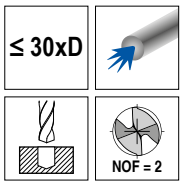
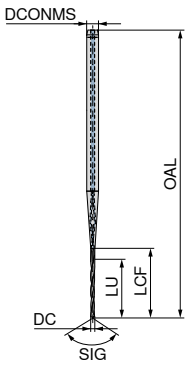
→ v_c Page 28

Minimum coolant pressure: 30 bar

WTX – High performance deep hole drills

- ▲ Specialised micro deep hole drill
- ▲ Universal application
- ▲ Extremely high process security
- ▲ Pilot drill: WTX – Micropilot or 5xD WTX – Micro





SIG 128°

Solid carbide

10 699 ...

DC h6 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	£ T4/9F	
0.8	3	59	25.6	19.2	252.29	**00800**
0.9	3	62	28.8	24.5	252.29	**00900**
1.0	3	65	32.0	30.0	226.81	**01000**
1.1	3	68	35.2	33.0	226.81	**01100**
1.2	3	71	38.4	36.0	226.81	**01200**
1.3	3	74	41.6	39.0	226.81	**01300**
1.4	3	78	44.8	42.0	226.81	**01400**
1.5	3	81	48.0	45.0	226.81	**01500**
1.6	3	84	51.2	48.0	238.93	**01600**
1.7	3	87	54.4	51.0	238.93	**01700**
1.8	3	90	57.6	54.0	238.93	**01800**
1.9	3	93	60.8	57.0	238.93	**01900**
2.0	3	96	64.0	60.0	238.93	**02000**
2.1	3	99	67.2	63.0	244.02	**02100**
2.2	3	102	70.4	66.0	244.02	**02200**
2.3	3	106	73.6	69.0	244.02	**02300**
2.4	3	109	76.8	72.0	244.02	**02400**
2.5	3	112	80.0	75.0	244.02	**02500**
2.6	3	115	83.2	78.0	249.21	**02600**
2.7	3	118	86.4	81.0	249.21	**02700**
2.8	3	121	89.6	84.0	249.21	**02800**
2.9	3	124	92.8	87.0	249.21	**02900**

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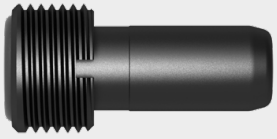
→ v_c Page 28

Minimum coolant pressure: 30 bar

Coolant transfer pipe with strainer
HSK-A 63 / HSK-A 100



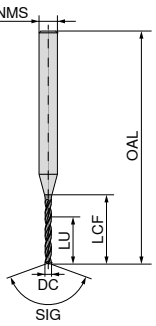
With the help of the new coolant transfer pipe, it is possible to filter very small chips and impurities out of the coolant.
More information on this can be found in the →
Catalogue Clamping Technology, chapter 16, page 156.

WTX – High Performance Drills

▲ standard shank Ø 3 mm h6 for use in heat shrink adapters

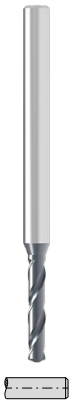
≤ 5xD

NOF = 2



MINI

TiAlN



SIG 140°

Solid carbide

DC +0,004 mm	DCONMS h6 mm	OAL mm	LCF mm	LU mm	11 770 ... £ T7/9G	
0.10	3	38	1.2	1.0	50.56	00100
0.15	3	38	2.0	1.7	44.66	00150
0.20	3	38	3.5	3.0	39.04	00200
0.25	3	38	3.5	3.0	33.26	00250
0.30	3	38	5.5	5.0	27.36	00300
0.35	3	38	5.5	5.0	27.36	00350
0.40	3	38	7.0	6.0	27.36	00400
0.45	3	38	7.0	6.0	27.36	00450
0.50	3	38	7.0	6.0	27.36	00500
0.55	3	38	7.0	6.0	27.36	00550
0.60	3	38	7.0	6.0	27.36	00600
0.65	3	38	7.0	6.0	27.36	00650
0.70	3	38	10.5	8.0	27.36	00700
0.75	3	38	10.5	8.0	27.36	00750
0.80	3	38	10.5	8.0	27.36	00800
0.85	3	38	10.5	8.0	27.36	00850
0.90	3	38	10.5	8.0	27.36	00900
0.95	3	38	10.5	8.0	27.36	00950
0.97	3	38	10.5	8.0	27.36	00970
0.98	3	38	10.5	8.0	27.36	00980
0.99	3	38	10.5	8.0	27.36	00990
1.00	3	38	10.5	8.0	27.36	01000
1.01	3	38	10.5	8.0	27.36	01010
1.02	3	38	10.5	8.0	27.36	01020
1.03	3	38	10.5	8.0	27.36	01030
1.05	3	38	10.5	8.0	27.36	01050
1.10	3	38	10.5	8.0	27.36	01100
1.15	3	38	10.5	8.0	27.36	01150
1.20	3	38	10.5	8.0	27.36	01200
1.25	3	38	10.5	8.0	27.36	01250
1.30	3	38	10.5	8.0	27.36	01300
1.35	3	38	10.5	8.0	27.36	01350
1.40	3	38	10.5	8.0	27.36	01400
1.45	3	38	10.5	8.0	27.36	01450
1.47	3	38	10.5	8.0	27.36	01470
1.48	3	38	10.5	8.0	27.36	01480
1.49	3	38	10.5	8.0	27.36	01490
1.50	3	38	10.5	8.0	27.36	01500
1.51	3	38	10.5	8.0	27.36	01510
1.52	3	38	10.5	8.0	27.36	01520
1.53	3	38	10.5	8.0	27.36	01530
1.55	3	38	10.5	8.0	27.36	01550
1.60	3	38	10.5	8.0	27.36	01600
1.65	3	38	10.5	8.0	27.36	01650
1.70	3	38	10.5	8.0	27.36	01700
1.75	3	38	10.5	8.0	27.36	01750
1.80	3	38	10.5	8.0	27.36	01800
1.85	3	38	12.0	8.0	27.36	01850
1.90	3	38	12.0	8.0	27.36	01900
1.95	3	38	12.0	8.0	27.36	01950
1.97	3	38	12.0	8.0	27.36	01970
1.98	3	38	12.0	8.0	27.36	01980
1.99	3	38	12.0	8.0	27.36	01990
2.00	3	42	13.0	9.0	39.22	02000
2.01	3	42	13.0	9.0	39.22	02010
2.02	3	42	13.0	9.0	39.22	02020
2.03	3	42	13.0	9.0	39.22	02030
2.05	3	42	13.0	9.0	39.22	02050
2.10	3	42	13.0	9.0	39.22	02100
2.15	3	42	13.0	9.0	39.22	02150
2.20	3	46	15.0	10.0	44.16	02200
2.25	3	46	15.0	10.0	44.16	02250
2.30	3	46	15.0	10.0	44.16	02300
2.35	3	46	15.0	10.0	44.16	02350
2.40	3	46	15.0	10.0	44.16	02400
2.45	3	46	15.0	10.0	44.16	02450
2.47	3	46	15.0	10.0	44.16	02470
2.48	3	46	15.0	10.0	44.16	02480
2.49	3	46	15.0	10.0	44.16	02490
2.50	3	46	15.0	10.0	44.16	02500
2.51	3	46	15.0	10.0	44.16	02510
2.52	3	46	15.0	10.0	44.16	02520
2.53	3	46	15.0	10.0	44.16	02530
2.60	3	46	15.0	10.0	44.16	02600
2.70	3	46	15.0	10.0	44.16	02700
2.80	3	46	15.0	10.0	44.16	02800
2.90	3	46	15.0	10.0	44.16	02900

P	○
M	
K	●
N	●
S	○
H	
O	

→ v_c Page 29

Material examples for cutting data tables

	Material sub-group	Index	Composition / Structure / Heat treatment		Tensile strength N/mm²* / HB / HRC	Material number	Material designation	Material number	Material designation
P	Unalloyed steel	P.1.1	< 0,15 % C	Annealed	420 N/mm² / 125 HB	1.0401	C15	1.1141	Ck15
		P.1.2	< 0,45 % C	Annealed	640 N/mm² / 190 HB	1.1191	C45E	1.0718	9SMnPb28
		P.1.3		Tempered	840 N/mm² / 250 HB	1.1191	C45E	1.0535	C55
		P.1.4	< 0,75 % C	Annealed	910 N/mm² / 270 HB	1.1223	C60R	1.0535	C55
		P.1.5		Tempered	1010 N/mm² / 300 HB	1.1223	C60R	1.0727	45S20
	Low-alloy steel	P.2.1		Annealed	610 N/mm² / 180 HB	1.7131	16MnCr5	1.6587	17CrNiMo6
		P.2.2		Tempered	930 N/mm² / 275 HB	1.7131	16MnCr5	1.6587	17CrNiMo6
		P.2.3		Tempered	1010 N/mm² / 300 HB	1.7225	42CrMo4	1.3505	100Cr6
		P.2.4		Tempered	1200 N/mm² / 375 HB	1.7225	42CrMo4	1.3505	100Cr6
	High-alloy steel and high-alloy tool steel	P.3.1		Annealed	680 N/mm² / 200 HB	1.4021	X20Cr13	1.4034	X46Cr13
		P.3.2		Hardened and tempered	1100 N/mm² / 300 HB	1.2343	X38CrMoV5-1	1.4034	X46Cr13
		P.3.3		Hardened and tempered	1300 N/mm² / 400 HB	1.2343	X38CrMoV5-1	1.4034	X46Cr13
	Stainless steel	P.4.1	Ferritic / martensitic	Annealed	680 N/mm² / 200 HB	1.4016	X6Cr17	1.2316	X36CrMo16
		P.4.2	Martensitic	Tempered	1010 N/mm² / 300 HB	1.4112	X90CrMoV18	1.2316	X36CrMo16
M	Stainless steel	M.1.1	Austenitic / austenitic-ferritic	Quenched	610 N/mm² / 180 HB	1.4301	X5CrNi18-10	1.4571	X6CrNiMoTi17-12-2
		M.2.1	Austenitic	Tempered	300 HB	1.4841	X15CrNiSi25-21	1.4539	X1NiCrMoCu25-20-5
		M.3.1	Austenitic / ferritic (Duplex)		780 N/mm² / 230 HB	1.4462	X2CrNiMoN22-5-3	1.4501	X2CrNiMoCuWN25-7-4
K	Grey cast iron	K.1.1	Pearlitic / ferritic		350 N/mm² / 180 HB	0.6010	GG-10	0.6025	GG-25
		K.1.2	Pearlitic (martensitic)		500 N/mm² / 260 HB	0.6030	GG-30	0.6045	GG-45
	Spherulitic graphite cast iron	K.2.1	Ferritic		540 N/mm² / 160 HB	0.7040	GGG-40	0.7060	GGG-60
		K.2.2	Pearlitic		845 N/mm² / 250 HB	0.7070	GGG-70	0.7080	GGG-80
	Malleable iron	K.3.1	Ferritic		440 N/mm² / 130 HB	0.8035	GTW-35-04	0.8045	GTW-45
		K.3.2	Pearlitic		780 N/mm² / 230 HB	0.8165	GTS-65-02	0.8170	GTS-70-02
N	Aluminium wrought alloy	N.1.1	Non-hardenable		60 HB	3.0255	Al99,5	3.3315	AlMg1
		N.1.2	Hardenable	Age-hardened	340 N/mm² / 100 HB	3.1355	AlCuMg2	3.2315	AlMgSi1
	Cast aluminium alloy	N.2.1	≤ 12 % Si, non-hardenable		250 N/mm² / 75 HB	3.2581	G-AlSi12	3.2163	G-AlSi9Cu3
		N.2.2	≤ 12 % Si, hardenable	Age-hardened	300 N/mm² / 90 HB	3.2134	G-AlSi5Cu1Mg	3.2373	G-AlSi9Mg
		N.2.3	> 12 % Si, non-hardenable		440 N/mm² / 130 HB		G-AlSi17Cu4Mg		G-AlSi18CuNiMg
	Copper and copper alloys (bronze/brass)	N.3.1	Free-machining alloys, PB > 1 %		375 N/mm² / 110 HB	2.0380	CuZn39Pb2 (Ms58)	2.0410	CuZn44Pb2
		N.3.2	CuZn, CuSnZn		300 N/mm² / 90 HB	2.0331	CuZn15	2.4070	CuZn28Sn1As
		N.3.3	CuSn, lead-free copper and electrolytic copper		340 N/mm² / 100 HB	2.0060	E-Cu57	2.0590	CuZn40Fe
	Magnesium alloys	N.4.1	Magnesium and magnesium alloys		70 HB	3.5612	MgAl6Zn	3.5312	MgAl3Zn
S	Heat-resistant alloys	S.1.1	Fe - basis	Annealed	680 N/mm² / 200 HB	1.4864	X12NiCrSi 36-16	1.4865	G-X40NiCrSi38-18
		S.1.2		Age-hardened	950 N/mm² / 280 HB	1.4980	X6NiCrTiMoVB25-15-2	1.4876	X10NiCrAlTi32-20
		S.2.1	Ni or Co basis	Annealed	840 N/mm² / 250 HB	2.4631	NiCr20TiAl (Nimonic80A)	3.4856	NiCr22Mo9Nb
		S.2.2		Age-hardened	1180 N/mm² / 350 HB	2.4668	NiCr19Nb5Mo3 (Inconel 718)	2.4955	NiFe25Cr20NbTi
		S.2.3		Cast	1080 N/mm² / 320 HB	2.4765	CoCr20W15Ni	1.3401	G-X120Mn12
	Titanium alloys	S.3.1	Pure titanium		400 N/mm²	3.7025	Ti99,8	3.7034	Ti99,7
		S.3.2	Alpha + beta alloys	Age-hardened	1050 N/mm² / 320 HB	3.7165	TiAl6V4	Ti-6246	Ti-6Al-2Sn-4Zr-6Mo
		S.3.3	Beta alloys		1400 N/mm² / 410 HB	Ti555.3	Ti-5Al-5V-5Mo-3Cr	R56410	Ti-10V-2Fe-3Al
H	Hardened steel	H.1.1		Hardened and tempered	46–55 HRC				
		H.1.2		Hardened and tempered	56–60 HRC				
		H.1.3		Hardened and tempered	61–65 HRC				
		H.1.4		Hardened and tempered	66–70 HRC				
	Chilled iron	H.2.1		Cast	400 HB				
	Hardened cast iron	H.3.1		Hardened and tempered	55 HRC				
O	Non-metal materials	O.1.1	Plastics, duroplastic		≤ 150 N/mm²				
		O.1.2	Plastics, thermoplastic		≤ 100 N/mm²				
		O.2.1	Aramid fibre-reinforced		≤ 1000 N/mm²				
		O.2.2	Glass/carbon-fibre reinforced		≤ 1000 N/mm²				
		O.3.1	Graphite						

*** Tensile strength**

Cutting data standard values – WTX – Micropilot

Index	10 692 ...						
	2,5xD						
	without through coolant	≤ Ø 1	> Ø 1–1,25	> Ø 1,25–1,5	> Ø 1,5–2	> Ø 2–2,5	> Ø 2,5–3
		f (mm/rev)					
P.1.1	**70**	0,010	0,013	0,015	0,019	0,022	0,025
P.1.2	**60**	0,010	0,013	0,015	0,019	0,022	0,025
P.1.3	**60**	0,010	0,013	0,015	0,019	0,022	0,025
P.1.4	**60**	0,010	0,013	0,015	0,019	0,022	0,025
P.1.5	60	0,010	0,013	0,015	0,019	0,022	0,025
P.2.1	**70**	0,010	0,013	0,015	0,019	0,022	0,025
P.2.2	**60**	0,010	0,013	0,015	0,019	0,022	0,025
P.2.3	60	0,010	0,013	0,015	0,019	0,022	0,025
P.2.4							
P.3.1	**60**	0,010	0,013	0,015	0,019	0,022	0,025
P.3.2	50	0,010	0,013	0,015	0,019	0,022	0,025
P.3.3							
P.4.1	**50**	0,005	0,006	0,007	0,010	0,013	0,015
P.4.2	**35**	0,005	0,006	0,007	0,010	0,013	0,015
M.1.1	40	0,005	0,006	0,007	0,010	0,013	0,015
M.2.1	40	0,005	0,006	0,007	0,010	0,013	0,015
M.3.1	40	0,005	0,006	0,007	0,010	0,013	0,015
K.1.1	**70**	0,010	0,013	0,015	0,019	0,022	0,025
K.1.2	**70**	0,010	0,013	0,015	0,019	0,022	0,025
K.2.1	**70**	0,010	0,013	0,015	0,019	0,022	0,025
K.2.2	**70**	0,010	0,013	0,015	0,019	0,022	0,025
K.3.1	**70**	0,010	0,013	0,015	0,019	0,022	0,025
K.3.2	**70**	0,010	0,013	0,015	0,019	0,022	0,025
N.1.1							
N.1.2							
N.2.1							
N.2.2							
N.2.3							
N.3.1							
N.3.2							
N.3.3							
N.4.1							
S.1.1	**15**	0,005	0,006	0,007	0,010	0,013	0,015
S.1.2	**15**	0,005	0,006	0,007	0,010	0,013	0,015
S.2.1	10	0,005	0,006	0,007	0,010	0,013	0,015
S.2.2	10	0,005	0,006	0,007	0,010	0,013	0,015
S.2.3	10	0,005	0,006	0,007	0,010	0,013	0,015
S.3.1	**30**	0,005	0,006	0,007	0,010	0,013	0,015
S.3.2	**20**	0,005	0,006	0,007	0,010	0,013	0,015
S.3.3							
H.1.1							
H.1.2							
H.1.3							
H.1.4							
H.2.1							
H.3.1							
O.1.1							
O.1.2							
O.2.1							
O.2.2							
O.3.1							

The cutting data depends extremely on the external conditions, the material and machine type. The indicated values are possible values which have to be increased or reduced according to the application conditions.

Cutting data standard values – WTX – Micro

Index	10 693 ...							
	5xD							
	with through coolant	MQL	≤ Ø 1,0	> Ø 1,0–1,25	> Ø 1,25–1,5	> Ø 1,5–2,0	> Ø 2,0–2,5	> Ø 2,5–3,0
	v_c (m/min)		f (mm/rev)					
P.1.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
P.1.2	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.3	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.4	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.5	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
P.2.2	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.3	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.4								
P.3.1	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.3.2	50	34	0,028	0,034	0,045	0,070	0,095	0,115
P.3.3								
P.4.1	50		0,015	0,018	0,024	0,040	0,060	0,080
P.4.2	35		0,015	0,018	0,024	0,040	0,060	0,080
M.1.1	40		0,015	0,018	0,024	0,040	0,060	0,080
M.2.1	40		0,015	0,018	0,024	0,040	0,060	0,080
M.3.1	40		0,015	0,018	0,024	0,040	0,060	0,080
K.1.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.1.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.2.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.2.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.3.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.3.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
N.1.1								
N.1.2								
N.2.1								
N.2.2								
N.2.3								
N.3.1								
N.3.2								
N.3.3								
N.4.1								
S.1.1	15		0,015	0,018	0,024	0,040	0,060	0,080
S.1.2	15		0,015	0,018	0,024	0,040	0,060	0,080
S.2.1	10		0,015	0,018	0,024	0,040	0,060	0,080
S.2.2	10		0,015	0,018	0,024	0,040	0,060	0,080
S.2.3								
S.3.1	30		0,015	0,018	0,024	0,040	0,060	0,080
S.3.2	20		0,015	0,018	0,024	0,040	0,060	0,080
S.3.3								
H.1.1								
H.1.2								
H.1.3								
H.1.4								
H.2.1								
H.3.1								
O.1.1								
O.1.2								
O.2.1								
O.2.2								
O.3.1								

The cutting data depends extremely on the external conditions, the material and machine type. The indicated values are possible values which have to be increased or reduced according to the application conditions.

Cutting data standard values – WTX – Micro

Index	10 694 ..., 10 695 ...							
	8xD / 12xD							
	with through coolant	MQL	≤ Ø 1,0	> Ø 1,0–1,25	> Ø 1,25–1,5	> Ø 1,5–2,0	> Ø 2,0–2,5	> Ø 2,5–3,0
	v_c (m/min)		f (mm/rev)					
P.1.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
P.1.2	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.3	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.4	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.1.5	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
P.2.2	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.3	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.2.4								
P.3.1	60	43	0,028	0,034	0,045	0,070	0,095	0,115
P.3.2	50	34	0,028	0,034	0,045	0,070	0,095	0,115
P.3.3								
P.4.1	50		0,015	0,018	0,024	0,040	0,060	0,080
P.4.2	35		0,015	0,018	0,024	0,040	0,060	0,080
M.1.1	40		0,015	0,018	0,024	0,040	0,060	0,080
M.2.1	40		0,015	0,018	0,024	0,040	0,060	0,080
M.3.1	40		0,015	0,018	0,024	0,040	0,060	0,080
K.1.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.1.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.2.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.2.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.3.1	70	51	0,028	0,034	0,045	0,070	0,095	0,115
K.3.2	70	51	0,028	0,034	0,045	0,070	0,095	0,115
N.1.1								
N.1.2								
N.2.1								
N.2.2								
N.2.3								
N.3.1								
N.3.2								
N.3.3								
N.4.1								
S.1.1	15		0,015	0,018	0,024	0,040	0,060	0,080
S.1.2	15		0,015	0,018	0,024	0,040	0,060	0,080
S.2.1	10		0,015	0,018	0,024	0,040	0,060	0,080
S.2.2	10		0,015	0,018	0,024	0,040	0,060	0,080
S.2.3								
S.3.1	30		0,015	0,018	0,024	0,040	0,060	0,080
S.3.2	20		0,015	0,018	0,024	0,040	0,060	0,080
S.3.3								
H.1.1								
H.1.2								
H.1.3								
H.1.4								
H.2.1								
H.3.1								
O.1.1								
O.1.2								
O.2.1								
O.2.2								
O.3.1								

The cutting data depends extremely on the external conditions, the material and machine type. The indicated values are possible values which have to be increased or reduced according to the application conditions.

Cutting data standard values – WTX – Micro

Index	10 696 ..., 10 697 ..., 10 698 ..., 10 699 ...						
	16xD / 20xD / 25xD / 30xD						
	with through coolant	≤ Ø 1,0	> Ø 1,0–1,25	> Ø 1,25–1,5	> Ø 1,5–2,0	> Ø 2,0–2,5	> Ø 2,5–3,0
	v_c (m/min)	f (mm/rev)					
P.1.1	58	0,028	0,034	0,045	0,070	0,095	0,115
P.1.2	50	0,028	0,034	0,045	0,070	0,095	0,115
P.1.3	50	0,028	0,034	0,045	0,070	0,095	0,115
P.1.4	50	0,028	0,034	0,045	0,070	0,095	0,115
P.1.5	50	0,028	0,034	0,045	0,070	0,095	0,115
P.2.1	58	0,028	0,034	0,045	0,070	0,095	0,115
P.2.2	50	0,028	0,034	0,045	0,070	0,095	0,115
P.2.3	50	0,028	0,034	0,045	0,070	0,095	0,115
P.2.4							
P.3.1	50	0,028	0,034	0,045	0,070	0,095	0,115
P.3.2	42	0,028	0,034	0,045	0,070	0,095	0,115
P.3.3							
P.4.1	42	0,015	0,018	0,024	0,040	0,060	0,080
P.4.2	30	0,015	0,018	0,024	0,040	0,060	0,080
M.1.1	34	0,015	0,018	0,024	0,040	0,060	0,080
M.2.1	34	0,015	0,018	0,024	0,040	0,060	0,080
M.3.1	34	0,015	0,018	0,024	0,040	0,060	0,080
K.1.1	58	0,028	0,034	0,045	0,070	0,095	0,115
K.1.2	58	0,028	0,034	0,045	0,070	0,095	0,115
K.2.1	58	0,028	0,034	0,045	0,070	0,095	0,115
K.2.2	58	0,028	0,034	0,045	0,070	0,095	0,115
K.3.1	58	0,028	0,034	0,045	0,070	0,095	0,115
K.3.2	58	0,028	0,034	0,045	0,070	0,095	0,115
N.1.1							
N.1.2							
N.2.1							
N.2.2							
N.2.3							
N.3.1							
N.3.2							
N.3.3							
N.4.1							
S.1.1							
S.1.2							
S.2.1							
S.2.2							
S.2.3							
S.3.1							
S.3.2							
S.3.3							
H.1.1							
H.1.2							
H.1.3							
H.1.4							
H.2.1							
H.3.1							
O.1.1							
O.1.2							
O.2.1							
O.2.2							
O.3.1							

The cutting data depends extremely on the external conditions, the material and machine type. The indicated values are possible values which have to be increased or reduced according to the application conditions.

Cutting data standard values – WTX – Mini

Index	11 770 ...				
	5xD				
	without through coolant	≤ Ø 1,0	> Ø 1,0–1,5	> Ø 1,5–2,0	> Ø 2,0–2,9
	v_c (m/min)	f (mm/rev)			
P.1.1	75	0,01	0,01	0,013	0,015
P.1.2	65	0,02	0,02	0,025	0,03
P.1.3	65	0,01	0,01	0,013	0,015
P.1.4	65	0,01	0,01	0,013	0,015
P.1.5	70	0,01	0,01	0,013	0,015
P.2.1	70	0,01	0,01	0,013	0,015
P.2.2	65	0,01	0,01	0,013	0,015
P.2.3	65	0,02	0,02	0,025	0,03
P.2.4	65	0,01	0,01	0,013	0,015
P.3.1					
P.3.2					
P.3.3					
P.4.1					
P.4.2					
M.1.1					
M.2.1					
M.3.1					
K.1.1	**70**	0,01	0,01	0,013	0,015
K.1.2	**70**	0,01	0,01	0,013	0,015
K.2.1	**70**	0,01	0,01	0,013	0,015
K.2.2	**70**	0,01	0,01	0,013	0,015
K.3.1	**70**	0,01	0,01	0,013	0,015
K.3.2	**70**	0,01	0,01	0,013	0,015
N.1.1	**200**	0,01	0,01	0,013	0,015
N.1.2	**200**	0,01	0,01	0,013	0,015
N.2.1	**160**	0,01	0,01	0,013	0,015
N.2.2	**180**	0,01	0,01	0,013	0,015
N.2.3	**130**	0,01	0,01	0,013	0,015
N.3.1	**160**	0,01	0,01	0,013	0,015
N.3.2	**160**	0,01	0,01	0,013	0,015
N.3.3	**100**	0,01	0,01	0,013	0,015
N.4.1	**200**	0,01	0,01	0,013	0,015
S.1.1					
S.1.2					
S.2.1					
S.2.2					
S.2.3					
S.3.1	30	0,01	0,01	0,013	0,015
S.3.2	20	0,01	0,01	0,013	0,015
S.3.3					
H.1.1					
H.1.2					
H.1.3					
H.1.4					
H.2.1					
H.3.1					
O.1.1					
O.1.2					
O.2.1					
O.2.2					
O.3.1					

The cutting data depends extremely on the external conditions, the material and machine type. The indicated values are possible values which have to be increased or reduced according to the application conditions.

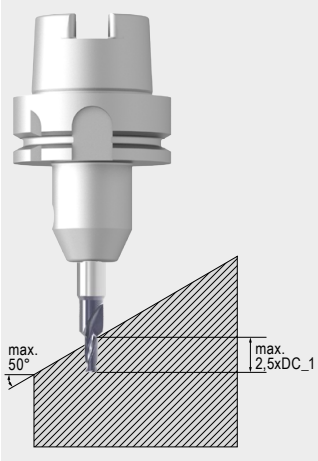
WTX – Micropilot application recommendation

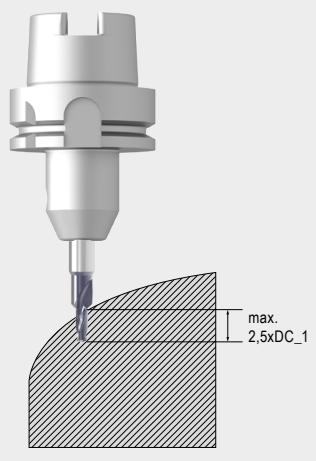
General references

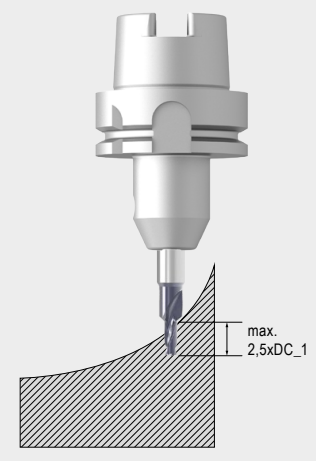
It is advisable to use the tool with external cooling. Be careful to ensure that the coolant is aimed directly at the tool tip. This will ensure that there is adequate cooling and effective chip evacuation. Apply our cutting data recommendations when using the tool.

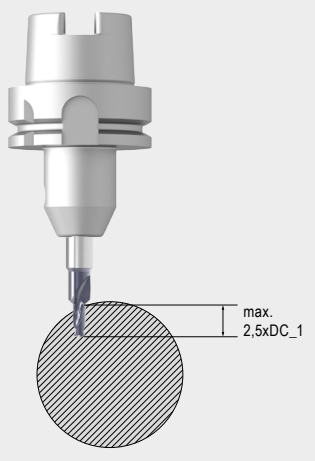
1. Pilot hole in angled or curved surfaces

Produce pilot hole in one go up to a maximum hole depth of 2.5xD. Angled or curved surfaces can be machined up to a max. inclination of 50° without prior spot-facing. Applying a countersink at the hole entrance is not possible on angled or curved surfaces.



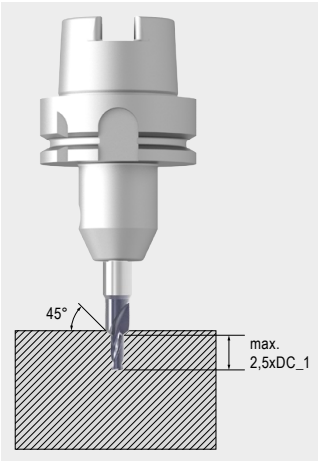






2. Hole with chamfer

Produce pilot hole in a single sweep. If required, a 90° chamfer can additionally be produced at the hole entrance (with flat drilling application) after the 2.5xD hole depth is reached.

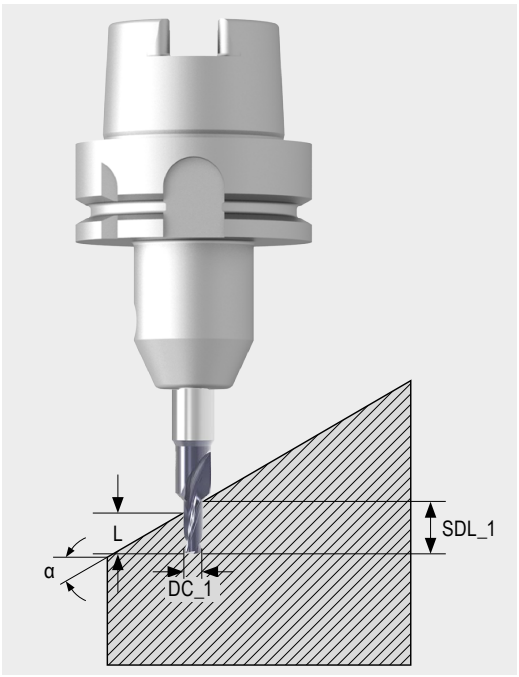


Calculating pilot hole depth with angled drilling application

With an angled drilling application, the remaining depth of the pilot hole will change depending on the angle of inclination. This can be determined using the formula below:

$$L = SDL\_1 - (DC\_1 \times \tan(\alpha))$$

DC_1 = Cutting diameter
SDL_1 = Step length (max. 2.5xDC_1)
α = Component surface angle of inclination (max. 50°)
L = Remaining pilot hole depth

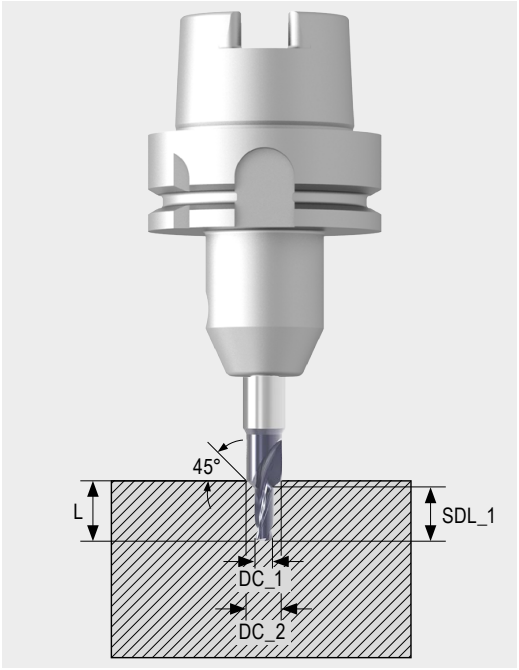


Calculating maximum hole depth with 90° countersink

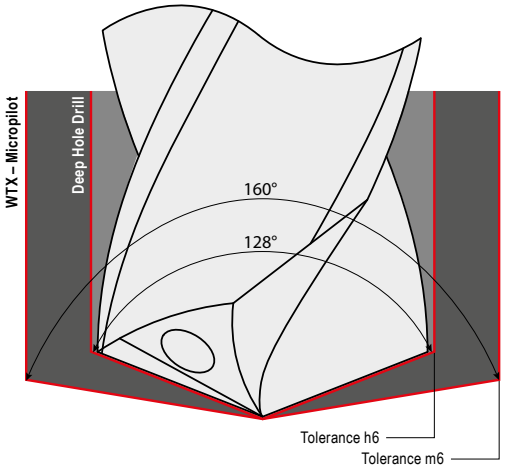
The maximum hole depth incl. 90° countersink can be found using the formula below.

$$L = \left(\frac{DC\_2 - DC\_1}{2}\right) + SDL\_1$$

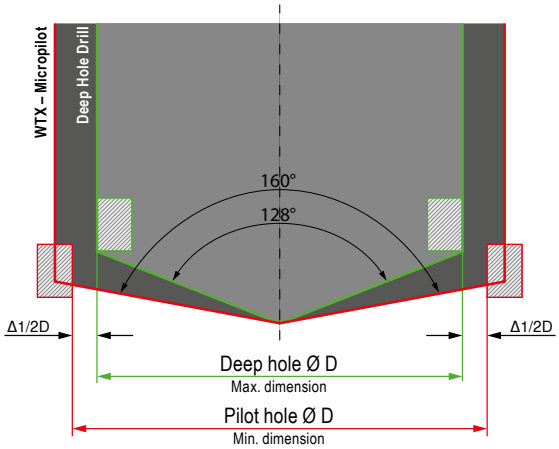
DC_1 = Cutting diameter
DC_2 = Max. countersink diameter
SDL_1 = Step length (max. 2.5xDC_1)
L = Max. hole depth incl. countersink



Tolerances and angles



The following must apply to use the pilot and deep hole twist drill consecutively and without collisions:
ΔD = ØD (pilot hole) – ØD (deep hole) > 0

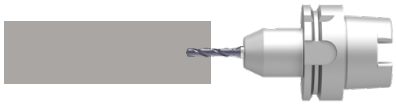


WTX – Micro – recommended application

General references

- During vertical machining, a pilot hole is not required for regular and straight surfaces from Ø 1.0 mm up to a length of 12xD due to the excellent self-centring. During horizontal drilling, a pilot drill must be used for irregular and angled surfaces.
  The WTX – Micropilot (10 692 ...) and the WTX – Micro 5xD (10 693 ...) are ideal pilot drills.
- To guarantee problem-free insertion of the deep hole drill in the pilot hole, during horizontal machining a 90° countersink is recommended. This can be produced with the WTX – Micropilot or alternatively with a suitable NC countersink.
- During vertical machining, drills from Ø 1.0 mm up to a length of 12xD can also be operated outside the pilot hole without a reduction in speed.
- For through holes, the feed per revolution must be reduced by 50% before exiting the hole.
- For long-chipping materials, chip clearing may be required every 3xD from a hole depth of 10xD. Peck drilling (retraction) should occur at the pilot hole depth.
- Due to the small thro' coolant Ø of micro drills, effective filtration of the coolant is of the utmost importance.
  Drill < Ø 2.0 mm, filter ≤ 0.010 mm
  Drill < Ø 3.0 mm, filter ≤ 0.020 mm
- The longer the coolant is in the machine, suspended particles and particulate matter in the cooling medium prevent effective coolant flow. Regular replacement of the coolant is therefore recommended.
- A suitable clamping device with maximum radial run-out accuracy and balance quality is required for process-secure production.
  Radial run-out accuracy ≤ 0.003 mm
  Suitable for high speed ranges
- To guarantee a process-secure drilling process, the coolant pressure must be a minimum of 30 bar.

1 Producing the pilot hole



- Pilot hole depth: min. 2xD
- It must be ensured that the prepared pilot hole is free from chips to avoid blocking of the micro deep hole twist drill cutting edges

2 Entering the pilot hole with a deep hole twist drill

- Speed 300 1/min (reverse rotation sometimes possible)
- Entry speed approx. 1.000 mm/min
- Switch on cooling
- Increase parameters 0.5–1.0 mm before reaching the bottom of the pilot hole

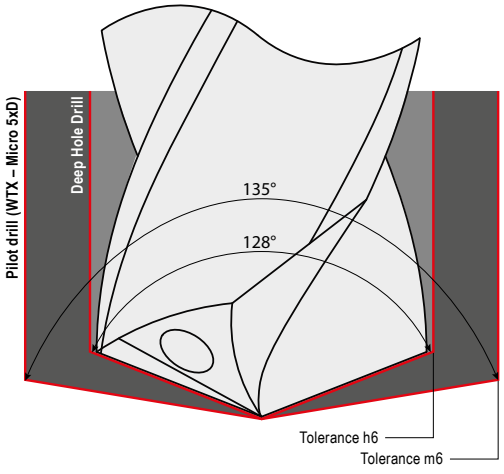
3 Deep hole drilling

- At hole depth without pecking

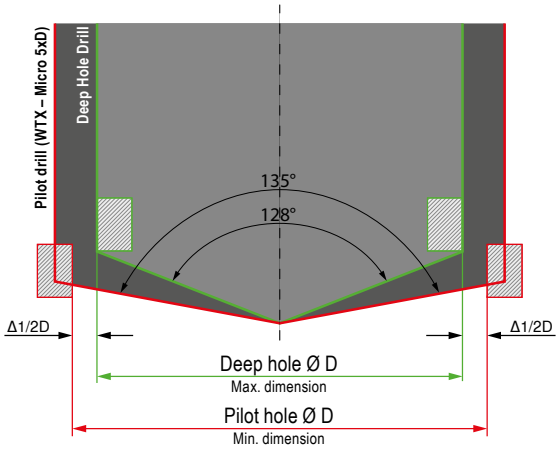
4 Retracting the drill

- Retract drill approx. 1xD
- Reduce speed to 300 1/min
- Exit speed approx. 1.000 mm/min
- Switch off emulsion before exiting the hole

Tolerances and angles



The following must apply to use the pilot and deep hole twist drill consecutively and without collisions:
ΔD = ØD (pilot hole) – ØD (deep hole) > 0



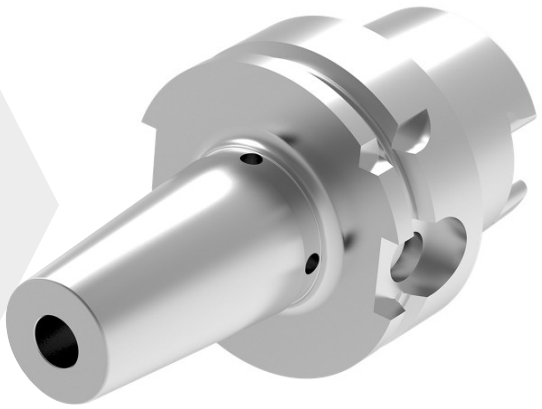
Suitable clamping devices:

It is essential to use a suitable clamping device to achieve satisfactory results. Radial run-out accuracies and balance quality must be taken into account. They are a key criterion, particularly at the high speeds required for machining with micro tools, and allow vibrations at the tool to be reduced, which has a positive effect on the service life of the tool and the surface quality that can be achieved. Recommended adapters include shrink-fit chucks, hydraulic chucks and ER precision collet chucks.

Shrink-fit chucks:

Characteristics:

- ▲ Maximum radial run-out accuracy of ≤ 0.003 mm
- ▲ Non-positive clamping of the tool
- ▲ Very high transmittable torque
- ▲ High clamping accuracy
- ▲ Comparatively small adapter dimensions
- ▲ Disadvantage: a shrink fit unit is required for tool changes



Hydraulic chucks:

Characteristics:

- ▲ Very high radial run-out accuracy of 0.003 mm
- ▲ High torque transmission possible
- ▲ High clamping accuracy
- ▲ Adapter has vibration-damping properties
- ▲ Short tool change times compared to shrink-fit chucks

ER precision collet chucks:

Characteristics:

- ▲ High radial run-out accuracy of up to 0.003 mm possible
- ▲ High clamping accuracy
- ▲ Short tool change times, although a special tool is required for tool changes (roll key)

More adapters can be found in the main catalogue, Chapter 16

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