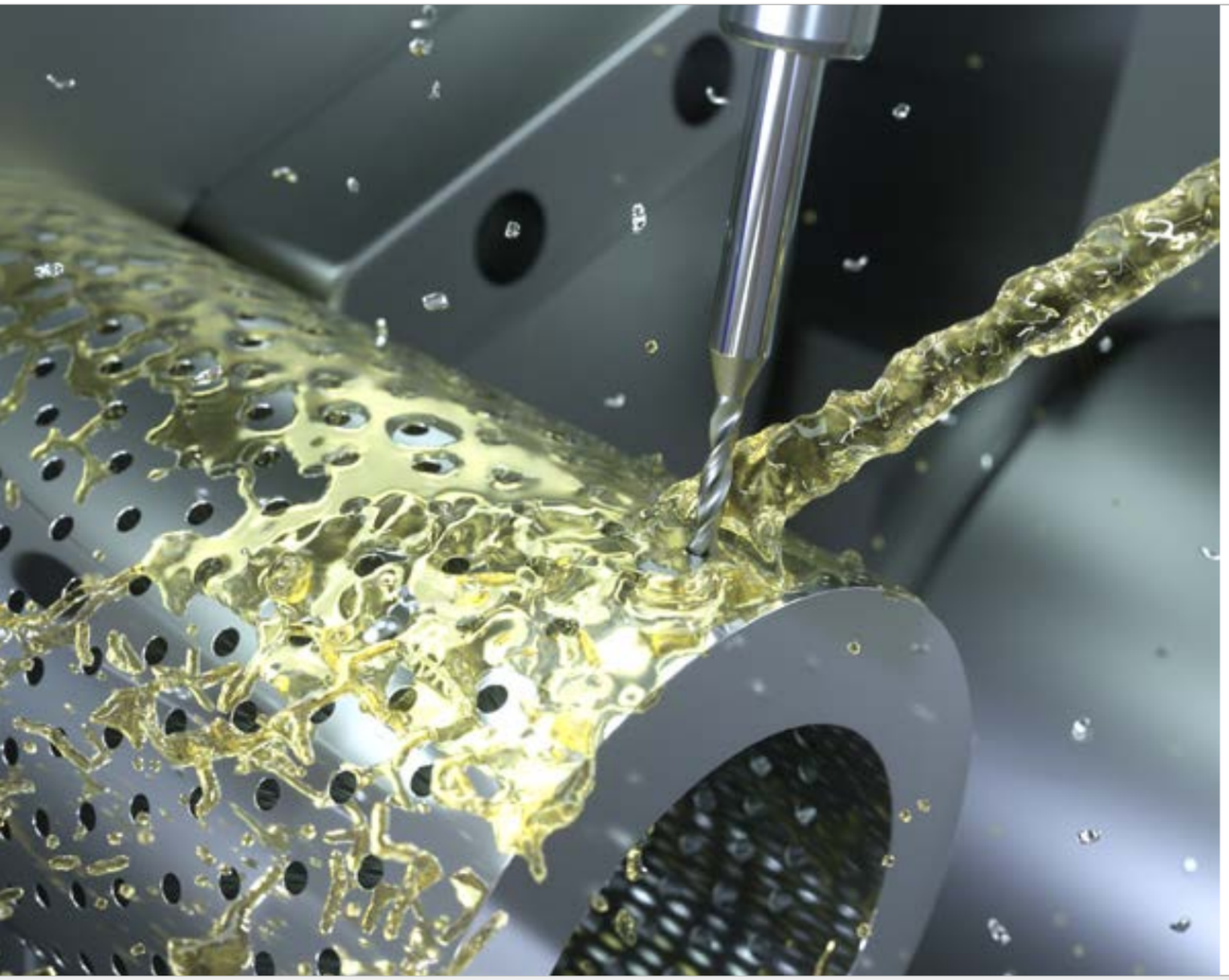
DRILLING TOOLS
CRAZYDRILL STEEL

CrazyDrill Steel



CRAZYDRILL Steel

FAST AND PRECISE DRILLING UP TO 7 X D

Mikron Tool offers with CrazyDrill Steel a small drill for drilling in steel for max. drilling depths up to 7 x d and in a diameter range from 0.4 up to 6.35 mm.

Quicker and deeper – these are the typical attributes of this solid carbide drill. CrazyDrill Steel creates small holes with the performance and accuracy that amaze every user. Due to the combination of its chisel "s"-form and tip angle of 140° the drill is self-centering and reaches the highest drilling speeds. Its excellent tool life, the high hole and surface quality and the hole roundness make this cutting tool to a reliable partner.

No wonder the term "hole punching" was invented for this drill. It drills through the material at the highest feed rates, chip removal is unnecessary in most cases.

CRAZYDRILL™ by Mikron Tool Steel

CRAZYDRILL™ by Mikron Tool Steel

DRILLING TOOLS
CRAZYDRILL STEEL

Quick and accurate

A SMALL DRILL FOR HIGHEST REQUIREMENTS IN STEEL

Mikron Tool offers with CrazyDrill Steel a small drill for drilling in steel for max. drilling depths up to 7 x d and in a diameter range from 0.4 to 6.35 mm.

- CrazyDrill Steel, drilling depths 4 x d / 6 - 7 x d

4 x d	6 - 7 x d
■ External cooling ■ Coated	■ External cooling ■ Coated

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Page 245

1 | SHAFT
The robust carbide shaft guarantees a high degree of concentricity accuracy and therefore highest drilling reliability.

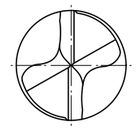
2 | SOLID CARBIDE
The use of a newest generation's solid carbide allows high machining feeds.

3 | COATING
The high-performance coating eXedur RI / RIP guarantees a long tool life and excellent surface quality.

4 | HELICAL FLUTE
The geometry of the helical flute provides optimal chip flow, only minimal chip removal (pecking) is requested.

5 | CUTTING GEOMETRY
- Optimized cutting geometry with cutting edge preparation prevent from premature wear.
- Highest drilling speeds are possible with high process reliability.
- The solid carbide drill is self-centering due to its chisel "s"-form and guarantees a high position accuracy.

Tip drill



CRAZYDRILL™ by Mikron Tool Steel

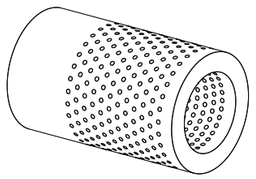
CRAZYDRILL™ by Mikron Tool Steel

DRILLING TOOLS
CRAZYDRILL STEEL

Benefits and applications

A SMALL DRILL FOR THE HIGHEST DEGREE OF PERFORMANCE COST-EFFECTIVENESS

- **SHORT MACHINING TIME** | due to high feeds
- **LONG TOOL LIFE** | from 10 to 20 times longer than HSS drills
- **HIGH DEGREE OF PROCESS RELIABILITY** | due to high quality
- **HIGH DEGREE OF PRECISION** | due to good self-centering



COMPONENT
Filter screen

MATERIAL
90MnCrV8 / 1.2842 / AISI O2

MACHINING
- 500 holes
- d = 0.8 mm
- Drilling depth 4.5 mm

DRILLING TOOL
Mikron Tool - CrazyDrill Steel - 6 x d

DATA	MIKRON TOOL
Tool type	CrazyDrill Steel - Carbide - Coated - External cooling
Item number	2.CD.070080.S
Cutting data	v_c = 80 m/min f = 0.030 mm/rev Q_1 = 4.5 mm

APPLICATION DOMAINS	COMPONENTS EXAMPLES
Automotive industry	Components for gasoline direct injection
Mechanical engineering	Particle of engine Mounting bracket
Watches	Watch housing
Hydraulics / Pneumatics	Solenoid valve

MATERIALS GROUPS	EXAMPLES		
	Mat. no.	DIN	AISI / ASTM / UNS
Group P Unalloyed and alloyed steel	1.0401	C15	1015
	1.3505	100Cr6	52100
	1.2436	X210CrW12	D4 / D6
Group K Cast iron	0.7040	GGG40	60-40-18
Group N Non ferrous metals	3.2315	AlMgSi1	6351
	3.2163	GD-AlSi9Cu3	A380
	2.004	Cu-OF / CW008A	C10100
	2.0321	CuZn37 CW508L	C27400
	2.102	CuSn6	C51900
	2.096	CuAl9Mn2	C63200
Group H1 Hardened steel <55 HRC	1.2510	100MnCrMoW4	O1

CRAZYDRILL™ by Mikron Tool Steel

CRAZYDRILL™ by Mikron Tool Steel

DRILLING TOOLS
CRAZYDRILL STEEL

CrazyDrill Steel 4 x d

Carbide | 4xd1 | 140° | Z2 | eXedur RI/RIP

Ø d_1	0.1 - 3.0 mm	3.1 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.004 mm 0	+ 0.006 mm + 0.001 mm	+ 0.007 mm + 0.001 mm

DRILLING WITH EXTERNAL COOLING

Drilling steel with highest speed, highest process reliability and accuracy. These are the typical attributes of the coated drill CrazyDrill Steel. It is designed for unalloyed and alloyed steels, for cast iron, aluminum and brass and other metals. In the majority of cases the drill reaches the complete drilling depth in one step. Only in long-chipping materials a minimal pecking ensures a high degree of reliability.

For the short version with drilling depths of 4 x d centering is not necessary, with its tip angle of 140° and its chisel "s"-form the drill has a good self-centering. We recommend a pilot drilling only on inclined surfaces. In this case CrazyDrill Crosspilot is adapted for an inclined angle up to a maximum of 60°. For details see drilling process.

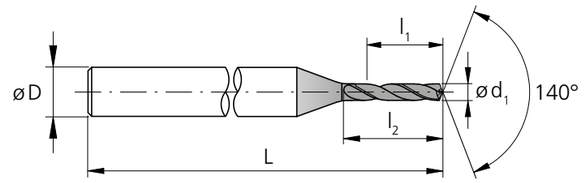
Coolant type, pressure and filtration

Recommendations for coolant type, pressure and filtration are on page "drilling process".

Please note

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

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



d_1 [mm]	d_1 [inch]	l_1 [mm]	l_2 [mm]	D (h6) [mm]	L [mm]	Item number	Availability
0.396	**1/64**	1.60	2.3	3	42.0	2.CD.040F164.S	■
0.40		1.60	2.3	3	42.0	2.CD.040040.S	■
0.45		1.80	2.6	3	42.0	2.CD.040045.S	■
0.50		2.00	2.9	3	42.0	2.CD.040050.S	■
0.55		2.20	3.2	3	42.0	2.CD.040055.S	■
0.60		2.40	3.5	3	43.5	2.CD.040060.S	■
0.65		2.60	3.8	3	43.5	2.CD.040065.S	■
0.70		2.80	4.1	3	43.5	2.CD.040070.S	■
0.75		3.00	4.4	3	43.5	2.CD.040075.S	■
0.793	**1/32**	3.20	4.6	3	43.5	2.CD.040F132.S	■
0.80		3.20	4.6	3	43.5	2.CD.040080.S	■
0.85		3.40	4.9	3	43.5	2.CD.040085.S	■
0.90		3.60	5.2	3	43.5	2.CD.040090.S	■
0.95		3.80	5.5	3	43.5	2.CD.040095.S	■
1.00		4.00	5.8	3	44.0	2.CD.040100.S	■
1.05		4.20	6.1	3	44.0	2.CD.040105.S	■
1.10		4.40	6.3	3	44.0	2.CD.040110.S	■
1.15		4.60	6.6	3	44.0	2.CD.040115.S	■
1.20		4.80	7.0	3	45.0	2.CD.040120.S	■
1.25		5.00	7.3	3	45.0	2.CD.040125.S	■
1.30		5.20	7.6	3	45.0	2.CD.040130.S	■
1.35		5.40	7.9	3	45.0	2.CD.040135.S	■
1.40		5.60	8.2	3	46.0	2.CD.040140.S	■
1.45		5.80	8.6	3	46.0	2.CD.040145.S	■
1.50		6.00	8.7	3	46.0	2.CD.040150.S	■
1.55		6.20	9.1	3	46.0	2.CD.040155.S	■
1.587	**1/16**	6.40	9.5	3	47.0	2.CD.040F116.S	■
1.60		6.40	9.5	3	47.0	2.CD.040160.S	■
1.65		6.60	9.7	3	47.0	2.CD.040165.S	■
1.70		6.80	10.0	3	47.0	2.CD.040170.S	■
1.75		7.00	10.3	3	47.0	2.CD.040175.S	■
1.80		7.20	10.8	3	48.0	2.CD.040180.S	■
1.85		7.40	11.0	3	48.0	2.CD.040185.S	■
1.90		7.60	11.2	3	48.0	2.CD.040190.S	■

■ Stock item

Complementary products

CrazyDrill Crosspilot p.175

CRAZYDRILL™ by Mikron Tool Steel

CRAZYDRILL™ by Mikron Tool Steel

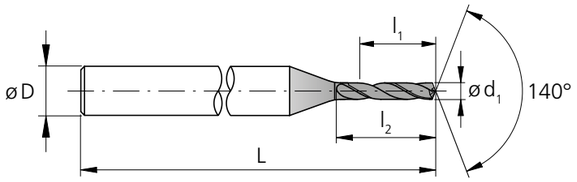
DRILLING TOOLS
CRAZYDRILL STEEL

CrazyDrill Steel 4 x d

Carbide | 4xd$_1$ | 140° | Z2 | eXedur RI/RIP

Ø d$_1$	0.1 - 3.0 mm	3.1 - 6.0 mm	6.1 - 10.0 mm
Tolerance	+ 0.004 mm 0	+ 0.006 mm + 0.001 mm	+ 0.007 mm + 0.001 mm

DRILLING WITH EXTERNAL COOLING



d$_1$ [mm]	d$_1$ [inch]	l$_1$ [mm]	l$_2$ [mm]	D (h6) [mm]	L [mm]	Item number	Availability
1.95		7.80	11.4	3	48.0	2.CD.040195.S	■
2.00		8.00	11.9	4	55.0	2.CD.040200.S	■
2.05		8.20	12.1	4	55.0	2.CD.040205.S	■
2.10		8.40	12.3	4	55.0	2.CD.040210.S	■
2.15		8.60	12.6	4	55.0	2.CD.040215.S	■
2.20		8.80	13.0	4	56.0	2.CD.040220.S	■
2.25		9.00	13.3	4	56.0	2.CD.040225.S	■
2.30		9.20	13.6	4	56.0	2.CD.040230.S	■
2.35		9.40	13.9	4	56.0	2.CD.040235.S	■
2.381	**3/32**	9.60	14.2	4	57.0	2.CD.040F332.S	■
2.40		9.60	14.2	4	57.0	2.CD.040240.S	■
2.45		9.80	14.6	4	57.0	2.CD.040245.S	■
2.50		10.00	14.7	4	57.0	2.CD.040250.S	■
2.55		10.20	15.1	4	57.0	2.CD.040255.S	■
2.60		10.40	15.5	4	58.0	2.CD.040260.S	■
2.65		10.60	15.7	4	58.0	2.CD.040265.S	■
2.70		10.80	16.0	4	58.0	2.CD.040270.S	■
2.75		11.00	16.3	4	58.0	2.CD.040275.S	■
2.80		11.20	16.8	4	59.0	2.CD.040280.S	■
2.85		11.40	17.0	4	59.0	2.CD.040285.S	■
2.90		11.60	17.2	4	59.0	2.CD.040290.S	■
2.95		11.80	17.4	4	59.0	2.CD.040295.S	■
3.00		12.00	17.6	4	59.0	2.CD.040300.S	■
3.05		12.20	17.8	4	60.0	2.CD.040305.S	■
3.10		12.40	18.1	4	60.0	2.CD.040310.S	■
3.15		12.60	18.4	4	60.0	2.CD.040315.S	■
3.175	**1/8**	12.80	18.7	4	60.0	2.CD.040F18.S	■
3.20		12.80	18.7	4	60.0	2.CD.040320.S	■
3.25		13.00	19.0	4	60.0	2.CD.040325.S	■
3.30		13.20	19.3	4	60.0	2.CD.040330.S	■
3.35		13.40	19.6	4	60.0	2.CD.040335.S	■
3.40		13.60	19.9	4	60.0	2.CD.040340.S	■
3.45		13.80	20.2	4	60.0	2.CD.040345.S	■
3.50		14.00	20.5	4	60.0	2.CD.040350.S	■

■ Stock item

d$_1$ [mm]	d$_1$ [inch]	l$_1$ [mm]	l$_2$ [mm]	D (h6) [mm]	L [mm]	Item number	Availability
3.55		14.20	20.8	4	60.0	2.CD.040355.S	■
3.60		14.40	21.1	4	64.5	2.CD.040360.S	■
3.65		14.60	21.4	4	64.5	2.CD.040365.S	■
3.70		14.80	21.6	4	64.5	2.CD.040370.S	■
3.75		15.00	21.9	4	64.5	2.CD.040375.S	■
3.80		15.20	22.2	4	64.5	2.CD.040380.S	■
3.85		15.40	22.5	4	64.5	2.CD.040385.S	■
3.90		15.60	22.8	4	64.5	2.CD.040390.S	■
3.95		15.80	23.1	4	64.5	2.CD.040395.S	■
3.968	**5/32**	16.00	23.4	6	70.0	2.CD.040F532.S	■
4.00		16.00	23.4	6	70.0	2.CD.040400.S	■
4.10		16.40	24.0	6	70.0	2.CD.040410.S	■
4.20		16.80	24.6	6	70.0	2.CD.040420.S	■
4.30		17.20	25.2	6	70.0	2.CD.040430.S	■
4.40		17.60	25.7	6	70.0	2.CD.040440.S	■
4.50		18.00	26.3	6	70.0	2.CD.040450.S	■
4.60		18.40	26.9	6	70.0	2.CD.040460.S	■
4.70		18.80	27.5	6	70.0	2.CD.040470.S	■
4.762	**3/16**	19.20	28.1	6	70.0	2.CD.040F316.S	■
4.80		19.20	28.1	6	70.0	2.CD.040480.S	■
4.90		19.60	28.7	6	70.0	2.CD.040490.S	■
5.00		20.00	29.2	6	70.0	2.CD.040500.S	■
5.10		20.40	29.8	6	70.0	2.CD.040510.S	■
5.20		20.80	30.4	6	75.0	2.CD.040520.S	■
5.30		21.20	31.0	6	75.0	2.CD.040530.S	■
5.40		21.60	31.6	6	75.0	2.CD.040540.S	■
5.50		22.00	32.2	6	75.0	2.CD.040550.S	■
5.560	**7/32**	22.40	32.8	6	75.0	2.CD.040F732.S	■
5.60		22.40	32.8	6	75.0	2.CD.040560.S	■
5.70		22.80	33.3	6	75.0	2.CD.040570.S	■
5.80		23.20	33.9	6	75.0	2.CD.040580.S	■
5.90		23.60	34.5	6	75.0	2.CD.040590.S	■
6.00		24.00	35.1	6	75.0	2.CD.040600.S	■
6.350	**1/4**	25.40	37.1	8	75.0	2.CD.040F14.S	■

■ Stock item

Complementary products

CrazyDrill Crosspilot p.175

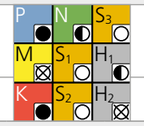
CRAZYDRILL™ by Mikron Tool Steel

CRAZYDRILL™ by Mikron Tool Steel

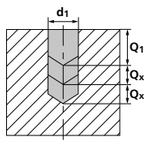
DRILLING TOOLS
CRAZYDRILL STEEL

CrazyDrill Steel 4 x d

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



DRILLING WITH EXTERNAL COOLING | CUTTING DATA OVERVIEW



Materials group	Material	Mat. no.	DIN	AISI/ASTM/UNS	v_c [m/min]	Q_1	Q_x	f [mm/rev] Ød1 0.4 mm 1/64"	0.8 mm 1/32"	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"
P	Unalloyed carbon steel Rm < 800 N/mm²	1.0301	C10	AISI 1010	120	4xd1	–	0.040	0.100	0.120	0.150	0.200	0.250	0.270	0.350	0.370	0.390	0.400
		1.0401	C15	AISI 1015														
		1.1191	C45E/CK45	AISI 1045														
		1.0044	S275JR	AISI 1020														
		1.0715	11SMn30	AISI 1215														
	Low alloyed steel Rm > 900 N/mm²	1.5752	15NiCr13	ASTM 3415 / AISI 3310	80	4xd1	–	0.015	0.030	0.080	0.120	0.160	0.200	0.230	0.250	0.270	0.300	0.320
		1.7131	16MnCr5	AISI 5115														
		1.3505	100Cr6	AISI 52100														
		1.7225	42CrMo4	AISI 4140														
		1.2842	90MnCrV8	AISI O2														
	High alloyed tool steel Rm < 1200 N/mm²	1.2379	X153CrMoV12	AISI D2	60	4xd1	–	0.020	0.070	0.120	0.150	0.200	0.250	0.280	0.300	0.320	0.340	0.350
		1.2436	X210CrW12	AISI D4/D6														
		1.3343	HS6-5-2C	AISI M2 / UNS T11302														
		1.3355	HS18-0-1	AISI T1 / UNS T12001														
M	Stainless steel ferritic	1.4016	X6Cr17	AISI 430 / UNS S43000														
		1.4105	X6CrMoS17	AISI 430F														
	Stainless steel martensitic	1.4034	X46Cr13	AISI 420C														
		1.4112	X90CrMoV18	AISI 440B														
	Stainless steel martensitic – PH	1.4542	X5CrNiCuNb 16-4	AISI 630 / ASTM 17-4 PH														
		1.4545	X5CrNiCuNb 15-5	ASTM 15-5 PH														
	Stainless steel austenitic	1.4301	X5CrNi 18-10	AISI 304														
		1.4435	X2CrNiMo 18-14-3	AISI 316L														
		1.4441	X2CrNiMo 18-15-3	AISI 316LM														
		1.4539	X1NiCrMoCu 25-20-5	AISI 904L														
K	Cast iron	0.6020	GG20	ASTM 30	150	4xd1	–	0.040	0.150	0.200	0.250	0.300	0.350	0.400	0.450	0.470	0.490	0.500
		0.6030	GG30	ASTM 40B														
		0.7040	GGG40	ASTM 60-40-18														
		0.7060	GGG60	ASTM 80-60-03														
N	Aluminium alloy wrought	3.2315	AlMgSi1	ASTM 6351	220	4xd1	–	0.045	0.060	0.080	0.095	0.110	0.130	0.150	0.180	0.190	0.210	0.250
		3.4365	AlZnMgCu1.5	ASTM 7075														
	Aluminium alloy cast	3.2163	GD-AlSi9Cu3	ASTM A380	200	4xd1	–	0.040	0.055	0.075	0.085	0.100	0.120	0.140	0.170	0.180	0.200	0.240
		3.2381	GD-AlSi10Mg	UNS A03590														
	Copper	2.0040	Cu-OF / CW008A	UNS C10100	120	1.5xd1	1xd1	0.030	0.050	0.060	0.065	0.075	0.080	0.095	0.110	0.130	0.160	0.200
		2.0065	Cu-ETP / CW004A	UNS C11000														
	Brass lead free	2.0321	CuZn37 CW508L	UNS C27400	150	1.5xd1	1xd1	0.030	0.050	0.065	0.070	0.075	0.090	0.110	0.140	0.160	0.200	0.220
		2.0360	CuZn40 CW509L	UNS C28000														
	Brass, Bronze Rm < 400 N/mm²	2.0401	CuZn39Pb3 / CW614N	UNS C38500	100	1.5xd1	1xd1	0.035	0.055	0.070	0.080	0.090	0.110	0.130	0.150	0.180	0.220	0.240
		2.1020	CuSn6	UNS C51900														
	Bronze Rm < 600 N/mm²	2.0966	CuAl10Ni5Fe4	UNS C63000	100	4xd1	–	0.015	0.025	0.035	0.050	0.060	0.075	0.095	0.110	0.130	0.160	0.220
		2.0960	CuAl9Mn2	UNS C63200														
S_1	Super alloys	2.4856		Inconel 625	40	1xd1	0.25xd1	0.002	0.004	0.005	0.006	0.007	0.010	0.012	0.015	0.020	0.025	0.030
		2.4668		Inconel 718														
		2.4617	NiMo28	Hastelloy B-2														
		2.4665	NiCr22Fe18Mo	Hastelloy X														
S_2	Titanium pure	3.7035	Gr.2	ASTM B348 / F67	40	1xd1	0.25xd1	0.012	0.024	0.030	0.040	0.045	0.060	0.075	0.090	0.120	0.150	0.180
		3.7065	Gr.4	ASTM B348 / F68														
	Titanium alloys	3.7165	TiAl6V4	ASTM B348 / F136	20	1xd1	0.3xd1	0.020	0.030	0.040	0.050	0.055	0.070	0.080	0.100	0.140	0.160	0.200
		9.9367	TiAl6Nb7	ASTM F1295														
S_3	CrCo alloys	2.4964	CoCr20W15Ni	Haynes 25	30	4xd1	–	0.006	0.012	0.015	0.020	0.025	0.030	0.035	0.045	0.060	0.075	0.090
			CrCoMo28	ASTM F1537														
H_1	Hardened steel < 55 HRC	1.2510	100MnCrMoW4	AISI O1	30	4xd1	–	0.005	0.007	0.010	0.011	0.012	0.015	0.020	0.025	0.030	0.035	0.040
H_2	Hardened steel ≥ 55 HRC	1.2379	X153CrMoV12	AISI D2														

CRAZYDRILL Steel

CRAZYDRILL Steel

DRILLING TOOLS
CRAZYDRILL STEEL

Drilling process CrazyDrill Steel

ACCURATE AND QUICK DRILLING UP TO 7 X D

Coolant type, pressure, filtration and flowrate

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

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

Tool holders

For detailed indications for tool holders see chapter "Technical information".

CrazyDrill Steel up to 4 x d

Due to the excellent self-centering of CrazyDrill Steel, centering or pilot drilling is not necessary on regular and straight surfaces up to a maximal drilling depth of 4 x d.

CrazyDrill Steel 6 x d / 7 x d

Due to the excellent self-centering of CrazyDrill Steel, centering or pilot drilling is not necessary for drilling diameters over Ø 0.8 mm on regular and straight surfaces up to a maximal drilling depth of 7 x d.

Pilot drilling and drilling

Higher requirements: On irregular, rough or inclined surfaces or for highest position accuracy and in general for drilling until 6 x d under diameter 0.8 mm, Mikron Tool recommends:

- **CrazyDrill Pilot** for pilot drilling
- **CrazyDrill Crosspilot** for pilot drilling on inclined surfaces

Pilot drilling with CrazyDrill Pilot 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 quality of drilling (position and alignment accuracy, no measurable transition from pilot hole to follow-up hole) and a stable machining process are guaranteed by means of a predetermined tool.

CRAZYDRILL by Mikron Tool Steel

CRAZYDRILL by Mikron Tool Steel

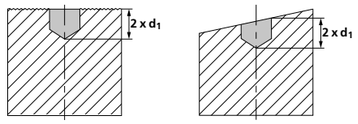
DRILLING TOOLS
CRAZYDRILL STEEL

Drilling process CrazyDrill Steel

DRILLING IN ONE STEP (DEPENDING ON MATERIAL, SEE CUTTING DATA CHART)

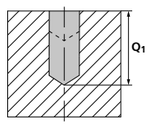
1 | PILOT DRILLING

- CrazyDrill Pilot (irregular or rough surfaces) or CrazyDrill Crosspilot (inclined surfaces).



2 | DRILLING

- CrazyDrill Steel up to maximum drilling depth Q_1 in one step.



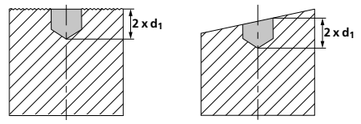
Note:
After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position.

DRILLING AS PER DIN 66025 / PAL (DEPENDING ON MATERIAL, SEE CUTTING DATA CHART)

G83 deep-drilling cycle with chip break and chip removal (pecks)
Q = depth of the respective peck

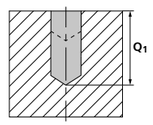
1 | PILOT DRILLING

- With CrazyDrill Pilot (irregular or rough surfaces) or CrazyDrill Crosspilot (inclined surfaces).

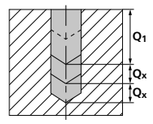


2 | DRILLING

- Drilling with CrazyDrill Steel up to maximum drilling depth Q_1 in one step, with subsequent chip removal.



- Further pecks Q_X according to cutting data table, with subsequent chip removal.



Note:
Drill can be retracted completely from the hole between pecks.
After the drill reached desired cutting depth, return at increased feed rate (or in case of perfect conditions rapid traverse) to safety position.