HARTNER

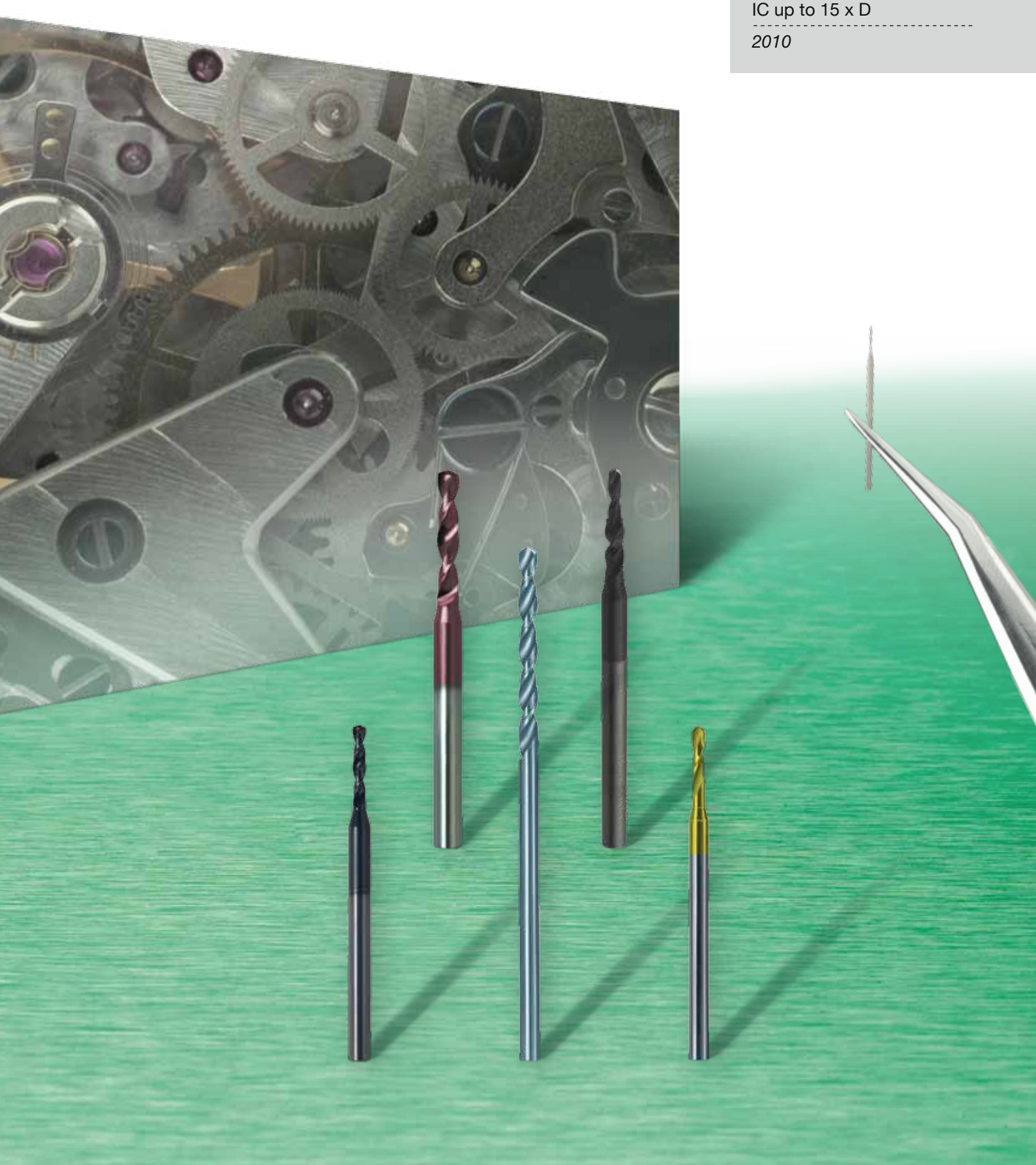
Precision Cutting Tools

Micro-Precision-Drills

HSS-E-PM / Solid Carbide

New: Solid carbide micro-precision drills with IC up to 15 x D

2010



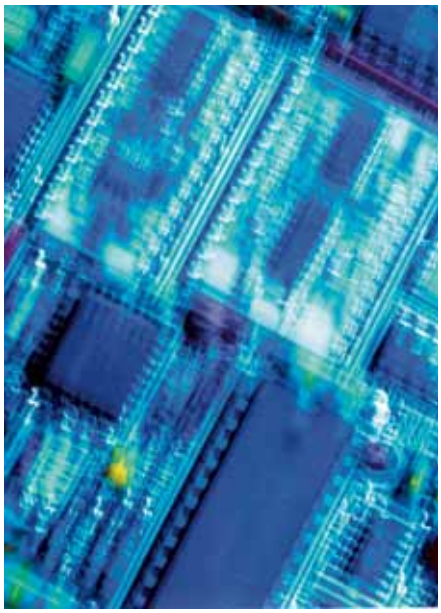
Hartner HSCO and Solid Carbide Micro Drills – Precision starting from Diameter 0.05 mm

Smallest borings require highest quality, as the least deviation in the straightness of the boring, in the tolerance or in the surface quality on the workpiece will already mean a defect or scrap in today's miniaturised productions. For micro productions, Hartner offers precision micro drills made of PM-HSS and solid carbide in nominal diameters from 0.05 and 0.2 mm respectively.

Point- and flute geometry, surfaces, shank types and cutting materials are perfectly concerted to match the application, so that smallest borings are worked out well and fabricated process-safe. Our HSS-E-PM micro drills are especially applied for small-series productions, where they offer high quality at a beneficial cost-performance ratio.

On the one hand, Hartner solid carbide micro drills, as drills with a long tool life, stand by for large-scale productions. On the other hand, with the article no. 89286 we also offer a specialist for processing glass fibre reinforced plastics (GRP) in the electric and electronic industry.

See the quality and performance of our micro drills for yourself. Numerous customers in the branches of precision mechanics, horology, medical technology, conductor board manufacturing and other fields of the micro production already rely on Hartner.



HARTNER

Micro-precision drills

Order no. 87011

from page 6

A special purpose drill with oversize shank for use in the instrument and clock making industries and for general precision engineering.
Specially designed for drilling structural and carbon steels, high-alloyed steels, tool steels, cast und cast-alloys, Magnesium-alloys, Aluminium and plastics.

Standard	DIN 1899
Tool material	HSS-E-PM
Surface	◯
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	118
Tolerance	0/-0,004

Order no. 87016

from page 6

A special purpose drill with oversize shank for use in the instrument and clock making industries and for general precision engineering.
Specially designed for drilling structural and carbon steels, high-alloyed steels, tool steels, cast und cast-alloys, Magnesium-alloys, Aluminium and plastics.

Standard	DIN 1899
Tool material	HSS-E-PM
Surface	◯
Type	N
Cutting direction	left-hand
Point grinding	Facet point
Point angle	118
Tolerance	0/-0,004

Order no. 84810

from page 6

A special purpose drill with oversize shank for use in the instrument and clock making industries and for general precision engineering.
Specially designed for drilling structural and carbon steels, high-alloyed steels, tool steels, cast und cast-alloys, Magnesium-alloys, Aluminium and plastics.

Standard	DIN 1899
Tool material	HSS-E-PM
Surface	(T)
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	118
Tolerance	0/-0,004

Order no. 89281

from page 6

A special purpose drill with oversize shank for use in the instrument and clock making industries and for general precision engineering.
Specially designed for drilling structural and carbon steels, high-alloyed steels, tool steels, cast und cast-alloys, Magnesium-alloys, Aluminium and plastics.

Standard	Hartner std.
Tool material	Solid carbide
Surface	◯
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	130
Tolerance	0/-0,004

Order no. 89286

page 12

Specially designed drill for drilling fi berglass reinforced plastics (i.e. printed circuit boards) and other resin-based thermo-hardened products likely to cause rapid wear on the lands and cutting edges of high speed drills.

Standard	Hartner std.
Tool material	Solid carbide
Surface	◯
Type	N
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle	130
Tolerance	0/-0,004

◯ bright (T) TiN

HARTNER

Solid carbide Micro-precision drills for high performance machining

Small but mighty - with and without internal cooling

Solid carbide micro-precision drills without internal cooling for drilling depths up to 4xD and 7xD are available in the diameter range from 0.8 to 3.0 mm.

Holes up to 8xD and 15xD are the domain of solid carbide micro-precision drills with internal cooling. Thanks to the optimised tool geometry, pecking is not required for holes up to 15xD with Hartner's solid carbide micro-precision drills.

The tool design makes the solid carbide micro-precision drill 4xD without internal cooling optimally suitable as a pilot drill for the 15xD micro-precision drill with internal cooling.

NEW
now with IC for 8xD and 15xD

Superior in every sense

Solid carbide micro-precision drills have proven their exceptional performance capabilities in various volume applications and tool life tests. The tables below document a few application examples with convincing results.

Machining examples of solid carbide micro-precision drills 8xD and 15xD with IC

Hartner no.	86408	86408	86412	86412
Diameter	1.4 mm	2.5 mm	2.5 mm	2.1 mm
Coating	AlTiN	AlTiN	AlTiN	AlTiN
Material group	cast iron	alloyed case hardened steel	alloyed heat-treatable steel	stainless steel
Material description	GG25	16MnCr5	42CrMo4	X6CrNiTi18 10
Drill. depth [mm]	8xD	8xD	15xD	15xD
Hole type	blind hole	blind hole	blind hole	blind hole
Cooling	IC 80 bar	IC 80 bar	IC 80 bar	IC 80 bar
Coolant	soluble oil	soluble oil	soluble oil	soluble oil
Machine type	machining centre	machining centre	machining centre	machining centre
v_c [mm/min]	80	120	100	60
f [mm/rev.]	0.1	0.14	0.1	0.03
Tool life [m]	150	110	60	60

Internal cooling increases tool life considerably!

A comparison between a conventional micro-precision drill w/o internal cooling for holes up to 7xD and a 8xD drill with internal cooling 86408 demonstrates the advantages of internal cooling: Tool life increases considerably.

Hartner no.	Competitor without internal cooling	86408 with internal cooling
Diameter	2.6 mm	2.6 mm
Coating	TiAlN	AlTiN
Material group	stainless steel	stainless steel
Material description	X105CrMo17	X105CrMo17
Drill. depth [mm]	7xD	8xD
Hole type	blind hole	blind hole
Cooling	external	internal 100 bar
Coolant	neat oil	neat oil
Machine type	machining centre	machining centre
v_c [mm/min]	53	53
f [mm/rev.]	0.06	0.06
Tool life [m]	100 workpieces	500 workpieces, end of tool life not reached!

HARTNER

Solid carbide Micro-precision drills for high performance machining

Order no. 86400

page 13

Solid carbide special drill with AlTiN-coating and reinforced shank without internal cooling for drilling small holes up to 4 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special fl ute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	140
Tolerance	m7

Order no. 86401

page 14

Solid carbide special drill with AlTiN-coating and reinforced shank without internal cooling for drilling small holes up to 7 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special fl ute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	140
Tolerance	m7

Order no. 86408

page 15

Solid carbide special drill with AlTiN-coating and reinforced shank with internal cooling for drilling small holes up to 8 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special fl ute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Hints:
Please apply 86400 as pilot drill (approx. 2-3 x D drilling depth).
When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	Facet point
Point angle	135
Tolerance	h7

Order no. 86412

page 16

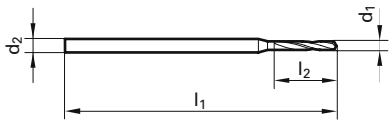
Solid carbide special drill with AlTiN-coated tip and reinforced shank with internal cooling for drilling small holes up to 15 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special fl ute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Hints:
Please apply 86400 as pilot drill (approx. 2-3 x D drilling depth).
When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters.

Norm	Hartner std.
Standard	Solid carbide
Tool material	A
Surface	N
Type	right-hand
Cutting direction	Facet point
Point grinding	135
Tolerance	h7

A AlTiN

Micro-precision drills



	87011	87016	84810	89281
	HSS-E-PM			Solid carbide
	134	138	135	102
	right-hand	left-hand	right-hand	right-hand
	N	N	N	N
	○	○	Ⓣ	○

d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
0.050	1.000	25.00	0.40	●			
0.060	1.000	25.00	0.40	●			
0.070	1.000	25.00	0.50	●			
0.075	1.000	25.00	0.50	●			
0.080	1.000	25.00	0.50	●			
0.090	1.000	25.00	0.50	●			
0.100	1.000	25.00	0.50	●			
0.105	1.000	25.00	0.50	●			
0.110	1.000	25.00	0.50	●			
0.115	1.000	25.00	0.50	●			
0.120	1.000	25.00	0.50	●			
0.121	1.000	25.00	0.80	●			
0.124	1.000	25.00	0.80	●			
0.125	1.000	25.00	0.80	●			
0.128	1.000	25.00	0.80	●		●	
0.130	1.000	25.00	0.80	●	●		
0.138	1.000	25.00	0.80	●			
0.140	1.000	25.00	0.80	●	●		
0.143	1.000	25.00	0.80	●			
0.145	1.000	25.00	0.80	●			
0.147	1.000	25.00	0.80	●			
0.150	1.000	25.00	0.80	●	●		
0.155	1.000	25.00	1.10	●	●		
0.160	1.000	25.00	1.10	●	●	●	
0.170	1.000	25.00	1.10	●	●	●	
0.175	1.000	25.00	1.10	●	●		
0.180	1.000	25.00	1.10	●	●	●	
0.185	1.000	25.00	1.10		●		
0.190	1.000	25.00	1.10	●	●	●	
0.195	1.000	25.00	1.50	●	●		
0.200	1.000	25.00	1.50	●	●	●	●
0.205	1.000	25.00	1.50	●			
0.210	1.000	25.00	1.50	●	●	●	
0.215	1.000	25.00	1.50	●	●		
0.220	1.000	25.00	1.50	●	●	●	●
0.225	1.000	25.00	1.50	●	●		
0.230	1.000	25.00	1.50	●	●	●	
0.235	1.000	25.00	1.50	●	●	●	
0.240	1.000	25.00	1.50	●	●	●	●
0.245	1.000	25.00	1.90	●	●		
0.250	1.000	25.00	1.90	●	●	●	●
0.255	1.000	25.00	1.90	●	●	●	
0.260	1.000	25.00	1.90	●	●	●	●
0.265	1.000	25.00	1.90	●	●	●	
0.270	1.000	25.00	1.90	●	●	●	
0.275	1.000	25.00	1.90	●	●		
0.280	1.000	25.00	1.90	●	●	●	●
0.285	1.000	25.00	1.90	●	●		
0.290	1.000	25.00	1.90	●	●	●	
0.295	1.000	25.00	1.90	●	●	●	
0.300	1.000	25.00	1.90	●	●	●	●
0.305	1.000	25.00	2.40	●		●	
0.310	1.000	25.00	2.40	●	●	●	
0.315	1.000	25.00	2.40	●	●		

○ bright Ⓣ TiN

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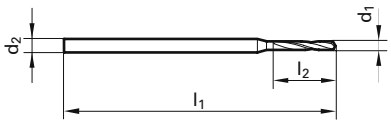
Micro-precision drills



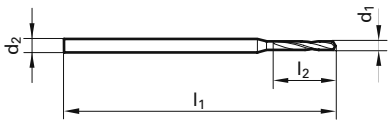
	87011	87016	84810	89281
	HSS-E-PM			Solid carbide
	134	138	135	102
	right-hand	left-hand	right-hand	right-hand
	N	N	N	N
	○	○	(T)	○

d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
0.320	1.000	25.00	2.40	●	●	●	
0.325	1.000	25.00	2.40	●		●	
0.330	1.000	25.00	2.40	●	●	●	●
0.335	1.000	25.00	2.40	●		●	
0.340	1.000	25.00	2.40	●	●	●	
0.345	1.000	25.00	2.40	●			
0.350	1.000	25.00	2.40	●	●	●	●
0.355	1.000	25.00	2.40	●	●		
0.360	1.000	25.00	2.40	●	●	●	
0.365	1.000	25.00	2.40	●			
0.370	1.000	25.00	2.40	●	●	●	
0.375	1.000	25.00	2.40	●			
0.380	1.000	25.00	2.40	●	●	●	
0.385	1.000	25.00	3.00	●			
0.390	1.000	25.00	3.00	●	●	●	
0.395	1.000	25.00	3.00	●			
0.400	1.000	25.00	3.00	●	●	●	●
0.405	1.000	25.00	3.00	●			
0.410	1.000	25.00	3.00	●	●	●	
0.415	1.000	25.00	3.00	●	●		
0.420	1.000	25.00	3.00	●	●	●	
0.425	1.000	25.00	3.00	●			
0.430	1.000	25.00	3.00	●	●	●	
0.432	1.000	25.00	3.00	●			
0.435	1.000	25.00	3.00	●	●		
0.440	1.000	25.00	3.00	●	●	●	
0.445	1.000	25.00	3.00	●	●		
0.450	1.000	25.00	3.00	●	●	●	●
0.455	1.000	25.00	3.00	●			
0.460	1.000	25.00	3.00	●	●	●	
0.465	1.000	25.00	3.00	●	●		
0.470	1.000	25.00	3.00	●	●	●	
0.475	1.000	25.00	3.00	●		●	
0.480	1.000	25.00	3.00	●	●	●	
0.485	1.000	25.00	3.40	●	●		
0.490	1.000	25.00	3.40	●	●	●	
0.495	1.000	25.00	3.40	●	●		
0.500	1.000	25.00	3.40	●	●	●	●
0.505	1.000	25.00	3.40	●		●	
0.510	1.000	25.00	3.40	●	●	●	
0.515	1.000	25.00	3.40	●			
0.520	1.000	25.00	3.40	●	●	●	
0.525	1.000	25.00	3.40	●	●		
0.530	1.000	25.00	3.40	●	●	●	
0.535	1.000	25.00	3.90	●	●		
0.540	1.000	25.00	3.90	●	●	●	
0.545	1.000	25.00	3.90	●	●	●	
0.550	1.000	25.00	3.90	●	●	●	
0.555	1.000	25.00	3.90	●	●		
0.560	1.000	25.00	3.90	●	●	●	
0.565	1.000	25.00	3.90		●		
0.570	1.000	25.00	3.90	●	●	●	
0.575	1.000	25.00	3.90	●			
0.580	1.000	25.00	3.90	●	●	●	

○ bright (T) TiN

HARTNER

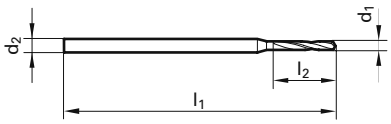
Micro-precision drills



				87011	87016	84810	89281
				HSS-E-PM			Solid carbide
				134	138	135	102
				right-hand	left-hand	right-hand	right-hand
				N	N	N	N
				◯	◯	Ⓣ	◯
d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
0.585	1.000	25.00	3.90	●			
0.590	1.000	25.00	3.90	●	●	●	
0.595	1.000	25.00	3.90	●			
0.600	1.000	25.00	3.90	●	●	●	●
0.605	1.000	25.00	4.20	●			
0.610	1.000	25.00	4.20	●	●	●	
0.615	1.000	25.00	4.20	●	●		
0.620	1.000	25.00	4.20	●	●	●	
0.625	1.000	25.00	4.20	●	●		
0.630	1.000	25.00	4.20	●	●	●	
0.632	1.000	25.00	4.20	●			
0.635	1.000	25.00	4.20		●		
0.640	1.000	25.00	4.20	●	●	●	
0.650	1.000	25.00	4.20	●	●	●	●
0.655	1.000	25.00	4.20	●	●		
0.660	1.000	25.00	4.20	●	●	●	
0.665	1.000	25.00	4.20	●			
0.670	1.000	25.00	4.20	●	●	●	
0.675	1.000	25.00	4.80	●	●		
0.680	1.000	25.00	4.80	●	●	●	
0.685	1.000	25.00	4.80		●		
0.690	1.000	25.00	4.80	●	●	●	
0.695	1.000	25.00	4.80	●	●		
0.700	1.000	25.00	4.80	●	●	●	●
0.705	1.000	25.00	4.80	●			
0.710	1.000	25.00	4.80	●	●	●	
0.720	1.000	25.00	4.80	●	●	●	
0.725	1.000	25.00	4.80	●	●		
0.730	1.000	25.00	4.80	●	●	●	
0.740	1.000	25.00	4.80	●	●	●	
0.750	1.000	25.00	4.80	●	●	●	●
0.755	1.000	25.00	5.30		●		
0.760	1.000	25.00	5.30	●	●	●	
0.770	1.000	25.00	5.30	●	●	●	
0.775	1.000	25.00	5.30	●	●		
0.780	1.000	25.00	5.30	●	●	●	
0.790	1.000	25.00	5.30	●	●	●	
0.795	1.500	25.00	5.30	●			
0.800	1.500	25.00	5.30	●	●	●	●
0.805	1.500	25.00	5.30		●		
0.810	1.500	25.00	5.30	●	●	●	●
0.820	1.500	25.00	5.30	●	●	●	
0.825	1.500	25.00	5.30	●			
0.830	1.500	25.00	5.30	●	●	●	●
0.835	1.500	25.00	5.30		●		
0.840	1.500	25.00	5.30	●	●	●	
0.845	1.500	25.00	5.30	●			
0.850	1.500	25.00	5.30	●	●	●	●
0.855	1.500	25.00	6.00		●		
0.860	1.500	25.00	6.00	●	●	●	
0.870	1.500	25.00	6.00	●	●	●	
0.875	1.500	25.00	6.00		●		
0.880	1.500	25.00	6.00	●	●	●	
0.885	1.500	25.00	6.00		●		

◯ bright Ⓣ TiN

Micro-precision drills

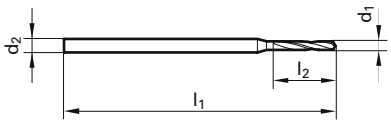


	87011	87016	84810	89281
	HSS-E-PM			Solid carbide
	134	138	135	102
	right-hand	left-hand	right-hand	right-hand
	N	N	N	N
	○	○	(T)	○

d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
0.890	1.500	25.00	6.00	●	●		
0.900	1.500	25.00	6.00	●	●	●	●
0.910	1.500	25.00	6.00	●	●	●	
0.915	1.500	25.00	6.00		●		
0.920	1.500	25.00	6.00	●	●	●	
0.925	1.500	25.00	6.00	●	●		
0.930	1.500	25.00	6.00	●	●	●	
0.935	1.500	25.00	6.00		●		
0.940	1.500	25.00	6.00	●	●	●	
0.945	1.500	25.00	6.00		●		
0.950	1.500	25.00	6.00	●	●	●	
0.960	1.500	25.00	6.80	●	●	●	
0.965	1.500	25.00	6.80		●		
0.970	1.500	25.00	6.80	●	●	●	
0.975	1.500	25.00	6.80		●		
0.980	1.500	25.00	6.80	●	●	●	
0.985	1.500	25.00	6.80		●		
0.990	1.500	25.00	6.80	●	●		
0.995	1.500	25.00	6.80		●		
1.000	1.500	25.00	6.80	●	●	●	●
1.005	1.500	25.00	6.80		●		
1.010	1.500	25.00	6.80	●	●		
1.020	1.500	25.00	6.80	●	●	●	
1.030	1.500	25.00	6.80	●	●		
1.035	1.500	25.00	6.80		●		
1.040	1.500	25.00	6.80	●	●	●	
1.050	1.500	25.00	6.80	●	●	●	●
1.055	1.500	25.00	6.80	●			
1.060	1.500	25.00	6.80	●	●		
1.070	1.500	25.00	7.60	●	●	●	
1.080	1.500	25.00	7.60	●	●	●	
1.085	1.500	25.00	7.60		●		
1.090	1.500	25.00	7.60	●	●	●	
1.095	1.500	25.00	7.60	●			
1.100	1.500	25.00	7.60	●	●	●	●
1.110	1.500	25.00	7.60	●	●		
1.115	1.500	25.00	7.60		●		
1.120	1.500	25.00	7.60	●	●	●	
1.125	1.500	25.00	7.60		●		
1.130	1.500	25.00	7.60	●			
1.140	1.500	25.00	7.60	●			
1.150	1.500	25.00	7.60	●	●	●	●
1.160	1.500	25.00	7.60	●	●		
1.170	1.500	25.00	7.60	●	●		
1.175	1.500	25.00	7.60	●			
1.180	1.500	25.00	7.60	●	●	●	
1.190	1.500	25.00	8.50	●	●		
1.200	1.500	25.00	8.50	●	●	●	●
1.205	1.500	25.00	8.50		●		
1.210	1.500	25.00	8.50	●	●		
1.220	1.500	25.00	8.50	●	●	●	
1.230	1.500	25.00	8.50	●			
1.240	1.500	25.00	8.50	●			
1.250	1.500	25.00	8.50	●	●	●	●

○ bright (T) TiN

Micro-precision drills

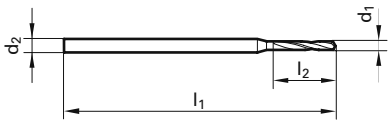


	87011	87016	84810	89281
	HSS-E-PM			Solid carbide
	134	138	135	102
	right-hand	left-hand	right-hand	right-hand
	N	N	N	N
	○	○	Ⓣ	○

d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
1.260	1.500	25.00	8.50	●			
1.265	1.500	25.00	8.50	●			
1.270	1.500	25.00	8.50	●	●		
1.275	1.500	25.00	8.50		●		
1.280	1.500	25.00	8.50	●			
1.290	1.500	25.00	8.50	●	●		
1.300	1.500	25.00	8.50	●	●	●	●
1.310	1.500	25.00	8.50	●	●		
1.320	1.500	25.00	8.50	●	●		
1.325	1.500	25.00	9.50	●			
1.330	1.500	25.00	9.50	●	●		
1.340	1.500	25.00	9.50	●			
1.350	1.500	25.00	9.50	●	●	●	●
1.360	1.500	25.00	9.50		●		
1.370	1.500	25.00	9.50	●			
1.375	1.500	25.00	9.50		●		
1.380	1.500	25.00	9.50	●			
1.390	1.500	25.00	9.50	●		●	
1.400	1.500	25.00	9.50	●	●	●	●
1.405	1.500	25.00	9.50		●		
1.410	1.500	25.00	9.50	●			
1.420	1.500	25.00	9.50	●	●	●	
1.425	1.500	25.00	9.50		●		
1.430	1.500	25.00	9.50	●			
1.440	1.500	25.00	9.50	●	●		
1.450	1.500	25.00	9.50	●	●	●	
1.460	2.000	30.00	9.50	●	●		
1.470	2.000	30.00	9.50	●			
1.500	2.000	30.00	9.50	●	●	●	
1.520	2.000	30.00	10.60	●			
1.525	2.000	30.00	10.60		●		
1.530	2.000	30.00	10.60	●			
1.540	2.000	30.00	10.60	●			
1.550	2.000	30.00	10.60	●			
1.590	2.000	30.00	10.60	●			
1.600	2.000	30.00	10.60	●	●		
1.610	2.000	30.00	10.60	●			
1.615	2.000	30.00	10.60		●		
1.630	2.000	30.00	10.60	●			
1.650	2.000	30.00	10.60	●			
1.660	2.000	30.00	10.60	●			
1.690	2.000	30.00	10.60	●			
1.700	2.000	30.00	10.60	●			
1.710	2.000	30.00	11.80	●			
1.715	2.000	30.00	11.80	●			
1.730	2.000	30.00	11.80	●			
1.745	2.000	30.00	11.80	●			
1.750	2.000	30.00	11.80	●			
1.775	2.000	30.00	11.80	●			
1.800	2.000	30.00	11.80	●	●	●	
1.830	2.000	30.00	11.80	●			
1.840	2.000	30.00	11.80	●			
1.850	2.000	30.00	11.80	●	●		
1.860	2.000	30.00	11.80	●			

○ bright Ⓣ TiN

Micro-precision drills

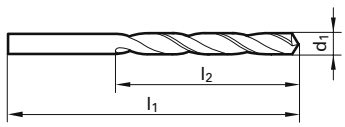


	87011	87016	84810	89281
	HSS-E-PM			Solid carbide
	134	138	135	102
	right-hand	left-hand	right-hand	right-hand
	N	N	N	N
	○	○	Ⓣ	○

d1	d2	l1	l2	Availability			
mm	mm	mm	mm				
1.880	2.000	30.00	11.80		●		
1.900	2.000	30.00	11.80	●		●	
1.920	2.000	30.00	13.20	●			
1.945	2.000	30.00	13.20		●		

○ bright Ⓣ TiN

Micro-precision drills



	89286
	Solid carbide
	102
	right-hand
	N
	◯

d1	l1	l2	Availability
mm	mm	mm	
0.500	38.00	8.50	●
0.600	38.00	9.50	●
0.650	38.00	10.50	●
0.700	38.00	10.50	●
0.750	38.00	12.50	●
0.800	38.00	12.50	●
0.850	38.00	14.50	●
0.900	38.00	14.50	●
1.000	38.00	17.00	●
1.050	38.00	17.00	●
1.100	38.00	17.00	●
1.200	38.00	17.00	●
1.300	38.00	17.00	●
1.400	38.00	17.00	●
1.450	38.00	17.00	●
1.500	38.00	17.00	●

◯ bright

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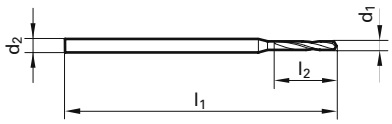
Solid carbide micro-precision drills 4 x D with external cooling



	86400
	Solid carbide
	164
	right-hand
	N
	A

d1	d2	l1	l2	Availability
mm	mm	mm	mm	
0.800	3.000	47.00	4.80	●
0.850	3.000	47.00	5.10	●
0.900	3.000	47.00	5.40	●
0.950	3.000	47.00	5.70	●
1.000	3.000	47.00	6.00	●
1.050	3.000	47.00	6.30	●
1.100	3.000	47.00	6.60	●
1.150	3.000	47.00	6.90	●
1.200	3.000	47.00	7.20	●
1.250	3.000	47.00	7.50	●
1.300	3.000	47.00	7.80	●
1.350	3.000	47.00	8.10	●
1.400	3.000	47.00	8.40	●
1.450	3.000	47.00	8.70	●
1.500	3.000	47.00	9.00	●
1.550	3.000	47.00	9.30	●
1.600	3.000	47.00	9.60	●
1.650	3.000	47.00	9.90	●
1.700	3.000	47.00	10.20	●
1.750	3.000	47.00	10.50	●
1.800	3.000	52.00	10.80	●
1.850	3.000	52.00	11.10	●
1.900	3.000	52.00	11.40	●
1.950	3.000	52.00	11.70	●
1.980	3.000	52.00	11.90	●
2.000	4.000	59.00	12.00	●
2.050	4.000	59.00	12.30	●
2.100	4.000	59.00	12.60	●
2.150	4.000	59.00	12.90	●
2.200	4.000	59.00	13.20	●
2.250	4.000	59.00	13.50	●
2.300	4.000	59.00	13.80	●
2.350	4.000	59.00	14.10	●
2.380	4.000	59.00	14.30	●
2.400	4.000	59.00	14.40	●
2.450	4.000	59.00	14.70	●
2.500	4.000	59.00	15.00	●
2.550	4.000	59.00	15.30	●
2.600	4.000	59.00	15.60	●
2.650	4.000	59.00	15.90	●
2.700	4.000	59.00	16.20	●
2.750	4.000	59.00	16.50	●
2.780	4.000	59.00	16.70	●
2.800	4.000	59.00	16.80	●
2.850	4.000	59.00	17.10	●
2.900	4.000	59.00	17.40	●
2.950	4.000	59.00	17.70	●
3.000	4.000	59.00	18.00	●

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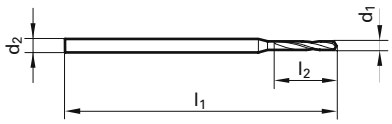
Solid carbide micro-precision drills 7 x D with external cooling



	86401
	Solid carbide
	164
	right-hand
	N
	A

d1	d2	l1	l2	Availability
mm	mm	mm	mm	
0.800	3.000	47.00	6.40	●
0.850	3.000	47.00	6.80	●
0.900	3.000	47.00	7.20	●
0.950	3.000	47.00	7.60	●
1.000	3.000	47.00	8.00	●
1.050	3.000	47.00	8.40	●
1.100	3.000	47.00	8.80	●
1.150	3.000	47.00	9.20	●
1.200	3.000	52.00	10.80	●
1.250	3.000	52.00	11.30	●
1.300	3.000	52.00	11.70	●
1.350	3.000	52.00	12.20	●
1.400	3.000	52.00	12.60	●
1.450	3.000	52.00	13.10	●
1.500	3.000	52.00	13.50	●
1.550	3.000	52.00	14.00	●
1.600	3.000	52.00	14.40	●
1.650	3.000	52.00	14.90	●
1.700	3.000	52.00	15.30	●
1.750	3.000	52.00	15.80	●
1.800	3.000	52.00	16.20	●
1.850	3.000	52.00	16.70	●
1.900	3.000	52.00	17.10	●
1.950	3.000	52.00	17.60	●
1.980	3.000	52.00	17.80	●
2.000	4.000	63.00	18.00	●
2.050	4.000	63.00	18.50	●
2.100	4.000	63.00	18.90	●
2.150	4.000	63.00	19.40	●
2.200	4.000	63.00	19.80	●
2.250	4.000	63.00	20.30	●
2.300	4.000	63.00	20.70	●
2.350	4.000	63.00	21.20	●
2.380	4.000	63.00	21.40	●
2.400	4.000	63.00	21.60	●
2.450	4.000	63.00	22.10	●
2.500	4.000	63.00	22.50	●
2.550	4.000	63.00	23.00	●
2.600	4.000	67.00	23.40	●
2.650	4.000	67.00	23.90	●
2.700	4.000	67.00	24.30	●
2.750	4.000	67.00	24.80	●
2.780	4.000	67.00	25.00	●
2.800	4.000	67.00	25.20	●
2.850	4.000	67.00	25.70	●
2.900	4.000	67.00	26.10	●
2.950	4.000	67.00	26.60	●
3.000	4.000	67.00	27.00	●

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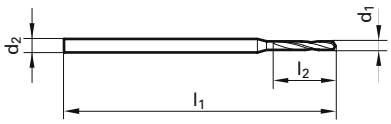
HARTNER

Solid carbide micro-precision drills 8 x D with internal cooling



	86408
	Solid carbide
	164
	right-hand
	N
	A

d1	d2	l1	l2	Availability
mm	mm	mm	mm	
1,400	4,000	52,000	15,000	●
1,450	4,000	52,000	16,000	●
1,500	4,000	52,000	17,000	●
1,550	4,000	52,000	17,000	●
1,590	4,000	52,000	18,000	●
1,600	4,000	52,000	18,000	●
1,650	4,000	52,000	18,000	●
1,700	4,000	56,000	19,000	●
1,750	4,000	56,000	19,000	●
1,800	4,000	56,000	20,000	●
1,850	4,000	56,000	20,000	●
1,900	4,000	56,000	21,000	●
1,950	4,000	56,000	21,000	●
1,980	4,000	56,000	22,000	●
2,000	4,000	56,000	22,000	●
2,050	4,000	56,000	23,000	●
2,100	4,000	62,000	23,000	●
2,150	4,000	62,000	24,000	●
2,200	4,000	62,000	24,000	●
2,250	4,000	62,000	25,000	●
2,300	4,000	62,000	25,000	●
2,350	4,000	62,000	26,000	●
2,380	4,000	62,000	26,000	●
2,400	4,000	62,000	26,000	●
2,450	4,000	62,000	27,000	●
2,500	4,000	62,000	28,000	●
2,550	4,000	62,000	28,000	●
2,600	4,000	66,000	29,000	●
2,650	4,000	66,000	29,000	●
2,700	4,000	66,000	30,000	●
2,750	4,000	66,000	30,000	●
2,780	4,000	66,000	31,000	●
2,800	4,000	66,000	31,000	●
2,850	4,000	66,000	31,000	●
2,900	4,000	66,000	32,000	●
2,950	4,000	66,000	32,000	●
3,000	4,000	66,000	33,000	●

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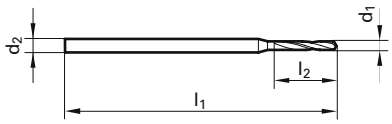
HARTNER

Solid carbide micro-precision drills 15 x D with internal cooling



	86412
	Solid carbide
	164
	right-hand
	N
	A

d1	d2	l1	l2	Availability
mm	mm	mm	mm	
1.400	4.000	62.000	25.000	●
1.500	4.000	62.000	27.000	●
1.590	4.000	62.000	29.000	●
1.600	4.000	62.000	29.000	●
1.700	4.000	70.000	31.000	●
1.800	4.000	70.000	32.000	●
1.900	4.000	70.000	34.000	●
1.980	4.000	70.000	36.000	●
2.000	4.000	70.000	36.000	●
2.100	4.000	78.000	38.000	●
2.200	4.000	78.000	40.000	●
2.300	4.000	78.000	42.000	●
2.380	4.000	78.000	44.000	●
2.400	4.000	78.000	44.000	●
2.500	4.000	78.000	45.000	●
2.600	4.000	87.000	47.000	●
2.700	4.000	87.000	48.000	●
2.780	4.000	87.000	50.000	●
2.800	4.000	87.000	50.000	●
2.900	4.000	87.000	52.000	●
3.000	4.000	87.000	54.000	●

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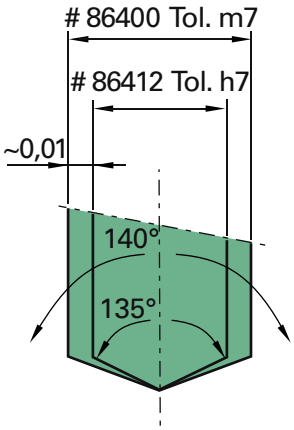
Application recommendations for Hartner solid carbide micro precision drills

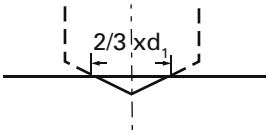
Pilot drilling

For the application of solid carbide micro-precision drills 15xD we recommend a pilot hole 1xD up to 2xD depth.
For this pilot hole, the solid carbide micro-precision drill 4xD is optimally suitable. Its point angle and its diameter tolerance are perfectly adapted.



Centering

In order to achieve full performance with solid carbide micro-precision drills from 8xD drilling depth, we recommend centering.
The solid carbide micro-precision drill up to 4xD, Hartner no. 86400, can be applied for this purpose. The centering diameter should be approximately 2/3xD.



Filter quality

When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant‘s filter quality due to the extremely small coolant duct diameters.

HARTNER

Recommendations

NEW
now with IC for 8xD and 15xD

Drill Ø mm	Feed column no. 101	102	103	104	105	106	107	108	109
	f (mm/rev.)								
0.10	0.002	0.003	0.003	0.004	0.006	0.007	0.010	0.013	0.016
0.16	0.002	0.003	0.004	0.005	0.007	0.009	0.012	0.016	0.022
0.25	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.019	0.024
0.30	0.004	0.005	0.007	0.009	0.011	0.015	0.019	0.025	0.033
0.50	0.005	0.007	0.008	0.011	0.014	0.019	0.024	0.031	0.041
0.63	0.007	0.009	0.012	0.015	0.020	0.026	0.034	0.044	0.057
0.80	0.010	0.013	0.016	0.020	0.024	0.031	0.038	0.048	0.060
1.00	0.020	0.024	0.029	0.035	0.041	0.050	0.060	0.072	0.086
1.50	0.030	0.035	0.040	0.046	0.052	0.060	0.069	0.080	0.092
2.00	0.040	0.046	0.053	0.061	0.070	0.080	0.093	0.106	0.122

☒ with external cooling
■ with internal cooling

Drill Ø mm	Feed column no. for art. no. 86400/86401/86408/86412 56	57	58	59	60	61	62	63	64	65	66	67	68
	f (mm/rev.)												
0.80	0.008	0.016	0.024	0.032	0.04	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09
1.00	0.012	0.022	0.032	0.042	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12
1.50	0.021	0.036	0.051	0.066	0.09	0.10	0.12	0.13	0.15	0.15	0.16	0.17	0.18
2.00	0.032	0.052	0.072	0.092	0.12	0.14	0.16	0.18	0.20	0.21	0.22	0.23	0.24
2.50	0.045	0.070	0.095	0.120	0.15	0.17	0.20	0.22	0.25	0.26	0.27	0.28	0.30
3.00	0.060	0.090	0.120	0.150	0.18	0.21	0.24	0.27	0.30	0.31	0.33	0.34	0.36

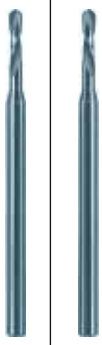
STOP

All drilling tools from 8xD must be guided during spot drilling. They must never operate at full speed without support in the machine shop

Material	Material example *Figures in bold = material no. to DIN EN 10 027*	Tens. strength MPa N/mm²	Hard-ness
Common structural steels	**1.0035** S185, **1.0486** StE P275N, **1.0345** P235GH, **1.0425** P265GH **1.0050** E295, **1.0070** E360, **1.8937** P500NH	≤500 >500-850	
Free-cutting steels	**1.0718** 11SMnPb30, **1.0736** 115Mn37 **1.0727** 46 S20, **1.0728** 60 S20, **1.0757** 46SPb20	≤850 850-1000	
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E **1.0503** C45, **1.1191** C45E **1.0601** C60, **1.1221** C60E	≤ 700 700-850 850-1000	
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4 **1.5710** 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	850-1000 1000-1200	
Unalloyed case hardened steels	**1.0301** C10, **1.1121** C10E	≤750	
Alloyed case hardened steels	**1.7043** 38Cr4 **1.5752** 14NiCr14, **1.7131** 16MnCr5, **1.7264** 20CrMo5	850-1000 1000-1200	
Nitriding steels	**1.8504** 34CrAl6 **1.8519** 31CrMoV9, **1.8550** 34CrAlNi7	≥850-1000 1000-1200	
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9 **1.2080** X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤850 850-1000	
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** 61CrV4	≥650-1000	
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4		≤330 HB
Stainless steels, sulphured austenitic martensitic	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18 9 **1.4301** X5CrNi18 10, **1.4541** X6CrNiTi18 10, **1.4571** X6CrNiMoTi 17 12 2 **1.4057** X17CrNi16-1, **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18 2	≤850 ≤850 ≤850	
Hardened steels	–		≤40-48 HRC >48-60 HRC
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200	
Cast iron	EN-GJL-100 ... EN-GJL-200 (bisher GG10 ... GG20) EN-GJL-250 ... EN-GJL-350 (bisher GG25 ... GG45)		≤240 HB <300 HB
Spheroidal graphite and malleable cast iron	EN-GJMW-350-4, EN-GJMB-550-4, EN-GJS-500-7 (bisher GTW35, GTS55, GGG50) EN-GJMB-700-2, EN-GJS-700-2 (bisher GTW65, GTS70, GGG70)		≤240 HB <300 HB
Chilled cast iron	–		≤350 HB
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2 **3.7154** TiAl6Zr5, **3.7164** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 850-1200	
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400	
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤450	
Al cast iron ≤ 10 % Si > 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9 **3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600	
Magnesium alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450	
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤400	
Brass, short-chipping long-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2 **2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600 ≤600	
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn **2.0790** CuNi18Zn19Pb	≤600 >600-850	
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10 **2.0980** CuAl11Ni, **2.1247** CuBe2	≤850 850-100	
Duroplastics Thermoplastics	Bakelit, Resopal, Pertinax, Moltopren Plexiglass, Hostalen, Novodur, Makralon		– –
Kevlar Glass, carbon concent. plastics	Kevlar GFK/CFK		– –

○ bright (A) AlTiN (T) TiN

Tool material	HSS-E-PM		HSS-E-PM	Solid carbide	Solid carbide	Solid carbide		Solid carbide	
Surface finish	◯		Ⓣ	◯	◯	Ⓐ		Ⓐ	
Cooling	☒		☒	☒	☒	☒		■	
Drilling depth					~ 10 x D	~ 4 x D	~ 7 x D	~ 8 x D	~ 15 x D
Article no.	**87011**	**87016**	**84810**	**89281**	**89286**	**86400**	**86401**	**86408**	**86412**







v_c m/min	Feed column no.		v_c m/min	Feed column no.		v_c m/min	Feed column no.		v_c m/min	Feed column no.		v_c m/min	Feed column no.		v_c m/min	Feed column no.	
21	106		*27*	106		*50*	105					*90-120*	**64**	**62**	*90-120*	**58**	**58**
18	105		*23*	105		*35*	104					*90-110*	**64**	**62**	*90-110*	**58**	**58**
18	106		*23*	106		*50*	**105**					*90-120*	**64**	**62**	*90-120*	**59**	**59**
16	105		*21*	105		*45*	**104**					*80-100*	**63**	**61**	*80-100*	**59**	**59**
20	105		*26*	105		*45*	104					*80-110*	**64**	**62**	*80-110*	**58**	**58**
18	105		*23*	105		*35*	104					*80-110*	**64**	**62**	*80-110*	**58**	**58**
14	**104**		*18*	**104**		*30*	103					*80-100*	**63**	**61**	*80-100*	**58**	**58**
14	**104**		*18*	**104**		*30*	103					*80-100*	**63**	**61**	*80-100*	**58**	**58**
12	103		*16*	103								*60-80*	**62**	**60**	*60-80*	**58**	**58**
18	106		*23*	106		*50*	103					*90-110*	**63**	**61**	*90-110*	**57**	**57**
14	**104**		*18*	**104**		*40*	103					*70-100*	**63**	**61**	*70-100*	**58**	**58**
12	103		*16*	103								*60-80*	**62**	**60**	*60-80*	**58**	**58**
14	**104**		*18*	**104**		*25*	103					*60-80*	**62**	**60**	*60-80*	**57**	**57**
12	103		*16*	103								*50-70*	**62**	**60**	*50-70*	**57**	**57**
16	**104**		*20*	**104**		*25*	103					*40-60*	**62**	**60**	*40-60*	**58**	**58**
14	103		*18*	103								*40-60*	**62**	**60**	*40-60*	**58**	**58**
14	103		*18*	103								*40-60*	**57**	**57**	*40-60*	**57**	**57**
108	102		*10*	102		*20*	102					*40-60*	57	57	*40-60*	57	57
106	104		*108*	104		*25*	**103**					*30*	**57**	**57**	*60-80*	**57**	**57**
106	103		*108*	103		*25*	**102**					*15*	**56**	**56**	*60*	**56**	**56**
106	103		*108*	103		*25*	**102**					*30*	**57**	**57**	*60-80*	**57**	**57**
						15	104										
						15	**103**					*10*	56	56	*25*	56	56
26	106		*33*	106		*80*	**105**					*<150*	**68**	**66**	*<150*	**60**	**60**
22	**106**		*28*	**106**		*60*	**105**					*<140*	**68**	**66**	*<140*	**60**	**60**
18	106		*23*	106		*60*	105					*<140*	**68**	**66**	*<140*	**60**	**60**
22	**106**		*28*	**106**		*50*	**105**					*<130*	**67**	**65**	*<130*	**60**	**60**
						45	**104**					*15*	56	56	*35*	56	56
						25	**104**					*15*	56	56	*35*	56	56
						160	**107**					*60-80*	68	68	*60-80*	68	68
						150	**106**					*60-80*	68	68	*60-80*	68	68
26	107		*33*	107		*100*	**106**					*120-150*	59	59	*120-150*	59	59
18	106		*23*	106		*60*	**106**					*120-150*	59	59	*120-150*	59	59
75	106		*97*	106		*150*	**105**										
42	105		*53*	105		*50*	**105**										
						67	106										
22	105		*28*	105		*44*	104										
22	104		*28*	104		*68*	103										
18	104		*23*	104		*49*	103										
13	104		*16*	104		*53*	103										
			14	104		*36*	103										
16	104		*20*	104		*50*	103		*50*	**104**							
18	104		*23*	104		*36*	103		*40*	**103**							
						60	104		*80*	**103**							

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