



# HARTNER

Precision Cutting Tools

## Micro Precision Drills

HSS-E-PM / Solid Carbide

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New: Solid carbide  
micro precision drills with  
IC up to 15 x D  
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2011





# HARTNER

## Micro precision drills

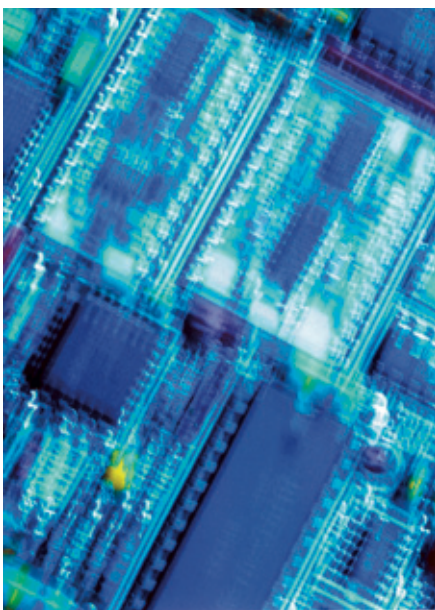
### Hartner HSCO and Solid Carbide Micro Drills – Precision starting from Diameter 0.05 mm

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.





### 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 and 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 and 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 and 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. 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 and 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 fiberglass 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

ⓧ TiN





## 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.

### 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.

**NEW**  
now with IC for 8xD  
and 15xD

### 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 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!



## 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 flute 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 flute 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 flute 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 flute 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



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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
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
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

Ⓣ 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
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





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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
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

● 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				
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







## 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	●	





## 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	●





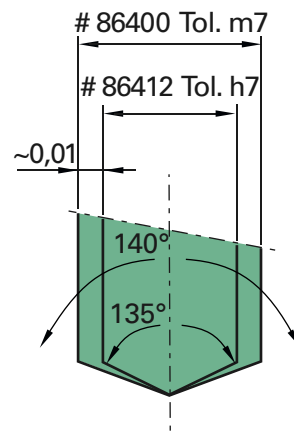


## Solid carbide micro precision drills

### Application recommendations for Hartner solid carbide micro precision drills

#### Pilot drilling

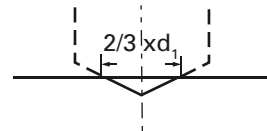
For the application of solid carbide micro precision drills 15xD we recommend a pilot hole 1xD up to 2xD depth. For this pilot hole, the solid carbide micro precision drill 4xD is optimally suitable. Its point angle and its diameter tolerance are perfectly adapted.



#### 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  $2/3 \times D$ .



#### 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.



**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



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

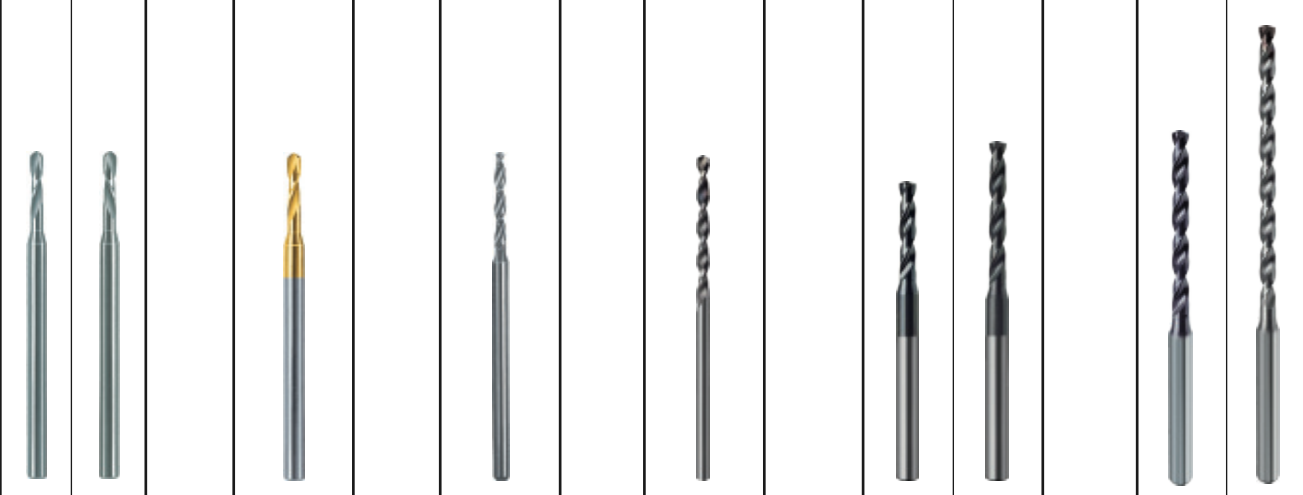
Material	Material example <i>Figures in bold = material no. to DIN EN 10 027</i>	Tens. strength MPa N/mm <sup>2</sup>	Hard- ness
Common structural steels	<b>1.0035</b> S185, <b>1.0486</b> StE P275N, <b>1.0345</b> P235GH, <b>1.0425</b> P265GH <b>1.0050</b> E295, <b>1.0070</b> E360, <b>1.8937</b> P500NH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

○ bright

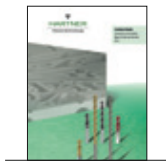
Ⓐ AITiN

Ⓙ TiN



Tool material	HSS-E-PM		HSS-E-PM		Solid carbide		Solid carbide		Solid carbide		Solid carbide			
	Surface finish		Surface finish		Surface finish		Surface finish		Surface finish		Surface finish			
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 <sub>c</sub> m/min	Feed column no.		V <sub>c</sub> m/min	Feed column no.		V <sub>c</sub> m/min	Feed column no.		V <sub>c</sub> m/min	Feed column no.		V <sub>c</sub> 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		30	103		80-100	63	61	80-100	58	58
18	106		23	106		50	103		80-80	62	60	80-80	58	58
14	104		18	104		40	103		90-110	63	61	90-110	57	57
12	103		16	103		25	103		70-100	63	61	70-100	58	58
14	104		18	104		25	103		60-80	62	60	60-80	58	58
12	103		16	103		25	103		60-80	62	60	60-80	57	57
16	104		20	104		20	102		50-70	62	60	50-70	57	57
14	103		18	103		25	103		40-60	62	60	40-60	58	58
14	103		18	103		25	103		40-60	62	60	40-60	58	58
108	102		10	102		15	104		40-60	57	57	40-60	57	57
106	104		108	104		15	103		40-60	57	57	40-60	57	57
106	103		108	103		25	102		30	57	57	60-80	57	57
106	103		108	103		25	102		15	56	56	60	56	56
						15	104		30	57	57	60-80	57	57
						15	103							
26	106		33	106		80	105		10	56	56	25	56	56
22	106		28	106		60	105		<150	68	66	<150	60	60
18	106		23	106		60	105		<140	68	66	<140	60	60
22	106		28	106		50	105		<140	68	66	<140	60	60
						50	105		<130	67	65	<130	60	60
						45	104							
						25	104							
						160	107							
						150	106		15	56	56	35	56	56
26	107		33	107		100	106		15	56	56	35	56	56
18	106		23	106		60	106		60-80	68	68	60-80	68	68
75	106		97	106		150	105		60-80	68	68	60-80	68	68
42	105		53	105		50	105		120-150	59	59	120-150	59	59
						67	106		120-150	59	59	120-150	59	59
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							
18	104		23	104		36	103		50	104				
						60	104		40	103				
									80	103				

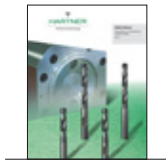
## Our programme:



FU 500/FN500



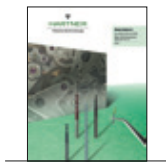
Gun Drills



INOX Drills



Multiplex



Micro Precision Drills



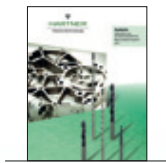
Multiplex HPC



TS-Drills



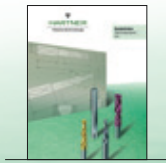
Standard Range



Highlights



TM Vending Machines



Special Drills



Solid Carbide  
High Performance Milling Cutters

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