

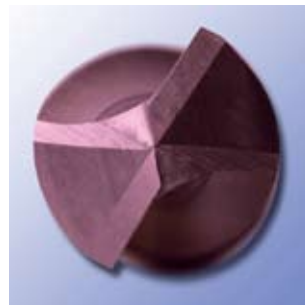
GUHRING



Hard machining

Powerful tools for special applications

- hard profile cutters
- multi teeth end mills
- twist drills
- taps



Extremely hard tools

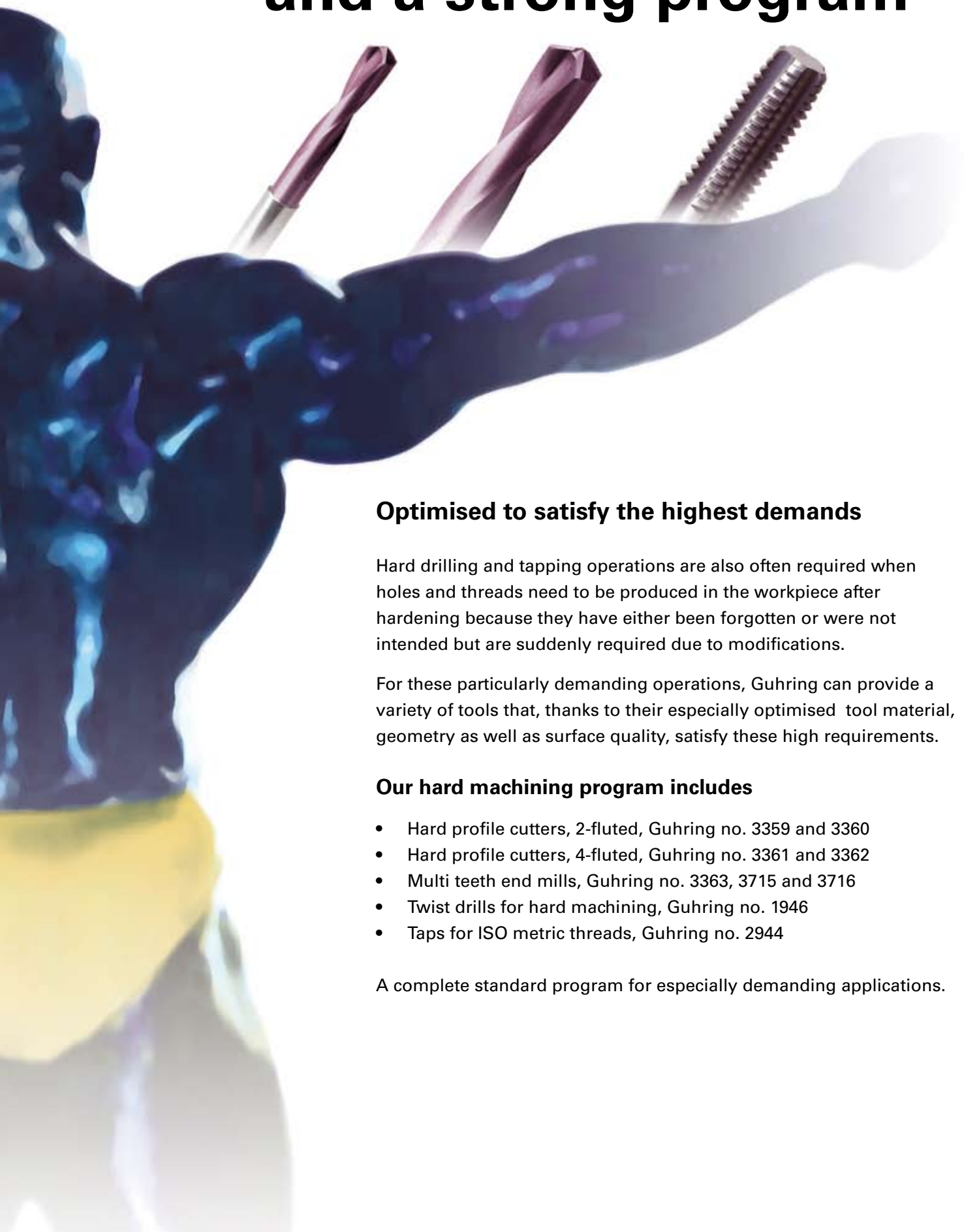


Your cost advantage for the production

Hard machining is the machining of hardened materials possessing a hardness of 54 to 62 HRC (Rockwell). The classic operation in hard machining is milling. Special HSC milling strategies and the high surface quality achievable with hard milling eliminate distortion problems from heat treatment, the unclamping and reclamping of the workpiece as well as in many cases any expensive polishing operations – and therefore time and money.

Cost and time reduction is also the main reason for the request for tools for drilling and tapping in hardened steels. When holes and threads are produced in the yet unhardened steel, the workpiece requires clamping and unclamping twice: First the workpiece is clamped to drill and tap the unhardened steel. It is then unclamped to be hardened and clamped again to then be, irrespective of the distortion problem, finish machined through, for example, hard milling. Thanks to the application of drills and taps specifically for hard machining the unclamping and re-clamping operation following the first machining cycle can be dispensed with – a considerable cost advantage for the production!

and a strong program



Optimised to satisfy the highest demands

Hard drilling and tapping operations are also often required when holes and threads need to be produced in the workpiece after hardening because they have either been forgotten or were not intended but are suddenly required due to modifications.

For these particularly demanding operations, Guhring can provide a variety of tools that, thanks to their especially optimised tool material, geometry as well as surface quality, satisfy these high requirements.

Our hard machining program includes

- Hard profile cutters, 2-fluted, Guhring no. 3359 and 3360
- Hard profile cutters, 4-fluted, Guhring no. 3361 and 3362
- Multi teeth end mills, Guhring no. 3363, 3715 and 3716
- Twist drills for hard machining, Guhring no. 1946
- Taps for ISO metric threads, Guhring no. 2944

A complete standard program for especially demanding applications.

Carbide and coating -

The ideal tool material: Carbide

Every Guhring hard machining tool is produced in a special carbide, optimised to satisfy the special demands of the material. These carbide grades possess extreme hardness, compression resistance, temperature stability and toughness.

They optimally withstand the high dynamic and thermal load that occurs during hard machining and at the same time absorb the mechanical impact load that also occurs.

Thanks to our own carbide production, located in Berlin, Guhring is in the position to combine the comprehensive know-how in the production of tools with the knowledge in the production of carbide. The result is tool materials that are perfectly optimised for the individual machining tasks and achieve optimal results regarding tool life, cutting speed and surface qualities.

Optimised performance: Thanks to the ideal coating

Combined with an efficient coating, the carbide tool material is transformed into an even more efficient tool. The FIRE-coat, developed by Guhring, provides milling cutters with the necessary heat-resistance and toughness required for hard machining operations .

With the TiAlN-coating Guhring takes account to the special requirements of hard drilling.

The Guhring hard tap is provided with a TiCN-coat that again offers a very high hardness and toughness and achieves excellent results in thread cutting.

As with carbide, Guhring relies heavily on its inhouse R & D and knowledge regarding coating. The coating division, in constant co-operation with tool manufacturers and tool material specialists, develops coatings that are also optimally adapted to the different machining tasks.

High-tech: The production of carbide rods.



- an unbeatable team



Under stress: The machine

Hard machining is not only extremely demanding on tools. In addition, the machines must also satisfy the highest demands regarding rigidity and damping capacity in order to achieve the required cutting rates and precision. Especially hard milling operations are performed under high speed (HSC) or high performance (HPC) conditions. Therefore, suitably optimised machines should be applied for hard machining in order to utilise the full potential of the tools.



HSC/HPC: Maximum performance demanded from machine and tool.

Efficient: Modern Sinter-HIP-furnaces in the carbide production.



Know-how: The coating process for Guhring tools.



Optimal tools for hard milling operations

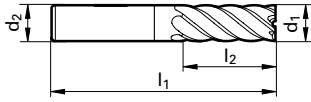

Guhring's hard milling cutters offer optimal conditions for the time and cost efficient machining of hardened workpieces. The different geometries are optimally adapted for the varying milling operations, as is the DK500UF carbide, offering high hardness and extremely high toughness.

Thus, for example in fine finishing operations with drilling depths up to 4xD, hard milling cutters achieve highest surface qualities and contour accuracy. In addition, milling cutters with full or corner radii are optimally suited for roughing or finishing operations in the 3D-HSC machining of dies and moulds!

FIRE-coated, they achieve an optimal tool life with high machining performance.

Solid carbide multi teeth end mill Fine finishing in materials >50-62 HRC

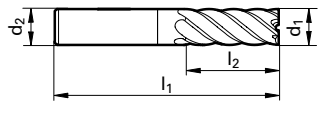

Tool material	DK 500 UF					
Surface finish	F					
Discount group	106					
Guhring no.	3715					
Type	H					
DIN	Std.					
Shank form	HA					
Length	long					
Helix angle	55°					
Tolerance	h10					

d1	d2	l1	l2	Z	Code no.	Availability
3	6	57	8	6	3.000	40.50
4	6	57	11		4.000	38.50
5	6	57	13		5.000	36.50
6	6	57	13		6.000	36.50
8	8	63	19		8.000	42.00
10	10	72	22		10.000	72.00
12	12	83	26		12.000	98.00
14	14	83	26		14.000	128.00
14	16	92	32		14.001	173.00
16	16	92	32	6	16.000	173.00
18	18	92	32	8	18.000	193.00
18	20	104	38		18.001	248.00
20	20	104	38	8	20.000	248.00

Solid carbide multi teeth end mill Fine finishing in materials >50-62 HRC

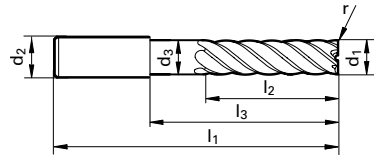

Tool material	DK 500 UF					
Surface finish	F					
Discount group	106					
Guhring no.	3716					
Type	H					
DIN	Std.					
Shank form	HA					
Length	extra long					
Helix angle	55°					
Tolerance	h10					

d1	d2	l1	l2	Z	Availability
6	6	75	30	6	42.50
8	8	100	40		48.50
10	10	100	40		82.00
12	12	150	45		115.00
16	16	150	65	6	216.00
20	20	150	65	8	318.00

Solid carbide multi teeth end mill Fine finishing in materials >50-62 HRC

Tool material	DK 500 UF							
Surface finish	F							
Discount group	106							
Guhring no.	3363							
Type	H							
DIN	Std.							
Shank form	HA							
Length	extra long							
Helix angle	55°							
Tolerance	h10							

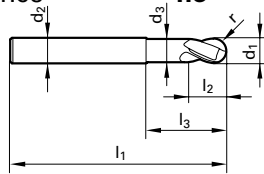
with corner radius

d1	d2	d3	l1	l2	l3	Z	r	Availability
6	6	5.7	75	13	39	6	0.5	35.50
8	8	7.7	100	19	64		0.5	41.50
10	10	9.5	100	22	60		0.5	73.00
12	12	11.5	150	26	105		1.0	102.00
16	16	15.5	150	32	102	6	1.0	182.00

Solid carbide hard profile cutter (2-fluted) with corner radius and cutting to centre

Tool material	DK 500 UF
Surface finish	F
Discount group	106
Guhring no.	3359

Type **H**
 DIN **Std.**
 Shank form **HA**
 Length **long**
 Helix angle **30°**
 Tolerance **h8**

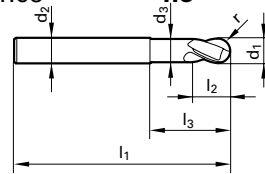


d ₁	d ₂	d ₃	l ₁	l ₃	l ₂	r	Availability
0.5	3	0.4	38	10	0.75	0.25	36.00
0.8	3	0.7	38	10	1.20	0.40	36.00
1	3	0.9	38	10	1.50	0.50	34.00
1.5	3	1.4	38	10	2.25	0.75	33.00
2	6	1.9	57	21	3.00	1.00	33.00
3	6	2.7	57	21	5.00	1.50	34.00
4	6	3.7	57	21	6.00	2.00	35.00
5	6	4.7	57	21	8.00	2.50	35.00
6	6	5.7	57	21	9.00	3.00	36.00
8	8	7.7	63	27	12.00	4.00	45.00
10	10	9.5	72	32	15.00	5.00	61.00
12	12	11.5	83	38	18.00	6.00	82.00
16	16	15.5	92	44	24.00	8.00	138.00

Solid carbide hard profile cutter (2-fluted) with corner radius and cutting to centre

Tool material	DK 500 UF
Surface finish	F
Discount group	106
Guhring no.	3360

Type **H**
 DIN **Std.**
 Shank form **HA**
 Length **extra long**
 Helix angle **30°**
 Tolerance **h8**

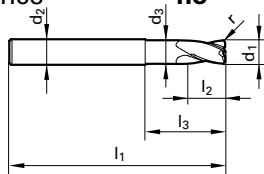


d ₁	d ₂	d ₃	l ₁	l ₃	l ₂	r	Availability
3	6	2.7	75	39	5	1.5	54.00
4	6	3.7	75	39	6	2.0	60.00
5	6	4.7	75	39	8	2.5	62.00
6	6	5.7	75	39	9	3.0	66.00
8	8	7.7	100	64	12	4.0	80.00
10	10	9.5	100	60	15	5.0	104.00
12	12	11.5	150	105	18	6.0	156.00
16	16	15.5	150	102	24	8.0	240.00

Solid carbide hard profile cutter (4-fluted) with corner radius and cutting to centre

Tool material	DK 500 UF
Surface finish	F
Discount group	106
Guhring no.	3361

Type **H**
 DIN **Std.**
 Shank form **HA**
 Length **long**
 Helix angle **30°**
 Tolerance **h8**

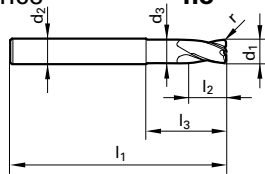


d ₁	d ₂	d ₃	l ₁	l ₃	l ₂	r	Availability
3	6	2.7	57	21	5	0.5	35.50
4	6	3.7	57	21	6	0.5	36.00
5	6	4.7	57	21	8	0.5	36.00
6	6	5.7	57	21	9	1.0	39.00
8	8	7.7	63	27	12	1.0	48.50
10	10	9.5	72	32	15	1.5	66.00
12	12	11.5	83	38	18	1.5	89.00
16	16	15.5	92	44	24	2.0	148.00

Solid carbide hard profile cutter (4-fluted) with corner radius and cutting to centre

Tool material	DK 500 UF
Surface finish	F
Discount group	106
Guhring no.	3362

Type **H**
 DIN **Std.**
 Shank form **HA**
 Length **extra long**
 Helix angle **30°**
 Tolerance **h8**

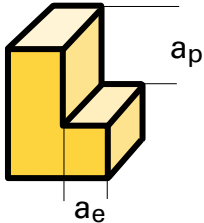


d ₁	d ₂	d ₃	l ₁	l ₃	l ₂	r	Availability
6	6	5.7	75	39	9	1.0	71.00
8	8	7.7	100	64	12	1.0	87.00
10	10	9.5	100	60	15	1.5	112.00
12	12	11.5	150	105	18	1.5	167.00
16	16	15.5	150	102	24	2.0	260.00

Application recommendations

Tools with **bold** feed column nos. are preferred choice.

a_e = cutting width
 a_p = cutting depth



Cutter- Ø mm	Feed column no.															
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	f_z (mm/tooth)															
2.00	0.001	0.001	0.001	0.002	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.018	0.020
3.00	0.002	0.002	0.003	0.003	0.004	0.007	0.010	0.010	0.010	0.015	0.016	0.013	0.019	0.022	0.024	0.030
5.00	0.005	0.006	0.007	0.009	0.010	0.014	0.020	0.020	0.022	0.025	0.026	0.026	0.028	0.030	0.032	0.038
6.00	0.006	0.008	0.009	0.011	0.013	0.017	0.024	0.025	0.027	0.031	0.029	0.033	0.039	0.036	0.041	0.047
8.00	0.010	0.012	0.014	0.016	0.019	0.024	0.032	0.032	0.035	0.042	0.042	0.047	0.053	0.052	0.058	0.064
10.00	0.013	0.015	0.018	0.021	0.025	0.030	0.038	0.039	0.044	0.050	0.053	0.059	0.065	0.066	0.073	0.080
12.50	0.016	0.018	0.022	0.026	0.030	0.036	0.046	0.048	0.052	0.059	0.063	0.072	0.079	0.085	0.090	0.100
16.00	0.020	0.023	0.027	0.032	0.038	0.045	0.054	0.058	0.063	0.071	0.079	0.088	0.095	0.100	0.110	0.120
20.00	0.023	0.028	0.033	0.038	0.045	0.057	0.066	0.073	0.080	0.090	0.097	0.100	0.110	0.120	0.130	0.140










Tool material
 Standard
 Type
 Guhring no.

Coolant
 ● soluble oil
 ● oil
 ○ air

Feed/
 application

$a_p = 0.5 \times D$	$a_p = 1.5 \times D$		
$a_e = 0.05 \times D$	$a_e = 0.05 \times D$		
v_c m/min	Feed column no.	v_c m/min	Feed column no.
153 - 187	48	153 - 187	47
126 - 154	46	126 - 154	45
94 - 116	47	94 - 116	46
94 - 116	46	94 - 116	45
49 - 61	44	49 - 61	43
40 - 50	41	40 - 50	40
220 - 270	48	220 - 270	47
202 - 248	47	202 - 248	46
180 - 220	48	180 - 220	47
157 - 193	47	157 - 193	46
99 - 121	47	99 - 121	46
-	-	-	2 x D = 75%

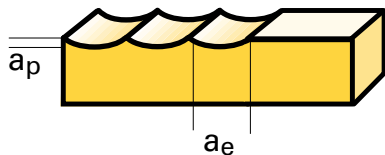
Material group	Material examples	Tensile strength N/mm ²	Hard- ness	Cool- ant
Common structural steels	1.0035 S185, 1.0486 P275N, 1.0345 P235GH, 1.0425 P265GH 1.0050 E295, 1.0070 E360, 1.8937 P500NH	≤500 >500-850		● ●
Free-cutting steels	1.0718 11SMnPb30, 1.0736 11SMn37 1.0727 46 S20, 1.0728 60 S20, 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 15NiCr13, 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 S 6-5-3	≥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 X20CrNi17-2, 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	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB <300 HB		● ○
Spheroidal graphite and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤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	≤850 850-1000		● ●
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		○
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		○
		a_p with f_z - correction		

DK 500 UF		DK 500 UF						DK 500 UF			
6527		WN						WN			
H		H						H			
3715		3363						3716			
											
$a_p = 0.5 \times D$  $a_e = 0.02 \times D$		$a_p = 1.5 \times D$  $a_e = 0.02 \times D$		$a_p = 1.5 \times D$  $a_e = 0.05 \times D$		$a_p = 1.5 \times D$  $a_e = 0.02 \times D$		$a_p = 3 \times D$  $a_e = 0.04 \times D$		$a_p = 4 \times D$  $a_e = 0.03 \times D$	
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.
214 - 262	48	214 - 262	47	153 - 187	46	198 - 244	46	153 - 187	44		
176 - 216	46	176 - 216	45	126 - 154	44	163 - 201	44	126 - 154	42		
132 - 162	47	132 - 162	46	94 - 116	45	122 - 151	45	94 - 116	43	75 - 93	41
132 - 162	47	132 - 162	46	94 - 116	44	137 - 168	44	94 - 116	42	75 - 93	40
76 - 94	44	76 - 94	43	49 - 61	42	64 - 79	42	49 - 61	40	39 - 49	38
62 - 77	42	62 - 77	41	40 - 50	39	58 - 72	40	40 - 50	37	32 - 40	35
308 - 378	48	308 - 378	47	220 - 270	46	286 - 351	46	220 - 270	44	176 - 216	42
283 - 347	47	283 - 347	46	202 - 248	45	263 - 322	45	202 - 248	43	162 - 198	41
252 - 308	48	252 - 308	47	180 - 220	46	234 - 286	46	180 - 220	44	144 - 176	42
220 - 270	47	220 - 270	46	157 - 193	45	204 - 251	45	157 - 193	43	126 - 154	41
138 - 170	48	138 - 170	47	99 - 121	45	143 - 176	46	99 - 121	43	79 - 97	41
		2 x D = 75%		2 x D = 75%		2 x D = 75%		4 x D = 50%			

Application recommendations

Tools with **bold** feed column nos. are preferred choice.

a_e = cutting width
 a_p = cutting depth



Tool material
 Standard
 Type
 Guhring no.

DK500 UF						
WN						
H						
3359						


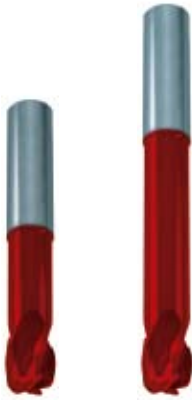


Feed/
application

Coolant
 soluble oil
 oil
 air

Material group	Material examples	Tensile strength N/mm ²	Hard- ness	Cool- ant
Common structural steels	1.0035 S185, 1.0486 P275N, 1.0345 P235GH, 1.0425 P265GH 1.0050 E295, 1.0070 E360, 1.8937 P500NH	≤500 >500-850		<input type="radio"/> <input type="radio"/>
Free-cutting steels	1.0718 11SMnPb30, 1.0736 11SMn37 1.0727 46 S20, 1.0728 60 S20, 1.0757 46SPb20	≤850 850-1000		<input type="radio"/> <input type="radio"/>
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		<input type="radio"/> <input type="radio"/> <input type="radio"/>
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		<input type="radio"/> <input type="radio"/>
Unalloyed case hardened steels	1.0301 C10, 1.1121 C10E	≤750		<input type="radio"/>
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850-1000 1000-1200		<input checked="" type="radio"/> <input checked="" type="radio"/>
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850-1000 1000-1200		<input type="radio"/> <input checked="" type="radio"/>
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		<input type="radio"/> <input checked="" type="radio"/>
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥650-1000		<input checked="" type="radio"/>
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4	≤330 HB		<input checked="" type="radio"/>
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 X20CrNi17-2, 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18 2	≤850 ≤850 ≤850		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Hardened steels	-	≤40-48 HRC >48-56 HRC >56-60 HRC		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200 ≤240 HB		<input checked="" type="radio"/>
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	<300 HB ≤240 HB		<input type="radio"/> <input type="radio"/>
Spheroidal graphite and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	<300 HB ≤350 HB		<input type="radio"/> <input type="radio"/>
Chilled cast iron	-			<input type="radio"/>
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		<input checked="" type="radio"/> <input checked="" type="radio"/>
Aluminium and Al-alloys	3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		<input type="radio"/>
Al-wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1,5	≤450		<input type="radio"/>
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		<input type="radio"/> <input type="radio"/>
Magnesium-alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450		<input type="radio"/>
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤400		<input type="radio"/>
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		<input type="radio"/> <input type="radio"/>
Bronze, short-chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn 2.0790 CuNi18Zn19Pb	≤600 >600-850		<input type="radio"/> <input checked="" type="radio"/>
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 850-1000		<input checked="" type="radio"/> <input checked="" type="radio"/>
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren			<input type="radio"/>
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon			<input type="radio"/> <input type="radio"/>

Roughing							
Ø	4	6	8	10	12	16	
eff. Ø	1.74	2.99	4.21	5.27	6.63	9.33	
a_p (mm)	0.20	0.40	0.60	0.75	1.00	1.50	
a_e (mm)	0.30	0.50	0.75	1.00	1.50	2.50	
v_c m/min	fz	fz	fz	fz	fz	fz	fz
250-500	0.04	0.06	0.08	0.1	0.15	0.2	
150-250	0.04	0.06	0.08	0.1	0.13	0.15	
100-200	0.03	0.05	0.06	0.08	0.1	0.12	
200-400	0.04	0.06	0.08	0.1	0.13	0.15	
150-300	0.03	0.05	0.06	0.08	0.1	0.15	
100-200	0.02	0.04	0.05	0.08	0.1	0.12	
200-400	0.06	0.1	0.15	0.2	0.25	0.3	
200-400	0.05	0.08	0.1	0.15	0.2	0.25	
150-350	0.05	0.08	0.1	0.12	0.15	0.2	
150-300	0.04	0.06	0.08	0.1	0.12	0.15	
100-200	0.03	0.05	0.08	0.1	0.12	0.15	
300-500	0.06	0.1	0.15	0.2	0.25	0.3	
200-400	0.05	0.08	0.12	0.15	0.2	0.3	
200-350	0.04	0.06	0.1	0.12	0.15	0.2	

DK500 UF							DK500 UF					DK500 UF											
WN							WN					WN											
H							H					H											
3360							3361					3362											
																							
Finishing							Roughing					Finishing											
Ø	4		6		8		10		12		16		Ø	6		8		10		12		16	
	eff. Ø	ap (mm)	ae (mm)	Vc (m/min)	fz	ap (mm)	ae (mm)	Vc (m/min)	fz	ap (mm)	ae (mm)	Vc (m/min)		fz	ap (mm)	ae (mm)	Vc (m/min)	fz	ap (mm)	ae (mm)	Vc (m/min)	fz	
	1.25	0.10	0.07										2.99	0.40	3.50								
	1.81	0.14	0.10										4.21	0.60	5.50								
	2.24	0.16	0.15										5.27	0.75	6.50								
	2.66	0.18	0.20										6.63	1.00	8.50								
	3.07	0.20	0.25										9.33	1.50	11.50								
	3.97	0.25	0.30																				
400-600	0.04	0.06	0.08	0.1	0.15	0.2	250-500	0.05	0.06	0.07	0.08	0.1	400-600	0.05	0.06	0.07	0.08	0.1					
250-400	0.04	0.06	0.08	0.1	0.13	0.15	150-250	0.04	0.05	0.06	0.07	0.08	250-400	0.04	0.05	0.06	0.07	0.08					
200-300	0.03	0.05	0.06	0.08	0.1	0.12	100-200	0.02	0.03	0.04	0.05	0.06	200-300	0.02	0.03	0.04	0.05	0.06					
350-550	0.04	0.06	0.08	0.1	0.13	0.15	200-400	0.05	0.06	0.07	0.08	0.1	350-550	0.05	0.06	0.07	0.08	0.1					
250-380	0.03	0.05	0.06	0.08	0.1	0.15	150-300	0.04	0.05	0.06	0.07	0.08	250-380	0.04	0.05	0.06	0.07	0.08					
130-250	0.02	0.04	0.05	0.08	0.1	0.12	100-200	0.02	0.03	0.04	0.05	0.06	130-250	0.02	0.03	0.04	0.05	0.06					
300-500	0.06	0.1	0.15	0.2	0.25	0.3	200-400	0.06	0.08	0.1	0.12	0.15	300-500	0.06	0.08	0.1	0.12	0.15					
300-500	0.05	0.08	0.1	0.15	0.2	0.25	200-400	0.06	0.08	0.1	0.12	0.15	300-500	0.06	0.08	0.1	0.12	0.15					
250-400	0.05	0.08	0.1	0.12	0.15	0.2	150-350	0.05	0.06	0.07	0.08	0.1	250-400	0.05	0.06	0.07	0.08	0.1					
200-350	0.04	0.06	0.08	0.1	0.12	0.15	150-300	0.04	0.05	0.06	0.07	0.08	200-350	0.04	0.05	0.06	0.07	0.08					
150-300	0.03	0.05	0.08	0.1	0.12	0.15	100-200	0.02	0.03	0.04	0.05	0.06	150-300	0.02	0.03	0.04	0.05	0.06					
350-600	0.06	0.1	0.15	0.2	0.25	0.3	300-500	0.06	0.08	0.1	0.12	0.15	350-600	0.06	0.08	0.1	0.12	0.15					
200-500	0.05	0.08	0.12	0.15	0.2	0.3	200-400	0.06	0.08	0.1	0.12	0.15	200-500	0.06	0.08	0.1	0.12	0.15					
200-400	0.04	0.06	0.1	0.12	0.15	0.2	200-350	0.05	0.06	0.07	0.08	0.1	200-400	0.05	0.06	0.07	0.08	0.1					

Solid carbide drills for efficient hard machining

Guhring's new hard drill enables the efficient and process reliable production of holes in hardened steels up to 62 HRC. Convex cutting edges give the tool its extremely high rigidity and ensure an optimal chip fracture. The flute profile is optimised for hard machining and evacuates the swarf safely from the hole.

The Guhring hard drill is available as a standard tool with straight shank to DIN 6535 form HA in the diameter range from 3.0 to 12.0 mm.



Solid carbide twist drill for hard machining to DIN 6537 short

		DK 460 UF			
Tool material		TiAlN			
Surface finish		102			
Guhring no.		1946			
Type	H (15°)				
Shank	DIN 6535				
Shank form	HA				
Point geometry	4-facet point grind				
Tolerance	m7				
d1	d2	l1	l2	l3	Availability
3.0	6.0	62	20	36	42.00
3.4		62	20		42.00
4.0		66	24		51.00
4.3			24		53.00
5.0			28		57.00
5.1					62.00
6.0	6.0	66	28		77.00
6.9	8.0	79	34		97.00
8.0	8.0	79	41	36	99.00
8.6	10.0	89	47	40	127.00
10.0	10.0	89	47	40	151.00
10.4	12.0	102	55	45	164.00
12.0	12.0	102	55	45	188.00

Application recommendations

Tools with **bold** feed column nos. are preferred choice.

Tool material
Carbide grade
Standard
Surface finish
Type
Guhring no.

DK 460 UF
K
6537
TiAlN
H
1946



Drill-Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
0,50	0,004	0,006	0,007	0,008	0,010	0,012	0,014	0,016	0,019
1,00	0,006	0,008	0,012	0,014	0,016	0,018	0,020	0,023	0,025
2,00	0,020	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125
2,50	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
3,15	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200
4,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
5,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
6,30	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
8,00	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400
10,00	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
12,50	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
16,00	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
20,00	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800
25,00	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
31,50	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000
40,00	0,200	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250
50,00	0,250	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600
63,00	0,315	0,400	0,500	0,630	0,800	1,000	1,250	1,600	2,000
80,00	0,400	0,500	0,630	0,800	1,000	1,250	1,600	2,000	

Coolant
 soluble oil
 oil
 air

Material group	Material examples	Tensile strength N/mm ²	Hard- ness	Cool- ant	v _c m/min	Feed column no.
Common structural steels	1.0035 S185, 1.0486 P275N, 1.0345 P235GH, 1.0425 P265GH 1.0050 E295, 1.0070 E360, 1.8937 P500NH	≤500 >500-850		<input type="radio"/> <input type="radio"/>		
Free-cutting steels	1.0718 11SMnPb30, 1.0736 11SMn37 1.0727 46 S20, 1.0728 60 S20, 1.0757 46SPb20	≤850 850-1000		<input type="radio"/> <input type="radio"/>		
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		<input type="radio"/> <input type="radio"/> <input type="radio"/>		
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		<input type="radio"/> <input checked="" type="radio"/>	80	6
Unalloyed case hardened steels	1.0301 C10, 1.1121 C10E	≤750		<input type="radio"/>		
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850-1000 1000-1200		<input checked="" type="radio"/> <input type="radio"/>	65	4
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850-1000 1000-1200		<input type="radio"/> <input checked="" type="radio"/>	80	4
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		<input type="radio"/> <input checked="" type="radio"/>		
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥650-1000		<input type="radio"/>		
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4	≤330 HB		<input checked="" type="radio"/>		
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 X20CrNi17-2, 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18 2	≤850 ≤850 ≤850		<input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/>		
Hardened steels	-	≤40-48 HRC >48-60 HRC		<input checked="" type="radio"/> <input checked="" type="radio"/>	40 30	2 1
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		<input type="radio"/>		
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB <300 HB		<input checked="" type="radio"/> <input checked="" type="radio"/>	90 80	8 8
Spheroidal graphite and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤240 HB <300 HB		<input checked="" type="radio"/> <input checked="" type="radio"/>	80 70	8 7
Chilled cast iron	-	≤350 HB		<input checked="" type="radio"/>	30	2
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		<input checked="" type="radio"/>		
Aluminium and Al-alloys	3.0255 Al99,5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		<input type="radio"/>		
Al-wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1,5	≤450		<input type="radio"/>		
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		<input type="radio"/> <input type="radio"/>		
Magnesium-alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450		<input type="radio"/>		
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤400		<input type="radio"/>		
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		<input type="radio"/> <input type="radio"/>		
Bronze, short-chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn 2.0790 CuNi18Zn19Pb	≤600 >600-850		<input type="radio"/> <input checked="" type="radio"/>		
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 850-1000		<input checked="" type="radio"/> <input checked="" type="radio"/>		
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		<input type="radio"/>		
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		<input type="radio"/>		

Hard tapping

Thread production under extremely hard conditions


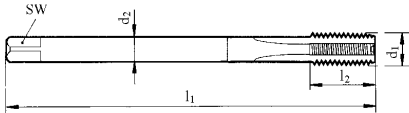
With the Guhring tap, Guhring no. 2944, extremely accurate internal threads can be produced cost-efficiently in hardened materials up to 62 HRC. The tool is suitable for tapping through holes as well as blind holes.

The perfect synthesis of a specially developed carbide, a tool geometry optimised specifically for the application as well as the optimal hard coating for the required operations enable the difficult hard machining process with cutting speeds up to a maximum of 2 m/min.

The Guhring machine tap for hard machining is available as a standard tool for ISO-metric threads M3 to M12 for thread depths $\leq 1.5 \times D$ with tolerance zone 6HX. The shank is to Guhring standard, similar to DIN 371. Further dimensions or thread types respectively are available on request.



Solid carbide machine taps for hard machining for ISO-metric threads

		Solid carbide						
Tool material		C TiCN						
Surface finish		103						
Guhring no.		2944						
Type	H							
Standard	Guhring std. sim. to DIN 371							
Form	D							
Tolerance zone	ISO 2 / 6H							
								
d ₁	p	d ₂	SW	d ₃ *	d ₄ *	l ₁	l ₂	Availability
M3	0.50	3.5	2.7	2.50	2.60	56	12	166.00
M4	0.70	4.5	3.4	3.30	3.40	63	14	158.00
M5	0.80	6.0	4.9	4.20	4.30	70	17	182.00
M6	1.00	6.0	4.9	5.00	5.10	80	20	220.00
M8	1.25	8.0	6.2	6.80	6.90	90	20	260.00
M10	1.50	10.0	8.0	8.50	8.60	100	24	324.00
M12	1.75	12.0	9.0	10.20	10.40	110	28	362.00

Application:
Thread production in housing.



*d₃ = Tapping hole size to DIN; d₄ = These special tapping hole sizes are optimized for hard machining.

GM 300

The Modular Tooling System

- to ISO 12164, DIN 69 893 and DIN 69871
- for transfer lines, machining and turning centres



Guhring's milling and drilling tools for hard machining with HA shank and the GM 300 tooling system are the ideal complementary partners for cost-efficient and highly precise production:

- Both ranges perfectly satisfy the demands from machining centres, flexible production systems as well as transfer lines and therefore, in combination with each other, achieve optimal results.
- The Guhring tools for hard machining as well as the GM 300 system are specially optimised to satisfy the current trends in production techniques and are ideally suited for high speed machining (HSC), dry machining as well as quasi dry machining (minimal lubrication technology, dry HSC).
- The high precision offered by the GM 300 tool holders supports the efficiency and precision provided by the hard machining tools.

GUHRING

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www.guehring.de

OUR PRODUCT RANGE:

1. DRILLING TOOLS IN HIGH SPEED STEEL AND CARBIDE

Twist drills
Ratio drills
Micro-precision drills
Oil feed drills
Subland drills
Centre drills
Core drills
Gun drills
Drilling systems with interchangeable inserts

2. THREAD CUTTING TOOLS IN HIGH SPEED STEEL AND CARBIDE

Machine taps and fluteless taps
Oil feed taps and oil feed fluteless taps
Hand taps
Thread milling cutters
Dies

3. MILLING CUTTERS IN HIGH SPEED STEEL AND CARBIDE

Ratio end mills
Slot drills
End mills
Radius profile cutters
Hard profile cutters
Diesinking cutters

4. REAMING TOOLS IN HIGH SPEED STEEL AND CARBIDE

NC machine chucking reamers
Machine and machine chucking reamers
Taper pin reamers
Hand reamers

5. COUNTERSINKING TOOLS IN HIGH SPEED STEEL AND CARBIDE

Countersinks, counterbores and spot facers
Short counterbores, back spot facers
De-burring tools

6. CUTTING TOOLS IN ULTRA-HARD MATERIALS

Face milling cutter PF 1000
Cermet and ceramic tools
PCD- and PCB-tipped tools

7. COATED TOOLS

A-tools, TiAlN-coated
SuperA-tools, AlTiN-coated
C-tools, TiCN-coated
F-tools, FIRE-coated (allround)
P-tools, AlCrNN-coated
S-tools, TiN-coated (allround)
M-tools, MolyGlide-coated

8. MODULAR TOOLING SYSTEMS

TOOLING SYSTEM GM 300

Tool holders, clamping systems and accessories to ISO 12164, DIN 69893 and DIN 69871 for transfer lines, machining and turning centres

FLEXIBLE TOOLING SYSTEM GE 100

a tooling system for the combined machining operations facing, chamfering, boring, centering etc.

ISO INDEXABLE INSERTS, SHORT CLAMPING HOLDERS AND KV 400 CARTRIDGES

9. Special Tools

to sketch or drawing, the more complex, the better

10. CARBIDES FOR PRECISION CUTTING TOOLS

11. CARBIDE SPECIAL PARTS FOR THE FORMING, MACHINING AND WEAR PROTECTION INDUSTRY

Cold heading dies, ribbed rolls, dies, mandrels, drawing dies, gear cutters, etc.

12. TOOL RESTORATION SERVICE

Re-grinding, re-coating, tool management



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