

Application recommendations for Solid carbide twist drills

Tools with **bold** feed column no. are preferred choice.

General hints:

For safety reasons it is very important, that a drill does not exceed a speed of $n = 6\,000$ rev./min when not supported. The centrifugal forces could break these long tools before reaching the workpiece surface!

Pilot holes are always necessary for drilling depths over 7xD-, 10xD- and 12xD:

1.) The pilot hole can be produced with a short, rigid drill. The diameter should be 0.01 - 0.02 mm larger than the diameter of the Ratio drill. Drilling depth $\geq 1 \times D$.

2.) Alternatively, the Ratio Drills can produce their own pilot hole. Cutting speed and feed rate must therefore be reduced by 30-40%.

A coolant pressure of 40 bar is recommended.

drill dia. mm	Feed column nos.								
	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	0.160
4.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
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	0.315
10.00	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
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	0.630
25.00	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800
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	0.310	0.400	0.500	0.630	0.800	1.000	1.250	1.250
63.00	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600
80.00	0.400	0.500	0.630	0.800	1.000	1.250	1.600	2.000	2.000

with coolant ducts

bright

FIRE-coated

UF Ultra fine grain

* Cutting lip corrected to appr. 10°

Coolant

soluble oil

oil

air

$\leq 3 \times D$ drilling depth

Tool material	Sol. carb.
Carbide grade	K10/K20
Carbide description	Carbide
Surface finish	○
Type	N
Coolant ducts	-

Article no.	Form HA, plain shank	
	DIN 6537	
	Form HE, whistle notch	
	DIN 6539	89235
Hartner std.		

Tool material	Sol. carb.
Carbide grade	K/P
Carbide description	Carbide-UF
Surface finish	●
Type	TS 100 U
Coolant ducts	□

89410	
89415	



Material group	Material examples, new description (old description in brackets) Figures in bold = material no. to DIN EN	Tensile str. MPa (N/mm²)	Hard- ness	Cool- ant	V _c m/min	Feed column no.	V _c m/min	Feed column no.
Common structural steels	1.0035 S185(S133), 1.0486 P275N(StE285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937 P500NH (WStE500)	≤500 >500-850		○	80 70	4 4	145 120	7 6
Free-cutting steels	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000		○	80 70	5 4	170 145	8 8
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000		○	80 70 60	4 4 4	130 125 120	8 7 7
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		○	60	4	120 105	7 7
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750		○	80	5	145	8
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13 (15NiCr13), 1.7131 16MnCr5, 1.7264 20CrMo5	850-1000 1000-1200		●	60	4	120 85	7 5
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850-1000 1000-1200		○	50	4	110 105	7 5
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		○	50	3	80 65	6 5
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 (51CrV4)	≤330 HB		●	25	2	60	3
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305	≤850		●	25	4	60	5
	1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi	≤850		●	25	3	55	5
	1.4057 X20CrNi 17 2 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤850		●	25	3	45	5
Hardened steels	-	≤40-48 HRC >48-60 HRC		●	20	3	55 35	3 2
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●	15	2	35	4
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		○	90 80	4 4	195 160	9 9
	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35)	≤240 HB		○	80	4	140	9
	0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤300 HB		○	70	4	130	8
Chilled cast iron	-	≤350 HB		○			40	3
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5, - TiAl8Mo1V1	≤850 850-1200		●	20 15	3 2	45 40	4 3
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		○	200	7	310	9
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450		○	200	7	310	9
Al cast alloys ≤ 10 % Si > 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		○	150	6	260	9
	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○	120	6	220	9
	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05 G-MgAl6Zn1	≤450		○	180	5	280	8
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnNb	≤400		○	80	5	125	7
Brass, short-chipping long-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600		○	180	5*	325	8
	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600		○	180	5*	220	7
	2.1090 CuSn7ZnNb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600		○	120	5	125	7
Bronze, short-chipping	2.0790 CuNi18Zn19Pb	>600-850		●	120	5	105	6
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤850		●	70	4	90	6
	2.0980 CuAl11Ni, 2.1247 CuBe2	850-1000		●	50	3	80	6
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		○	50	4		
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		○	40	3		
Kevlar	Kevlar	-		○				
Glass, carbon concent. plastics	GFK/CFK	-		○	80	3		

th

≤ **5xD** drilling depth

≤ **7xD** ≤ **10xD** ≤ **12xD**

Sol. carb.		Sol. carb.		Sol. carb.		Sol. carb.		Sol. carb.		Sol. carb.		Sol. carb.		Sol. carbide	
K/P		K10/K20		K/P		K/P		K		K/P		K		K/P	
Carbide-UF		Carbide		Carbide-UF		Carbide-UF		Carbide-UF		Carbide-UF		Carbide-UF		Carbide-UF	
															
TS 100 U		N		TS 100 U		TS 100 U		TS 3 G		TS 100 U		TS 150 GG		TS 100 U	
-		-				-		-							
89413				89411		89414		89247		89412					
89402				89408		89417				89416					
		89244										89293		89418	
															
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.	V _c m/min	Feed column no.	V _c m/min	Feed column no.
130	7	80	4	145	7	130	7			145	6			90	6
110	6	70	4	120	6	110	6			120	5			80	5
145	8	80	5	170	8	145	8			170	7			100	7
110	7	70	4	145	8	110	7			145	7			90	7
120	7	80	4	130	8	120	7			130	7			90	7
110	7	70	4	125	7	110	7			125	6			80	6
105	7	60	4	120	7	105	7			120	6			80	6
105	7	60	4	120	7	105	7			120	6			80	6
100	6			105	7	100	6			105	6			60	6
130	8	80	5	145	8	130	8			145	7			90	7
120	7	60	4	120	7	120	7			120	6			80	6
85	5			85	5	85	5			85	4			60	4
100	6	50	4	110	7	100	6			110	6			60	6
90	5			105	5	90	5			105	4			50	4
65	6	50	3	80	6	65	6			80	5			50	5
55	5			65	5	55	5			65	4			40	4
				60	5					60	4			35	4
45	3	25	2			45	3			60	2			35	2
55	4	25	4	60	5	55	4			60	4			40	4
45	4	25	3	55	5	45	4			55	4			40	4
45	3	25	3	45	5	45	3			45	4			40	4
45	3	20	3	55	3	45	3			55	2				
25	2			35	2	25	2			35	1				
25	4	15	2	35	4	25	4			35	3				
210	8	90	4	210	9	195	8	100	6	210	8	120	6	120	8
155	8	80	4	160	9	155	8	80	6	180	8	100	6	120	8
155	7	70	4	140	9	145	7	80	6	160	8	90	6	90	8
125	7	80	4	130	8	125	7	70	6	130	7	80	6	80	7
35	3			40	3	35	3			40	2	40	2		
40	4	20	3	45	4	40	4			40	3				
35	3	15	2	40	3	35	3			40	2				
260	9	200	7	310	9	260	9	180	7	310	8	410	8	150	8
260	9	200	7	310	9	260	9	160	7	310	8	410	8	150	8
220	9	150	6	260	9	220	8	150	7	260	8	380	8	150	8
180	8	120	6	220	9	170	8	120	6	220	8	330	8	120	8
260	8	180	5	280	8	260	8	180	6	280	7			150	7
105	7	80	5*	125	7	105	7			125	6			80	6
270	8	180	5*	325	8	270	8	180	6	325	7	280	7	120	7
180	7	180	5*	220	7	180	7			220	6			120	6
105	6	120	5	125	7	105	6			125	6	110	6	40	6
85	6	120	5	105	6	85	6			105	5	80	5		
80	5	70	4	90	6	80	5			90	5			40	5
60	5	50	3	80	6	60	5			80	5				
		50	4												
		40	3												
		80	3												