

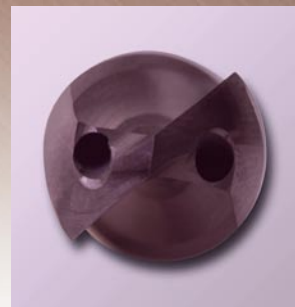
GUHRING



RT 100 R

**The new Ratio drill
with patented point grind**

- for the machining of CGI and ADI
- for top performance and cost efficiency



New materials require new tooling solutions. As the global leader in cutting tool innovation, Guhring thrives on every opportunity to “push the envelope” on tool performance or to tackle the newest, most difficult machining challenges. The increased use of CGI (compacted graphite iron) and ADI (austempered ductile iron) in the automotive and other industries certainly presents such a challenge. Our answer for CGI and ADI holemaking applications: our new RT 100 R.

High tensile strength materials are exceptionally demanding

CGI and ADI’s attractiveness stems from their high tensile strength combined with light weight. Regarding engine design, this offers the opportunity to increase engine

output while maintaining current engine block wall thickness. Alternatively, current engine output can be maintained while reducing engine block wall thickness and thereby decreasing engine weight.

The challenge is that these new materials are extremely hard and abrasive and, as such, are extremely difficult to machine. Conventional tools have failed to deliver satisfactory results in terms of machining speed, quality and tolerance; tool life; and, ultimately, cost efficiency.

To fill this void and provide a suitable holemaking solution for CGI and ADI and similar materials, Guhring developed the RT 100 R coolant-through carbide drill. Based on our popular RT 100 line, the new drill’s key features include:

- patented radius point geometry
- uniquely balanced face contour and flute profile,
- in-house developed, ultra wear-resistant DK 255 F carbide substrate, and
- GUHRING’s proprietary “super tough” FIREX® multilayer coating.

Powerful in common cast materials

The new radius point geometry offers more than machining of CGI and ADI, the new radius point is also a top choice for machining common cast materials, such as gray cast iron, spheroidal graphite iron and malleable cast iron.

Standard versus Special range

The RT 100 R is available as a stocked standard with coolant-through and FIREX® coating, in 5xD and 7xD lengths, and in many popular fractional inch and metric diameters from 3.00 mm to 20.00 mm. Alternatively, a RT 100 R can be custom-made with or without coolant through, with a different coating, in different lengths and diameters, and with multiple cutting diameters to perfectly match your specific application(s). Please see the RT 100 R Special Tool Request Form on page 7.

Our recommendation:



The RT 100 R drills are well-suited for machining with minimal quantity lubrication (MQL) systems. For more information, please contact our Technical Service Department.



Selected machining results with RT 100 R drills

Diameter	16	17
Coating	FIREX®	Super A™
Material	GGG50	GGG40
Drilling depth (mm)	20	50
Cooling	IC	IC
Lubricant	neat oil	soluble oil
v_c [m/min]	120	160
f [mm/rev.]	0.5	0.6
Tool life [m]	615	305

Top performer in key benchmark tests:

Best in tool wear and life

In technical third-party tests performed by the Technical University of Darmstadt (PTW Darmstadt – Darmstadt, Germany), the RT 100 R significantly outperformed all competitors in machining CGI, registering the lowest tool wear while scoring the highest tool life.

In the first test, tool wear was compared by measuring the cutting edge wear width of 5.00 mm diameter drills after they had machined 5,000 20 mm-deep holes for a total depth of 100 m. As shown in Diagram 1 below, the tool wear of the RT 100 R was only 0.196 mm, the lowest figure among the 7 tools tested.

As a key indicator of potential total tool life, outer corner wear was also measured (See Diagram 2). Even after 5,000 holes, the RT 100 R registered little corner wear, suggesting that the tool could be used to machine considerably more holes.

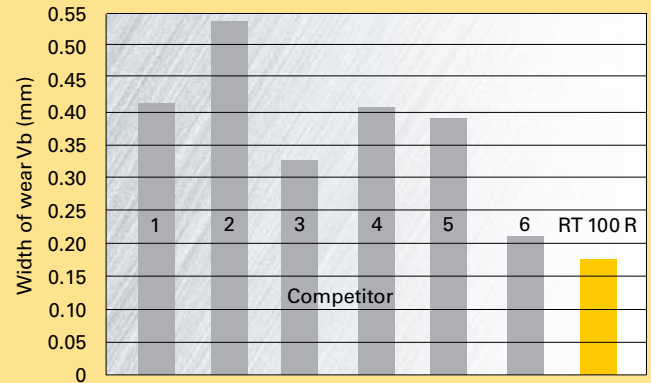
A second test was conducted to measure face wear and to confirm total tool life. For this test, the technicians selected

step drills with an inside cutting diameter of 14.50 mm and an outside diameter of 20.00 mm with a 45° chamfer at the step.

Based on the results of the first test, a total tool life of 120 m (approx. 1,715 holes at a depth of 70 mm per hole) was expected. Not only did the RT 100 R dominate the test, it was well on its way to doubling the pre-test predictions

when the test was called. At that point, the RT 100 R step drill had cut a total of 3,057 holes, or a total depth of 214 m (See Figure 3). It displayed a very even wear pattern, was the only tool whose coating was still intact at the leading land, and could have kept on producing more holes!

Diagram 1: Cutting edge wear width after drilling total depth of 100 m
workpiece material = GG V40
coolant pressure = 65 bar speed = 80 m/min feed = 0.20 mm/rev.
hole diameter = 5.00 mm hole depth = 20 mm no. of holes = 5,000



Development of outer corner wear VB in µm

Diagram 2: Outer corner wear after drilling total depth of 100 m

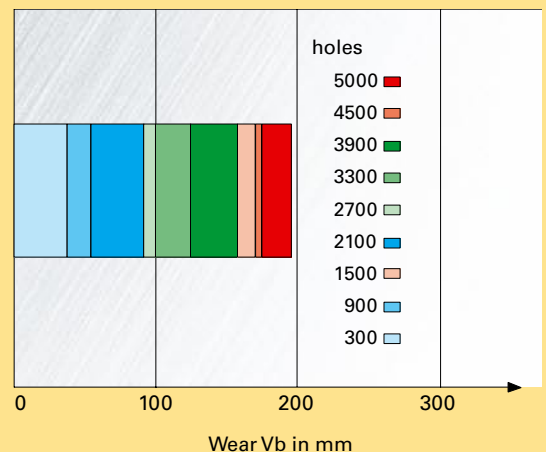
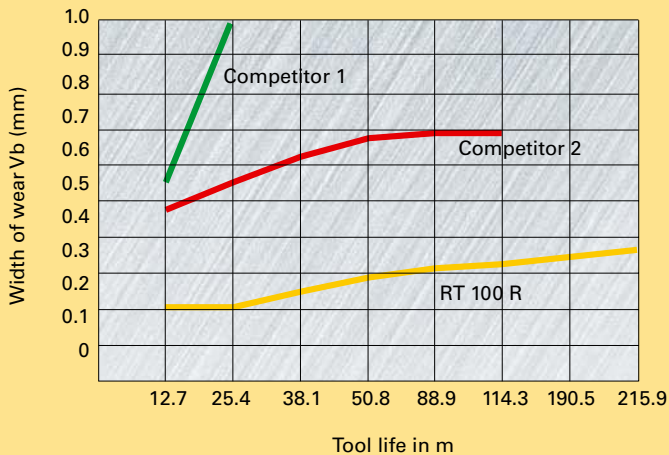


Diagram 3: Face wear and life

workpiece material = GG V40
coolant pressure = 50 bar speed = 70 m/min feed = 0.30 mm/rev.
hole diameters = 14.50 mm x 20.00 mm hole depth = 70 mm



RT 100 R for CGI and ADI

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

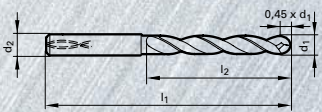
Guhring no.

6501

DIN 6537
Shank design **DIN 6535 HA**
Type **Ratio R**

Product information

- drilling depth – 5 x D
- righthand cutting
- patented radius point geometry
- 30° flute helix
- Cutting dia m7 tolerance



d1			mm	d2	mm	l1	mm	l2	mm
Dec in	Fract in	W/L							
0.1181			3.00	6.00	66	28			
0.1220			3.10						
0.1248	1/8		3.17						
0.1260			3.20						
0.1280			3.25						
0.1299			3.30						
0.1339			3.40						
0.1378			3.50						
0.1406	9/64	28	3.57						
0.1417			3.60						
0.1457			3.70		66	28			
0.1496		25	3.80		74	36			
0.1535			3.90						
0.1563	5/32		3.97						
0.1575			4.00						
0.1614			4.10						
0.1654			4.20						
0.1693		18	4.30						
0.1720	11/64		4.37						
0.1732			4.40						
0.1772		16	4.50						
0.1811			4.60						
0.1831			4.65						
0.1850		13	4.70		74	36			
0.1874	3/16		4.76		82	44			
0.1890		12	4.80						
0.1929			4.90						
0.1969			5.00						
0.2008			5.10						
0.2031	13/64		5.16						
0.2047			5.20						
0.2087			5.30						
0.2126			5.40						
0.2165			5.50						
0.2185			5.55						
0.2189	7/32		5.56						
0.2205			5.60						
0.2244			5.70						
0.2283			5.80	6.00	82	44			

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

Guhring no.

6501

d1				mm	d2	mm	l1	mm	l2	mm
Dec in	Fract in	W/L	mm							
0.2323			5.90							
0.2343	15/64		5.95							
0.2362			6.00	6.00	82	44				
0.2402			6.10	8.00	91	53				
0.2441			6.20							
0.2480			6.30							
0.2500	1/4	E	6.35							
0.2520			6.40							
0.2559			6.50							
0.2598			6.60							
0.2638			6.70							
0.2657	17/64	H	6.75							
0.2677			6.80							
0.2717		I	6.90							
0.2756			7.00							
0.2795			7.10							
0.2811	9/32	K	7.14							
0.2835			7.20							
0.2874			7.30							
0.2913			7.40							
0.2953			7.50							
0.2969	19/64		7.54							
0.2992			7.60							
0.3031			7.70							
0.3071			7.80							
0.3110			7.90							
0.3126	5/16		7.94							
0.3150			8.00	8.00	91	53				
0.3189			8.10	10.00	103	61				
0.3228		P	8.20							
0.3268			8.30							
0.3280	21/64		8.33							
0.3307			8.40							
0.3346			8.50							
0.3386			8.60							
0.3425			8.70							
0.3437	11/32		8.73							
0.3465			8.80							
0.3504			8.90							
0.3543			9.00							
0.3583			9.10							
0.3594	23/64		9.13							
0.3622			9.20							
0.3642			9.25							
0.3661			9.30							
0.3701			9.40							
0.3740			9.50							
0.3748	3/8		9.52							
0.3780			9.60							
0.3819			9.70							
0.3858		W	9.80							
0.3898			9.90							
0.3906	25/64		9.92							
0.3937			10.00	10.00	103	61				
0.3976			10.10	12.00	118	71				
0.4016			10.20							
0.4055			10.30							
0.4063	13/32		10.32							
0.4094			10.40							
0.4134			10.50							
0.4173			10.60							
0.4213			10.70							
0.4220	27/64		10.72							

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

Guhring no.

6501

d1				mm	d2	mm	l1	mm	l2	mm
Dec in	Fract in	W/L	mm							
0.4252			10.80							
0.4291			10.90							
0.4331			11.00							
0.4370			11.10							
0.4374	7/16		11.11							
0.4409			11.20							
0.4449			11.30							
0.4488			11.40							
0.4528			11.50							
0.4567			11.60							
0.4606			11.70							
0.4646			11.80							
0.4685			11.90							
0.4689	15/32		11.91							
0.4724			12.00	12.00	118	71				
0.4764			12.10	14.00	124	77				
0.4803			12.20							
0.4843	31/64		12.30							
0.4882			12.40							
0.4921			12.50							
0.4961			12.60							
0.5000	1/2		12.70							
0.5039			12.80							
0.5079			12.90							
0.5118			13.00							
0.5157	33/64		13.10							
0.5236			13.30							
0.5276			13.40							
0.5315			13.50							
0.5394			13.70							
0.5433			13.80							
0.5472			13.90							
0.5512			14.00	14.00	124	77				
0.5551			14.10	16.00	133	83				
0.5591			14.20							
0.5626	9/16		14.29							
0.5630			14.30							
0.5669			14.40							
0.5709			14.50							
0.5748			14.60							
0.5787			14.70							
0.5866			14.90							
0.5906			15.00							
0.5945			15.10							
0.5984			15.20							
0.6024			15.30							
0.6063			15.40							
0.6102			15.50							
0.6142			15.60							
0.6181			15.70							
0.6220			15.80							
0.6248	5/8		15.87							
0.6260			15.90							
0.6299			16.00	16.00	133	83				
0.6496			16.50	18.00	143	93				
0.6563	21/32		16.67							
0.6693			17.00							
0.6890			17.50							
0.7087			18.00	18.00	143	93				
0.7283			18.50	20.00	153	101				
0.7480			19.00							
0.7677			19.50							
0.7874			20.00	20.00	153	101				

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

Guhring no.

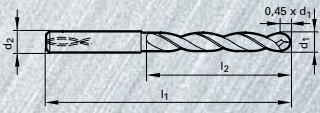
6502

DIN Guhring Std
Shank design **DIN 6535 HA**
Type **Ratio R**



Product information

- drilling depth – 7 x D
- righthand cutting
- patented radius point geometry
- 30° flute helix
- Cutting dia m7 tolerance



d ₁				d ₂	l ₁	l ₂
Dec in	Fract in	W/L	mm	mm	mm	mm
0.1575			4.00	6.00	75	38
0.1614			4.10			
0.1654			4.20		75	38
0.1693		18	4.30		85	45
0.1720	11/64		4.37			
0.1732			4.40			
0.1772		16	4.50			
0.1811			4.60			
0.1831			4.65			
0.1850		13	4.70		85	45
0.1874	3/16		4.76		90	50
0.1890		12	4.80			
0.1929			4.90			
0.1969			5.00			
0.2008			5.10			
0.2031	13/64		5.16			
0.2047			5.20			
0.2087			5.30		90	50
0.2126			5.40		97	57
0.2165			5.50			
0.2185			5.55			
0.2189	7/32		5.56			
0.2205			5.60			
0.2244			5.70			
0.2283			5.80			
0.2323			5.90			
0.2343	15/64		5.95			
0.2362			6.00	6.00	97	57
0.2402			6.10	8.00	106	66
0.2441			6.20			
0.2480			6.30			
0.2500	1/4	E	6.35			
0.2520			6.40			
0.2559			6.50			
0.2598			6.60			
0.2638			6.70			
0.2657	17/64	H	6.75			
0.2677			6.80		106	66
0.2717		I	6.90		116	76

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

Guhring no.

6502

d ₁				d ₂	l ₁	l ₂
Dec in	Fract in	W/L	mm	mm	mm	mm
0.2756			7.00			
0.2795			7.10			
0.2811	9/32	K	7.14			
0.2835			7.20			
0.2874			7.30			
0.2913			7.40			
0.2953			7.50			
0.2969	19/64		7.54			
0.2992			7.60			
0.3031			7.70			
0.3071			7.80			
0.3110			7.90			
0.3126	5/16		7.94			
0.3150			8.00	8.00	116	76
0.3189			8.10	10.00	131	87
0.3228		P	8.20			
0.3268			8.30			
0.3280	21/64		8.33			
0.3307			8.40			
0.3346			8.50			
0.3386			8.60			
0.3425			8.70			
0.3437	11/32		8.73			
0.3465			8.80			
0.3504			8.90			
0.3543			9.00		131	87
0.3583			9.10		139	95
0.3594	23/64		9.13			
0.3622			9.20			
0.3642			9.25			
0.3661			9.30			
0.3701			9.40			
0.3740			9.50			
0.3748	3/8		9.52			
0.3780			9.60			
0.3819			9.70			
0.3858		W	9.80			
0.3898			9.90			
0.3906	25/64		9.92			
0.3937			10.00	10.00	139	95
0.3976			10.10	12.00	155	106
0.4016			10.20			
0.4055			10.30			
0.4063	13/32		10.32			
0.4094			10.40			
0.4134			10.50			
0.4173			10.60			
0.4213			10.70			
0.4220	27/64		10.72			
0.4252			10.80			
0.4291			10.90			
0.4331			11.00		155	106
0.4370			11.10		163	114
0.4374	7/16		11.11			
0.4409			11.20			
0.4449			11.30			
0.4488			11.40			
0.4528			11.50			
0.4567			11.60			
0.4606			11.70			
0.4646			11.80			
0.4685			11.90			
0.4689	15/32		11.91			

Tool material
Carbide type
Carbide grade
Surface finish
Cooling

Solid Carbide
K20
DK 255 F
FIREX®
Internal

Guhring no.

6502

d ₁				d ₂	l ₁	l ₂
Dec in	Fract in	W/L	mm	mm	mm	mm
0.4724			12.00	12.00	163	114
0.4764			12.10	14.00	182	133
0.4803			12.20			
0.4843	31/64		12.30			
0.4882			12.40			
0.4921			12.50			
0.4961			12.60			
0.5000	1/2		12.70			
0.5039			12.80			
0.5079			12.90			
0.5118			13.00			
0.5157	33/64		13.10			
0.5236			13.30			
0.5276			13.40			
0.5315			13.50			
0.5394			13.70			
0.5433			13.80			
0.5472			13.90			
0.5512			14.00	14.00	182	133
0.5551			14.10	16.00	204	152
0.5591			14.20			
0.5626	9/16		14.29			
0.5630			14.30			
0.5669			14.40			
0.5709			14.50			
0.5748			14.60			
0.5787			14.70			
0.5866			14.90			
0.5906			15.00			
0.5945			15.10			
0.5984			15.20			
0.6024			15.30			
0.6063			15.40			
0.6102			15.50			
0.6142			15.60			
0.6181			15.70			
0.6220			15.80			
0.6248	5/8		15.87			
0.6260			15.90			
0.6299			16.00	16.00	204	152
0.6496			16.50	18.00	223	171
0.6563	21/32		16.67			
0.6693			17.00			
0.6890			17.50			
0.7087			18.00	18.00	223	171
0.7283			18.50	20.00	244	190
0.7480			19.00			
0.7677			19.50			
0.7874			20.00	20.00	244	190

Application recommendations

Prerequisites for the application of RT 150 GG/GN drills:

- Powerful machines
- No play in spindle bearings
- Alignment-accurate toolholders
(Hydraulic or shrinkfit chucks recommended)
- Max. concentricity error of clamped tools 0.02 mm
- High coolant pressure

Coolant hints:

We recommend lubrication by soluble or neat oil. Under special conditions, air cooling is possible, but cooling by Minimum Quantity Lubrication is preferred. For optimum performance, the tools should have conical end shanks and Guhring MQL components should be utilized. Please contact our technical service department for more information.



CONVERSIONS

$$\text{SFM} = \text{m/min.} \times 3.28$$

$$\text{IPR} = \text{mm/rev} \div 25.4$$

drill-Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
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

Tool material	Solid carbide	
Carbide grade	K20	
Surface finish	F	
Cooling	□	
Drilling depth	~ 5 x D	~ 7 x D

Guh. no.	DIN 6537	6501	
	Guhring std.		6502



Material	Material example Figures in bold = material no. to DIN EN 10 027	Tens. strength Hard- MPa (N/mm ²) ness	V _c m/min	Feed column no.	
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	-	≤40-60 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	210 160	9 9	8 8
New cast materials GGV	EN-GJV250 (GGV25), EN-GJV350 (GGV35) EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo 6		130 100	8 8	7 7
New cast materials ADI	EN-GJS-800-8 (ADI800), EN-GJS-1000-5 (ADI1000) EN-GJS-1200-2 (ADI1200), EN-GJS-1400-1 (ADI1400)	800-1000 1200-1400	80 60	8 8	7 7
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	160 130	9 8	8 7
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			
Aluminum 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	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2 2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600 >600-850			
Bronze, long-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2 2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤850 850-1000			

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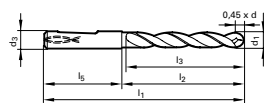
Customer no.	New customer
Company	
Street no.	
Telephone no.	
Date	

Order no.
Contact name
City, State & Postal code
Fax no.
Signature

Solid carbide Ratio drills RT 100 R

Carbide grade
K20

SINGLE DIAMETER



Relation of nom.-Ø d₁, shank-Ø d₃ and shank length l₅

nom.-Ø d ₁ min/max	4-6	>6-8	>8-10	>10-12	>12-14	>14-16	>16-18	>18-20
shank-Ø d ₃	6	8	10	12	14	16	18	20
shank length l ₅	36	40	45	48	50			

Nom.-Ø d ₁	4.0 – 20.0 mm
Shank-Ø d ₃ to DIN 6535	see table above
Shank design to DIN 6535	HA <input type="checkbox"/> , HE <input type="checkbox"/>
Drilling depth l ₃	max. 7 x D (run out min. 0.01-0.02)
Flute length l ₂	max. 155 mm
Total length l ₁	56 – 205 mm
Double margins	yes / no
Cooling	internal / external / soluble oil / minimal quantity lubrication / dry
Surface finish/coating	bright / FIRE X® / MolyGlide® / Super-A™
Workpiece material	
Quantity	

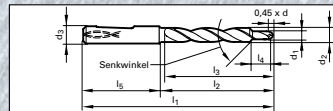
Range	Complete
4.0 – 20.0 mm	
see table above	
HA <input type="checkbox"/> , HE <input type="checkbox"/>	
max. 7 x D (run out min. 0.01-0.02)	
max. 155 mm	
56 – 205 mm	
yes / no	
internal / external / soluble oil / minimal quantity lubrication / dry	
bright / FIRE X® / MolyGlide® / Super-A™	

Standard tolerances: nom.-Ø = m7, shank-Ø = h6

Solid carbide Ratio drills RT 100 R

Carbide grade
K20

MULTIPLE DIAMETERS / STEP



Relation of nom.-Ø d₂, shank-Ø d₃ and shank length l₅

nom.-Ø d ₂ min/max	4-6	>6-8	>8-10	>10-12	>12-14	>14-16	>16-18	>18-20
shank-Ø d ₃	6	8	10	12	14	16	18	20
shank length l ₅	36	40	45	48	50			

Step-Ø d ₁	4.0 – 20.0 mm
Step-Ø d ₂	4.0 – 20.0 mm
Shank-Ø d ₃ to DIN 6535	see table above
Shank form to DIN 6535	HA <input type="checkbox"/> , HE <input type="checkbox"/>
Step length l ₄	5 – 100 mm
Drilling depth l ₃	max. 7 x D (run out min. 0.01-0.02)
Flute length l ₂	max. 155 mm
Total length l ₁	56 – 205 mm
Step angle	60° / 90° / 120° / 180°
Double margins	yes / no
Cooling	internal / external / soluble oil / min. quantity lubrication / dry
Surface finish/coating	bright / FIRE X® / MolyGlide® / Super-A™
Workpiece material	
Quantity	

Range	Complete
4.0 – 20.0 mm	
4.0 – 20.0 mm	
see table above	
HA <input type="checkbox"/> , HE <input type="checkbox"/>	
5 – 100 mm	
max. 7 x D (run out min. 0.01-0.02)	
max. 155 mm	
56 – 205 mm	
60° / 90° / 120° / 180°	
yes / no	
internal / external / soluble oil / min. quantity lubrication / dry	
bright / FIRE X® / MolyGlide® / Super-A™	

Standard tolerances: step-Ø d₁ = m7; body-Ø d₂ = h7; shank-Ø d₃ = h6

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in High Speed Steel and Carbide

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Ratio drills
Micro-precision drills
Oil feed drills
Subland drills
Center drills
Core drills
Gun drills
NC spot drills

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in High Speed Steel and Carbide

Hand taps
Machine taps and fluteless taps
Oil feed taps and oil feed fluteless 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

HSS and HSS-E reamers
Carbide reamers
Taper pin reamers
Hand reamers

5. Countersinking Tools

in High Speed Steel and Carbide

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Short counterbores
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in ultra-hard materials

Cermet and ceramic tools
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A-tools, TiAlN coated
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a tooling system for the combined machining operations facing, chamfering, boring, centering etc.

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with indexable inserts for roughing and finishing operations in complex workpieces

9. Special Tools

to sketch or drawing, the more complex, the better

10. Carbides

for precision cutting tools, for metal forming and punching tools

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Heading die inserts
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12. HSC Motor Spindles, Hydro expansion chucks, Shrinkfit chucks and systems

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Regrinding, recoating, tool management