



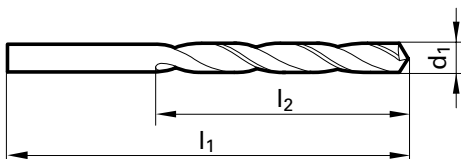
DRILLS
DRILLS

JOBBER DRILLS

HSS - HSCO - HSS-E-PM - CARBIDE

JOBBER DRILLS - HSS - HSCO - HSS-E-PM - CARBIDE

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance



205	9651	5523	5522	658	732	5517	2464
DIN 338					Guhring std.		
HSS	HSS	HSCO	HSS-E-PM	HSCO	Solid carbide		
N	N	N	GT - 100	GT - 100	N	N	N
rh							
h8	h8	h8	h8	h8	h7	h7	h7

d1		l1	l2
mm	Inch	mm	mm
5.900		93.00	57.00
5.950	15/64	93.00	57.00
6.000		93.00	57.00
6.100		101.00	63.00
6.200		101.00	63.00
6.300		101.00	63.00
6.350	1/4	101.00	63.00
6.400		101.00	63.00
6.500		101.00	63.00
6.600		101.00	63.00
6.700		101.00	63.00
6.750	17/64	109.00	69.00
6.800		109.00	69.00
6.900		109.00	69.00
7.000		109.00	69.00
7.100		109.00	69.00
7.140	9/32	109.00	69.00
7.200		109.00	69.00
7.300		109.00	69.00
7.400		109.00	69.00
7.500		109.00	69.00
7.540	19/64	117.00	75.00
7.600		117.00	75.00
7.700		117.00	75.00
7.800		117.00	75.00
7.900		117.00	75.00
7.940	5/16	117.00	75.00
8.000		117.00	75.00
8.100		117.00	75.00
8.200		117.00	75.00
8.300		117.00	75.00
8.330	21/64	117.00	75.00
8.400		117.00	75.00

AVAILABILITY

•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•

DRILLS

JOBBER DRILLS
HSS - HSCO - HSS-E-PM - CARBIDE

Guhring no.	
Standard	
Tool material	
Surface	
Type	
Cutting direction	
Tolerance	

d1		l1	l2
mm	Inch	mm	mm
8.500		117.00	75.00
8.600		125.00	81.00
8.700		125.00	81.00
8.730	11/32	125.00	81.00
8.800		125.00	81.00
8.900		125.00	81.00
9.000		125.00	81.00
9.100		125.00	81.00
9.130	23/64	125.00	81.00
9.200		125.00	81.00
9.300		125.00	81.00
9.400		125.00	81.00
9.500		125.00	81.00
9.520	3/8	133.00	87.00
9.600		133.00	87.00
9.700		133.00	87.00
9.800		133.00	87.00
9.900		133.00	87.00
9.920	25/64	133.00	87.00
10.000		133.00	87.00
10.100		133.00	87.00
10.200		133.00	87.00
10.300		133.00	87.00
10.320	13/32	133.00	87.00
10.400		133.00	87.00
10.500		133.00	87.00
10.600		133.00	87.00
10.700		142.00	94.00
10.720	27/64	142.00	94.00
10.800		142.00	94.00
10.900		142.00	94.00
11.000		142.00	94.00
11.100		142.00	94.00

205	9651	5523	5522	658	732	5517	2464
DIN 338					Guhring std.		
HSS	HSS	HSCO	HSS-E-PM	HSCO	Solid carbide		
>Ø 2,36							
N	N	N	GT - 100	GT - 100	N	N	N
rh							
h8	h8	h8	h8	h8	h7	h7	h7

AVAILABILITY							
•	•	•	•	•	•	•	
•	•	•		•	•		
•	•	•			•	•	
•	•	•	•	•	•		
•	•	•		•	•	•	
•	•	•		•	•		
•	•	•	•	•	•		
•	•	•		•	•	•	
•	•	•		•	•		
•	•	•	•	•	•		
•	•	•		•	•	•	
•	•	•		•	•		
•	•	•	•	•	•		
•	•	•		•	•	•	
•	•	•		•	•		
•	•	•		•	•		
•	•	•		•	•		
•	•	•	•	•	•		
•	•	•		•	•	•	
•	•	•		•	•		

JOBBER DRILLS HSS - HSCO - HSS-E-PM - CARBIDE

Guhring no.
 Standard
 Tool material
 Surface
 Type
 Cutting direction
 Tolerance

205	9651	5523	5522	658	732	5517	2464
DIN 338					Guhring std.		
HSS	HSS	HSCO	HSS-E-PM	HSCO	Solid carbide		
N	N	N	GT - 100	GT - 100	N	N	N
rh							
h8	h8	h8	h8	h8	h7	h7	h7

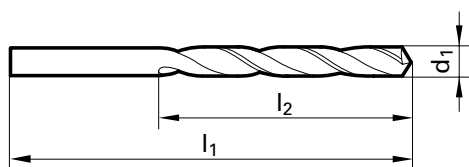
d1		l1	l2
mm	Inch		
11.110	7/16	142.00	94.00
11.200		142.00	94.00
11.300		142.00	94.00
11.400		142.00	94.00
11.500		142.00	94.00
11.510	29/64	142.00	94.00
11.600		142.00	94.00
11.700		142.00	94.00
11.800		142.00	94.00
11.900		151.00	101.00
11.910	15/32	151.00	101.00
12.000		151.00	101.00
12.100		151.00	101.00
12.200		151.00	101.00
12.300	31/64	151.00	101.00
12.400		151.00	101.00
12.500		151.00	101.00
12.600		151.00	101.00
12.700	1/2	151.00	101.00
12.800		151.00	101.00
12.900		151.00	101.00
13.000		151.00	101.00
13.500		160.00	108.00
14.000		160.00	108.00
14.290	9/16	169.00	114.00
14.500		169.00	114.00
15.000		169.00	114.00
15.200		178.00	120.00
15.500		178.00	120.00
16.000		178.00	120.00

AVAILABILITY

•	•		•	•		•	
•							
•							
•							
•	•	•	•			•	
•	•						
•							
•							
•							
•	•						
•	•	•	•	•			
•							
•	•	•	•	•			
•	•	•		•			
•							
•	•						
•	•						
•							
•							

LONG SERIES DRILLS TWIST DRILLS - HSS - HSCO

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction



217	5536	5537
DIN 340		
HSS	HSCO	HSCO
N	GU 500 DZ	GU 500 DZ
rh	rh	rh





d1		l1	l2
mm	Inch	mm	mm
1.000		56.00	33.00
1.500		70.00	45.00
2.000		85.00	56.00
2.500		95.00	62.00
2.700		100.00	66.00
2.800		100.00	66.00
3.000		100.00	66.00
3.170	1/8	106.00	69.00
3.300		106.00	69.00
3.400		112.00	73.00
3.500		112.00	73.00
3.570	9/64	112.00	73.00
3.800		119.00	78.00
3.900		119.00	78.00
3.970	5/32	119.00	78.00
4.000		119.00	78.00
4.200		119.00	78.00
4.300		126.00	82.00
4.370	11/64	126.00	82.00
4.500		126.00	82.00
4.700		126.00	82.00
4.760	3/16	132.00	87.00
4.800		132.00	87.00
4.900		132.00	87.00
5.000		132.00	87.00
5.100		132.00	87.00
5.160	13/64	132.00	87.00
5.200		132.00	87.00
5.300		132.00	87.00
5.400		139.00	91.00
5.500		139.00	91.00
5.560	7/32	139.00	91.00
5.700		139.00	91.00

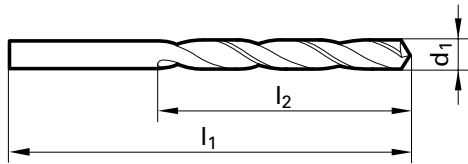
AVAILABILITY

•	○	○
•	○	○
•	•	○
•	•	○
•	•	○
•	•	○
•	•	○
•	•	○
•	•	○
•	•	○
•	•	○
○	•	○
•	•	○
•	•	○
•	•	○
•	•	○
○	•	○
○	•	○
•	•	○
•	•	○
•	•	○
•	•	○
○	•	○

• Australian stock item ○ German stock item

LONG SERIES DRILLS
TWIST DRILLS - HSS - HSCO

Gühring no.
Standard
Tool material
Surface
Type
Cutting direction



217	5536	5537
DIN 340		
HSS	HSCO	HSCO
N	GU 500 DZ	GU 500 DZ
rh	rh	rh

d1		l1	l2
mm	Inch		
5.800		139.00	91.00
5.950	15/64	139.00	91.00
6.000		139.00	91.00
6.300		148.00	97.00
6.350	1/4	148.00	97.00
6.500		148.00	97.00
6.700		148.00	97.00
6.750	17/64	156.00	102.00
6.800		156.00	102.00
6.900		156.00	102.00
7.000		156.00	102.00
7.200		156.00	102.00
7.500		156.00	102.00
7.540	19/64	165.00	109.00
7.940	5/16	165.00	109.00
8.000		165.00	109.00
8.100		165.00	109.00
8.500		165.00	109.00
8.700		175.00	115.00
8.730	11/32	175.00	115.00
9.000		175.00	115.00
9.500		175.00	115.00
9.520	3/8	184.00	121.00
9.700		184.00	121.00
9.800		184.00	121.00
9.900		184.00	121.00
10.000		184.00	121.00
10.200		184.00	121.00
10.300		184.00	121.00
10.500		184.00	121.00
11.000		195.00	128.00
11.500		195.00	128.00
12.000		205.00	134.00

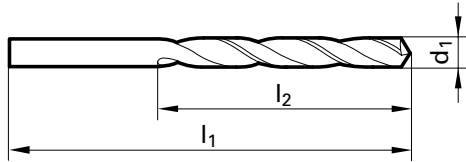
AVAILABILITY





•	•	○
•		
•	•	○
○		
•	•	○
○		
•	•	○
•		
○	•	○
•		
○	•	○
•		
○	•	○
•	•	○
•		
○	•	○
•	•	○
○		
○	•	○
•	•	○
•		
•	•	○
•		
•	•	○
•		
•	•	○
•		
•	•	○

• Australian stock item ○ German stock item

**LONG SERIES DRILLS
TWIST DRILLS - HSS - HSCO**

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction



217	5536	5537
DIN 340		
HSS	HSCO	HSCO
		
N	GU 500 DZ	GU 500 DZ
rh	rh	rh
		

d1		l1	l2
mm	Inch	mm	mm
12.500		205.00	134.00
12.700	1/2	205.00	134.00
13.000		205.00	134.00
13.500			
14.000			

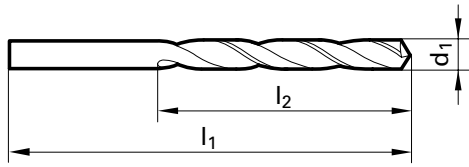
AVAILABILITY

•	•	◦
•	•	◦
•	•	◦
•	•	◦
•	•	◦

• Australian stock item ◦ German stock item

**LONG SERIES DRILLS
EXTRA LENGTH TWIST DRILLS - SERIES 1 - HSS - HSCO**

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction



502	618
DIN 1869	
HSS	HSCO
GT 100	GT 100
rh	rh

d1		l1	l2
mm	Inch	mm	mm
11.500		280.00	195.00
12.000		295.00	205.00
12.500		295.00	205.00
12.700	1/2	295.00	205.00
13.000		295.00	205.00

AVAILABILITY

•	
•	
•	
•	
•	

LONG SERIES DRILLS
EXTRA LENGTH TWIST DRILLS - SERIES 2 - HSS - HSCO

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction

d1		l1	l2
mm	Inch	mm	mm
2.000		160.00	110.00
3.000		190.00	130.00
3.170	1/8	200.00	135.00
3.500		210.00	145.00
3.570	9/64	210.00	145.00
3.970	5/32	220.00	150.00
4.000		220.00	150.00
4.370	11/64	235.00	160.00
4.760	3/16	245.00	170.00
5.000		245.00	170.00
5.160	13/64	245.00	170.00
5.500		260.00	180.00
6.000		260.00	180.00
6.350	1/4	275.00	190.00
6.500		275.00	190.00
7.000		290.00	200.00
7.140	9/32	290.00	200.00
7.500		290.00	200.00
7.940	5/16	305.00	210.00
8.000		305.00	210.00
8.330	21/64	305.00	210.00
8.730	11/32	320.00	220.00
9.000		320.00	220.00
9.520	3/8	340.00	235.00
10.000		340.00	235.00
10.720	27/64	365.00	250.00
11.000		365.00	250.00
11.110	7/16	365.00	250.00
12.000		375.00	260.00
12.700	1/2	375.00	260.00
13.000		375.00	260.00

503	619
DIN 1869	
HSS	HSCO
GT 100	GT 100
rh	rh

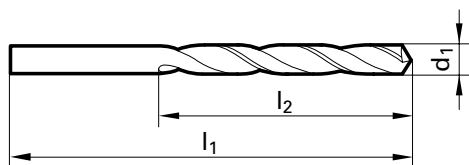
AVAILABILITY

•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	○

• Australian stock item ○ German stock item

LONG SERIES DRILLS EXTRA LENGTH TWIST DRILLS - SERIES 3 - HSS

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction



504

DIN 1869

HSS

GT 100

rh



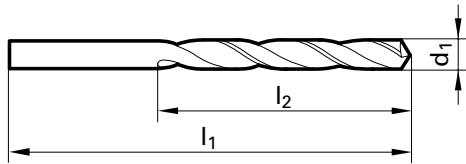
AVAILABILITY

d1		l1	l2
mm	Inch	mm	mm
3.000		240.00	160.00
3.170	1/8	250.00	170.00
3.500		265.00	180.00
3.970	5/32	280.00	190.00
4.000		280.00	190.00
4.370	11/64	295.00	200.00
4.760	3/16	315.00	210.00
5.000		315.00	210.00
5.500		330.00	225.00
6.000		330.00	225.00
6.350	1/4	350.00	235.00
6.500		350.00	235.00
6.750	17/64	370.00	250.00
7.000		370.00	250.00
7.140	9/32	370.00	250.00
7.500		370.00	250.00
7.940	5/16	390.00	265.00
8.000		390.00	265.00
8.330	21/64	390.00	265.00
8.730	11/32	410.00	280.00
9.000		410.00	280.00
9.520	3/8	430.00	295.00
10.000		430.00	295.00
10.320	13/32	430.00	295.00
10.500		430.00	295.00
11.000		455.00	310.00
11.110	7/16	455.00	310.00
12.000		480.00	330.00
13.000		480.00	330.00

•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•

**LONG SERIES DRILLS
EXTRA LENGTH TWIST DRILLS - HSS**

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction



242	243	244
Guhring std.		
HSS		
●	○	○
GT 100	GT 100	GT 100
rh	rh	rh

d1		l1	l2
mm	Inch	mm	mm
6.000		500.00	400.00
8.000		500.00	400.00
10.000		600.00	500.00
11.000		600.00	500.00
12.000		600.00	500.00
8.000		750.00	650.00
10.000		750.00	650.00
11.000		750.00	650.00
12.000		750.00	650.00
10.000		1000.00	850.00
11.000		1000.00	850.00
12.000		1000.00	850.00

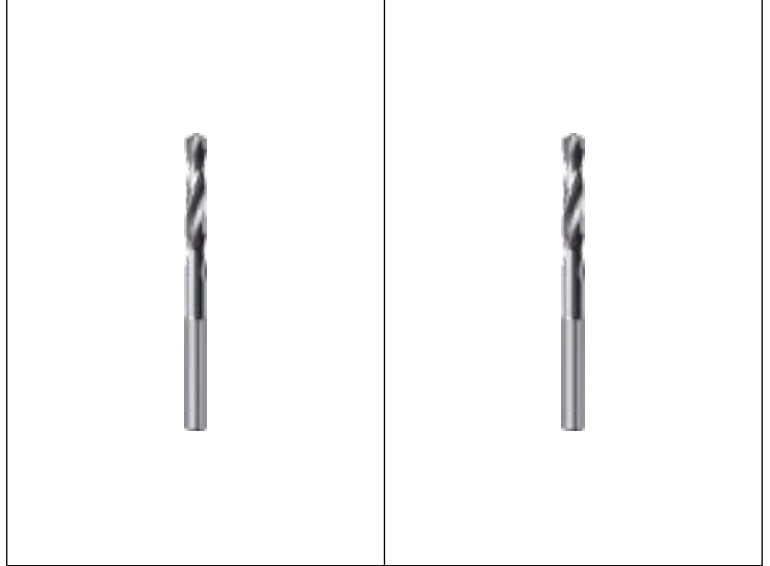
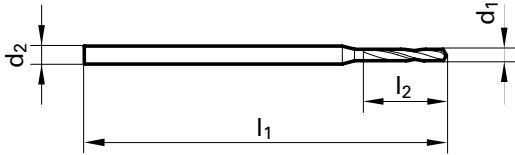
AVAILABILITY

•		
•		
•		
•		
•		
	•	
	•	
	•	
		•
		•
		•

MICRO-PRECISION DRILLS - HSS-E-PM - CARBIDE

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance

301	701
DIN 1899	Guhring std.
HSS-E-PM	Solid Carbide
○	○
N	N
rh	rh
0/-0,004	0/-0,004



d1	d2	l1	l2
mm	mm	mm	mm
0.100	1.00	25.00	0.50
0.180	1.00	25.00	1.10
0.200	1.00	25.00	1.50
0.300	1.00	25.00	1.90
0.400	1.00	25.00	3.00
0.500	1.00	25.00	3.40
0.600	1.00	25.00	3.90
0.700	1.00	25.00	4.20
0.800	1.50	25.00	5.30
0.900	1.50	25.00	6.00
1.000	1.50	25.00	6.80
1.100	1.50	25.00	7.60
1.200	1.50	25.00	8.50
1.300	1.50	25.00	8.50
1.400	1.50	25.00	9.50
1.500	2.00	30.00	9.50
1.600	2.00	30.00	10.60
1.700	2.00	30.00	10.60
1.800	2.00	30.00	11.80
1.900	2.00	30.00	11.80

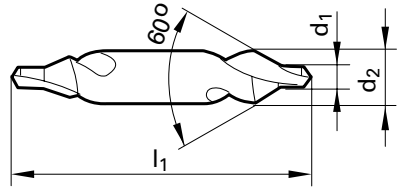
AVAILABILITY

•	
•	
•	○
•	○
•	○
•	○
•	○
•	○
•	○
•	
•	
•	
•	
•	
•	
•	
•	
•	
•	
•	
•	
•	

• Australian stock item ○ German stock item

CENTRE DRILLS WITHOUT FLAT - HSS - CARBIDE

Guhring no.
Standard
Tool material
Surface
Form
Cutting direction



581	736
DIN 333	Guhring std.
HSS	Solid Carbide
A	A
rh	rh

d1	No.	d2	l1
mm		mm	mm
0.500		3.150	25.00
0.800		3.150	25.00
1.000		3.150	31.50
1.250	1	3.150	31.50
1.600	2	4.000	35.50
2.000		5.000	40.00
2.500	3	6.300	45.00
3.150	4	8.000	50.00
4.000	5	10.000	56.00
5.000	6	12.500	63.00
6.300	7	16.000	71.00

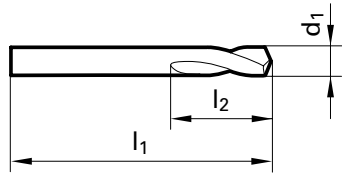
AVAILABILITY




•	
•	
•	
•	
•	•
•	
•	•
•	•
•	
•	
•	

• Australian stock item ○ German stock item

90° NC-SPOTTING DRILLS - HSS - CARBIDE

Guhring no. Standard
 Tool material Surface
 Type Point angle°
 Cutting direction Tolerance



557	568	557F	723
Guhring std.			
HSS			Solid Carbide
○	● S	● F	○
N	N	N	N
90	90	90	90
rh	rh	rh	rh
h6	h6	h6	h6
			

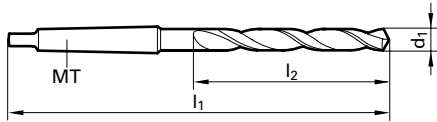
d1		l1	l2
mm	Inch	mm	mm
3.000		46.00	12.00
4.000		55.00	12.00
5.000		62.00	14.00
6.000		66.00	16.00
6.350	1/4	70.00	17.00
8.000		79.00	21.00
9.520	3/8	89.00	25.00
10.000		89.00	25.00
12.000		102.00	30.00
12.700	1/2	102.00	30.00
15.870	5/8	115.00	37.50
16.000		115.00	37.50
19.050	3/4	131.00	45.00
20.000		131.00	45.00
25.000	63/64	151.00	53.00
25.400	1	156.00	53.00

AVAILABILITY

•		•	•
•			•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•		•	•
•	•		•
•			•
•			•

TAPER SHANK
EXTRA LENGTH TWIST DRILLS - HSS

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance



298	299
Guhring std.	
HSS	
○	○
GT 100	GT 100
rh	rh
h8	h8





d1	MT	l1	l2
mm		mm	mm
14.000	1	750.00	650.00
15.000	2	750.00	650.00
16.000	2	750.00	650.00
18.000	2	750.00	650.00
14.000	1	1000.00	850.00
15.000	2	1000.00	850.00
16.000	2	1000.00	850.00
18.000	2	1000.00	850.00

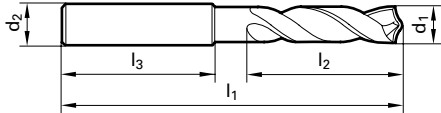
AVAILABILITY

•	
•	
•	
•	
	•
	•
	•

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 3 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth

5514	5510
DIN 6537 K	
Solid carbide	
	
RT 100 U	RT 100 U
rh	rh
m7	m7
3 x D	3 x D
	



AVAILABILITY

d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
10.600		12.000	102.00	55.00	45.00
10.700		12.000	102.00	55.00	45.00
10.800		12.000	102.00	55.00	45.00
10.900		12.000	102.00	55.00	45.00
11.000		12.000	102.00	55.00	45.00
11.100		12.000	102.00	55.00	45.00
11.110	7/16	12.000	102.00	55.00	45.00
11.200		12.000	102.00	55.00	45.00
11.300		12.000	102.00	55.00	45.00
11.400		12.000	102.00	55.00	45.00
11.500		12.000	102.00	55.00	45.00
11.600		12.000	102.00	55.00	45.00
11.700		12.000	102.00	55.00	45.00
11.800		12.000	102.00	55.00	45.00
11.900		12.000	102.00	55.00	45.00
11.910	15/32	12.000	102.00	55.00	45.00
12.000		12.000	102.00	55.00	45.00
12.200		14.000	107.00	60.00	45.00
12.500		14.000	107.00	60.00	45.00
12.700	1/2	14.000	107.00	60.00	45.00
12.800		14.000	107.00	60.00	45.00
13.000		14.000	107.00	60.00	45.00
13.500		14.000	107.00	60.00	45.00
13.700		14.000	107.00	60.00	45.00
14.000		14.000	107.00	60.00	45.00
14.200		16.000	115.00	65.00	48.00
14.290	9/16	16.000	115.00	65.00	48.00
14.500		16.000	115.00	65.00	48.00
14.700		16.000	115.00	65.00	48.00
15.000		16.000	115.00	65.00	48.00
15.100		16.000	115.00	65.00	48.00
15.200		16.000	115.00	65.00	48.00
15.500		16.000	115.00	65.00	48.00

•	○
○	•
•	•
○	○
•	•
•	○
•	○
•	○
•	○
•	○
•	○
○	○
•	•
•	○
•	○
•	•
○	○
•	•
•	○
○	○
•	○
•	•
•	○
•	○
•	○

• Australian stock item ○ German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 3 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth

Technical drawing of a 3-flute drill bit with dimensions: d1 (minor diameter), d2 (major diameter), l1 (total length), l2 (cutting length), and l3 (shank length).

5514	5510
DIN 6537 K	
Solid carbide	
F	F
RT 100 U	RT 100 U
rh	rh
m7	m7
3 x D	3 x D

Two photographs of the drill bits. The left image shows part 5514, and the right image shows part 5510, which has blue-coated cutting edges.

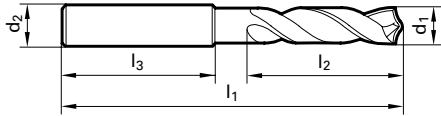
d1		d2	l1	l2	l3
mm	inch				
15.700		16.000	115.00	65.00	48.00
16.000		16.000	115.00	65.00	48.00
16.100		18.000	123.00	73.00	48.00
16.500		18.000	123.00	73.00	48.00
16.900		18.000	123.00	73.00	48.00
17.000		18.000	123.00	73.00	48.00
17.500		18.000	123.00	73.00	48.00
18.000		18.000	123.00	73.00	48.00
18.500		20.000	131.00	79.00	50.00
19.000		20.000	131.00	79.00	50.00
19.500		20.000	131.00	79.00	50.00
20.000		20.000	131.00	79.00	50.00


AVAILABILITY	
○	○
●	●
○	●
○	○
○	●
○	●
○	○
○	●
○	○
○	●
○	○
○	○
○	●
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

● Australian stock item ○ German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 5 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth



5515	5511
DIN 6537 L	
Solid carbide	
F	F
RT 100 U	RT 100 U
rh	rh
m7	m7
5 x D	5 x D
	

AVAILABILITY

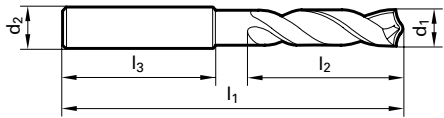
d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
3.000		6.000	66.00	28.00	36.00
3.100		6.000	66.00	28.00	36.00
3.170	1/8	6.000	66.00	28.00	36.00
3.200		6.000	66.00	28.00	36.00
3.250		6.000	66.00	28.00	36.00
3.300		6.000	66.00	28.00	36.00
3.400		6.000	66.00	28.00	36.00
3.500		6.000	66.00	28.00	36.00
3.570	9/64	6.000	66.00	28.00	36.00
3.600		6.000	66.00	28.00	36.00
3.700		6.000	66.00	28.00	36.00
3.800		6.000	74.00	36.000	36.00
3.900		6.000	74.00	36.000	36.00
3.970	5/32	6.000	74.00	36.000	36.00
4.000		6.000	74.00	36.000	36.00
4.100		6.000	74.00	36.000	36.00
4.200		6.000	74.00	36.000	36.00
4.300		6.000	74.00	36.000	36.00
4.370	11/64	6.000	74.00	36.000	36.00
4.400		6.000	74.00	36.000	36.00
4.500		6.000	74.00	36.000	36.00
4.600		6.000	74.00	36.000	36.00
4.650		6.000	74.00	36.000	36.00
4.700		6.000	74.00	36.000	36.00
4.760	3/16	6.000	82.00	44.00	36.00
4.800		6.000	82.00	44.00	36.00
4.900		6.000	82.00	44.00	36.00
5.000		6.000	82.00	44.00	36.00
5.100		6.000	82.00	44.00	36.00
5.160	13/64	6.000	82.00	44.00	36.00
5.200		6.000	82.00	44.00	36.00
5.300		6.000	82.00	44.00	36.00
5.400		6.000	82.00	44.00	36.00



•	•
•	•
•	•
•	•
○	○
•	•
•	•
•	•
•	•
•	•
○	•
•	•
•	•
•	•
•	•
○	•
•	•
•	•
•	•
•	•
•	•
•	•
○	•

• Australian stock item ○ German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 5 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth



5515	5511
DIN 6537 L	
Solid carbide	
F	F
RT 100 U	RT 100 U
rh	rh
m7	m7
5 x D	5 x D
	

d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
8.000		8.000	91.00	53.00	36.00
8.100		10.000	103.00	61.00	40.00
8.200		10.000	103.00	61.00	40.00
8.300		10.000	103.00	61.00	40.00
8.330	21/64	10.000	103.00	61.00	40.00
8.400		10.000	103.00	61.00	40.00
8.500		10.000	103.00	61.00	40.00
8.600		10.000	103.00	61.00	40.00
8.700		10.000	103.00	61.00	40.00
8.730	11/32	10.000	103.00	61.00	40.00
8.800		10.000	103.00	61.00	40.00
8.900		10.000	103.00	61.00	40.00
9.000		10.000	103.00	61.00	40.00
9.100		10.000	103.00	61.00	40.00
9.130	23/64	10.000	103.00	61.00	40.00
9.200		10.000	103.00	61.00	40.00
9.250		10.000	103.00	61.00	40.00
9.300		10.000	103.00	61.00	40.00
9.400		10.000	103.00	61.00	40.00
9.500		10.000	103.00	61.00	40.00
9.520	3/8	10.000	103.00	61.00	40.00
9.600		10.000	103.00	61.00	40.00
9.700		10.000	103.00	61.00	40.00
9.800		10.000	103.00	61.00	40.00
9.900		10.000	103.00	61.00	40.00
9.920	25/64	10.000	103.00	61.00	40.00
10.000		10.000	103.00	61.00	40.00
10.100		12.000	118.00	71.00	45.00
10.200		12.000	118.00	71.00	45.00
10.300		12.000	118.00	71.00	45.00
10.320	13/32	12.000	118.00	71.00	45.00
10.400		12.000	118.00	71.00	45.00
10.500		12.000	118.00	71.00	45.00

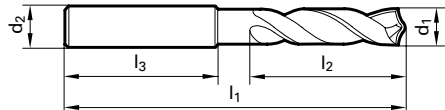
AVAILABILITY


•	•
○	•
○	•
○	•
•	•
○	•
•	•
•	•
○	•
•	•
•	•
•	•
○	•
•	•
○	•
•	•
•	•
○	•
•	•
○	•
•	•
•	•
•	•
○	•
•	•
•	•
•	•
•	•

• Australian stock item ○ German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 5 X D

- Guhring no.**
- Standard**
- Tool material**
- Surface**
- Type**
- Cutting direction**
- Tolerance**
- Drilling depth**



5515	5511
DIN 6537 L	
Solid carbide	
F	F
RT 100 U	RT 100 U
rh	rh
m7	m7
5 x D	5 x D
	

d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
10.600		12.000	118.00	71.00	45.00
10.700		12.000	118.00	71.00	45.00
10.800		12.000	118.00	71.00	45.00
10.900		12.000	118.00	71.00	45.00
11.000		12.000	118.00	71.00	45.00
11.100		12.000	118.00	71.00	45.00
11.110	7/16	12.000	118.00	71.00	45.00
11.200		12.000	118.00	71.00	45.00
11.300		12.000	118.00	71.00	45.00
11.400		12.000	118.00	71.00	45.00
11.500		12.000	118.00	71.00	45.00
11.600		12.000	118.00	71.00	45.00
11.700		12.000	118.00	71.00	45.00
11.800		12.000	118.00	71.00	45.00
11.900		12.000	118.00	71.00	45.00
11.910	15/32	12.000	118.00	71.00	45.00
12.000		12.000	118.00	71.00	45.00
12.100		14.000	124.00	77.00	45.00
12.200		14.000	124.00	77.00	45.00
12.500		14.000	124.00	77.00	45.00
12.700	1/2	14.000	124.00	77.00	45.00
13.000		14.000	124.00	77.00	45.00
13.500		14.000	124.00	77.00	45.00
13.700		14.000	124.00	77.00	45.00
14.000		14.000	124.00	77.00	45.00
14.200		16.000	133.00	83.00	48.00
14.290	9/16	16.000	133.00	83.00	48.00
14.500		16.000	133.00	83.00	48.00
14.700		16.000	133.00	83.00	48.00
14.800		16.000	133.00	83.00	48.00
15.000		16.000	133.00	83.00	48.00
15.200		16.000	133.00	83.00	48.00
15.500		16.000	133.00	83.00	48.00

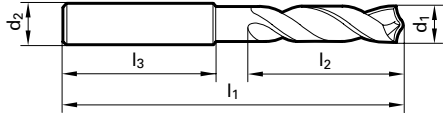
AVAILABILITY

○	●
○	●
●	●
○	●
●	●
○	●
●	●
○	●
●	●
○	●
●	●
○	●
●	●
○	●
●	○
○	●
●	●
○	●
●	●
○	●
●	○
○	○
○	○

● Australian stock item ○ German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 5 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth



5515	5511
DIN 6537 L	
Solid carbide	
F	F
RT 100 U	RT 100 U
rh	rh
m7	m7
5 x D	5 x D

AVAILABILITY

5515		5511	
o		•	
•		•	
		o	
		•	
o		•	
o		•	
o		•	
o		•	
o		o	
o		o	
o		o	
o		•	

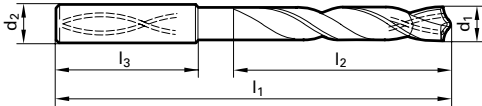
d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
15.700		16.000	133.00	83.00	48.00
16.000		16.000	133.00	83.00	48.00
16.500		18.000	143.00	93.00	48.00
17.000		18.000	143.00	93.00	48.00
17.500		18.000	143.00	93.00	48.00
18.000		18.000	143.00	93.00	48.00
18.500		20.000	153.00	101.00	50.00
19.000		20.000	153.00	101.00	50.00
19.500		20.000	153.00	101.00	50.00
20.000		20.000	153.00	101.00	50.00

• Australian stock item o German stock item

CARBIDE HIGH PERFORMANCE RATIO DRILLS - 7 X D

Guhring no.
Standard
Tool material
Surface
Type
Cutting direction
Tolerance
Drilling depth

5512
Guhring std.
Solid carbide
F
RT 100 U
rh
m7
7 x D



d1		d2	l1	l2	l3
mm	inch	mm	mm	mm	mm
11.110		12.000	163.00	114.00	45.00
11.500		12.000	163.00	114.00	45.00
11.910		12.000	163.00	114.00	45.00
12.000		12.000	163.00	114.00	45.00
12.500		14.000	182.00	133.00	45.00
12.700	1/2	14.000	182.00	133.00	45.00
13.000		14.000	182.00	133.00	45.00
13.500		14.000	182.00	133.00	45.00
14.000		14.000	182.00	133.00	45.00
14.500		16.000	204.00	152.00	48.00
15.000		16.000	204.00	152.00	48.00
15.500		16.000	204.00	152.00	48.00
16.000		16.000	204.00	152.00	48.00

AVAILABILITY

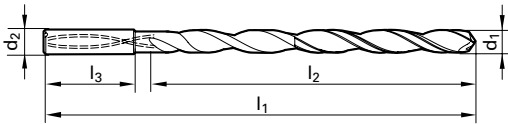
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•
•

• Australian stock item ○ German stock item

SPIRAL-FLUTED DEEP HOLE DRILL RT 100 T - 20 X D

Guhring no.
 Standard
 Tool material
 Carbide Grade
 Surface
 Type
 Shank
 Cutting Direction
 Tolerance
 Drilling depth

6511
Guhring std.
Solid carbide
K30/K40
ⓐ
RT 100 T
HA
rh
h7
20 x D



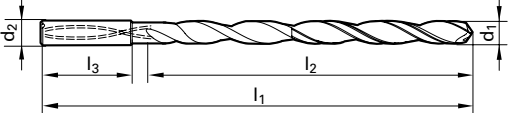
d1	d2	l1	l2	l3
mm	mm	mm	mm	mm
3.000	6.000	110.00	70.00	36.00
4.000	6.000	136.00	96.00	36.00
4.500	6.000	158.00	118.00	36.00
5.000	6.000	158.00	118.00	36.00
5.500	6.000	180.00	140.00	36.00
6.000	6.000	180.00	140.00	36.00
6.500	8.000	202.00	162.00	36.00
7.000	8.000	202.00	162.00	36.00
7.500	8.000	223.00	183.00	36.00
8.000	8.000	223.00	183.00	36.00
8.500	10.000	249.00	205.00	40.00
9.000	10.000	249.00	205.00	40.00
10.000	10.000	271.00	227.00	40.00

AVAILABILITY


•
•
•
•
•
•
•
•
•
•
•
•
•
•

SPIRAL-FLUTED DEEP HOLE DRILL RT 100 T - 30 X D

Guhring no.
Standard
Tool material
Carbide Grade
Surface
Type
Shank
Cutting Direction
Tolerance
Drilling depth



6513
Guhring std.
Solid carbide
K30/K40
⦿
RT 100 T
HA
rh
h7
30 x D



d1	d2	l1	l2	l3
mm	mm	mm	mm	mm
4.000	6.000	176.00	136.00	36.00
4.500	6.000	208.00	168.00	36.00
5.000	6.000	208.00	168.00	36.00
5.500	6.000	240.00	200.00	36.00
6.000	8.000	240.00	200.00	36.00
6.500	8.000	272.00	232.00	36.00
7.000	8.000	272.00	232.00	36.00
7.500	8.000	303.00	263.00	36.00
8.000	8.000	303.00	263.00	36.00
8.500	10.000	339.00	295.00	40.00
9.000	10.000	339.00	295.00	40.00
9.520	10.000	371.00	327.00	40.00
10.000	10.000	371.00	327.00	40.00

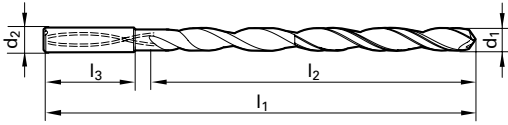
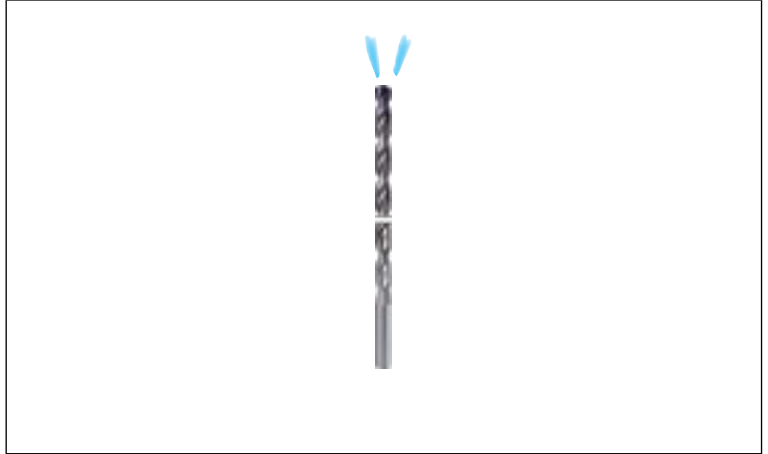
AVAILABILITY

-
-
-
-
-
-
-
-
-
-

SPIRAL-FLUTED DEEP HOLE DRILL RT 100 T - 40 X D

Guhring no.
Standard
Tool material
Carbide Grade
Surface
Type
Shank
Cutting Direction
Tolerance
Drilling depth

6514
Guhring std.
Solid carbide
K30/K40
A
RT 100 T
HA
rh
h7
40 x D



d1	d2	l1	l2	l3
mm	mm	mm	mm	mm
4.000	6.000	216.00	176.00	36.00
5.000	6.000	258.00	218.00	36.00
5.500	6.000	280.00	240.00	36.00
6.000	6.000	300.00	260.00	36.00
6.500	8.000	322.00	282.00	36.00
7.000	8.000	342.00	302.00	36.00
7.500	8.000	363.00	323.00	36.00
8.000	8.000	383.00	343.00	36.00

AVAILABILITY

•
•
•
•
•
•
•
•
•

HT 800 WP - THE INTERCHANGEABLE INSERT DRILLING SYSTEM

With the new HT 800 WP interchangeable drilling system Guhring provides high-performance and cost-efficient holders for holes in the diameter range from 11.00 to 40.0 mm that excell thanks to the following advantages:

A Extended tool life

Thanks to special, micro-machined cutting edges and the application oriented surface finish the interchangeable inserts of the HT 800 WP drilling system are especially wear resistant.

The holders of the HT 800 WP drilling system also possess a very high wear resistance. This is based on the optimised holder material with nickel plated surface as well as incremental holder sizes in steps of 0.5 mm up to diameter 31.99 mm and in steps of 1.0 mm above diameter 32.00 mm. This leads to less wear on the holder body.

B Optimised chip flow

Thanks to their flute cross section the holders of the HT 800 WP drilling system ensure optimal chip evacuation from the hole even with larger drilling depths.

C Perfect cooling lubrication

A perfect cooling lubrication is ensured by coolant ducts with maximum cross section, exiting in the flute. Thereby enabling an optimal cooling lubrication of the cutting edges and additionally support the chip evacuation from the hole.

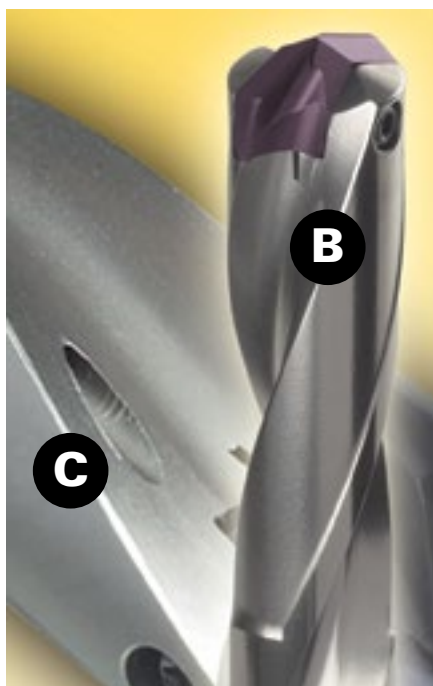
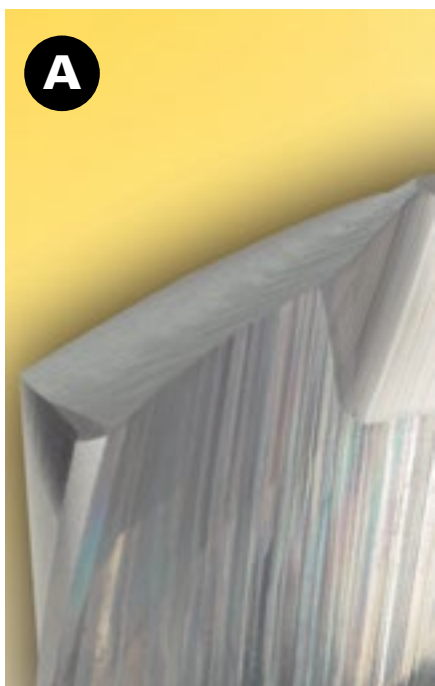
D Highly accurate and rigid insert seat

The accurate insert seat enables the insert change in the machine in only a few, simple steps with a standard Torx screw driver. Thanks to the optimised material for the holders of the HT 800 WP drilling system, the insert can be changed more frequently than with conventional systems before the holder needs to be replaced due to wear of the insert seat.

The clamping screws with screw lock ensure a secure holding of the interchangeable insert in the holder even with machines subject to high levels of vibrations.

Rigid holders

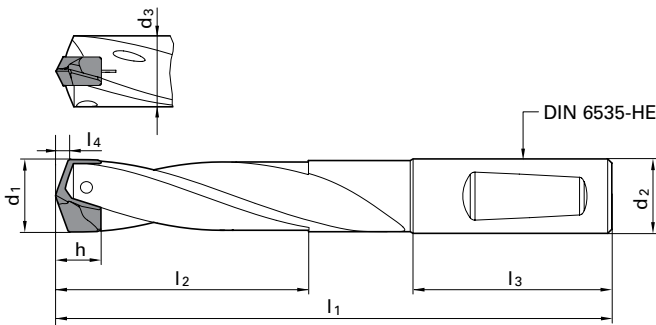
The close stepped diameter jumps with the holder sizes not only reduce wear. Through the better guidance of the tool in the hole they also increase the rigidity of the HT 800 WP drilling system. Subsequently, resulting in longer tool life as well as improved workpiece surfaces.



INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 3 X D

Guhring no.

4107



Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3
		mm	mm	mm		mm	mm
11,000	110	11.00 - 11.49	12.00	10.70	101.00	36.60	45.00
11,005	110	11.00 - 11.49	12.70	10.70	101.00	36.60	45.00
11,500	115	11.50 - 11.99	12.00	11.20	103.00	38.10	45.00
11,505	115	11.50 - 11.99	12.70	11.20	103.00	38.10	45.00
12,000	120	12.00 - 12.49	12.00	11.70	106.00	39.70	45.00
12,005	120	12.00 - 12.49	12.70	11.70	106.00	39.70	45.00
12,500	125	12.50 - 12.99	14.00	12.20	108.00	41.30	45.00
12,505	125	12.50 - 12.99	15.875	12.20	108.00	41.30	45.00
13,000	130	13.00 - 13.49	14.00	12.70	110.00	42.90	45.00
13,005	130	13.00 - 13.49	15.875	12.70	110.00	42.90	45.00
13,500	135	13.50 - 13.99	14.00	13.20	113.00	44.60	45.00
13,505	135	13.50 - 13.99	15.875	13.20	113.00	44.60	45.00
14,000	140	14.00 - 14.49	14.00	13.70	115.00	46.20	45.00
14,005	140	14.00 - 14.49	15.875	13.70	115.00	46.20	48.00
14,500	145	14.50 - 14.99	16.00	14.20	120.00	47.80	48.00
14,505	145	14.50 - 14.99	15.875	14.20	120.00	47.80	48.00
15,000	150	15.00 - 15.49	16.00	14.70	123.00	49.30	48.00
15,005	150	15.00 - 15.49	15.875	14.70	123.00	49.30	48.00
15,500	155	15.50 - 15.99	16.00	15.20	125.00	50.90	48.00
15,505	155	15.50 - 15.99	15.875	15.20	125.00	50.90	48.00
16,000	160	16.00 - 16.49	16.00	15.70	127.00	52.90	48.00
16,005	160	16.00 - 16.49	15.875	15.70	127.00	52.90	48.00
16,500	165	16.50 - 16.99	18.00	16.20	130.00	54.10	48.00
16,505	165	16.50 - 16.99	19.05	16.20	130.00	54.10	48.00
17,000	170	17.00 - 17.49	18.00	16.70	132.00	55.80	48.00
17,005	170	17.00 - 17.49	19.05	16.70	132.00	55.80	48.00
17,500	175	17.50 - 17.99	18.00	17.20	134.00	57.40	48.00
17,505	175	17.50 - 17.99	19.05	17.20	134.00	57.40	48.00
18,000	180	18.00 - 18.49	18.00	17.70	137.00	58.90	48.00
18,005	180	18.00 - 18.49	19.05	17.70	137.00	58.90	48.00
18,500	185	18.50 - 18.99	20.00	18.20	141.00	60.50	50.00
18,505	185	18.50 - 18.99	19.05	18.20	141.00	60.50	50.00
19,000	190	19.00 - 19.49	20.00	18.70	143.00	62.10	50.00

AVAILABILITY

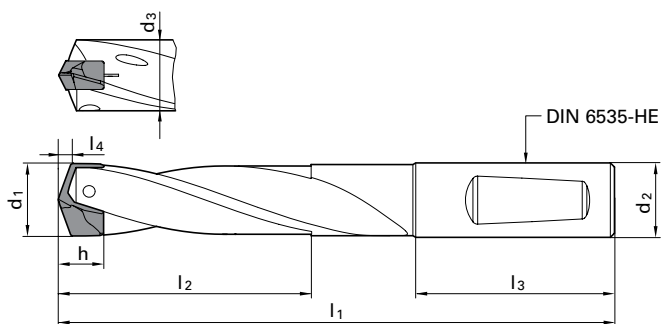
•
•
•
○
•
•
○
○
•
•
○
○
•
•
○
○
•
•
○
○
•
•
○
○
•
•
○
○
•
•

• Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 3 X D

Guhring no.

4107



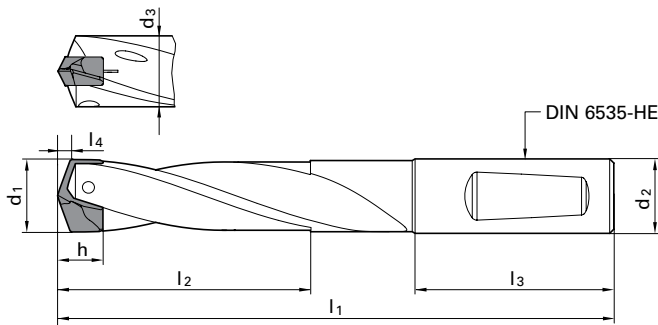
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
19,005	190	19.00 - 19.49	19.05	18.70	143.00	62.10	50.00	○
19,500	195	19.50 - 19.99	20.00	19.20	146.00	63.70	50.00	●
19,505	195	19.50 - 19.99	19.05	19.20	146.00	63.70	50.00	○
20,000	200	20.00 - 20.49	20.00	19.70	148.00	65.30	50.00	●
20,005	200	20.00 - 20.49	19.05	19.70	148.00	65.30	50.00	○
20,500	205	20.50 - 20.99	25.00	20.20	159.00	67.00	56.00	●
20,505	205	20.50 - 20.99	25.40	20.20	159.00	67.00	56.00	○
21,000	210	21.00 - 21.49	25.00	20.70	161.00	68.60	56.00	●
21,005	210	21.00 - 21.49	25.40	20.70	161.00	68.60	56.00	○
21,500	215	21.50 - 21.99	25.00	21.20	163.00	70.10	56.00	●
21,505	215	21.50 - 21.99	25.40	21.20	163.00	70.10	56.00	○
22,000	220	22.00 - 22.49	25.00	21.70	165.00	71.70	56.00	●
22,005	220	22.00 - 22.49	25.40	21.70	165.00	71.70	56.00	○
22,500	225	22.50 - 22.99	25.00	22.20	168.00	73.30	56.00	●
22,505	225	22.50 - 22.99	25.40	22.20	168.00	73.30	56.00	○
23,000	230	23.00 - 23.49	25.00	22.70	170.00	74.9	56.00	●
23,005	230	23.00 - 23.49	25.40	22.70	170.00	74.90	56.00	○
23,500	235	23.50 - 23.99	25.00	23.20	173.00	76.50	56.00	●
23,505	235	23.50 - 23.99	25.40	23.20	173.00	76.50	56.00	○
24,000	240	24.00 - 24.49	25.00	23.70	175.00	78.10	56.00	●
24,005	240	24.00 - 24.49	25.40	23.70	175.00	78.10	56.00	○
24,500	245	24.50 - 24.99	25.00	24.20	177.00	79.70	56.00	●
24,505	245	24.50 - 24.99	25.40	24.20	177.00	79.70	56.00	○
25,000	250	25.00 - 25.49	25.00	24.70	180.00	81.30	56.00	●
25,005	250	25.00 - 25.49	25.40	24.70	180.00	81.30	56.00	○
25,500	255	25.50 - 25.99	32.00	25.20	187.00	82.9	60.00	○
25,505	255	25.50 - 25.99	31.75	25.20	187.00	82.90	60.00	○
26,000	260	26.00 - 26.49	32.00	25.70	191.00	84.00	60.00	●
26,005	260	26.00 - 26.49	31.75	25.70	191.00	84.00	60.00	○
26,500	265	26.50 - 26.99	32.00	26.20	193.00	86.10	60.00	○
26,505	265	26.50 - 26.99	31.75	26.20	193.00	86.10	60.00	○
27,000	270	27.00 - 27.49	32.00	26.70	196.00	87.20	60.00	●
27,005	270	27.00 - 27.49	31.75	26.70	196.00	87.20	60.00	○

● Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 3 X D

Guhring no.

4107



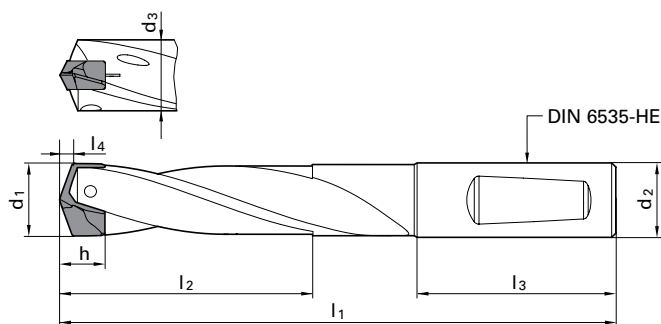
Code no.	Holder Size	d1 mm	d2 mm	d3 mm	incl. WP l1* mm	l2 max mm	l3 mm	AVAILABILITY
27,500	275	27.50 - 27.99	32.00	27.20	198.00	88.90	60.00	○
27,505	275	27.50 - 27.99	31.75	27.20	198.00	88.90	60.00	○
28,000	280	28.00 - 28.49	32.00	27.70	200.00	90.40	60.00	●
28,005	280	28.00 - 28.49	31.75	27.70	200.00	90.40	60.00	○
28,500	285	28.50 - 28.99	32.00	28.20	202.00	92.50	60.00	○
28,505	285	28.50 - 28.99	31.75	28.20	202.00	92.50	60.00	○
29,000	290	29.00 - 29.49	32.00	28.70	205.00	94.60	60.00	●
29,005	290	29.00 - 29.49	31.75	28.70	205.00	94.60	60.00	○
29,500	295	29.50 - 29.99	32.00	29.20	207.00	95.10	60.00	○
29,505	295	29.50 - 29.99	31.75	29.20	207.00	95.10	60.00	○
30,000	300	30.00 - 30.49	32.00	29.70	210.00	96.70	60.00	●
30,005	300	30.00 - 30.49	31.75	29.70	210.00	96.70	60.00	○
30,500	305	30.50 - 30.99	32.00	30.20	212.00	98.30	60.00	○
30,505	305	30.50 - 30.99	31.75	30.20	212.00	98.30	60.00	○
31,000	310	31.00 - 31.49	32.00	30.70	214.00	99.80	60.00	●
31,005	310	31.00 - 31.49	31.75	30.70	214.00	99.80	60.00	○
31,500	315	31.50 - 31.99	32.00	31.20	216.00	101.40	60.00	○
31,505	315	31.50 - 31.99	31.75	31.20	216.00	101.40	60.00	○
32,000	320	32.00 - 32.99	32.00	31.70	221.00	104.60	60.00	○
32,005	320	32.00 - 32.99	31.75	31.70	221.00	104.60	60.00	○
33,000	330	33.00 - 33.99	32.00	32.70	226.00	107.80	60.00	○
33,005	330	33.00 - 33.99	31.75	32.70	226.00	107.80	60.00	○
34,000	340	34.00 - 34.99	32.00	33.70	230.00	111.00	60.00	○
34,005	340	34.00 - 34.99	31.75	33.70	230.00	111.00	60.00	○
35,000	350	35.00 - 35.99	32.00	34.70	235.00	114.20	60.00	○
35,005	350	35.00 - 35.99	31.75	34.70	235.00	114.20	60.00	○
36,000	360	36.00 - 36.99	32.00	35.70	240.00	117.30	60.00	○
36,005	360	36.00 - 36.99	31.75	35.70	240.00	117.30	60.00	○
37,000	370	37.00 - 37.99	32.00	36.70	245.00	120.50	60.00	○
37,005	370	37.00 - 37.99	31.75	36.70	245.00	120.50	60.00	○
38,000	380	38.00 - 38.99	32.00	37.70	249.00	123.70	60.00	○
38,005	380	38.00 - 38.99	31.75	37.70	249.00	123.70	60.00	○
39,000	390	39.00 - 40.00	32.00	38.70	254.00	126.90	60.00	○
39,005	390	39.00 - 40.00	31.75	38.70	254.00	126.90	60.00	○

● Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 5 X D

Guhring no.

4108



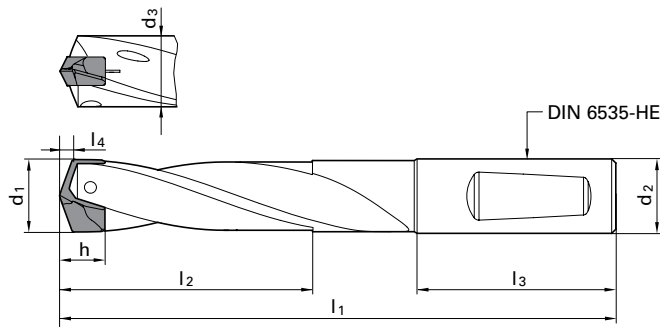
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
11,000	110	11.00 - 11.49	12.00	10.70	124.00	59.60	45.00	•
11,005	110	11.00 - 11.49	12.70	10.70	124.00	59.60	45.00	•
11,500	115	11.50 - 11.99	12.00	11.20	127.00	62.10	45.00	•
11,505	115	11.50 - 11.99	12.70	11.20	127.00	62.10	45.00	•
12,000	120	12.00 - 12.49	12.00	11.70	131.00	64.70	45.00	•
12,005	120	12.00 - 12.49	12.70	11.70	131.00	64.70	45.00	•
12,500	125	12.50 - 12.99	14.00	12.20	134.00	67.30	45.00	•
12,505	125	12.50 - 12.99	15.875	12.20	134.00	67.30	45.00	•
13,000	130	13.00 - 13.49	14.00	12.70	137.00	69.90	45.00	•
13,005	130	13.00 - 13.49	15.875	12.70	137.00	69.90	45.00	•
13,500	135	13.50 - 13.99	14.00	13.20	141.00	72.60	45.00	•
13,505	135	13.50 - 13.99	15.875	13.20	141.00	72.60	45.00	•
14,000	140	14.00 - 14.49	14.00	13.70	144.00	75.20	45.00	•
14,005	140	14.00 - 14.49	15.875	13.70	144.00	75.20	45.00	•
14,500	145	14.50 - 14.99	16.00	14.20	150.00	77.80	48.00	•
14,505	145	14.50 - 14.99	15.875	14.20	150.00	77.80	48.00	•
15,000	150	15.00 - 15.49	16.00	14.70	154.00	80.30	48.00	•
15,005	150	15.00 - 15.49	15.875	14.70	154.00	80.30	48.00	•
15,500	155	15.50 - 15.99	16.00	15.20	157.00	82.90	48.00	•
15,505	155	15.50 - 15.99	15.875	15.20	157.00	82.90	48.00	•
16,000	160	16.00 - 16.49	16.00	15.70	160.00	85.90	48.00	•
16,005	160	16.00 - 16.49	15.875	15.70	160.00	85.90	48.00	•
16,500	165	16.50 - 16.99	18.00	16.20	164.00	88.10	48.00	•
16,505	165	16.50 - 16.99	19.05	16.20	164.00	88.10	48.00	•
17,000	170	17.00 - 17.49	18.00	16.70	167.00	90.80	48.00	•
17,005	170	17.00 - 17.49	19.05	16.70	167.00	90.80	48.00	•
17,500	175	17.50 - 17.99	18.00	17.20	170.00	93.40	48.00	•
17,505	175	17.50 - 17.99	19.05	17.20	170.00	93.40	48.00	•
18,000	180	18.00 - 18.49	18.00	17.70	174.00	95.90	48.00	•
18,005	180	18.00 - 18.49	19.05	17.70	174.00	95.90	48.00	•
18,500	185	18.50 - 18.99	20.00	18.20	179.00	98.50	50.00	•
18,505	185	18.50 - 18.99	19.05	18.20	179.00	98.50	50.00	•
19,000	190	19.00 - 19.49	20.00	18.70	182.00	101.10	50.00	•

• Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 5 X D

Guhring no.

4108



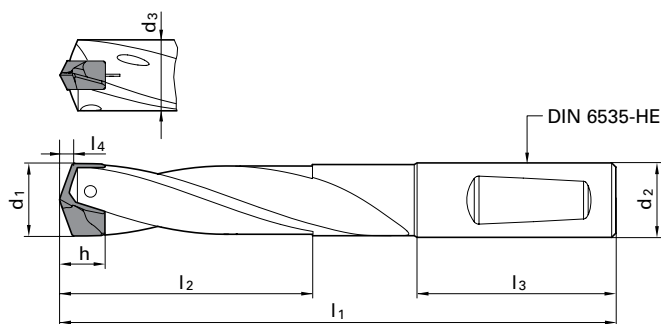
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
19,005	190	19.00 - 19.49	19.05	18.70	182.00	101.10	50.00	○
19,500	195	19.50 - 19.99	20.00	19.20	186.00	103.70	50.00	●
19,505	195	19.50 - 19.99	19.05	19.20	186.00	103.70	50.00	○
20,000	200	20.00 - 20.49	20.00	19.70	189.00	106.30	50.00	●
20,005	200	20.00 - 20.49	19.05	19.70	189.00	106.30	50.00	○
20,500	205	20.50 - 20.99	25.00	20.20	201.00	109.00	56.00	●
20,505	205	20.50 - 20.99	25.40	20.20	201.00	109.00	56.00	○
21,000	210	21.00 - 21.49	25.00	20.70	204.00	111.60	56.00	●
21,005	210	21.00 - 21.49	25.40	20.70	204.00	111.60	56.00	○
21,500	215	21.50 - 21.99	25.00	21.20	207.00	114.10	56.00	●
21,505	215	21.50 - 21.99	25.40	21.20	207.00	114.10	56.00	○
22,000	220	22.00 - 22.49	25.00	21.70	210.00	116.70	56.00	●
22,005	220	22.00 - 22.49	25.40	21.70	210.00	116.70	56.00	○
22,500	225	22.50 - 22.99	25.00	22.20	214.00	119.30	56.00	●
22,505	225	22.50 - 22.99	25.40	22.20	214.00	119.30	56.00	○
23,000	230	23.00 - 23.49	25.00	22.70	217.00	121.90	56.00	●
23,005	230	23.00 - 23.49	25.40	22.70	217.00	121.90	56.00	○
23,500	235	23.50 - 23.99	25.00	23.20	221.00	124.50	56.00	●
23,505	235	23.50 - 23.99	25.40	23.20	221.00	124.50	56.00	○
24,000	240	24.00 - 24.49	25.00	23.70	224.00	127.10	56.00	●
24,005	240	24.00 - 24.49	25.40	23.70	224.00	127.10	56.00	○
24,500	245	24.50 - 24.99	25.00	24.20	227.00	129.70	56.00	●
24,505	245	24.50 - 24.99	25.40	24.20	227.00	129.70	56.00	○
25,000	250	25.00 - 25.49	25.00	24.70	231.00	132.30	56.00	●
25,005	250	25.00 - 25.49	25.40	24.70	231.00	132.30	56.00	○
25,500	255	25.50 - 25.99	32.00	25.20	239.00	134.90	60.00	○
25,505	255	25.50 - 25.99	31.75	25.20	239.00	134.90	60.00	○
26,000	260	26.00 - 26.49	32.00	25.70	244.00	137.00	60.00	●
26,500	265	26.50 - 26.99	32.00	26.20	247.00	140.00	60.00	○
27,000	270	27.00 - 27.49	32.00	26.70	251.00	142.20	60.00	●
27,500	275	27.50 - 27.99	32.00	27.20	254.00	144.80	60.00	○
28,000	280	28.00 - 28.49	32.00	27.70	257.00	147.40	60.00	●
28,500	285	28.50 - 28.99	32.00	28.20	260.00	150.40	60.00	○

● Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 5 X D

Guhring no.

4108



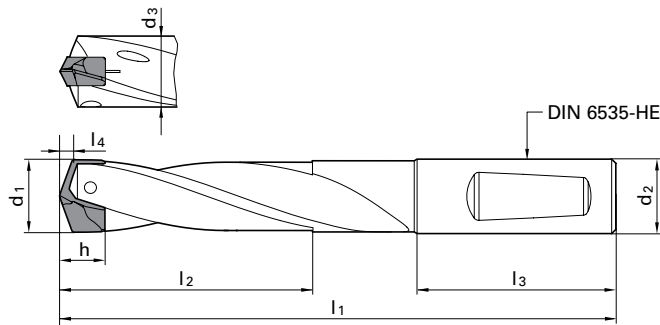
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
29,000	290	29.00 - 29.49	32.00	28.70	264.00	153.50	60.00	•
29,500	295	29.50 - 29.99	32.00	29.20	267.00	155.10	60.00	•
30,000	300	30.00 - 30.49	32.00	29.70	271.00	157.60	60.00	•
30,500	305	30.50 - 30.99	32.00	30.20	274.00	160.20	60.00	○
31,000	310	31.00 - 31.49	32.00	30.70	277.00	162.80	60.00	•
31,500	315	31.50 - 31.99	32.00	31.20	280.00	165.40	60.00	○
32,000	320	32.00 - 32.99	32.00	31.70	287.00	170.60	60.00	•
33,000	330	33.00 - 33.99	32.00	32.70	294.00	175.80	60.00	○
34,000	340	34.00 - 34.99	32.00	33.70	300.00	181.00	60.00	○
35,000	350	35.00 - 35.99	32.00	34.70	307.00	186.20	60.00	○
36,000	360	36.00 - 36.99	32.00	35.70	314.00	191.30	60.00	○
37,000	370	37.00 - 37.99	32.00	36.70	321.00	196.50	60.00	○
38,000	380	38.00 - 38.99	32.00	37.70	327.00	201.70	60.00	○
39,000	390	39.00 - 40.00	32.00	38.70	334.00	206.90	60.00	○

• Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 7 X D

Guhring no.

4109



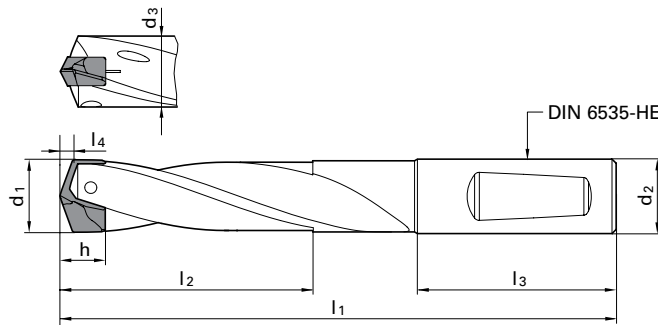
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
27,500	275	27.50 - 27.99	32.00	27.20	310.00	200.80	60.00	o
27,505	275	27.50 - 27.99	31.75	27.20	310.00	200.80	60.00	o
28,000	280	28.00 - 28.49	32.00	27.70	314.00	204.40	60.00	•
28,005	280	28.00 - 28.49	31.75	27.70	314.00	204.40	60.00	o
28,500	285	28.50 - 28.99	32.00	28.20	318.00	208.40	60.00	o
28,505	285	28.50 - 28.99	31.75	28.20	318.00	208.40	60.00	o
29,000	290	29.00 - 29.49	32.00	28.70	323.00	212.50	60.00	•
29,005	290	29.00 - 29.49	31.75	28.70	323.00	212.50	60.00	o
29,500	295	29.50 - 29.99	32.00	29.20	327.00	215.10	60.00	o
29,505	295	29.50 - 29.99	31.75	29.20	327.00	215.10	60.00	o
30,000	300	30.00 - 30.49	32.00	29.70	332.00	218.60	60.00	•
30,005	300	30.00 - 30.49	31.75	29.70	332.00	218.60	60.00	o
30,500	305	30.50 - 30.99	32.00	30.20	336.00	222.20	60.00	o
30,505	305	30.50 - 30.99	31.75	30.20	336.00	222.20	60.00	o
31,000	310	31.00 - 31.49	32.00	30.70	340.00	225.80	60.00	•
31,005	310	31.00 - 31.49	31.75	30.70	340.00	225.80	60.00	o
31,500	315	31.50 - 31.99	32.00	31.20	344.00	229.40	60.00	o
31,505	315	31.50 - 31.99	31.75	31.20	344.00	229.40	60.00	o

• Australian stock item
o German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 10 X D

Guhring no.

4110



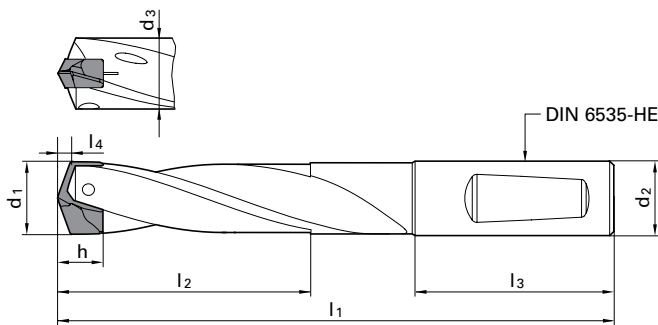
Code no.	Holder Size	d1	d2	d3	incl. WP l1*	l2 max	l3	AVAILABILITY
		mm	mm	mm	mm	mm	mm	
11.000	110	11.00 - 11.49	12.00	10.70	182.00	117.10	45.00	○
11.005	110	11.00 - 11.49	12.70	10.70	182.00	117.10	45.00	○
11.500	115	11.50 - 11.99	12.00	11.20	187.00	122.10	45.00	○
11.505	115	11.50 - 11.99	12.70	11.20	187.00	122.10	45.00	○
12.000	120	12.00 - 12.49	12.00	11.70	194.00	127.20	45.00	○
12.005	120	12.00 - 12.49	12.70	11.70	194.00	127.20	45.00	○
12.500	125	12.50 - 12.99	14.00	12.20	199.00	132.30	45.00	○
12.505	125	12.50 - 12.99	15.875	12.20	199.00	132.30	45.00	○
13.000	130	13.00 - 13.49	14.00	12.70	205.00	137.50	45.00	○
13.005	130	13.00 - 13.49	15.875	12.70	205.00	137.50	45.00	○
13.500	135	13.50 - 13.99	14.00	13.20	211.00	142.50	45.00	○
13.505	135	13.50 - 13.99	15.875	13.20	211.00	142.50	45.00	○
14.000	140	14.00 - 14.49	14.00	13.70	217.00	147.70	45.00	○
14.005	140	14.00 - 14.49	15.875	13.70	217.00	147.70	45.00	○
14.500	145	14.50 - 14.99	16.00	14.20	225.00	152.80	48.00	○
14.505	145	14.50 - 14.99	15.875	14.20	225.00	152.80	48.00	○
15.000	150	15.00 - 15.49	16.00	14.70	232.00	157.80	48.00	○
15.005	150	15.00 - 15.49	15.875	14.70	232.00	157.80	48.00	○
15.500	155	15.50 - 15.99	16.00	15.20	237.00	162.90	48.00	○
15.505	155	15.50 - 15.99	15.875	15.20	237.00	162.90	48.00	○
16.000	160	16.00 - 16.49	16.00	15.70	243.00	168.00	48.00	○
16.005	160	16.00 - 16.49	15.875	15.70	243.00	168.00	48.00	○
16.500	165	16.50 - 16.99	18.00	16.20	249.00	173.10	48.00	○
16.505	165	16.50 - 16.99	19.05	16.20	249.00	173.10	48.00	○
17.000	170	17.00 - 17.49	18.00	16.70	255.00	178.30	48.00	○
17.005	170	17.00 - 17.49	19.05	16.70	255.00	178.30	48.00	○
17.500	175	17.50 - 17.99	18.00	17.20	260.00	183.50	48.00	○
17.505	175	17.50 - 17.99	19.05	17.20	260.00	183.50	48.00	○
18.000	180	18.00 - 18.49	18.00	17.70	267.00	188.40	48.00	○
18.005	180	18.00 - 18.49	19.05	17.70	267.00	188.40	48.00	○
18.500	185	18.50 - 18.99	20.00	18.20	274.00	193.50	50.00	○
18.505	185	18.50 - 18.99	19.05	18.20	274.00	193.50	50.00	○
19.000	190	19.00 - 19.49	20.00	18.70	280.00	198.70	50.00	○

• Australian stock item
○ German stock item

INTERCHANGEABLE INSERT HOLDERS HT 800 WP - 10 X D

Guhring no.

4110



Code no.	Holder Size	d1 mm	d2 mm	d3 mm	incl. WP l1* mm	l2 max mm	l3 mm	AVAILABILITY
19.005	190	19.00 - 19.49	19.05	18.70	280.00	198.70	50.00	o
19.500	195	19.50 - 19.99	20.00	19.20	286.00	203.70	50.00	o
19.505	195	19.50 - 19.99	19.05	19.20	286.00	203.70	50.00	o
20.000	200	20.00 - 20.49	20.00	19.70	292.00	208.90	50.00	o
20.005	200	20.00 - 20.49	19.05	19.70	292.00	208.90	50.00	o
20.500	205	20.50 - 20.99	25.00	20.20	306.00	214.00	56.00	o
20.505	205	20.50 - 20.99	25.40	20.20	306.00	214.00	56.00	o
21.000	210	21.00 - 21.49	25.00	20.70	312.00	219.10	56.00	o
21.005	210	21.00 - 21.49	25.40	20.70	312.00	219.10	56.00	o
21.500	215	21.50 - 21.99	25.00	21.20	317.00	224.20	56.00	o
21.505	215	21.50 - 21.99	25.40	21.20	317.00	224.20	56.00	o
22.000	220	22.00 - 22.49	25.00	21.70	323.00	229.30	56.00	o
22.005	220	22.00 - 22.49	25.40	21.70	323.00	229.30	56.00	o
22.500	225	22.50 - 22.99	25.00	22.20	329.00	234.40	56.00	o
23.000	230	23.00 - 23.49	25.00	22.70	335.00	239.50	56.00	o
23.500	235	23.50 - 23.99	25.00	23.20	341.00	244.60	56.00	o
24.000	240	24.00 - 24.49	25.00	23.70	347.00	249.70	56.00	o
24.500	245	24.50 - 24.99	25.00	24.20	352.00	254.80	56.00	o
25.000	250	25.00 - 25.49	25.00	24.70	359.00	259.90	56.00	o
25.500	255	25.50 - 25.99	32.00	25.20	369.00	265.00	60.00	o
26.000	260	26.00 - 26.49	32.00	25.70	377.00	270.00	60.00	o
26.500	265	26.50 - 26.99	32.00	26.20	382.00	275.00	60.00	o
27.000	270	27.00 - 27.49	32.00	26.70	388.00	280.10	60.00	o
27.500	275	27.50 - 27.99	32.00	27.20	394.00	285.20	60.00	o
28.000	280	28.00 - 28.49	32.00	27.70	400.00	290.30	60.00	o
28.500	285	28.50 - 28.99	32.00	28.20	405.00	295.40	60.00	o
29.000	290	29.00 - 29.49	32.00	28.70	412.00	300.50	60.00	o
29.500	295	29.50 - 29.99	32.00	29.20	418.00	305.60	60.00	o
30.000	300	30.00 - 30.49	32.00	29.70	424.00	310.60	60.00	o
30.500	305	30.50 - 30.99	32.00	30.20	429.00	315.70	60.00	o
31.000	310	31.00 - 31.49	32.00	30.70	435.00	320.80	60.00	o
31.500	315	31.50 - 31.99	32.00	31.20	441.00	325.90	60.00	o

• Australian stock item
o German stock item

INTERCHANGEABLE INSERTS HT 800 WP



<p style="text-align: right;">Guhring no. Standard Tool material Application Surface finish Tolerance</p> <div style="text-align: center;"> </div>	4112	4115
	Guhring std.	Guhring std.
	Solid carbide	Solid carbide
	Steel	Stainless Steel
	Nano FIRE	Nano A
	m7	m7

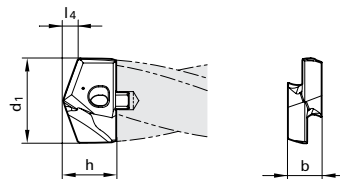
Code no.	for drill.	for pilot.	d1	l4	b	h	AVAILABILITY	
	holder size	holder size						
11,000	110	110	11.00	2.10	4.50	7.50	•	○
11,200	110	110	11.20	2.10	4.50	7.50	•	○
11,500	115	110	11.50	2.10	4.50	7.50	•	•
11,510	115	110	11.51	2.10	4.50	7.50	○	○
11,700	115	110	11.70	2.10	4.50	7.50	○	○
11,800	115	110	11.80	2.10	4.50	7.50	•	○
11,910	115	110	11.91	2.20	4.50	7.50	○	○
12,000	120	120	12.00	2.20	5.00	7.70	○	•
12,100	120	120	12.10	2.20	5.00	7.70	○	○
12,200	120	120	12.20	2.20	5.00	7.70	•	○
12,300	120	120	12.30	2.20	5.00	7.70	○	○
12,500	125	120	12.50	2.30	5.00	7.70	•	•
12,600	125	120	12.60	2.30	5.00	7.70	○	○
12,700	125	120	12.70	2.30	5.00	7.70	○	○
12,800	125	120	12.80	2.30	5.00	7.70	•	○
12,900	125	120	12.90	2.30	5.00	7.70	○	○
13,000	130	130	13.00	2.40	5.50	8.50	•	•
13,100	130	130	13.10	2.40	5.50	8.50	•	○
13,490	130	130	13.49	2.40	5.50	8.50	○	○
13,500	140	130	13.50	2.40	5.50	8.50	•	•
13,600	140	130	13.60	2.40	5.50	8.50	○	○
13,700	140	130	13.70	2.40	5.50	8.50	○	○
13,800	140	130	13.80	2.50	5.50	8.50	•	○
13,890	140	130	13.89	2.50	5.50	8.50	○	○
14,000	140	140	14.00	2.50	6.00	9.60	•	•
14,100	140	140	14.10	2.50	6.00	9.60	○	○
14,290	140	140	14.29	2.60	6.00	9.60	○	○
14,400	140	140	14.40	2.60	6.00	9.60	○	○
14,500	140	140	14.50	2.60	6.00	9.60	•	•
14,600	145	140	14.60	2.70	6.00	9.60	○	○
14,680	145	140	14.68	2.70	6.00	9.60	○	○
14,700	145	140	14.70	2.70	6.00	9.60	○	○
14,800	145	140	14.80	2.70	6.00	9.60	•	○

• Australian stock item
○ German stock item

INTERCHANGEABLE INSERTS HT 800 WP

Guhring no.
Standard
Tool material
Application
Surface finish
Tolerance

4112	4115
Guhring std.	Guhring std.
Solid carbide	Solid carbide
Steel	Stainless Steel
Nano FIRE	Nano A
m7	m7
	



Code no.	for drill.	for pilot.	d1	l4	b	h
	holder size	holder size				
15,000	150	140	15.00	2.70	6.00	9.80
15,080	150	140	15.08	2.70	6.00	9.80
15,100	150	140	15.10	2.70	6.00	9.80
15,200	150	140	15.20	2.80	6.00	9.80
15,300	150	140	15.30	2.80	6.00	9.80
15,480	150	140	15.48	2.80	6.00	9.80
15,500	155	140	15.50	2.80	6.00	9.80
15,600	155	140	15.60	2.90	6.00	9.80
15,700	155	140	15.70	2.90	6.00	9.80
15,800	155	140	15.80	2.90	6.00	9.80
15,870	155	140	15.87	2.90	6.00	9.80
16,000	160	160	16.00	2.90	7.00	11.00
16,270	160	160	16.27	3.00	7.00	11.00
16,500	165	160	16.50	3.00	7.00	11.00
16,670	165	160	16.67	3.00	7.00	11.00
17,000	170	160	17.00	3.10	7.00	11.00
17,070	170	160	17.07	3.10	7.00	11.00
17,460	170	160	17.46	3.10	7.00	11.00
17,500	175	160	17.50	3.20	7.00	11.00
17,600	175	160	17.60	3.20	7.00	11.00
17,860	175	160	17.86	3.30	7.00	11.00
18,000	180	180	18.00	3.30	8.00	12.60
18,260	180	180	18.26	3.40	8.00	12.60
18,500	185	180	18.50	3.40	8.00	12.60
18,650	185	180	18.65	3.40	8.00	12.60
19,000	190	180	19.00	3.50	8.00	12.60
19,050	190	180	19.05	3.50	8.00	12.60
19,250	190	180	19.25	3.60	8.00	12.60
19,450	190	180	19.45	3.60	8.00	12.60
19,500	195	180	19.50	3.60	8.00	12.60
19,600	195	180	19.60	3.60	8.00	12.60
19,840	195	180	19.84	3.70	8.00	12.60
20,000	200	180	20.00	3.70	9.00	13.90

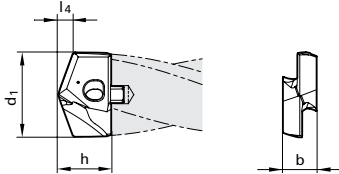
AVAILABILITY



○	●
○	○
●	○
●	○
○	○
○	○
○	○
○	●
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

● Australian stock item
 ○ German stock item

INTERCHANGEABLE INSERTS HT 800 WP

	Guhring no.	4112	4115
	Standard	Guhring std.	Guhring std.
	Tool material	Solid carbide	Solid carbide
	Application	Steel	Stainless Steel
	Surface finish	Nano FIRE	Nano A
	Tolerance	m7	m7








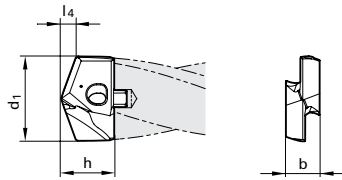
Code no.	for drill.	for pilot.	d1	l4	b	h	AVAILABILITY	
	holder size	holder size						
20,240	200	200	24.24	3.70	9.00	13.90	○	○
20,500	205	200	20.50	3.80	9.00	13.90	●	●
20,640	205	200	20.64	3.80	9.00	13.90	○	○
21,000	210	200	21.00	3.90	9.00	13.90	●	●
21,030	210	200	21.03	3.90	9.00	13.90	○	○
21,100	210	200	21.10	3.90	9.00	13.90	○	○
21,430	210	200	21.43	3.90	9.00	13.90	○	○
21,500	215	200	21.50	4.00	9.00	13.90	●	●
21,830	215	200	21.83	4.00	9.00	13.90	○	○
22,000	220	220	22.00	4.10	10.00	15.30	●	●
22,220	220	220	22.22	4.10	10.00	15.30	●	●
22,500	225	220	22.50	4.10	10.00	15.30	●	●
22,620	225	220	22.62	4.20	10.00	15.30	○	○
23,000	230	220	23.00	4.20	10.00	15.30	●	●
23,020	230	220	23.02	4.20	10.00	15.30	○	○
23,420	230	220	23.42	4.30	10.00	15.30	○	○
23,500	235	220	23.50	4.30	10.00	15.30	●	●
23,810	235	220	23.81	4.40	10.00	15.30	○	○
24,000	240	240	24.00	4.40	11.00	15.80	●	●
24,100	240	240	24.10	4.40	11.00	15.80	○	○
24,210	240	240	24.21	4.50	11.00	15.80	○	○
24,500	245	240	24.50	4.50	11.00	15.80	●	●
24,610	245	240	24.61	4.50	11.00	15.80	○	○
25,000	250	240	25.00	4.60	11.00	15.80	●	●
25,400	250	240	25.40	4.70	11.00	15.80	●	●
25,500	255	240	25.50	4.70	11.00	15.80	○	○
25,670	255	240	25.67	4.70	11.00	15.80	○	○
25,700	255	240	25.70	4.70	11.00	15.80	○	○
25,810	255	240	25.81	4.70	11.00	15.80	○	○
26,000	260	260	26.00	4.80	12.00	20.00	●	●
26,190	260	260	26.19	4.80	12.00	20.00	○	○
26,500	260	260	26.50	4.90	12.00	20.00	○	○
26,590	260	260	26.59	4.90	12.00	20.00	○	○

● Australian stock item
○ German stock item

INTERCHANGEABLE INSERTS HT 800 WP

Guhring no.
Standard
Tool material
Application
Surface finish
Tolerance

4112	4115
Guhring std.	Guhring std.
Solid carbide	Solid carbide
Steel	Stainless Steel
Nano FIRE	Nano A
m7	m7
	



Code no.	for drill. holder size	for pilot. holder size	d1 mm	l4 mm	b mm	h mm
27,000	270	260	27.00	5.00	12.00	20.00
27,500	270	260	27.50	5.10	12.00	20.00
27,700	270	260	27.70	5.10	12.00	20.00
27,780	270	260	27.78	5.10	12.00	20.00
28,000	280	280	28.00	5.10	13.00	20.70
28,180	280	280	28.18	5.20	13.00	20.70
28,500	280	280	28.50	5.20	13.00	20.70
28,580	280	280	28.58	5.30	13.00	20.70
29,000	290	280	29.00	5.30	13.00	20.70
29,370	290	280	29.00	5.40	13.00	20.70
29,500	290	280	29.50	5.40	13.00	20.70
29,770	290	280	29.77	5.50	13.00	20.70
30,000	300	300	30.00	5.50	14.00	22.30
30,160	300	300	30.16	5.50	14.00	22.30
30,500	300	300	30.50	5.60	14.00	22.30
30,960	300	300	30.96	5.70	14.00	22.30
31,000	310	300	31.00	5.70	14.00	22.30
31,500	310	300	31.50	5.80	14.00	22.30
31,750	310	300	31.75	5.80	14.00	22.30
32,000	320	320	32.00	5.90	15.00	23.10
32,500	320	320	32.50	6.00	15.00	23.10
32,540	320	320	32.54	6.00	15.00	23.10
34,940	320	320	34.94	6.00	15.00	23.10
33,000	330	320	33.00	6.10	15.00	23.10
33,340	330	320	33.34	6.10	15.00	23.10
33,500	330	320	33.50	6.10	15.00	23.10
34,000	340	320	34.00	6.20	15.00	23.10
34,130	340	320	34.13	6.30	15.00	23.10
34,500	340	320	34.50	6.30	15.00	23.10
34,930	340	320	34.93	6.40	15.00	23.10
35,000	350	360	35.00	6.40	15.00	23.10
35,500	350	360	35.50	6.50	15.00	23.10
35,720	350	360	35.72	6.50	15.00	23.10









AVAILABILITY

●	○
○	○
○	○
○	○
○	○
●	●
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

● Australian stock item
 ○ German stock item

CUTTING SPEED RECOMMENDATION HSS - HSCO DRILLING

Drill ø mm	Feed Column No.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev)								
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

Tool Material	HSS	HSS	HSS	HSS
Surface Finish	 >Ø 2,36	 >Ø 2,36	 >Ø 2,36	 S
Type	N	N	N	N
Gühring No.	223	205	217	9651
Internal Cooling Application	-	-	-	-
	DIN 1897	DIN 338	DIN 340	
				

Material Group	Material Examples	Tens. Strength (N/mm²)	Hardness	v _c m/min	Feed col. no.	v _c m/min	Feed col. no.	v _c m/min	Feed col. no.	v _c m/min	Feed col. no.
Common Structural Steels	Mild steel, Grade 250 plate, Grade 350 plate	≤ 500		27	6	32	6	28	6	28	6
Free-Cutting Steels	1020, S1214, S1213, S12L13, S12L14	> 500-850		22	5	25	5	22	5	22	5
		850-1000		30	6	32	6	28	6	28	6
Unalloyed Heat-Treatable Steels	1035, 1045, 1055, 1060, 1025	≤ 700		25	5	32	5	28	5	28	5
		700-850		25	5	25	5	22	5	22	5
Alloyed Heat-Treatable Steels	3140, 4130, 4140, 4150, 4340, 6150, EN16, EN26	850-1000									
		1000-1200									
Unalloyed Case Hardened Steels	1010, 1015	≤ 750		30	6	32	6	28	6	33	6
Alloyed Case Hardened Steels	3310, 3415, 5115, 4615, 4620, 5120, 8617, 8620, N33, EN36A	850-1000								20	4
		1000-1200									
Nitriding Steels	1.8504 34CrAl6, 1.8519 31CrMo V9, 1.8550 34CrAlNi7	≥ 850-1000								14	4
		1000-1200									
Tool Steels	H11, H13, P20, D2, D3	≤ 850		16	4	16	4	14	4	18	4
		850-1000									
High Speed Steels	M2, M3, M35, M45	≥ 650-1000									
Spring Steels	5155, 6150, 9255		≤ 330 HB								
Stainless Steels, Sulphured	410S, 430F, 630	≤ 850								12	4
Austenitic	302, 303, 304, 310, 316, 316Ti, 321	≤ 850								16	
Martensitic	410, 410X, 416, 420, 420C, 431, 440C	≤ 850									
Special Alloys	Nimonic, Inconel, Monel, Hastelloy, Bisalloy	≤ 1200									
Cast Iron	GG10, GG15, GG20, GG25, GG30, GG35, GG40	≤ 240 HB		30	6	32	6	28	6	33	6
		≤ 300 HB		30	6	25	6	22	6	33	6
Spheroidal Graphite and Malleable Cast Iron	GGG40, GGG50, GGG60, GGG70, 32510, 50005, Nodular Iron	≤ 240 HB		25	6	28	6	22	6	28	6
		≤ 300 HB		20	6	20	6	18	6	22	6
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, -TiAl8Mo 1V1	≤ 850									
		850-1200									
Al and Ti-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤ 400		70		80		70			
Al Wrought Alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤ 450		70		80		70			
Al Cast Alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤ 600		50	7	63	7	55	7		
Al Cast Alloys >10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, -GAlSi12CuNiMg	≤ 600		50	6	50	6	45	6		
Magnesium Alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤ 450		70	6	80	6	70	6	80	6
Copper, Low-Alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤ 450		60	5	32	5	28	5	65	5
Brass, Short-Chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤ 600		70		63	5	55	5	75	5
Brass, Long-Chipping	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤ 600		40	5	40	5	34	5	45	5
Bronze, Short-Chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn 2.0790 CuNi18Zn19Pb	≤ 600		30	4	32	4	28	4	33	4
		> 600 -850		25	4	28	4	22	4	27	4
Bronze, Long-Chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤ 850		15	4	25	4	22	4	16	4
		850-1000								15	4
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		18	4	16	4	14	4	22	4
Thermoplastics	Plexiglas, Hostalen, Novodur, Makralon	-		28	5	25	5	22	5	36	5

HSCO		HSCO		HSCO		HSCO		HSS-E-PM		HSCO		HSCO		HSS		HSS		HSS		HSS		HSS		HSS					
S		S		○		○		S		S		○		○		○		○		●		○		○					
GV120		GU500DZ		GU500DZ		N		GT500DZ		GT100		N		GT100		GT100		A		N		N		GT100		GT100			
659		5520		5523		5536		5522		658		301		502		242		581		380		245		293		526			
		1228				5537								503		243		557						298		527			
														504		244								299					
																								565					
-		-		-		-		-		-		-		-		-		-		-		-		-		-		-	
DIN 1897		DIN 1897		DIN 338		DIN 340		DIN 338		DIN 338		DIN 1899		DIN 1869		Guhring Std.		Guhring Std.		Guhring Std.		DIN 345		Guhring Std.		DIN 1870			
v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.	v_c m/min	Feed col. no.
38	5	45	6	35	6	35	5	40	6	38	6	21	6	22	5	22	5	32	6	32	6	32	6	22	5	22	5		
33	4	35	5	30	5	35	5	32	5	33	5	18	5	18	4	18	4	25	5	25	5	25	5	18	4	18	4		
44	5	50	6	40	6	40	6	45	6	44	5	18	6	22	5	22	5	32	6	32	6	32	6	22	5	22	5		
38	5	40	6	30	6	24	5	40	5	38	5	16	5	18	4	18	4	25	5	25	5	25	5	18	4	18	4		
44	5	42	6	32	6			42	6	44		20	5	22	4	22	4	32	5	32	5	32	5	22	4	22	4		
44	5	35	6	28	6	24	5	40	5	44	5	18	5	18	4	18	4	25	5	25	5	25	5	18	4	18	4		
38	4	22	5	20	5	16	4	28	4	38	4	14	4																
27	4		4	15	4	16	4	25	4	27	4	14	4																
22	3	18	3	13	3	12	3	20	3	22	3	12	3																
44	4	15	6	30	6			40	4	44	4	18	6	22	5	22	5	32	6	32	6	32	6	22	5	22	5		
22	4	40	4	16	4	14	4	22	4	22	4	14	4																
18	3	20	3	12	3	10	3	18	3	18	3	12	3																
22	4	15	4	15	4	12	4	20	4	22	4	14	4																
18	3	18	3	10	3	8	3	15	3	18	3	12	3																
19	4	12	4	15	4	16	4	25	4	19	4	16	4	12	3	12	3	16	4	16	4	16	4	12	3	12	3		
14	3	18	3	10	3	8	3	15	3	14	3	14	3	6	2	6	2							6	2	6	2		
14	3	13	3	10	3	8	3	15	3	14	3	14	3																
9	2	13				6	2	12	2	9		8	2																
20	4	18	4	14	4	12	4	15	4	20	4	6	4																
15	3	12	4	10	4	8	1	10	3	15		6	3																
18	3	15	4	12	4	10	3	12	3	18	3	6	3																
6	2					5				6	7																		
40	6	45	6	36	6	30	6	50	6	40	6	26	6	22	5	22	5	32	6	32	6	32	6	22	5	22	5		
35	6	36	6	30	6	24	6	40	6	35	6	22	6	18	5	18	5	25	6	25	6	25	6	18	5	18	5		
33	6	40	6	30	6	24	6	45	6	33	6	18	6	20	5	20	5	28	6	28	6	28	6	20	5	20	5		
27	6	28	6	22	6	20	6	32	6	27	6	22	6	14	5	14	5	20	6	20	6	20	6	14	5	14	5		
12	3					6		8	3	12																			
11	2					8				11																			
7	2					5				7																			
		70	7	50	7													80		80		80							
		70	7	50	7													80		80		80							
		85	7	65	7	60	7					26	7	45	6	45	6	63	7	63	7	63	7	45	6	45	6		
		70	6	60	6	50	6					18	6	36	5	36	5	50	6	50	6	50	6	36	5	36	5		
		70	6	60	6							75	6	55	5	55	5	80	6	80	6	80	6	55	5	55	5		
		32	5	25	5	30	5	50	5	88	5	4	5	22	4	22	4	32	5	32	5	32	5	22	4	22	4		
		63	5	45	5													63	5	63	5	63	5						
		40	5	30	5	38	5	60	5			22	5	28	4	28	4	40	5	40	5	40	5	28	4	28	4		
45	5	50	4	36	4	30		50	5			22	4	22	3	22	3	32	4	32	4	32	4	22	3	22	3		
40	4	35	4	30	4	24		45	4	40		18	4	20	3	20	3	28	4	28	4	28	4	20	3	20	3		
23	4	32	4	30	4	24	4	40	4	22	4	13	4	18	3	18	3	25	4	25	4	25	4	18	3	18	3		
17	4	28	4	25	4	20	4	32	4	17	4																		
		25	4	20	4	16	4	25	4	22	4	16	4	12	3	12	3	16	4	16	4	16	4	12	3	12	3		
		15	4	15	4							18	4	18	4	18	4	25	5	25	5	25	5	18	4	18	4		

CUTTING SPEED RECOMMENDATION CARBIDE DRILLING










Drill ø mm	Feed Column No.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev)								
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

Tool Material	Carbide	Carbide
Surface Finish	F	F
Type	N	RT100U
Guhring No.	2463	5514
Internal Cooling	-	-
HA	YES	YES
HE	-	-
Standard	DIN 6539	DIN 6537



Coolant
Soluble Oil ●
Oil ●
Air ○

Material Group	Material Examples	Tens. Strength (N/mm ²)	Hardness	Coolant	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.
Common Structural Steels	Mild steel, Grade 250 plate, Grade 350 plate	≤ 500		○	104	5	130	7
		> 500-850		●	91	5	110	6
Free-Cutting Steels	1020, S1214, S1213, S12L13, S12L14	≤ 850		●	104	6	145	8
		850-1000		●	91	5	110	7
Unalloyed Heat-Treatable Steels	1035, 1045, 1055, 1060, 1025	≤ 700		●	104	5	120	7
		700-850		●	91	5	110	7
		850-1000		●	78	5	105	7
Alloyed Heat-Treatable Steels	3140, 4130, 4140, 4150, 4340, 6150, EN16, EN26	850-1000		●	78	5	105	7
		1000-1200		●			100	6
Unalloyed Case Hardened Steels	1010, 1015	≤ 750		●	104	6	130	8
Alloyed Case Hardened Steels	3310, 3415, 5115, 4615, 4620, 5120, 8617, 8620, N33, EN36A	850-1000		●	78	5	120	7
		1000-1200		●			85	5
Nitriding Steels	1.8504 34CrAl6, 1.8519 31CrMo V9, 1.8550 34CrAlNi7	≥ 850-1000		●	65	5	100	6
		1000-1200		●			90	5
Tool Steels	H11, H13, P20, D2, D3	≤ 850		●	65	4	65	6
		850-1000		●			55	5
High Speed Steels	M2, M3, M35, M45	≥ 650-1000		●				
Spring Steels	5155, 6150, 9255		≤ 330 HB	●	32	3	45	3
Stainless Steels, Sulphured	410S, 430F, 630	≤ 850		●	32	5	55	4
Austenitic	302, 303, 304, 310, 316, 316Ti, 321	≤ 850		●	32	4	45	4
Martensitic	410, 410X, 416, 420, 420C, 431, 440C	≤ 850		●	32	4	45	3
Hardened Steels			≤ 40-48 HRC	●	26	4	45	3
			> 48-60 HRC	●			25	2
Special Alloys	Nimonic, Inconel, Monel, Hastelloy, Bisalloy	≤ 1200		●	20	3	25	4
Cast Iron	GG10, GG15, GG20, GG25, GG30, GG35, GG40		≤ 240 HB	●	117	5	210	8
			≤ 300 HB	○	104	5	155	8
Spheroidal Graphite and Malleable Cast Iron	GGG40, GGG50, GGG60, GGG70, 32510, 50005, Nodular Iron		≤ 240 HB	●	91	5	155	7
			≤ 300 HB	●	104	5	125	7
Chilled Cast Iron	-		≤ 350 HB	●			35	3
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, -TiAl8Mo 1V1	≤ 850		●	26	4	40	4
		850-1200		●	20	3	35	3
Al and Ti-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤ 400		●	260	8	260	9
Al Wrought Alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤ 450		●	260	8	260	9
Al Cast Alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤ 600		●	195	7	220	8
Al Cast Alloys >10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, -GAlSi12CuNiMg	≤ 600		●	156	7	180	8
Magnesium Alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤ 450		○	234	6	260	8
Copper, Low-Alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤ 450		●	104	6	105	7
Brass, Short-Chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤ 600		●	234	6	270	8
Brass, Long-Chipping	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤ 600		●	234	6	180	7
Bronze, Short-Chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn, 2.0790 CuNi18Zn19Pb	≤ 600		●	156	6	105	6
		> 600 -850		●	156	6	85	6
Bronze, Long-Chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10, 2.0980 CuAl11Ni, 2.1247 CuBe2	≤ 850		●	91	5	80	5
		850-1000		●	65	4	60	5
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren		-	○	65	5		
Thermoplastics	Plexiglas, Hostalen, Novodur, Makralon		-	○	52	4		
Kevlar	Kevlar		-	○				
Glass, carbon Concentr. Plastics	GFK/CFK		-	○	104	4		

Carbide	Carbide	Carbide	Carbide	Carbide	Carbide	Carbide	Carbide	Carbide	Carbide												
F	F	F	F	F	A	F	○	○	○												
N	RT100U	RT100U	RT100U	RT100	RT100T	HT800WP	RT100U	RT100U	RT100U												
2464	5515	5511	5512	5525	6511	4112	5516	732	723												
					6513	4115	730	5517													
					6514																
-	-	YES	YES	YES	YES	YES	-	-	-												
YES	YES	YES	YES	YES	YES																
-	-	-	-	-	-	-	-	-	-												
Guhring std.	DIN 537	DIN 6537	Guhring std.	Guhring std.	Guhring std.	Guhring std.	DIN 6539	DIN 6539	Guhring std.												
																					
v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.	v _c m/min	Feed col.no.		
100	5	130	7	145	7	145	6	110	8	80	7	130	6	80	4	80	4	80	4	80	4
90	5	110	6	120	6	120	5	110	8	80	7	110	5	70	4	70	4	70	4	70	4
100	6	145	8	170	8	170	7	120	8	100-120	8	130	7	80	5	80	5	80	5	80	5
90	5	110	7	145	8	145	7	120	8	100	8	110	6	70	4	70	4	70	4	70	4
100	5	120	7	130	8	130	7	110	6	110	6	130	6	80	4	80	4	80	4	80	4
90	5	110	7	125	7	125	6	110	8	80	7	125	6	70	4	70	4	70	4	70	4
80	5	105	7	120	7	120	6	100	7	80	7	110	5	60	4	60	4	60	4	60	4
80	5	105	7	120	7	120	6	110	7	80	7	110	6	60	4	60	4	60	4	60	4
		100	6	105	7	105	6	110	6	80	6	90	5								
100	6	130	8	145	8	145	7	110	8	80	7	130	7	80	5	80	5	80	5	80	5
80	5	120	7	120	7	120	6	110	7	80	6	110	6	60	4	60	4	60	4	60	4
		85	5	85	5	85	4	110	6	80	6	70	4								
65	5	100	6	105	7	110	6	100	5	80	5	105	5	50	4	50	4	50	4	50	4
		90	5	100	5	105	4	80	5	60	5	70	4								
65	4	65	6	70	6	80	5	100	6	80	6-7	60	5	50	3	50	3	50	3	50	3
		55	5	55	5	65	4	80	5	70	4	55	4								
				60	5	60	4	50	5	50	4	50	3								
30	3	45	3	60	3	60	2	50	5	50	4	55	2	25	2	25	2	25	2	25	2
30	5	55	4	60	5	60	4	100	5	80	5	55	3	25	4	25	4	25	4	25	4
30	4	45	4	55	5	55	4	60	3	60-80	2-3	40	3	25	3	25	3	25	3	25	3
30	4	45	3	50	5	45	4	100	5	80	5	35	3	25	3	25	3	25	3	25	3
25	3	45	3	55	3	55	2	50	4	50	4	25	2	20	3	20	3	20	3	20	3
		25	2	35	2	35	1					10									
20	3	25	4	35	4	35	3	30	2	30	2	25	2	15	2	15	2	15	2	15	2
115	5	210	8	195	9	195	8	140	8	120	8	100	6	90	4	90	4	90	4	90	4
100	5	155	8	160	9	160	8	100	8	80	8	90	6	80	4	80	4	80	4	80	4
90	5	145	7	140	9	140	8	140	8	120	8	80	5	80	4	70	4	80	4	80	4
80	5	125	7	130	8	130	7	100	8	80	8	80	5	70	4	60	4	70	4	70	4
		35	3	40	3	40	2					80	5	10		10		10		10	
25	4	40	4	45	4	40	3					80	5	20	3	20	3	20	3	20	3
20	3	35	3	40	3	40	2					120	7	15	2	15	2	15	2	15	2
260	8	260	9	310	9	310	8					100	6	200	7	200	7	200	7	200	7
260	8	260	9	310	9	310	8					90	6	200	7	200	7	200	7	200	7
195	7	235	8	260	9	260	8	220	7			40	3	150	6	150	6	150	6	150	6
155	7	170	8	220	9	220	8	180	7			35	2	120	6	120	6	120	6	120	6
235	6	260	8	280	8	280	7					200	7	180	5	180	5	180	5	180	5
100	6	105	7	125	7	125	6	120	1	120	1	180	7	80	5	80	5	80	5	80	5
235	6	270	8	325	8	325	7	120	8	100	8	150	7	180	5	180	5	180	5	180	5
235	6	180	7	220	7	220	6					120	7	180	5	180	5	180	5	180	5
155	6	105	6	125	7	125	6					180	7	120	5	120	5	120	5	120	5
155	6	85	6	105	6	105	5					70	6	120	5	120	5	120	5	120	5
90	5	80	5	90	6	90	5					180	7	70	4	70	4	70	4	70	4
65	4	60	5	80	6	80	5					120	6	50	3	50	3	50	3	50	3
50	5											70	6	50	4	40	4	40	4	40	4
65	4											50	6	40	3	50	3	50	3	50	3
100	4											45	6	150		150		150		150	
												35	5	80	3	80	3	80	3	80	3