EN

HARTNER

Precision Cutting Tools

GUN DRILLS

THE COMPLETE PROGRAMME

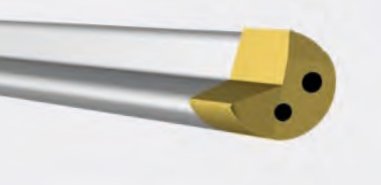
+ Edition 2025

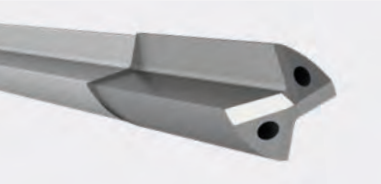
ISO-Code

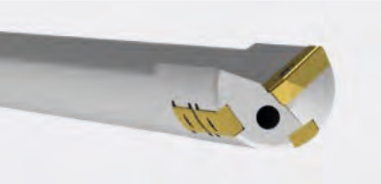
P	Steel, high-alloyed steel
M	Stainless steel
K	Grey cast iron, spheroidal graphite iron / malleable cast iron
N	Aluminium and other non ferrous metals
S	Special, super and titanium alloys
H	Hardened steel and chilled cast iron

Pictograms

Tool material	VHM			HM			
	Solid carbide			Carbide-tipped			
Surface	○	A	a	C	T		
	Bright	AlTiN	AlTiN nano	TiCN	TiN		
Type	TLB E 80	TLB E 100	TLB E 800	TLB Z 80			
Drilling depth	20xD	25xD	30xD	40xD	50xD	75xD	80xD
Ø-Tolerance	h5	h8					
Standard	WN						
	To Hardner standard						
Cutting direction	R						
	Right						
Shank form	HA	HB		T 3.1		Cyl	
	to DIN 6535			Driver Ø25x70mm		cylindrical	
Internal coolant							
	With IC						







Single-fluted gun drills E 100

P	M	K	N	S	H	Standard	Type	Tool material	Surface	Cutting direction	Shank form	Drilling depth	d1/mm	Article no.	Progr. page
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	25xD	1.000 - 16.000	**89523**	9
●	●	○	●	○	○	Company std.	TLB E 100	Solid carbide	a	right-hand	HA	25xD	1.000 - 16.000	**89520**	9
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	50xD	1.000 - 10.000	**89524**	11
●	●	○	●	○	○	Company std.	TLB E 100	Solid carbide	a	right-hand	HA	50xD	1.000 - 10.000	**89521**	11
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	75xD	1.000 - 7.144	**89525**	13
●	●	○	●	○	○	Company std.	TLB E 100	Solid carbide	a	right-hand	HA	75xD	1.000 - 7.144	**89522**	13
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	SPL 30	0.900 - 2.000	**89528**	15
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	45.000	0.900 - 4.000	**89503**	16
●	○	●	○	○	○	Company std.	TLB E 100	Solid carbide	A	right-hand	HA	45.000	1.000 - 4.000	**89510**	16
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	80.000	1.000 - 6.000	**89501**	17
●	○	●	○	○	○	Company std.	TLB E 100	Solid carbide	A	right-hand	HA	80.000	1.000 - 6.000	**89511**	17
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	120.000	1.500 - 5.000	**89504**	19
●	○	●	○	○	○	Company std.	TLB E 100	Solid carbide	A	right-hand	HA	120.000	1.500 - 6.000	**89512**	19
○	○	○	●	●	○	Company std.	TLB E 100	Solid carbide	◯	right-hand	HA	160.000	1.500 - 8.000	**89502**	20

P	M	K	N	S	H	Standard	Type	Tool material	Surface	Cutting direction	Shank form	Drilling depth	d1/mm	Article no.	Progr. page
Single-fluted gun drills E 100															
															
●	○	●	○	○	○	Company std.	TLB E 100	**Solid carbide**	A	right-hand	HA	160.000	1.500 - 8.000	**89513**	20
Single-fluted gun drills E 80															
															
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	HA	20xD	4.000 - 12.000	**89505**	24
															
○	●	○	○	●	○	Company std.	TLB E 80	**Carbide**	C	right-hand	HA	20xD	3.970 - 25.400	**89514**	24
															
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	HA	30xD	4.000 - 12.000	**89509**	26
															
○	●	○	○	●	○	Company std.	TLB E 80	**Carbide**	C	right-hand	HA	30xD	3.970 - 25.400	**89515**	26
															
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	HA	40xD	4.000 - 12.000	**89506**	28
															
○	●	○	○	●	○	Company std.	TLB E 80	**Carbide**	C	right-hand	HA	40xD	3.970 - 25.400	**89516**	28
															
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	HA	60xD	3.919 - 15.950	**89531**	30
															
●	●	○	○	●	○	Company std.	TLB E 80	**Carbide**	C	right-hand	HA	60xD	3.919 - 15.950	**89529**	30
															
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	HA	80xD	4.950 - 11.950	**89507**	32
															
○	●	○	○	●	○	Company std.	TLB E 80	**Carbide**	C	right-hand	HA	80xD	3.919 - 15.950	**89517**	32
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	T 3.1	GL 600	3.000 - 25.000	**89539**	34
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	T	right-hand	T 3.1	GL 800	3.000 - 25.000	**89540**	35

P	M	K	N	S	H	Standard	Type	Tool material	Surface	Cutting direction	Shank form	Drilling depth	d1/mm	Article no.	Progr. page
Single-fluted gun drills E 80															
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL1000	3.000 - 32.000	**89544**	36
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL1200	3.000 - 32.000	**89541**	38
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL1400	4.000 - 32.000	**89545**	40
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL1600	4.000 - 32.000	**89542**	41
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL1800	4.000 - 32.000	**89546**	42
														XXL	
●	○	●	○	○	○	Company std.	TLB E 80	**Carbide**	Ⓣ	right-hand	T 3.1	GL2000	4.000 - 32.000	**89543**	43
Gun drills with 2 cutting lips Z 80															
															
			●			Company std.	TLB Z 80	**Carbide**	◯	right-hand	HA	30xD	8.000 - 12.000	**89508**	45
															
		●				Company std.	TLB Z 80	**Carbide**	◯	right-hand	HA	30xD	8.000 - 12.000	**89518**	45
Single-fluted gun drills with interchangeable inserts E 800															
															
●	○	○	●	○		Company std.	TLB E 800	**Carbide**	Ⓣ	right-hand	HB	30xD	12.000 - 24.000	**89530**	47
Inserts for single-fluted gun drills E 800															
															
●	○	○	●	○		Company std.		**Solid carbide**	Ⓣ	right-hand			12.000 - 40.000	**89535**	50

P	M	K	N	S	H	Standard	Type	Tool material	Surface	Cutting direction	Shank form	Drilling depth	d1/mm	Article no.	Progr. page

Guide pads for single-fluted gun drills E 800

●	○	○	●	○		Company std.		**Solid carbide**	Ⓣ				12.000 - 40.000	**89536**	51

Inner inserts for single-fluted gun drills EB 800

●	○	○	●	○		Company std.		**Solid carbide**	Ⓣ	right-hand			1.000 - 1.000	**89532**	52

HARTNER

Precision Cutting Tools

Solid carbide single-fluted gun drills E 100

- suitable for almost every material
- from Ø 0,9 – 12,0 mm
- max. flute length 500 mm / max. 100xD

A selection of classic applications:

- Medical industry (bone nails, bone screws)
- Animal feed industry (pellet dies)
- Automobile technology (injection systems for diesel engines, starting valves, small crank shafts)

Solid carbide from the tip to the shank – Article no. 89520 | 89521 | 89522:

AlTiN nano-coated design for almost every material

Solid carbide solid shank with conical MQL shank end

Single-fluted solid carbide gun drill with soldered steel driver – Article no. 89501 | 89528:

bright finish for universal application

AlTiN-coated version for alloyed and high-alloy steels

In addition to our comprehensive standard programme, we offer you special tools on request specifically according to your specifications. Please use our inquiry form on page 73/74.

For certain materials a coating is required, as the successful application of gun drills with a bright surface finish cannot be guaranteed. For coating definitions see our application recommendations on page 104.

T TiN C TiCN A AlTiN a AlTiN nano

Single-fluted gun drills E 100

Article no. 89523

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | 25xD | WN | h5 | R | HA

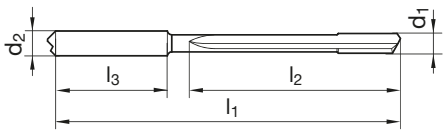
drilling depth up to 25xD • head form G • solid carbide shank with MQL shank end

Article no. 89520

P	M	K	N	S	H
●	●	○	●	○	○

VHM | a | TLB E 100 | 25xD | WN | h5 | R | HA

drilling depth up to 25xD • head form G • solid carbide shank with MQL shank end



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.000		3.000	65.000	32.000	28.000
1.100		3.000	70.000	34.000	28.000
1.191	3/64	3.000	70.000	39.000	28.000
1.200		3.000	70.000	35.000	28.000
1.300		4.000	80.000	43.000	28.000
1.400		4.000	80.000	45.000	28.000
1.500		4.000	80.000	49.000	28.000
1.588	1/16	4.000	85.000	51.000	28.000
1.600		4.000	85.000	49.000	28.000
1.700		4.000	85.000	49.000	28.000
1.800		4.000	85.000	50.000	28.000
1.900		4.000	85.000	50.000	28.000
1.984	5/64	4.000	95.000	64.000	28.000
2.000		4.000	95.000	65.000	28.000
2.381	3/32	4.000	100.000	70.000	28.000
2.500		4.000	115.000	85.000	28.000
2.778	7/64	4.000	115.000	85.000	28.000
3.000		6.000	145.000	105.000	36.000
3.175	1/8	6.000	145.000	105.000	36.000
3.500		6.000	145.000	105.000	36.000
3.572	9/64	6.000	160.000	120.000	36.000
3.969	5/32	6.000	160.000	120.000	36.000
4.000		6.000	160.000	120.000	36.000
4.366	11/64	6.000	220.000	180.000	36.000
4.500		6.000	220.000	178.000	36.000
4.763	3/16	6.000	220.000	180.000	36.000
5.000		6.000	220.000	180.000	36.000
5.159	13/64	6.000	220.000	180.000	36.000
5.500		6.000	220.000	179.000	36.000
5.556	7/32	6.000	220.000	180.000	36.000

Single-fluted gun drills E 100

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
5.953	15/64	6.000	220.000	180.000	36.000
6.000		6.000	220.000	180.000	36.000
6.350	1/4	8.000	260.000	210.000	36.000
6.500		8.000	260.000	210.000	36.000
6.747	17/64	8.000	260.000	210.000	36.000
7.000		8.000	260.000	210.000	36.000
7.144	9/32	8.000	285.000	240.000	36.000
7.500		8.000	285.000	240.000	36.000
7.541	19/64	8.000	285.000	240.000	36.000
7.938	5/16	8.000	285.000	240.000	36.000
8.000		8.000	285.000	240.000	36.000
8.334	21/64	10.000	310.000	260.000	40.000
8.500		10.000	315.000	268.000	40.000
8.731	11/32	10.000	330.000	280.000	40.000
9.000		10.000	350.000	300.000	40.000
9.128	23/64	10.000	350.000	300.000	40.000
9.500		10.000	350.000	300.000	40.000
9.525	3/8	10.000	350.000	300.000	40.000
9.922	25/64	10.000	350.000	300.000	40.000
10.000		10.000	350.000	300.000	40.000
10.319	13/32	12.000	385.000	330.000	45.000
10.500		12.000	395.000	340.000	45.000
10.716	27/64	12.000	405.000	350.000	45.000
11.000		12.000	420.000	360.000	45.000
11.113	7/16	12.000	420.000	360.000	45.000
11.500		12.000	420.000	360.000	45.000
11.509	29/64	12.000	420.000	360.000	45.000
11.906	15/32	12.000	420.000	360.000	45.000
12.000		12.000	420.000	360.000	45.000
12.303	31/64	14.000	440.000	385.000	45.000
12.500		14.000	450.000	395.000	45.000
12.700	1/2	14.000	455.000	396.000	45.000
13.000		14.000	460.000	405.000	45.000
13.097	33/64	14.000	465.000	410.000	45.000
13.494	17/32	14.000	480.000	425.000	45.000
13.500		14.000	485.000	430.000	45.000
13.891	35/64	14.000	490.000	435.000	45.000
14.000		14.000	500.000	437.000	45.000
14.288	9/16	16.000	510.000	450.000	48.000
14.500		16.000	520.000	460.000	48.000
14.684	37/64	16.000	525.000	465.000	48.000
15.000		16.000	535.000	468.000	48.000
15.081	19/32	16.000	540.000	475.000	48.000
15.478	39/64	16.000	550.000	485.000	48.000
15.500		16.000	555.000	490.000	48.000
15.875	5/8	16.000	560.000	495.000	48.000
16.000		16.000	565.000	499.000	48.000

Single-fluted gun drills E 100

Article no. 89524

P	M	K	N	S	H
○	○	○	●	●	○

VHM | TLB E 100 | 50xD | WN | h5 | R | HA

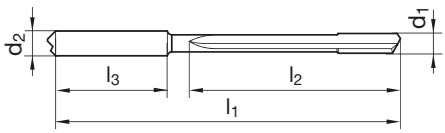
drilling depth up to 50xD • head form G • solid carbide shank with MQL shank end

Article no. 89521

P	M	K	N	S	H
●	●	○	●	○	○

VHM | a | TLB E 100 | 50xD | WN | h5 | R | HA

drilling depth up to 50xD • head form G • solid carbide shank with MQL shank end



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.000		3.000	90.000	57.000	28.000
1.100		3.000	100.000	64.000	28.000
1.191	3/64	3.000	100.000	68.000	28.000
1.200		3.000	100.000	65.000	28.000
1.300		4.000	110.000	75.000	28.000
1.400		4.000	115.000	80.000	28.000
1.500		4.000	120.000	86.000	28.000
1.588	1/16	4.000	125.000	91.000	28.000
1.600		4.000	125.000	89.000	28.000
1.700		4.000	125.000	89.000	28.000
1.800		4.000	125.000	89.000	28.000
1.900		4.000	125.000	89.000	28.000
1.984	5/64	4.000	145.000	114.000	28.000
2.000		4.000	145.000	115.000	28.000
2.381	3/32	4.000	160.000	130.000	28.000
2.500		4.000	185.000	155.000	28.000
2.778	7/64	4.000	185.000	155.000	28.000
3.000		6.000	230.000	190.000	36.000
3.175	1/8	6.000	230.000	190.000	36.000
3.500		6.000	230.000	190.000	36.000
3.572	9/64	6.000	260.000	220.000	36.000
3.969	5/32	6.000	260.000	220.000	36.000
4.000		6.000	260.000	220.000	36.000
4.366	11/64	6.000	290.000	245.000	36.000
4.500		6.000	290.000	248.000	36.000
4.763	3/16	6.000	310.000	268.000	36.000
5.000		6.000	370.000	330.000	36.000
5.159	13/64	6.000	370.000	330.000	36.000
5.500		6.000	370.000	329.000	36.000
5.556	7/32	6.000	370.000	330.000	36.000

Single-fluted gun drills E 100

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
5.953	15/64	6.000	370.000	330.000	36.000
6.000		6.000	370.000	330.000	36.000
6.350	1/4	8.000	430.000	385.000	36.000
6.500		8.000	430.000	385.000	36.000
6.747	17/64	8.000	430.000	385.000	36.000
7.000		8.000	430.000	385.000	36.000
7.144	9/32	8.000	485.000	440.000	36.000
7.500		8.000	485.000	440.000	36.000
7.541	19/64	8.000	485.000	440.000	36.000
7.938	5/16	8.000	485.000	440.000	36.000
8.000		8.000	485.000	440.000	36.000
8.334	21/64	10.000	520.000	470.000	40.000
8.500		10.000	530.000	480.000	40.000
8.731	11/32	10.000	545.000	495.000	40.000
9.000		10.000	555.000	506.000	40.000
9.128	23/64	10.000	565.000	515.000	40.000
9.500		10.000	585.000	535.000	40.000
9.525	3/8	10.000	590.000	540.000	40.000
9.922	25/64	10.000	610.000	560.000	40.000
10.000		10.000	615.000	562.000	40.000

Single-fluted gun drills E 100

Article no. 89525

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | 75xD | WN | h5 | R | HA

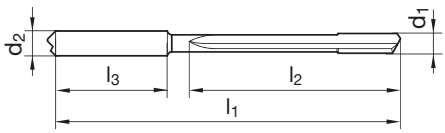
drilling depth up to 75xD • head form G • solid carbide shank with MQL shank end

Article no. 89522

P	M	K	N	S	H
●	●	○	●	○	○

VHM | a | TLB E 100 | 75xD | WN | h5 | R | HA

drilling depth up to 75xD • head form G • solid carbide shank with MQL shank end



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.000		3.000	115.000	82.000	28.000
1.100		3.000	130.000	92.000	28.000
1.191	3/64	3.000	130.000	98.000	28.000
1.200		3.000	130.000	94.000	28.000
1.300		4.000	145.000	108.000	28.000
1.400		4.000	155.000	117.000	28.000
1.500		4.000	155.000	124.000	28.000
1.588	1/16	4.000	165.000	131.000	28.000
1.600		4.000	165.000	128.000	28.000
1.700		4.000	165.000	128.000	28.000
1.800		4.000	165.000	129.000	28.000
1.900		4.000	165.000	129.000	28.000
1.984	5/64	4.000	195.000	163.000	28.000
2.000		4.000	195.000	165.000	28.000
2.381	3/32	4.000	220.000	190.000	28.000
2.500		4.000	255.000	220.000	28.000
2.778	7/64	4.000	255.000	220.000	28.000
3.000		6.000	290.000	247.000	36.000
3.175	1/8	6.000	320.000	280.000	36.000
3.500		6.000	320.000	280.000	36.000
3.572	9/64	6.000	360.000	320.000	36.000
3.969	5/32	6.000	360.000	320.000	36.000
4.000		6.000	360.000	320.000	36.000
4.366	11/64	6.000	395.000	355.000	36.000
4.500		6.000	395.000	352.000	36.000
4.763	3/16	6.000	430.000	387.000	36.000
5.000		6.000	450.000	406.000	36.000
5.159	13/64	6.000	465.000	419.000	36.000
5.500		6.000	495.000	450.000	36.000
5.556	7/32	6.000	525.000	485.000	36.000

Single-fluted gun drills E 100

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
5.953	15/64	6.000	525.000	485.000	36.000
6.000		6.000	525.000	485.000	36.000
6.350	1/4	8.000	560.000	516.000	36.000
6.500		8.000	575.000	528.000	36.000
6.747	17/64	8.000	595.000	548.000	36.000
7.000		8.000	615.000	568.000	36.000
7.144	9/32	8.000	625.000	580.000	36.000

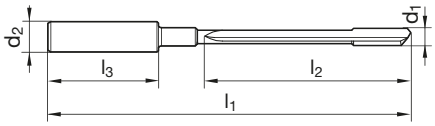
Single-fluted gun drills E 100

Article no. 89528

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | WN | h5 | R | HA | ≈

flute length 30 mm • head form G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
0.900		4.000	75.000	30.000	28.000
1.000		4.000	75.000	30.000	28.000
1.100		4.000	75.000	30.000	28.000
1.191	3/64	4.000	75.000	30.000	28.000
1.200		4.000	75.000	30.000	28.000
1.300		4.000	75.000	30.000	28.000
1.400		4.000	75.000	30.000	28.000
1.500		4.000	75.000	30.000	28.000
1.588	1/16	4.000	75.000	30.000	28.000
1.600		4.000	75.000	30.000	28.000
1.700		4.000	75.000	30.000	28.000
1.800		4.000	75.000	30.000	28.000
1.900		4.000	75.000	30.000	28.000
1.984	5/64	4.000	75.000	30.000	28.000
2.000		4.000	75.000	30.000	28.000

Single-fluted gun drills E 100

Article no. 89503

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | SPL 45,00 | WN | h5 | R | HA

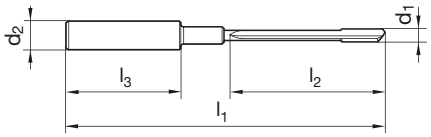
flute length 45 mm • head form G

Article no. 89510

P	M	K	N	S	H
●	○	●	○	○	○

VHM | A | TLB E 100 | SPL 45,00 | WN | h5 | R | HA

flute length 45 mm • head form G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
0.900		4.000	90.000	45.000	28.000
1.000		4.000	90.000	45.000	28.000
1.100		4.000	90.000	45.000	28.000
1.191	3/64	4.000	90.000	45.000	28.000
1.200		4.000	90.000	45.000	28.000
1.300		4.000	90.000	45.000	28.000
1.400		4.000	90.000	45.000	28.000
1.500		4.000	90.000	45.000	28.000
1.590	1/16	4.000	90.000	45.000	28.000
1.600		4.000	90.000	45.000	28.000
1.700		4.000	90.000	45.000	28.000
1.800		4.000	90.000	45.000	28.000
1.900		4.000	90.000	45.000	28.000
1.980	5/64	4.000	90.000	45.000	28.000
2.000		4.000	90.000	45.000	28.000
2.381	3/32	4.000	100.000	45.000	28.000
2.500		10.000	100.000	45.000	40.000
2.700		10.000	100.000	45.000	40.000
2.778	7/64	10.000	100.000	45.000	40.000
3.000		10.000	100.000	45.000	40.000
3.175	1/8	10.000	100.000	45.000	40.000
3.200		10.000	100.000	45.000	40.000
3.500		10.000	100.000	45.000	40.000
3.572	9/64	10.000	100.000	45.000	40.000
3.969	5/32	10.000	100.000	45.000	40.000
4.000		10.000	100.000	45.000	40.000

Single-fluted gun drills E 100

Article no. 89501

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ○ | TLB E 100 | SPL 80,00 | WN | h5 | R | HA

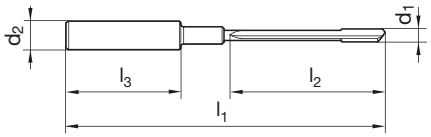
flute length 80 mm • head form G

Article no. 89511

P	M	K	N	S	H
●	○	●	○	○	○

VHM | A | TLB E 100 | SPL 80,00 | WN | h5 | R | HA

flute length 80 mm • head form G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.000		4.000	125.000	80.000	28.000
1.100		4.000	125.000	80.000	28.000
1.191	3/64	4.000	125.000	80.000	28.000
1.200		4.000	125.000	80.000	28.000
1.300		4.000	125.000	80.000	28.000
1.400		4.000	125.000	80.000	28.000
1.500		4.000	125.000	80.000	28.000
1.590	1/16	4.000	125.000	80.000	28.000
1.600		4.000	125.000	80.000	28.000
1.700		4.000	125.000	80.000	28.000
1.800		4.000	125.000	80.000	28.000
1.900		4.000	125.000	80.000	28.000
1.980	5/64	4.000	125.000	80.000	28.000
2.000		4.000	125.000	80.000	28.000
2.381	3/32	4.000	135.000	80.000	28.000
2.500		10.000	135.000	80.000	40.000
2.700		10.000	135.000	80.000	40.000
2.778	7/64	10.000	135.000	80.000	40.000
3.000		10.000	135.000	80.000	40.000
3.175	1/8	10.000	135.000	80.000	40.000
3.200		10.000	135.000	80.000	40.000
3.500		10.000	135.000	80.000	40.000
3.572	9/64	10.000	135.000	80.000	40.000
3.969	5/32	10.000	135.000	80.000	40.000
4.000		10.000	135.000	80.000	40.000
4.200		10.000	135.000	80.000	40.000
4.366	11/64	10.000	135.000	80.000	40.000
4.500		10.000	135.000	80.000	40.000
4.763	3/16	10.000	135.000	80.000	40.000
5.000		10.000	135.000	80.000	40.000

Single-fluted gun drills E 100

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
5.159	13/64	10.000	135.000	80.000	40.000
5.500		10.000	135.000	80.000	40.000
5.556	7/32	10.000	135.000	80.000	40.000
5.953	15/64	10.000	135.000	80.000	40.000
6.000		16.000	145.000	80.000	48.000

Single-fluted gun drills E 100

Article no. 89504

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | SPL 120,00 | WN | h5 | R | HA

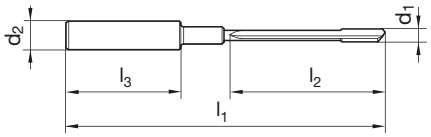
flute length 120 mm • head form G

Article no. 89512

P	M	K	N	S	H
●	○	●	○	○	○

VHM | A | TLB E 100 | SPL 120,00 | WN | h5 | R | HA

flute length 120 mm • head form G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.500		4.000	165.000	120.000	28.000
1.588	1/16	4.000	165.000	120.000	28.000
1.600		4.000	165.000	120.000	28.000
1.700		4.000	165.000	120.000	28.000
1.800		4.000	165.000	120.000	28.000
1.900		4.000	165.000	120.000	28.000
1.984	5/64	4.000	165.000	120.000	28.000
2.000		4.000	165.000	120.000	28.000
2.381	3/32	4.000	175.000	120.000	28.000
2.500		10.000	175.000	120.000	40.000
2.700		10.000	175.000	120.000	40.000
2.778	7/64	10.000	175.000	120.000	40.000
3.000		10.000	175.000	120.000	40.000
3.175	1/8	10.000	175.000	120.000	40.000
3.200		10.000	175.000	120.000	40.000
3.500		10.000	175.000	120.000	40.000
3.572	9/64	10.000	175.000	120.000	40.000
3.969	5/32	10.000	175.000	120.000	40.000
4.000		10.000	175.000	120.000	40.000
4.200		10.000	175.000	120.000	40.000
4.366	11/64	10.000	175.000	120.000	40.000
4.500		10.000	175.000	120.000	40.000
4.763	3/16	10.000	175.000	120.000	40.000
5.000		10.000	175.000	120.000	40.000
5.159	13/64	10.000	175.000	120.000	40.000
5.500		10.000	175.000	120.000	40.000
5.556	7/32	10.000	175.000	120.000	40.000
5.953	15/64	10.000	175.000	120.000	40.000
6.000		16.000	185.000	120.000	48.000

Single-fluted gun drills E 100

Article no. 89502

P	M	K	N	S	H
○	○	○	●	●	○

VHM | ◯ | TLB E 100 | SPL 160,00 | WN | h5 | R | HA

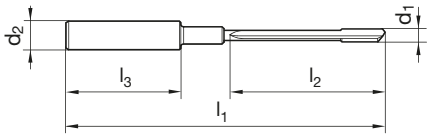
flute length 160 mm • head form G

Article no. 89513

P	M	K	N	S	H
●	○	●	○	○	○

VHM | A | TLB E 100 | SPL 160,00 | WN | h5 | R | HA

flute length 160 mm • head form G



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
1.500		4.000	205.000	160.000	28.000
1.588	1/16	4.000	205.000	160.000	28.000
1.600		4.000	205.000	160.000	28.000
1.700		4.000	205.000	160.000	28.000
1.800		4.000	205.000	160.000	28.000
1.900		4.000	205.000	160.000	28.000
1.984	5/64	4.000	205.000	160.000	28.000
2.000		4.000	205.000	160.000	28.000
2.381	3/32	4.000	215.000	160.000	28.000
2.500		10.000	215.000	160.000	40.000
2.700		10.000	215.000	160.000	40.000
2.778	7/64	10.000	215.000	160.000	40.000
3.000		10.000	215.000	160.000	40.000
3.175	1/8	10.000	215.000	160.000	40.000
3.200		10.000	215.000	160.000	40.000
3.500		10.000	215.000	160.000	40.000
3.572	9/64	10.000	215.000	160.000	40.000
3.969	5/32	10.000	215.000	160.000	40.000
4.000		10.000	215.000	160.000	40.000
4.200		10.000	215.000	160.000	40.000
4.366	11/64	10.000	215.000	160.000	40.000
4.500		10.000	215.000	160.000	40.000
4.763	3/16	10.000	215.000	160.000	40.000
5.000		10.000	215.000	160.000	40.000
5.159	13/64	10.000	215.000	160.000	40.000
5.500		10.000	215.000	160.000	40.000
5.556	7/32	10.000	215.000	160.000	40.000
5.953	15/64	10.000	215.000	160.000	40.000
6.000		16.000	225.000	160.000	48.000
6.350	1/4	16.000	225.000	160.000	48.000

Single-fluted gun drills E 100

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
6.500		16.000	225.000	160.000	48.000
6.747	17/64	16.000	225.000	160.000	48.000
7.000		16.000	225.000	160.000	48.000
7.144	9/32	16.000	225.000	160.000	48.000
7.500		16.000	225.000	160.000	48.000
7.541	19/64	16.000	225.000	160.000	48.000
7.938	5/16	16.000	225.000	160.000	48.000
8.000		16.000	225.000	160.000	48.000

HARTNER

Precision Cutting Tools

Single-fluted gun drills E 80 with brazed carbide head

- suitable for almost every material
- Ø 2,0 – 40,0 mm
- max. total length 3000 mm

Standard range:

TiN-coated design with chip breaker for long-chipping steels

TiCN-coated design without chip breaker for alloyed and high-alloyed steels

In addition to our comprehensive standard programme, we offer you special tools on request specifically according to your specifications. Please use our inquiry form on page 50/51.
From Ø 6.0 to 20.0 mm, we can fit PCD or CBN cutting edges on request.
With AlSi alloys for example, tool life subsequently increases multi-fold.

For certain materials a coating is required, as the successful application of gun drills with a bright finish surface finish cannot be guaranteed.
For coating definitions see our application recommendations on page 64/65.

T TiN C TiCN A AlTiN a AlTiN nano

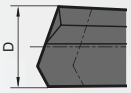
Fast service for brazed single-fluted gun drills

In just four steps to your custom-made gun drill!

Please choose:

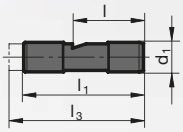
1 **nom.-Ø**

- Ø 2,0 – 13,9 mm in increments of 0,1 mm or
- Ø 14,0 – 22,0 mm in increments of 0,5 mm



2 **driver**

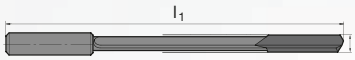
a standard driver from page 92



3 **total length**

- min. 20xD
- max. 1200 mm

please determine overall length according to instructions on page 56!



4 **surface**

- TiN-coating or
- bright

Send us your choice, **we will quote within 24 hour** and you will receive your custom-made tool **in just 2 weeks**.

This fast service is valid for gun drills that:

- fit in the above framework. Carbide head length, head form and other technical details are determined according to our company standard.
- are used for the machining of steel and cast materials. For all other materials, we recommend special geometries on request.
- have a flute length of min. 20xD and one of the two abovementioned surface finishes. Shorter gun drills and tools with other coatings have a delivery time of 4 weeks.

In addition to the ex stock range Hartner offers a fast service for gun drills with standard point grind and standard driver in following dimensions. Delivery time is max. 2 week.

Single-fluted gun drills E 80

Article no. 89505

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | 20xD | WN | h5 | R | HA

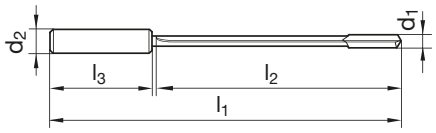
drilling depth up to 20xD • head form G • with lateral chip breaker

Article no. 89514

P	M	K	N	S	H
○	●	○	○	●	○

HM | C | TLB E 80 | 20xD | WN | h5 | R | HA

drilling depth up to 20xD • head form G • for alloyed and high alloyed steels



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.970	5/32	10.000	150.000	100.000	40.000
4.000		12.000	150.000	100.000	45.000
4.200		12.000	160.000	110.000	45.000
4.366	11/64	12.000	170.000	120.000	45.000
4.500		12.000	170.000	120.000	45.000
4.763	3/16	12.000	180.000	130.000	45.000
5.000		16.000	180.000	130.000	48.000
5.156		16.000	180.000	130.000	48.000
5.500		16.000	190.000	140.000	48.000
5.556	7/32	16.000	200.000	150.000	48.000
5.953	15/64	16.000	210.000	160.000	48.000
6.000		16.000	210.000	160.000	48.000
6.350	1/4	16.000	220.000	170.000	48.000
6.500		16.000	220.000	170.000	48.000
6.747	17/64	16.000	235.000	185.000	48.000
7.000		16.000	235.000	185.000	48.000
7.144	9/32	16.000	240.000	190.000	48.000
7.500		16.000	245.000	195.000	48.000
7.541	19/64	16.000	250.000	200.000	48.000
7.938	5/16	16.000	260.000	210.000	48.000
8.000		16.000	260.000	210.000	48.000
8.334	21/64	16.000	270.000	215.000	48.000
8.500		16.000	275.000	220.000	48.000
8.731	11/32	16.000	280.000	230.000	48.000
9.000		16.000	280.000	230.000	48.000
9.128	23/64	16.000	290.000	235.000	48.000
9.500		16.000	300.000	245.000	48.000
9.525	3/8	16.000	290.000	240.000	48.000
9.922	25/64	16.000	310.000	250.000	48.000
10.000		20.000	320.000	260.000	50.000

Single-fluted gun drills E 80

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10.319	13/32	20.000	320.000	265.000	50.000
10.500		20.000	330.000	275.000	50.000
10.716	27/64	20.000	340.000	285.000	50.000
11.000		20.000	340.000	290.000	50.000
11.113	7/16	20.000	340.000	290.000	50.000
11.500		20.000	355.000	300.000	50.000
11.906	15/32	20.000	370.000	305.000	50.000
12.000		20.000	370.000	310.000	50.000
12.303	31/64	20.000	370.000	315.000	50.000
12.500		20.000	380.000	325.000	50.000
12.700	1/2	20.000	385.000	330.000	50.000
13.000		20.000	390.000	335.000	50.000
13.097	33/64	20.000	390.000	335.000	50.000
13.500		20.000	395.000	340.000	50.000
13.891	35/64	20.000	395.000	340.000	50.000
14.000		20.000	400.000	345.000	50.000
14.288	9/16	25.000	410.000	350.000	56.000
14.500		25.000	420.000	355.000	56.000
14.684	37/64	25.000	420.000	360.000	56.000
15.000		25.000	430.000	370.000	56.000
15.081	19/32	25.000	430.000	370.000	56.000
15.478	39/64	25.000	445.000	380.000	56.000
15.500		25.000	445.000	380.000	56.000
15.875	5/8	25.000	450.000	390.000	56.000
16.000		25.000	455.000	395.000	56.000
16.272	41/64	25.000	460.000	400.000	56.000
16.500		25.000	465.000	405.000	56.000
16.669	21/32	25.000	470.000	410.000	56.000
17.000		25.000	475.000	415.000	56.000
17.066	43/64	25.000	475.000	415.000	56.000
17.463	11/16	25.000	485.000	425.000	56.000
17.859	45/64	25.000	495.000	435.000	56.000
18.000		25.000	500.000	440.000	56.000
18.256	23/32	25.000	505.000	445.000	56.000
18.653	47/64	25.000	515.000	455.000	56.000
19.000		25.000	520.000	460.000	56.000
19.050	3/4	32.000	525.000	460.000	60.000
19.447	49/64	32.000	535.000	570.000	60.000
19.844	25/32	32.000	545.000	480.000	60.000
20.000		32.000	550.000	485.000	60.000
20.241	51/64	32.000	550.000	485.000	60.000
20.638	13/16	32.000	555.000	490.000	60.000
21.000		32.000	560.000	495.000	60.000
21.034	53/64	32.000	560.000	495.000	60.000
21.431	27/32	32.000	570.000	505.000	60.000
21.828	55/64	32.000	580.000	515.000	60.000
22.000		32.000	580.000	515.000	60.000
22.225		32.000	585.000	520.000	60.000
22.622	57/64	32.000	595.000	530.000	60.000
23.000		32.000	605.000	540.000	60.000
23.019	29/32	32.000	605.000	540.000	60.000
23.416	59/64	32.000	615.000	550.000	60.000
23.813	15/16	32.000	625.000	560.000	60.000
24.000		32.000	625.000	560.000	60.000
24.209	61/64	32.000	630.000	565.000	60.000
24.606	31/32	32.000	640.000	575.000	60.000
25.000	63/64	32.000	650.000	585.000	60.000
25.400	1	32.000	660.000	595.000	60.000

Single-fluted gun drills E 80

Article no. 89509

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | 30xD | WN | h5 | R | HA

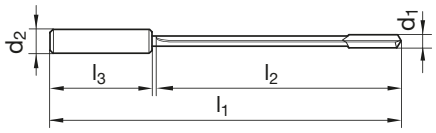
drilling depth up to 30xD • head form G • with lateral chip breaker

Article no. 89515

P	M	K	N	S	H
○	●	○	○	●	○

HM | C | TLB E 80 | 30xD | WN | h5 | R | HA

drilling depth up to 30xD • head form G • for alloyed and high alloyed steels



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.970	5/32	10.000	200.000	155.000	40.000
4.000		12.000	200.000	155.000	45.000
4.200		12.000	210.000	165.000	45.000
4.366	11/64	12.000	215.000	165.000	45.000
4.500		12.000	220.000	175.000	45.000
4.763	3/16	12.000	230.000	182.000	45.000
5.000		16.000	230.000	182.000	48.000
5.156		16.000	230.000	182.000	48.000
5.500		16.000	245.000	197.000	48.000
5.556	7/32	16.000	260.000	207.000	48.000
5.953	15/64	16.000	260.000	212.000	48.000
6.000		16.000	260.000	212.000	48.000
6.350	1/4	16.000	275.000	227.000	48.000
6.500		16.000	275.000	227.000	48.000
6.747	17/64	16.000	290.000	242.000	48.000
7.000		16.000	290.000	242.000	48.000
7.144	9/32	16.000	315.000	262.000	48.000
7.500		16.000	320.000	270.000	48.000
7.541	19/64	16.000	320.000	272.000	48.000
7.938	5/16	16.000	320.000	272.000	48.000
8.000		16.000	320.000	272.000	48.000
8.334	21/64	16.000	355.000	302.000	48.000
8.500		16.000	360.000	305.000	48.000
8.731	11/32	16.000	370.000	317.000	48.000
9.000		16.000	350.000	302.000	48.000
9.128	23/64	16.000	395.000	327.000	48.000
9.500		16.000	395.000	340.000	48.000
9.525	3/8	16.000	380.000	330.000	48.000
9.922	25/64	16.000	400.000	350.000	48.000
10.000		20.000	400.000	350.000	50.000

Single-fluted gun drills E 80

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10.319	13/32	20.000	425.000	370.000	50.000
10.500		20.000	435.000	380.000	50.000
10.716	27/64	20.000	430.000	380.000	50.000
11.000		20.000	430.000	380.000	50.000
11.113	7/16	20.000	430.000	380.000	50.000
11.500		20.000	470.000	415.000	50.000
11.906	15/32	20.000	450.000	400.000	50.000
12.000		20.000	450.000	400.000	50.000
12.303	31/64	20.000	495.000	440.000	50.000
12.500		20.000	505.000	450.000	50.000
12.700	1/2	20.000	500.000	450.000	50.000
13.000		20.000	520.000	465.000	50.000
13.097	33/64	20.000	520.000	465.000	50.000
13.500		20.000	530.000	475.000	50.000
13.891	35/64	20.000	535.000	480.000	50.000
14.000		20.000	540.000	485.000	50.000
14.288	9/16	25.000	555.000	494.000	56.000
14.500		25.000	565.000	500.000	56.000
14.684	37/64	25.000	570.000	509.000	56.000
15.000		25.000	580.000	520.000	56.000
15.081	19/32	25.000	580.000	520.000	56.000
15.478	39/64	25.000	595.000	534.000	56.000
15.500		25.000	600.000	535.000	56.000
15.875	5/8	25.000	610.000	549.000	56.000
16.000		25.000	615.000	555.000	56.000
16.272	41/64	25.000	620.000	559.000	56.000
16.500		25.000	630.000	569.000	56.000
16.669	21/32	25.000	635.000	574.000	56.000
17.000		25.000	645.000	584.000	56.000
17.066	43/64	25.000	645.000	584.000	56.000
17.463	11/16	25.000	660.000	599.000	56.000
17.859	45/64	25.000	675.000	614.000	56.000
18.000		25.000	680.000	619.000	56.000
18.256	23/32	25.000	685.000	624.000	56.000
18.653	47/64	25.000	700.000	639.000	56.000
19.000		25.000	710.000	649.000	56.000
19.050	3/4	32.000	715.000	650.000	60.000
19.447	49/64	32.000	730.000	665.000	60.000
19.844	25/32	32.000	745.000	680.000	60.000
20.000		32.000	750.000	685.000	60.000
20.241	51/64	32.000	750.000	685.000	60.000
20.638	13/16	32.000	760.000	695.000	60.000
21.000		32.000	770.000	705.000	60.000
21.034	53/64	32.000	770.000	705.000	60.000
21.431	27/32	32.000	785.000	720.000	60.000
21.828	55/64	32.000	795.000	730.000	60.000
22.000		32.000	800.000	735.000	60.000
22.225		32.000	810.000	745.000	60.000
22.622	57/64	32.000	820.000	755.000	60.000
23.000		32.000	835.000	770.000	60.000
23.019	29/32	32.000	835.000	770.000	60.000
23.416	59/64	32.000	850.000	785.000	60.000
23.813	15/16	32.000	860.000	798.000	60.000
24.000		32.000	865.000	800.000	60.000
24.209	61/64	32.000	875.000	810.000	60.000
24.606	31/32	32.000	885.000	820.000	60.000
25.000	63/64	32.000	900.000	835.000	60.000
25.400	1	32.000	910.000	845.000	60.000

Single-fluted gun drills E 80

Article no. 89506

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | 40xD | WN | h5 | R | HA

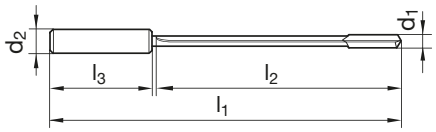
drilling depth up to 40xD • head form G • with lateral chip breaker

Article no. 89516

P	M	K	N	S	H
○	●	○	○	●	○

HM | C | TLB E 80 | 40xD | WN | h5 | R | HA

drilling depth up to 40xD • head form G • for alloyed and high alloyed steels



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.970	5/32	10.000	230.000	185.000	40.000
4.000		12.000	230.000	185.000	45.000
4.200		12.000	240.000	195.000	45.000
4.366	11/64	12.000	250.000	205.000	45.000
4.500		12.000	250.000	205.000	45.000
4.763	3/16	12.000	275.000	225.000	45.000
5.000		16.000	280.000	232.000	48.000
5.156		16.000	280.000	232.000	48.000
5.500		16.000	300.000	252.000	48.000
5.556	7/32	16.000	315.000	262.000	48.000
5.953	15/64	16.000	330.000	277.000	48.000
6.000		16.000	320.000	272.000	48.000
6.350	1/4	16.000	340.000	292.000	48.000
6.500		16.000	340.000	292.000	48.000
6.747	17/64	16.000	365.000	312.000	48.000
7.000		16.000	370.000	322.000	48.000
7.144	9/32	16.000	385.000	332.000	48.000
7.500		16.000	395.000	345.000	48.000
7.541	19/64	16.000	395.000	345.000	48.000
7.938	5/16	16.000	420.000	372.000	48.000
8.000		16.000	420.000	372.000	48.000
8.334	21/64	16.000	440.000	387.000	48.000
8.500		16.000	445.000	390.000	48.000
8.731	11/32	16.000	450.000	402.000	48.000
9.000		16.000	450.000	402.000	48.000
9.128	23/64	16.000	475.000	422.000	48.000
9.500		16.000	490.000	435.000	48.000
9.525	3/8	16.000	480.000	432.000	48.000
9.922	25/64	16.000	510.000	460.000	48.000
10.000		20.000	510.000	460.000	50.000

Single-fluted gun drills E 80

d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10.319	13/32	20.000	530.000	475.000	50.000
10.500		20.000	540.000	485.000	50.000
10.716	27/64	20.000	545.000	490.000	50.000
11.000		20.000	550.000	500.000	50.000
11.113	7/16	20.000	550.000	500.000	50.000
11.500		20.000	585.000	530.000	50.000
11.906	15/32	20.000	600.000	550.000	50.000
12.000		20.000	600.000	550.000	50.000
12.303	31/64	20.000	615.000	560.000	50.000
12.500		20.000	630.000	575.000	50.000
12.700	1/2	20.000	635.000	585.000	50.000
13.000		20.000	650.000	595.000	50.000
13.097	33/64	20.000	650.000	595.000	50.000
13.500		20.000	660.000	605.000	50.000
13.891	35/64	20.000	675.000	620.000	50.000
14.000		20.000	680.000	625.000	50.000
14.288	9/16	25.000	700.000	639.000	56.000
14.500		25.000	710.000	645.000	56.000
14.684	37/64	25.000	715.000	654.000	56.000
15.000		25.000	730.000	670.000	56.000
15.081	19/32	25.000	730.000	670.000	56.000
15.478	39/64	25.000	755.000	690.000	56.000
15.500		25.000	755.000	690.000	56.000
15.875	5/8	25.000	765.000	704.000	56.000
16.000		25.000	775.000	715.000	56.000
16.272	41/64	25.000	785.000	724.000	56.000
16.500		25.000	795.000	734.000	56.000
16.669	21/32	25.000	800.000	739.000	56.000
17.000		25.000	815.000	754.000	56.000
17.066	43/64	25.000	820.000	759.000	56.000
17.463	11/16	25.000	835.000	774.000	56.000
17.859	45/64	25.000	850.000	789.000	56.000
18.000		25.000	860.000	799.000	56.000
18.256	23/32	25.000	870.000	809.000	56.000
18.653	47/64	25.000	885.000	824.000	56.000
19.000		25.000	900.000	839.000	56.000
19.050	3/4	32.000	905.000	840.000	60.000
19.447	49/64	32.000	925.000	860.000	60.000
19.844	25/32	32.000	940.000	875.000	60.000
20.000		32.000	950.000	885.000	60.000
20.241	51/64	32.000	950.000	885.000	60.000
20.638	13/16	32.000	965.000	900.000	60.000
21.000		32.000	980.000	915.000	60.000
21.034	53/64	32.000	980.000	915.000	60.000
21.431	27/32	32.000	1000.000	935.000	60.000
21.828	55/64	32.000	1015.000	950.000	60.000
22.000		32.000	1020.000	955.000	60.000
22.225		32.000	1030.000	965.000	60.000
22.622	57/64	32.000	1050.000	985.000	60.000
23.000		32.000	1065.000	1000.000	60.000
23.019	29/32	32.000	1065.000	1000.000	60.000
23.416	59/64	32.000	1080.000	1015.000	60.000
23.813	15/16	32.000	1100.000	1035.000	60.000
24.000		32.000	1105.000	1040.000	60.000
24.209	61/64	32.000	1115.000	1050.000	60.000
24.606	31/32	32.000	1130.000	1065.000	60.000
25.000	63/64	32.000	1150.000	1085.000	60.000
25.400	1	32.000	1165.000	1100.000	60.000

Single-fluted gun drills E 80

Article no. 89531

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | 60xD | WN | h5 | R | HA

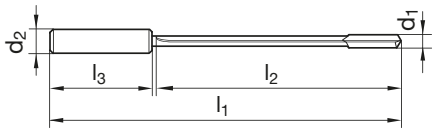
with recessed coolant chamber • head form G • with lateral chip breaker
max. flute length per tool 40xD, for larger drilling depths apply art. no. 5022 as first tool

Article no. 89529

P	M	K	N	S	H
●	●	○	○	●	○

HM | C | TLB E 80 | 60xD | WN | h5 | R | HA

head form G
max. flute length per tool 40xD, for larger drilling depths apply art. no. 5641 as first tool



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.919		10.000	310.000	265.000	40.000
3.969	5/32	10.000	310.000	265.000	40.000
4.150		12.000	325.000	275.000	45.000
4.316		12.000	345.000	290.000	45.000
4.450		12.000	345.000	295.000	45.000
4.713		12.000	375.000	315.000	45.000
4.950		16.000	375.000	325.000	48.000
5.109		16.000	390.000	335.000	48.000
5.450		16.000	410.000	360.000	48.000
5.506		16.000	420.000	367.000	48.000
5.903		16.000	445.000	390.000	48.000
5.953	15/64	16.000	445.000	390.000	48.000
6.300		16.000	470.000	415.000	48.000
6.450		16.000	480.000	425.000	48.000
6.697		16.000	500.000	447.000	48.000
6.950		16.000	510.000	460.000	48.000
7.094		16.000	525.000	472.000	48.000
7.450		16.000	545.000	490.000	48.000
7.491		16.000	550.000	497.000	48.000
7.888		16.000	575.000	520.000	48.000
7.950		16.000	575.000	525.000	48.000
8.284		16.000	600.000	547.000	48.000
8.450		16.000	610.000	555.000	48.000
8.681		16.000	625.000	572.000	48.000
8.950		16.000	645.000	590.000	48.000
9.078		16.000	655.000	602.000	48.000
9.450		16.000	675.000	625.000	48.000
9.475		16.000	680.000	625.000	48.000
9.872		16.000	705.000	652.000	48.000
9.950		20.000	710.000	655.000	50.000

Single-fluted gun drills E 80

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10.269		20.000	730.000	675.000	50.000
10.450		20.000	745.000	690.000	50.000
10.666		20.000	755.000	700.000	50.000
10.950		20.000	780.000	725.000	50.000
11.063		20.000	785.000	730.000	50.000
11.450		20.000	810.000	755.000	50.000
11.866		20.000	835.000	780.000	50.000
11.950		20.000	845.000	790.000	50.000
12.253		20.000	860.000	805.000	50.000
12.450		20.000	875.000	820.000	50.000
12.650		20.000	890.000	835.000	50.000
12.950		20.000	910.000	855.000	50.000
13.047		20.000	910.000	855.000	50.000
13.450		20.000	925.000	870.000	50.000
13.851		20.000	950.000	895.000	50.000
13.950		20.000	955.000	900.000	50.000
14.238		25.000	980.000	919.000	56.000
14.450		25.000	995.000	935.000	56.000
14.634		25.000	1005.000	944.000	56.000
14.950		25.000	1025.000	965.000	56.000
15.031		25.000	1030.000	969.000	56.000
15.428		25.000	1055.000	994.000	56.000
15.450		25.000	1060.000	1000.000	56.000
15.825		25.000	1080.000	1019.000	56.000
15.950		25.000	1090.000	1030.000	56.000

Single-fluted gun drills E 80

Article no. 89507

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | 80xD | WN | h5 | R | HA

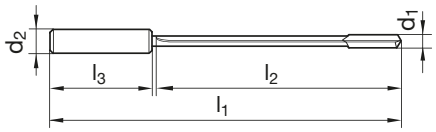
drilling depth up to 80xD • head form G • with lateral chip breaker • for long-chipping materials • maximum drilling depth per tool 40xD, for larger drilling depths first apply drill art. no. 89506

Article no. 89517

P	M	K	N	S	H
○	●	○	○	●	○

HM | C | TLB E 80 | 80xD | WN | h5 | R | HA

drilling depth up to 80xD • head form G • maximum drilling depth per tool 40xD, for larger drilling depths first apply drill art. no. 89516



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.919		10.000	390.000	345.000	40.000
3.969	5/32	10.000	390.000	345.000	40.000
4.150		12.000	405.000	355.000	45.000
4.316		12.000	430.000	380.000	45.000
4.450		12.000	430.000	380.000	45.000
4.713		12.000	460.000	410.000	45.000
4.950		16.000	480.000	432.000	48.000
5.109		16.000	480.000	432.000	48.000
5.450		16.000	520.000	470.000	48.000
5.506		16.000	530.000	477.000	48.000
5.903		16.000	560.000	512.000	48.000
5.953	15/64	16.000	560.000	512.000	48.000
6.300		16.000	590.000	542.000	48.000
6.450		16.000	605.000	556.000	48.000
6.697		16.000	635.000	582.000	48.000
6.950		16.000	650.000	602.000	48.000
7.094		16.000	665.000	612.000	48.000
7.450		16.000	695.000	640.000	48.000
7.491		16.000	700.000	647.000	48.000
7.888		16.000	740.000	692.000	48.000
7.950		16.000	740.000	692.000	48.000
8.284		16.000	765.000	712.000	48.000
8.450		16.000	780.000	725.000	48.000
8.681		16.000	800.000	747.000	48.000
8.950		16.000	820.000	772.000	48.000
9.078		16.000	835.000	782.000	48.000
9.450		16.000	865.000	815.000	48.000
9.475		16.000	870.000	822.000	48.000
9.872		16.000	900.000	847.000	48.000
9.950		20.000	910.000	860.000	50.000

Single-fluted gun drills E 80

d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
10.269		20.000	935.000	880.000	50.000
10.450		20.000	955.000	900.000	50.000
10.666		20.000	970.000	915.000	50.000
10.950		20.000	995.000	945.000	50.000
11.063		20.000	995.000	945.000	50.000
11.450		20.000	1040.000	985.000	50.000
11.866		20.000	1070.000	1015.000	50.000
11.950		20.000	1080.000	1030.000	50.000
12.253		20.000	1105.000	1050.000	50.000
12.450		20.000	1125.000	1070.000	50.000
12.650		20.000	1140.000	1090.000	50.000
12.950		20.000	1170.000	1115.000	50.000
13.047		20.000	1170.000	1115.000	50.000
13.450		20.000	1195.000	1140.000	50.000
13.851		20.000	1225.000	1170.000	50.000
13.950		20.000	1235.000	1180.000	50.000
14.238		25.000	1265.000	1204.000	56.000
14.450		25.000	1285.000	1225.000	56.000
14.634		25.000	1300.000	1239.000	56.000
14.950		25.000	1325.000	1265.000	56.000
15.031		25.000	1330.000	1269.000	56.000
15.428		25.000	1365.000	1304.000	56.000
15.450		25.000	1370.000	1310.000	56.000
15.825		25.000	1395.000	1334.000	56.000
15.950		25.000	1410.000	1350.000	56.000

Single-fluted gun drills E 80

Article no. 89539

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P	M	K	N	S	H
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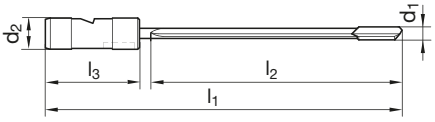
HM | T | TLB E 80 | GL 600 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.000	25.000	600.000	500.000	70.000
3.500	25.000	600.000	500.000	70.000
4.000	25.000	600.000	500.000	70.000
4.500	25.000	600.000	500.000	70.000
5.000	25.000	600.000	500.000	70.000
5.500	25.000	600.000	500.000	70.000
6.000	25.000	600.000	500.000	70.000
6.500	25.000	600.000	500.000	70.000
7.000	25.000	600.000	500.000	70.000
7.500	25.000	600.000	500.000	70.000
8.000	25.000	600.000	500.000	70.000
8.500	25.000	600.000	500.000	70.000
9.000	25.000	600.000	500.000	70.000
9.500	25.000	600.000	500.000	70.000
10.000	25.000	600.000	500.000	70.000
10.500	25.000	600.000	500.000	70.000
11.000	25.000	600.000	500.000	70.000
11.500	25.000	600.000	500.000	70.000
12.000	25.000	600.000	500.000	70.000
12.500	25.000	600.000	500.000	70.000
13.000	25.000	600.000	500.000	70.000
13.500	25.000	600.000	500.000	70.000
14.000	25.000	600.000	500.000	70.000
14.500	25.000	600.000	500.000	70.000
15.000	25.000	600.000	500.000	70.000
15.500	25.000	600.000	500.000	70.000
16.000	25.000	600.000	500.000	70.000
16.500	25.000	600.000	500.000	70.000
17.000	25.000	600.000	500.000	70.000
18.000	25.000	600.000	500.000	70.000
19.000	25.000	600.000	500.000	70.000
20.000	25.000	600.000	500.000	70.000
21.000	25.000	600.000	500.000	70.000
22.000	25.000	600.000	500.000	70.000
23.000	25.000	600.000	500.000	70.000
24.000	25.000	600.000	500.000	70.000
25.000	25.000	600.000	500.000	70.000

Single-fluted gun drills E 80

Article no. 89540

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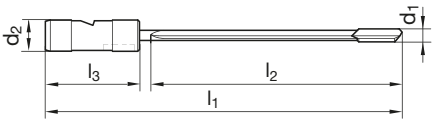
P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | GL 800 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.000	25.000	800.000	700.000	70.000
3.500	25.000	800.000	700.000	70.000
4.000	25.000	800.000	700.000	70.000
4.500	25.000	800.000	700.000	70.000
5.000	25.000	800.000	700.000	70.000
5.500	25.000	800.000	700.000	70.000
6.000	25.000	800.000	700.000	70.000
6.500	25.000	800.000	700.000	70.000
7.000	25.000	800.000	700.000	70.000
7.500	25.000	800.000	700.000	70.000
8.000	25.000	800.000	700.000	70.000
8.500	25.000	800.000	700.000	70.000
9.000	25.000	800.000	700.000	70.000
9.500	25.000	800.000	700.000	70.000
10.000	25.000	800.000	700.000	70.000
10.500	25.000	800.000	700.000	70.000
11.000	25.000	800.000	700.000	70.000
11.500	25.000	800.000	700.000	70.000
12.000	25.000	800.000	700.000	70.000
12.500	25.000	800.000	700.000	70.000
13.000	25.000	800.000	700.000	70.000
13.500	25.000	800.000	700.000	70.000
14.000	25.000	800.000	700.000	70.000
14.500	25.000	800.000	700.000	70.000
15.000	25.000	800.000	700.000	70.000
15.500	25.000	800.000	700.000	70.000
16.000	25.000	800.000	700.000	70.000
16.500	25.000	800.000	700.000	70.000
17.000	25.000	800.000	700.000	70.000
18.000	25.000	800.000	700.000	70.000
19.000	25.000	800.000	700.000	70.000
20.000	25.000	800.000	700.000	70.000
21.000	25.000	800.000	700.000	70.000
22.000	25.000	800.000	700.000	70.000
23.000	25.000	800.000	700.000	70.000
24.000	25.000	800.000	700.000	70.000
25.000	25.000	800.000	700.000	70.000

Single-fluted gun drills E 80

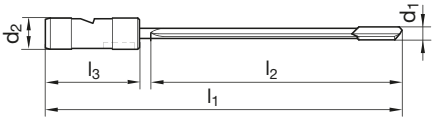
Article no. 89544

XXL

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | GL 1000 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.000	25.000	1000.000	900.000	70.000
3.500	25.000	1000.000	900.000	70.000
4.000	25.000	1000.000	900.000	70.000
4.500	25.000	1000.000	900.000	70.000
5.000	25.000	1000.000	900.000	70.000
5.500	25.000	1000.000	900.000	70.000
6.000	25.000	1000.000	900.000	70.000
6.500	25.000	1000.000	900.000	70.000
7.000	25.000	1000.000	900.000	70.000
7.500	25.000	1000.000	900.000	70.000
8.000	25.000	1000.000	900.000	70.000
8.500	25.000	1000.000	900.000	70.000
9.000	25.000	1000.000	900.000	70.000
9.500	25.000	1000.000	900.000	70.000
10.000	25.000	1000.000	900.000	70.000
10.500	25.000	1000.000	900.000	70.000
11.000	25.000	1000.000	900.000	70.000
11.500	25.000	1000.000	900.000	70.000
12.000	25.000	1000.000	900.000	70.000
12.500	25.000	1000.000	900.000	70.000
13.000	25.000	1000.000	900.000	70.000
13.500	25.000	1000.000	900.000	70.000
14.000	25.000	1000.000	900.000	70.000
14.500	25.000	1000.000	900.000	70.000
15.000	25.000	1000.000	900.000	70.000
15.500	25.000	1000.000	900.000	70.000
16.000	25.000	1000.000	900.000	70.000
16.500	25.000	1000.000	900.000	70.000
17.000	25.000	1000.000	900.000	70.000
18.000	25.000	1000.000	900.000	70.000
19.000	25.000	1000.000	900.000	70.000
20.000	25.000	1000.000	900.000	70.000
21.000	25.000	1000.000	900.000	70.000
22.000	25.000	1000.000	900.000	70.000
23.000	25.000	1000.000	900.000	70.000
24.000	25.000	1000.000	900.000	70.000
25.000	25.000	1000.000	900.000	70.000
26.000	25.000	1000.000	895.000	75.000
27.000	25.000	1000.000	895.000	75.000
28.000	25.000	1000.000	895.000	75.000
29.000	25.000	1000.000	895.000	75.000
30.000	25.000	1000.000	895.000	75.000

Single-fluted gun drills E 80

d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
31.000	25.000	1000.000	895.000	75.000
32.000	25.000	1000.000	895.000	75.000

Single-fluted gun drills E 80

Article no. 89541

XXL

P	M	K	N	S	H
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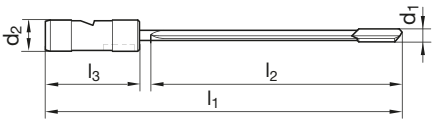
HM | T | TLB E 80 | GL 1200 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
3.000	25.000	1200.000	1100.000	70.000
3.500	25.000	1200.000	1100.000	70.000
4.000	25.000	1200.000	1100.000	70.000
4.500	25.000	1200.000	1100.000	70.000
5.000	25.000	1200.000	1100.000	70.000
5.500	25.000	1200.000	1100.000	70.000
6.000	25.000	1200.000	1100.000	70.000
6.500	25.000	1200.000	1100.000	70.000
7.000	25.000	1200.000	1100.000	70.000
7.500	25.000	1200.000	1100.000	70.000
8.000	25.000	1200.000	1100.000	70.000
8.500	25.000	1200.000	1100.000	70.000
9.000	25.000	1200.000	1100.000	70.000
9.500	25.000	1200.000	1100.000	70.000
10.000	25.000	1200.000	1100.000	70.000
10.500	25.000	1200.000	1100.000	70.000
11.000	25.000	1200.000	1100.000	70.000
11.500	25.000	1200.000	1100.000	70.000
12.000	25.000	1200.000	1100.000	70.000
12.500	25.000	1200.000	1100.000	70.000
13.000	25.000	1200.000	1100.000	70.000
13.500	25.000	1200.000	1100.000	70.000
14.000	25.000	1200.000	1100.000	70.000
14.500	25.000	1200.000	1100.000	70.000
15.000	25.000	1200.000	1100.000	70.000
15.500	25.000	1200.000	1100.000	70.000
16.000	25.000	1200.000	1100.000	70.000
16.500	25.000	1200.000	1100.000	70.000
17.000	25.000	1200.000	1100.000	70.000
18.000	25.000	1200.000	1100.000	70.000
19.000	25.000	1200.000	1100.000	70.000
20.000	25.000	1200.000	1100.000	70.000
21.000	25.000	1200.000	1100.000	70.000
22.000	25.000	1200.000	1100.000	70.000
23.000	25.000	1200.000	1100.000	70.000
24.000	25.000	1200.000	1100.000	70.000
25.000	25.000	1200.000	1100.000	70.000
26.000	25.000	1200.000	1095.000	75.000
27.000	25.000	1200.000	1095.000	75.000
28.000	25.000	1200.000	1095.000	75.000
29.000	25.000	1200.000	1095.000	75.000
30.000	25.000	1200.000	1095.000	75.000

Single-fluted gun drills E 80

d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
31.000	25.000	1200.000	1095.000	75.000
32.000	25.000	1200.000	1095.000	75.000

Single-fluted gun drills E 80

Article no. 89545

XXL

P	M	K	N	S	H
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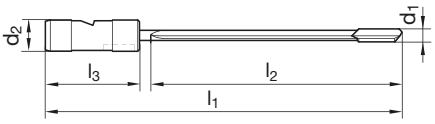
HM | T | TLB E 80 | GL 1400 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
4.000	25.000	1400.000	1300.000	70.000
4.500	25.000	1400.000	1300.000	70.000
5.000	25.000	1400.000	1300.000	70.000
5.500	25.000	1400.000	1300.000	70.000
6.000	25.000	1400.000	1300.000	70.000
6.500	25.000	1400.000	1300.000	70.000
7.000	25.000	1400.000	1300.000	70.000
7.500	25.000	1400.000	1300.000	70.000
8.000	25.000	1400.000	1300.000	70.000
8.500	25.000	1400.000	1300.000	70.000
9.000	25.000	1400.000	1300.000	70.000
9.500	25.000	1400.000	1300.000	70.000
10.000	25.000	1400.000	1300.000	70.000
10.500	25.000	1400.000	1300.000	70.000
11.000	25.000	1400.000	1300.000	70.000
11.500	25.000	1400.000	1300.000	70.000
12.000	25.000	1400.000	1300.000	70.000
12.500	25.000	1400.000	1300.000	70.000
13.000	25.000	1400.000	1300.000	70.000
13.500	25.000	1400.000	1300.000	70.000
14.000	25.000	1400.000	1300.000	70.000
14.500	25.000	1400.000	1300.000	70.000
15.000	25.000	1400.000	1300.000	70.000
15.500	25.000	1400.000	1300.000	70.000
16.000	25.000	1400.000	1300.000	70.000
16.500	25.000	1400.000	1300.000	70.000
17.000	25.000	1400.000	1300.000	70.000
18.000	25.000	1400.000	1300.000	70.000
19.000	25.000	1400.000	1300.000	70.000
20.000	25.000	1400.000	1300.000	70.000
21.000	25.000	1400.000	1300.000	70.000
22.000	25.000	1400.000	1300.000	70.000
23.000	25.000	1400.000	1300.000	70.000
24.000	25.000	1400.000	1300.000	70.000
25.000	25.000	1400.000	1300.000	70.000
26.000	25.000	1400.000	1295.000	75.000
27.000	25.000	1400.000	1295.000	75.000
28.000	25.000	1400.000	1295.000	75.000
29.000	25.000	1400.000	1295.000	75.000
30.000	25.000	1400.000	1295.000	75.000
31.000	25.000	1400.000	1295.000	75.000
32.000	25.000	1400.000	1295.000	75.000

HARTNER

Single-fluted gun drills E 80

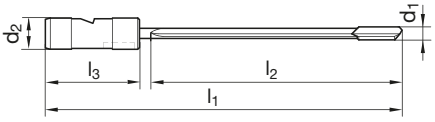
Article no. 89542

XXL

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | GL 1600 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
4.000	25.000	1600.000	1500.000	70.000
4.500	25.000	1600.000	1500.000	70.000
5.000	25.000	1600.000	1500.000	70.000
5.500	25.000	1600.000	1500.000	70.000
6.000	25.000	1600.000	1500.000	70.000
6.500	25.000	1600.000	1500.000	70.000
7.000	25.000	1600.000	1500.000	70.000
7.500	25.000	1600.000	1500.000	70.000
8.000	25.000	1600.000	1500.000	70.000
8.500	25.000	1600.000	1500.000	70.000
9.000	25.000	1600.000	1500.000	70.000
9.500	25.000	1600.000	1500.000	70.000
10.000	25.000	1600.000	1500.000	70.000
10.500	25.000	1600.000	1500.000	70.000
11.000	25.000	1600.000	1500.000	70.000
11.500	25.000	1600.000	1500.000	70.000
12.000	25.000	1600.000	1500.000	70.000
12.500	25.000	1600.000	1500.000	70.000
13.000	25.000	1600.000	1500.000	70.000
13.500	25.000	1600.000	1500.000	70.000
14.000	25.000	1600.000	1500.000	70.000
14.500	25.000	1600.000	1500.000	70.000
15.000	25.000	1600.000	1500.000	70.000
15.500	25.000	1600.000	1500.000	70.000
16.000	25.000	1600.000	1500.000	70.000
16.500	25.000	1600.000	1500.000	70.000
17.000	25.000	1600.000	1500.000	70.000
18.000	25.000	1600.000	1500.000	70.000
19.000	25.000	1600.000	1500.000	70.000
20.000	25.000	1600.000	1500.000	70.000
21.000	25.000	1600.000	1500.000	70.000
22.000	25.000	1600.000	1500.000	70.000
23.000	25.000	1600.000	1500.000	70.000
24.000	25.000	1600.000	1500.000	70.000
25.000	25.000	1600.000	1500.000	70.000
26.000	25.000	1600.000	1495.000	75.000
27.000	25.000	1600.000	1495.000	75.000
28.000	25.000	1600.000	1495.000	75.000
29.000	25.000	1600.000	1495.000	75.000
30.000	25.000	1600.000	1495.000	75.000
31.000	25.000	1600.000	1495.000	75.000
32.000	25.000	1600.000	1495.000	75.000

Single-fluted gun drills E 80

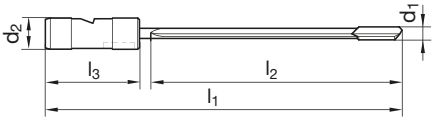
Article no. 89546

XXL

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | GL 1800 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
4.000	25.000	1800.000	1700.000	70.000
4.500	25.000	1800.000	1700.000	70.000
5.000	25.000	1800.000	1700.000	70.000
5.500	25.000	1800.000	1700.000	70.000
6.000	25.000	1800.000	1700.000	70.000
6.500	25.000	1800.000	1700.000	70.000
7.000	25.000	1800.000	1700.000	70.000
7.500	25.000	1800.000	1700.000	70.000
8.000	25.000	1800.000	1700.000	70.000
8.500	25.000	1800.000	1700.000	70.000
9.000	25.000	1800.000	1700.000	70.000
9.500	25.000	1800.000	1700.000	70.000
10.000	25.000	1800.000	1700.000	70.000
10.500	25.000	1800.000	1700.000	70.000
11.000	25.000	1800.000	1700.000	70.000
11.500	25.000	1800.000	1700.000	70.000
12.000	25.000	1800.000	1700.000	70.000
12.500	25.000	1800.000	1700.000	70.000
13.000	25.000	1800.000	1700.000	70.000
13.500	25.000	1800.000	1700.000	70.000
14.000	25.000	1800.000	1700.000	70.000
14.500	25.000	1800.000	1700.000	70.000
15.000	25.000	1800.000	1700.000	70.000
15.500	25.000	1800.000	1700.000	70.000
16.000	25.000	1800.000	1700.000	70.000
16.500	25.000	1800.000	1700.000	70.000
17.000	25.000	1800.000	1700.000	70.000
18.000	25.000	1800.000	1700.000	70.000
19.000	25.000	1800.000	1700.000	70.000
20.000	25.000	1800.000	1700.000	70.000
21.000	25.000	1800.000	1700.000	70.000
22.000	25.000	1800.000	1700.000	70.000
23.000	25.000	1800.000	1700.000	70.000
24.000	25.000	1800.000	1700.000	70.000
25.000	25.000	1800.000	1700.000	70.000
26.000	25.000	1800.000	1695.000	75.000
27.000	25.000	1800.000	1695.000	75.000
28.000	25.000	1800.000	1695.000	75.000
29.000	25.000	1800.000	1695.000	75.000
30.000	25.000	1800.000	1695.000	75.000
31.000	25.000	1800.000	1695.000	75.000
32.000	25.000	1800.000	1695.000	75.000

HARTNER

Single-fluted gun drills E 80

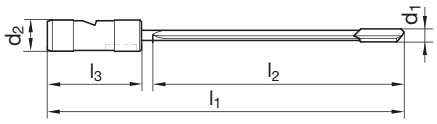
Article no. 89543

XXL

P	M	K	N	S	H
●	○	●	○	○	○

HM | T | TLB E 80 | GL 2000 | WN | h5 | R | T 3.1

for the use on gun drill machines • stock item with fixed overall length for deep hole drilling machines • polished flutes • brazed-on carbide head with circuit form G



d1 mm	d2 h6 mm	l1 mm	l2 mm	l3 mm
4.000	25.000	2000.000	1900.000	70.000
4.500	25.000	2000.000	1900.000	70.000
5.000	25.000	2000.000	1900.000	70.000
5.500	25.000	2000.000	1900.000	70.000
6.000	25.000	2000.000	1900.000	70.000
6.500	25.000	2000.000	1900.000	70.000
7.000	25.000	2000.000	1900.000	70.000
7.500	25.000	2000.000	1900.000	70.000
8.000	25.000	2000.000	1900.000	70.000
8.500	25.000	2000.000	1900.000	70.000
9.000	25.000	2000.000	1900.000	70.000
9.500	25.000	2000.000	1900.000	70.000
10.000	25.000	2000.000	1900.000	70.000
10.500	25.000	2000.000	1900.000	70.000
11.000	25.000	2000.000	1900.000	70.000
11.500	25.000	2000.000	1900.000	70.000
12.000	25.000	2000.000	1900.000	70.000
12.500	25.000	2000.000	1900.000	70.000
13.000	25.000	2000.000	1900.000	70.000
13.500	25.000	2000.000	1900.000	70.000
14.000	25.000	2000.000	1900.000	70.000
14.500	25.000	2000.000	1900.000	70.000
15.000	25.000	2000.000	1900.000	70.000
15.500	25.000	2000.000	1900.000	70.000
16.000	25.000	2000.000	1900.000	70.000
16.500	25.000	2000.000	1900.000	70.000
17.000	25.000	2000.000	1900.000	70.000
18.000	25.000	2000.000	1900.000	70.000
19.000	25.000	2000.000	1900.000	70.000
20.000	25.000	2000.000	1900.000	70.000
21.000	25.000	2000.000	1900.000	70.000
22.000	25.000	2000.000	1900.000	70.000
23.000	25.000	2000.000	1900.000	70.000
24.000	25.000	2000.000	1900.000	70.000
25.000	25.000	2000.000	1900.000	70.000
26.000	25.000	2000.000	1895.000	75.000
27.000	25.000	2000.000	1895.000	75.000
28.000	25.000	2000.000	1895.000	75.000
29.000	25.000	2000.000	1895.000	75.000
30.000	25.000	2000.000	1895.000	75.000
31.000	25.000	2000.000	1895.000	75.000
32.000	25.000	2000.000	1895.000	75.000

HARTNER

Precision Cutting Tools

Two-fluted gun drills Z 80 with brazed carbide head

- suitable for cast iron, aluminium and short-chipping nonferrous metal
- Ø 6,0 – 30,0 mm
- max. total length 1000 mm

Standard range:

Article no. 89508 with point for aluminium

Article no. 89518 with point grind for cast materials

In addition to our comprehensive standard programme,
we offer you special tools on request specifically according to your specifications.
Please use our inquiry form on page 73/74.

For certain materials a coating is required, as the successful application
of gun drills with a bright finish cannot be guaranteed.
For coating definitions see our application recommendations on page 104.

T TiN C TiCN A AlTiN a AlTiN nano

Gun drills with 2 cutting lips Z 80

Article no. 89508

P	M	K	N	S	H
			•		

HM | TLB Z 80 | 30xD | WN | h5 | R | HA

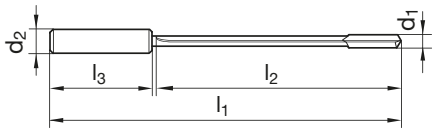
drilling depth up to 30xD • 4-facet gun drills • for aluminium

Article no. 89518

P	M	K	N	S	H
		•			

HM | TLB Z 80 | 30xD | WN | h5 | R | HA

drilling depth up to 30xD • 4-facet gun drills • for cast materials



d1 mm	inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
8.000		16.000	330.000	280.000	48.000
10.000		20.000	390.000	340.000	50.000
12.000		20.000	450.000	400.000	50.000

HARTNER

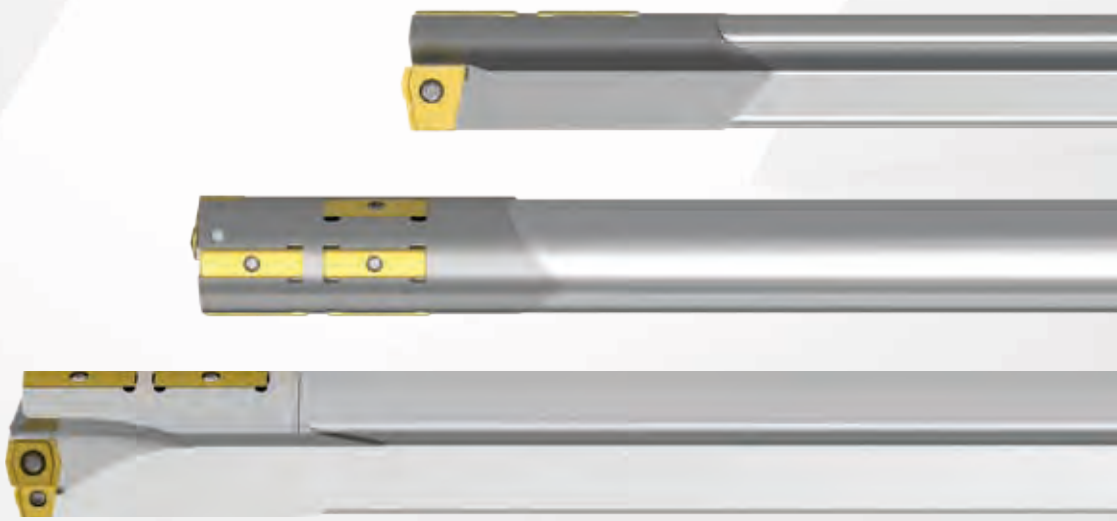
Precision Cutting Tools

Single-fluted gun drills E 800 with interchangeable inserts and supporting strips

- suitable for almost all materials
- Ø 12,0 – 52,0 mm
- max. total length 3000 mm
- interchangeable inserts and supporting strips in 1/10 mm dimensions

- Ø 12,0 – 40,00 mm
- with interchangeable insert

- Ø 40,01 – 52,00 mm
- with internal and external insert



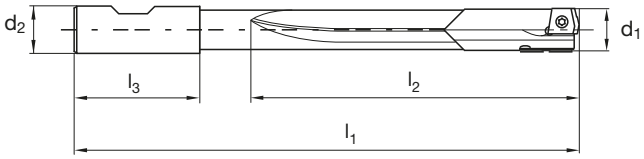
Single-fluted gun drills with interchangeable inserts E 800

Article no. 89530

P	M	K	N	S	H
●	○	○	●	○	

HM | T | TLB E 800 | 30xD | WN | h8 | R | HB

drilling depth up to 30xD • with interchangeable inserts • with interchangeable guide pads • with screw driver • with screws • for universal application



d1 mm	 inch	d2 h6 mm	l1 mm	l2 mm	l3 mm
12.000		20.000	446.000	384.000	50.000
12.700	1/2	20.000	468.000	406.000	50.000
14.000		20.000	510.000	448.000	50.000
15.000		25.000	548.000	480.000	56.000
16.000		25.000	580.000	512.000	56.000
18.000		25.000	644.000	576.000	56.000
20.000		32.000	712.000	640.000	60.000
24.000		32.000	840.000	768.000	60.000

Single-fluted gun drills E 800 with interchangeable inserts

Size	Diameter / holder range	Body/ holder	Exterior inserts					
			inserts				screws	screw driver
			 TiN-coated	 FIRE-coated	 TiAlSiN-coated	 AlTiN nano-coated		
0.	Ø12,00 - Ø12,49 Ø12,50 - Ø12,99 Ø13,00 - Ø13,49 Ø13,50 - Ø13,99 Ø14,00 - Ø14,49 Ø14,50 - Ø14,99 Ø15,00 - Ø15,49 Ø15,50 - Ø15,99	Body/holder especially to customer requirements. Total length up to 3000 mm. flute length from 15xD Alternatively: Standard range article no. 89530 from diameter 12.00 mm up to 24.00 mm in preferred sizes complete with TiN inserts and TiN supporting strips	P ● M ○ K ○ N ● S ○ H	P ● M ○ K ● N ○ S ○ H	P ● M ● K ● N S ● H ○	P ○ M ● K ○ N ○ S ● H ○	Item no. 4071 2,502 T8 M2,5x5,2	Item no. 86842 8,001
1.	Ø16,00 - Ø16,49 Ø16,50 - Ø16,99 Ø17,00 - Ø17,49 Ø17,50 - Ø17,99 Ø18,00 - Ø18,49 Ø18,50 - Ø18,99 Ø19,00 - Ø19,49 Ø19,50 - Ø19,99						Item no. 4071 3,002 T9 M3x6,4	Item no. 86842 9,001
2.	Ø20,00 - Ø20,49 Ø20,50 - Ø20,99 Ø21,00 - Ø21,49 Ø21,50 - Ø21,99 Ø22,00 - Ø22,49 Ø22,50 - Ø22,99 Ø23,00 - Ø23,49 Ø23,50 - Ø23,99 Ø24,00 - Ø24,49 Ø24,50 - Ø24,99 Ø25,00 - Ø25,49 Ø25,50 - Ø25,99		Item no. 89535 + nom.-Ø = Item no..	on request	on request	on request	Item no. 4071 4,001 T15 M4x7,7	Item no. 86842 15,001
3.	Ø26,00 - Ø26,49 Ø26,50 - Ø26,99 Ø27,00 - Ø27,49 Ø27,50 - Ø27,99 Ø28,00 - Ø28,49 Ø28,50 - Ø28,99 Ø29,00 - Ø29,49 Ø29,50 - Ø29,99						Item no. 4071 4,002 T15 M4x10,6	
4.	Ø30,00 - Ø30,49 Ø30,50 - Ø30,99 Ø31,00 - Ø31,49 Ø31,50 - Ø31,99 Ø32,00 - Ø32,49 Ø32,50 - Ø32,99 Ø33,00 - Ø33,49 Ø33,50 - Ø33,99							
5.	Ø34,00 - Ø34,49 Ø34,50 - Ø34,99 Ø35,00 - Ø35,49 Ø35,50 - Ø35,99 Ø36,00 - Ø36,49 Ø36,50 - Ø36,99 Ø37,00 - Ø37,49 Ø37,50 - Ø37,99						Item no. 4071 5,002 T20 M5x14,2	Item no. 86842 20,001
6.	Ø38,00 - Ø38,49 Ø38,50 - Ø38,99 Ø39,00 - Ø39,49 Ø39,50 - Ø40,00							
7.	Ø40,01 - Ø40,49 Ø40,50 - Ø40,99 Ø41,00 - Ø41,49 Ø41,50 - Ø41,99 Ø42,00 - Ø42,49 Ø42,50 - Ø42,99 Ø43,00 - Ø43,49 Ø43,50 - Ø43,99		on request	on request	on request	on request	Item no. 4071 3,002 TX9 M3x6,4	Item no. 86842 9,001
8.	Ø44,00 - Ø44,49 Ø44,50 - Ø44,99 Ø45,00 - Ø45,49 Ø45,50 - Ø45,99 Ø46,00 - Ø46,49 Ø46,50 - Ø46,99 Ø47,00 - Ø47,49 Ø47,50 - Ø47,99						Item no. 4071 4,001 TX15 M4x7,7	Item no. 86842 15,001
9.	Ø48,00 - Ø48,49 Ø48,50 - Ø48,99 Ø49,00 - Ø49,49 Ø49,50 - Ø49,99 Ø50,00 - Ø50,49 Ø50,50 - Ø50,99 Ø51,00 - Ø51,49 Ø51,50 - Ø52,00						Item no. 4071 4,002 TX15 M4x10,6	

- Accessory table for Ø 12,0 – Ø 52,0
- Further coatings on request

HARTNER

Single-fluted gun drills E 800 with interchangeable inserts

inserts	screws	screw driver	Supporting strips: supporting strips				Supporting strips: screws	Supporting strips: screw driver
			 TiN-coated	 FIRE-coated	 TiAlSiN-coated	 AlTiN nano-coated		
			P ● M ○ K ○ N ● S ○ H	P ● M ○ K ● N ○ S ○ H	P ● M ● K ● N S ○ H ○	P ○ M ● K ○ N ○ S ● H ○	Item no. 4071 1,601 T5 M1,6x4,4	Item no. 86842 5,001
							Item no. 4071 2,203 T7 / M2,2x 4,6	Item no. 86842 7,001
							Item no. 4071 2,202 T7 / M2,2x5,6	
							Item no. 4071 2,502 T8 M2,5x5,2	Item no. 86842 8,001
			Item no. 89536 + nom.-Ø = Item no..	on request	on request	on request	Item no. 4071 2,501 T8 M2,5x6,4	
Bright on request **TiN** on request **FIRE** on request	Item no. 4071 4,501 T15 M4,5x11,8	Item no. 1612 15,001	on request	on request	on request	on request	Item no. 4071 3,003 T9 M3x8	Item no. 86842 9,001

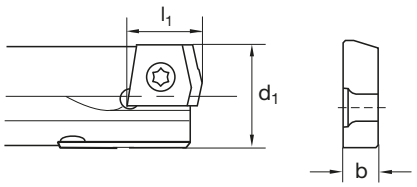
Inserts for single-fluted gun drills E 800

Article no. 89535

P	M	K	N	S	H
●	○	○	●	○	

VHM | T | WN | R

for universal application • Interchangeable inserts and supporting strips in 1/10 mm dimensions



d1 mm	l1 mm	b mm	Code no.
12.000	10.000	2.800	12.000
12.500	10.000	2.800	12.500
12.700	10.000	2.800	12.700
13.000	10.000	2.800	13.000
13.500	10.000	2.800	13.500
14.000	10.000	2.800	14.000
14.500	10.000	2.800	14.500
15.000	10.000	2.800	15.000
16.000	12.000	3.000	16.000
16.100	12.000	3.000	16.100
16.300	12.000	3.000	16.300
16.500	12.000	3.000	16.500
17.000	12.000	3.000	17.000
17.500	12.000	3.000	17.500
18.000	12.000	3.000	18.000
18.400	12.000	3.000	18.400
18.500	12.000	3.000	18.500
19.000	12.000	3.000	19.000
19.300	12.000	3.000	19.300
19.500	12.000	3.000	19.500
19.800	12.000	3.000	19.800
20.000	15.000	4.000	20.000
20.200	15.000	4.000	20.200
20.500	15.000	4.000	20.500
21.000	15.000	4.000	21.000
21.500	15.000	4.000	21.500
22.000	15.000	4.000	22.000
22.200	15.000	4.000	22.200
22.500	15.000	4.000	22.500
23.000	15.000	4.000	23.000
23.500	15.000	4.000	23.500
24.000	15.000	4.000	24.000
24.500	15.000	4.000	24.500
25.000	15.000	4.000	25.000
25.100	15.000	4.000	25.100
25.400	15.000	4.000	25.400

d1 mm	l1 mm	b mm	Code no.
25.500	15.000	4.000	25.500
25.800	15.000	4.000	25.800
26.000	16.000	5.000	26.000
26.500	16.000	5.000	26.500
27.000	16.000	5.000	27.000
27.500	16.000	5.000	27.500
28.000	16.000	5.000	28.000
28.100	16.000	5.000	28.100
28.500	16.000	5.000	28.500
29.000	16.000	5.000	29.000
29.500	16.000	5.000	29.500
29.700	16.000	5.000	29.700
30.000	18.000	6.000	30.000
30.100	18.000	6.000	30.100
30.500	18.000	6.000	30.500
31.000	18.000	6.000	31.000
31.500	18.000	6.000	31.500
32.000	18.000	6.000	32.000
32.500	18.000	6.000	32.500
33.000	18.000	6.000	33.000
33.500	18.000	6.000	33.500
34.000	19.000	6.500	34.000
34.500	19.000	6.500	34.500
35.000	19.000	6.500	35.000
35.500	19.000	6.500	35.500
36.000	19.000	6.500	36.000
36.500	19.000	6.500	36.500
37.000	19.000	6.500	37.000
37.500	19.000	6.500	37.500
37.700	19.000	6.500	37.700
38.000	20.000	7.000	38.000
38.100	20.000	7.000	38.100
38.500	20.000	7.000	38.500
39.000	20.000	7.000	39.000
39.500	20.000	7.000	39.500
40.000	20.000	7.000	40.000

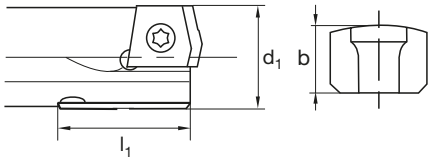
Guide pads for single-fluted gun drills E 800

Article no. 89536

P	M	K	N	S	H
●	○	○	●	○	

VHM T WN

for universal application • Interchangeable inserts and supporting strips in 1/10 mm dimensions



d1 mm	l1 mm	b mm	Code no.	d1 mm	l1 mm	b mm	Code no.
12.000	19.950	2.150	12.000	25.500	25.000	3.350	25.500
12.500	19.950	2.150	12.500	25.800	25.000	3.500	25.800
12.700	19.950	2.250	12.700	26.000	25.000	3.850	26.000
13.000	19.950	2.150	13.000	26.500	25.000	3.850	26.500
13.500	19.950	2.150	13.500	27.000	25.000	3.850	27.000
14.000	19.950	2.150	14.000	27.500	25.000	3.850	27.500
14.500	19.950	2.150	14.500	28.000	25.000	3.850	28.000
15.000	19.950	2.150	15.000	28.100	25.000	3.900	28.100
16.000	20.000	2.850	16.000	28.500	25.000	3.850	28.500
16.100	20.000	2.900	16.100	29.000	25.000	3.850	29.000
16.300	20.000	3.000	16.300	29.500	25.000	3.850	29.500
16.500	20.000	2.850	16.500	29.700	25.000	3.950	29.700
17.000	20.000	2.850	17.000	30.000	30.000	4.350	30.000
17.500	20.000	2.850	17.500	30.100	30.000	4.400	30.100
18.000	20.000	2.850	18.000	30.500	30.000	4.350	30.500
18.400	20.000	3.050	18.400	31.000	30.000	4.350	31.000
18.500	20.000	2.850	18.500	31.500	30.000	4.350	31.500
19.000	20.000	2.850	19.000	32.000	30.000	4.350	32.000
19.300	20.000	3.000	19.300	32.500	30.000	4.350	32.500
19.500	20.000	2.850	19.500	33.000	30.000	4.350	33.000
19.800	20.000	3.000	19.800	33.500	30.000	4.350	33.500
20.000	25.000	3.350	20.000	34.000	30.000	4.850	34.000
20.200	25.000	3.450	20.200	34.500	30.000	4.850	34.500
20.500	25.000	3.350	20.500	35.000	30.000	4.850	35.000
21.000	25.000	3.350	21.000	35.500	30.000	4.850	35.500
21.500	25.000	3.350	21.500	36.000	30.000	4.850	36.000
22.000	25.000	3.350	22.000	36.500	30.000	4.850	36.500
22.200	25.000	3.450	22.200	37.000	30.000	4.850	37.000
22.500	25.000	3.350	22.500	37.500	30.000	4.850	37.500
23.000	25.000	3.350	23.000	37.700	30.000	4.950	37.700
23.500	25.000	3.350	23.500	38.000	30.000	5.350	38.000
24.000	25.000	3.350	24.000	38.100	30.000	5.400	38.100
24.500	25.000	3.350	24.500	38.500	30.000	5.350	38.500
25.000	25.000	3.350	25.000	39.000	30.000	5.350	39.000
25.100	25.000	3.400	25.100	39.500	30.000	5.350	39.500
25.400	25.000	3.550	25.400	40.000	30.000	5.600	40.000

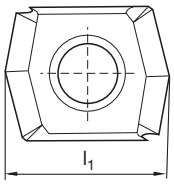
Inserts for single-fluted gun drills E 800

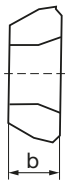
Article no. 89532

P	M	K	N	S	H
●	○	○	●	○	

VHM | T | WN | R

indexable insert with 2 cutting edges • observe tightening torques • order torque wrench set separately • internal cutting edge for EB800 special carrier diameter 40.01-52.0 • Interchangeable inserts and supporting strips in 1/10 mm dimensions





d1 mm	l1 mm	b mm	Code no.
1.000	15.000	4.763	1.000

d1 mm	l1 mm	b mm	Code no.

HARTNER

Precision Cutting Tools

XXL Programme

page 35

- for deep hole drilling machines
- total lengths 800 mm / 1200 mm / 1600 mm / 2000 mm
- suitable not just for the mould- and toolmaking industry
- polished flute for perfect chip evacuation
- TiN-coated for universal application
- driver T 3.1

HARTNER

Fax inquiry / Order interchangeable inserts gun drill

☐ **Inquiry** ☐ **Order by Fax to: +49 7431 125 - 21547**

Contact partner

Hartner GmbH
P. O. Box 10 04 27
D-72425 Albstadt
Tel.: +49 7431 125-0
Fax: +49 7431 125-21547
www.hartner.de

Customer no. New customer

Company

Street no.

Telephone

Date

Order no.

Contact

Town/post code

Fax

Signature

Workpiece

Material:

Description:

Quantity/Year:

Hole diameter:

Tolerance on diameter:

Drilling depth:

Surface quality required:

Protruding edge:
☐ No ☐ Yes mm

Additional information:

Machine

Machining centre:

Tool holder:

No. of spindles:

Deep drilling machine:

Tool holder:

No. of spindles:

Overall length of tool:

Coolant/lubrication:
☐ soluble oil ☐ neat oil

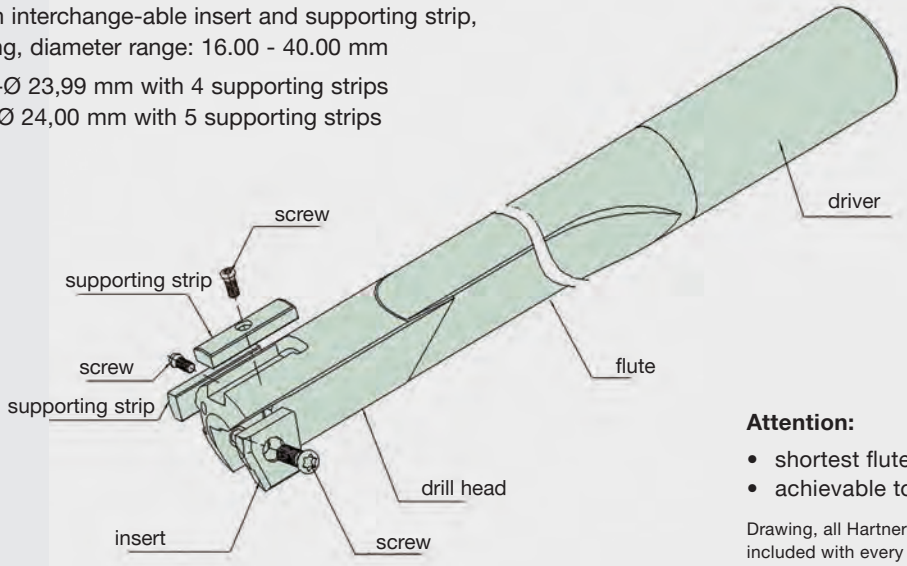
Pressure:
bar

Volume:
l/min

The Hartner E 800 for you application

Gun Drill with interchange-able insert and supporting strip, internal cooling, diameter range: 16.00 - 40.00 mm

- up to nom-Ø 23,99 mm with 4 supporting strips
- from nom-Ø 24,00 mm with 5 supporting strips



Attention:

- shortest flute length 15xD
- achievable tolerance on IT9/IT10

Drawing, all Hartner nos. and specifications included with every quote.

Accessories for deep hole drilling machines

Drilling bushes Article no. 89600

HSS WN

Discount group 123 • min. order quantity 3 pieces

Drilling bushes Article no. 89601

VHM WN

Discount group 123 • min. order quantity 3 pieces

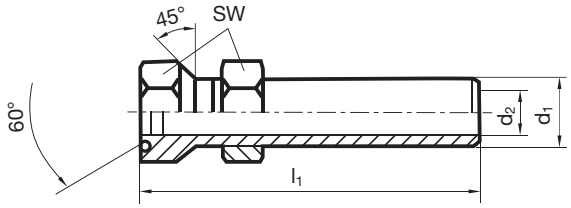
Code no.	d1 mm	d2 mm	l1 mm
0.900	0.900	3.00	9.00
1.590	1.590	4.00	9.00
1.600	1.600	4.00	9.00
1.605	1.605	4.00	9.00
2.000	2.000	5.00	9.00
2.030	2.030	5.00	9.00
2.040	2.040	5.00	9.00
2.500	2.500	5.00	9.00
3.000	3.000	6.00	12.00
3.500	3.500	7.00	12.00
3.750	3.750	7.00	12.00
4.000	4.000	7.00	12.00
4.500	4.500	8.00	12.00
5.000	5.000	8.00	12.00
5.200	5.200	10.00	16.00
5.500	5.500	10.00	16.00
5.515	5.515	10.00	16.00
5.525	5.525	10.00	16.00

Code-Nr.	d2 F7 mm	d1 n6 mm	l1 mm
6.000	6.000	10.00	16.00
6.100	6.100	12.00	16.00
6.900	6.900	12.00	16.00
7.100	7.100	12.00	16.00
8.000	8.000	12.00	16.00
8.015	8.015	12.00	16.00
8.510	8.510	15.00	20.00
10.000	10.000	15.00	20.00
10.100	10.100	18.00	20.00
10.920	10.920	18.00	20.00
11.000	11.000	18.00	20.00
12.000	12.000	18.00	20.00
12.030	12.030	18.00	20.00
12.100	12.100	22.00	28.00
12.600	12.600	22.00	28.00
13.000	13.000	22.00	28.00
13.020	13.020	22.00	28.00
14.000	14.000	22.00	28.00
14.020	14.020	22.00	28.00
14.030	14.030	22.00	28.00
14.400	14.400	22.00	28.00
15.020	15.020	22.00	28.00
16.000	16.000	26.00	28.00
16.030	16.030	26.00	28.00
16.200	16.200	26.00	28.00
18.000	18.000	26.00	28.00
18.030	18.030	26.00	28.00
18.050	18.050	26.00	28.00
18.100	18.100	30.00	36.00
20.000	20.000	30.00	36.00
20.030	20.030	30.00	36.00
22.000	22.000	30.00	36.00
22.030	22.030	30.00	36.00
22.120	22.120	35.00	36.00
23.500	23.500	35.00	36.00
24.000	24.000	35.00	36.00
24.030	24.030	35.00	36.00
25.000	25.000	35.00	36.00
26.000	26.000	35.00	36.00
28.000	28.000	42.00	45.00
30.000	30.000	42.00	45.00
34.000	34.000	48.00	45.00
35.000	35.000	48.00	45.00
40.000	40.000	55.00	55.00

Adjustable screw without sealing element Article no. 89602

WN

Discount group 123 • min. order quantity 5 pieces

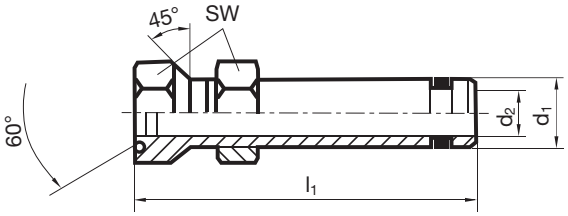


Code no.	thread mm	d2 mm	l1 mm	l2 mm	l3 mm	SW mm
6.000	M6x0.5	3.50	26.00	3.20	5.00	9
10.000	M10x1.0	6.00	38.00	5.00	7.00	13
16.000	M16x1.5	10.00	57.00	8.00	10.00	22

Adjustable screw with sealing element Article no. 89603

WN

Discount group 123 • min. order quantity 5 pieces

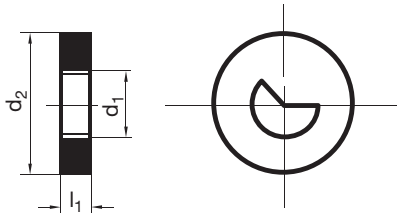


Code no.	thread mm	d2 mm	l1 mm	l2 mm	l3 mm	SW mm	O-Ring DIN 3770
6.000	M6x0.5	3.50	45.00	3.20	5.00	9	5x1.5
10.000	M10x1.0	6.00	50.00	5.00	7.00	13	8x2.0
16.000	M16x1.5	10.00	65.00	8.00	10.00	22	14x2.6
24.000	M24x1.5	16.00	90.00	12.00	15.00	30	20x3.0

Sealing disc for single-fluted gun drills Article no. 89604

WN

Discount group 123 • min. order quantity 5 pieces
special dimensions on request • d1 = gun drill nominal diameter



d1 mm	d2 n6 mm	l1 mm	Code-Nr.
1.850-1.999	20.000	3.00	101.800
2.000-2.099	20.000	3.00	101.900
2.100-2.199	20.000	3.00	102.000
2.200-2.299	20.000	3.00	102.100
2.300-2.399	20.000	3.00	102.200
2.400-2.499	20.000	3.00	102.300
2.500-2.599	20.000	3.00	102.400
2.600-2.699	20.000	3.00	102.500
2.700-2.799	20.000	3.00	102.600
2.800-2.899	20.000	3.00	102.700
2.900-3.099	20.000	3.00	102.800
3.100-3.359	20.000	3.00	103.000
3.360-3.459	20.000	3.00	103.200
3.460-3.559	20.000	3.00	103.300
3.560-3.799	20.000	3.00	103.400
3.800-3.959	20.000	3.00	103.600
3.960-4.259	20.000	3.00	103.700
4.260-4.499	20.000	3.00	104.000
4.500-4.749	20.000	3.00	104.200
4.750-4.999	20.000	3.00	104.500
5.000-5.249	20.000	3.00	104.700
5.250-5.499	20.000	3.00	105.000
5.000-5.249	32.000	3.00	204.700
5.250-5.499	32.000	3.00	205.000
5.500-5.749	32.000	4.00	305.200
5.750-5.999	32.000	4.00	305.500
6.000-6.249	32.000	4.00	305.700
6.250-6.449	32.000	4.00	306.000
6.450-6.749	32.000	4.00	306.200
6.750-6.999	32.000	4.00	306.500
7.000-7.299	32.000	4.00	306.700
7.300-7.599	32.000	4.00	307.000
7.600-7.799	32.000	4.00	307.300
7.800-7.999	32.000	4.00	307.500
8.000-8.299	32.000	4.00	307.700
8.300-8.699	32.000	4.00	308.000

Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	Code-Nr.
8.700-8.999	32.000	4.00	308.400
9.000-9.299	32.000	4.00	308.700
9.300-9.699	32.000	4.00	309.000
9.700-9.999	32.000	4.00	309.400
10.000-10.299	32.000	4.00	309.700
10.300-10.799	32.000	4.00	310.000
10.800-11.299	32.000	4.00	310.500
11.300-11.799	32.000	4.00	311.000
11.800-12.399	32.000	4.00	311.500
12.400-12.899	32.000	4.00	312.000
12.900-13.399	32.000	4.00	312.500
13.400-13.899	32.000	4.00	313.000
13.900-14.399	32.000	4.00	313.500
14.400-14.899	32.000	4.00	314.000
14.900-15.399	32.000	4.00	314.500
15.400-15.899	32.000	4.00	315.000
15.900-16.399	32.000	4.00	315.500
16.400-16.899	32.000	4.00	316.000
16.900-17.399	32.000	4.00	316.500
17.400-17.899	32.000	4.00	317.000
17.900-18.399	32.000	4.00	317.500
18.400-19.509	32.000	4.00	318.000
19.510-20.509	32.000	4.00	319.000
5.500-5.749	40.000	4.00	405.200
5.750-5.999	40.000	4.00	405.500
6.000-6.249	40.000	4.00	405.700
6.250-6.499	40.000	4.00	406.000
6.450-6.749	40.000	4.00	406.200
6.750-6.999	40.000	4.00	406.500
7.000-7.299	40.000	4.00	406.700
7.300-7.599	40.000	4.00	407.000
7.600-7.799	40.000	4.00	407.300
7.800-7.999	40.000	4.00	407.500
8.000-8.299	40.000	4.00	407.700
8.300-8.699	40.000	4.00	408.000
8.700-8.999	40.000	4.00	408.400
9.000-9.299	40.000	4.00	408.700
9.300-9.699	40.000	4.00	409.000
9.700-9.999	40.000	4.00	409.400
10.000-10.299	40.000	4.00	409.700
10.300-10.799	40.000	4.00	410.000
10.800-11.299	40.000	4.00	410.500
11.300-11.799	40.000	4.00	411.000
11.800-12.399	40.000	4.00	411.500
12.400-12.899	40.000	4.00	412.000
12.900-13.399	40.000	4.00	412.500
13.400-13.899	40.000	4.00	413.000
13.900-14.399	40.000	4.00	413.500
14.400-14.899	40.000	4.00	414.000
14.900-15.399	40.000	4.00	414.500
15.400-15.899	40.000	4.00	415.000
15.900-16.399	40.000	4.00	415.500
16.400-16.899	40.000	4.00	416.000
16.900-17.399	40.000	4.00	416.500
17.400-17.899	40.000	4.00	417.000
17.900-18.399	40.000	4.00	417.500
18.400-19.509	40.000	4.00	418.000
19.510-20.509	40.000	4.00	419.000
20.510-21.509	40.000	4.00	420.000
21.510-22.609	40.000	4.00	421.000
22.610-23.609	40.000	4.00	422.000
23.610-24.609	40.000	4.00	423.000
23.610-24.609	90.000	4.00	923.000
24.610-25.609	90.000	4.00	924.000

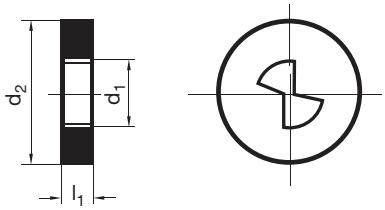
Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	Code-Nr.
25.610-26.609	90.000	4.00	925.000
26.610-27.609	90.000	4.00	926.000
27.610-28.609	90.000	4.00	927.000
28.610-29.609	90.000	4.00	928.000
29.610-30.609	90.000	4.00	929.000
30.610-32.609	90.000	4.00	930.000
32.610-34.699	90.000	4.00	932.000
34.700-36.699	90.000	4.00	934.000
36.700-38.699	90.000	4.00	936.000
38.700-42.699	90.000	4.00	938.000
42.700-45.699	90.000	4.00	942.000
45.700-48.999	90.000	4.00	945.000

Sealing disks for two-fluted gun drills Article no. 89605

WN

Discount group 123 • min. order quantity 5 pieces
special dimensions on request • d1 = gun drill nominal diameter



d1 mm	d2 n6 mm	l1 mm	Code-Nr.
5.000-5.249	32.000	4.00	304.700
5.250-5.499	32.000	4.00	305.000
5.500-5.749	32.000	4.00	305.200
5.750-5.999	32.000	4.00	305.500
6.000-6.249	32.000	4.00	305.700
6.250-6.449	32.000	4.00	306.000
6.450-6.749	32.000	4.00	306.200
6.750-6.999	32.000	4.00	306.500
7.000-7.299	32.000	4.00	306.700
7.300-7.599	32.000	4.00	307.000
7.600-7.799	32.000	4.00	307.300
7.800-7.999	32.000	4.00	307.500
8.000-8.299	32.000	4.00	307.700
8.300-8.699	32.000	4.00	308.000
8.700-8.999	32.000	4.00	308.400
9.000-9.299	32.000	4.00	308.700
9.300-9.699	32.000	4.00	309.000
9.700-9.999	32.000	4.00	309.400
10.000-10.299	32.000	4.00	309.700
10.300-10.799	32.000	4.00	310.000
10.800-11.299	32.000	4.00	310.500
11.300-11.799	32.000	4.00	311.000
11.800-12.399	32.000	4.00	311.500
12.400-12.899	32.000	4.00	312.000
12.900-13.399	32.000	4.00	312.500
13.400-13.899	32.000	4.00	313.000
13.900-14.399	32.000	4.00	313.500
14.400-14.899	32.000	4.00	314.000
14.900-15.399	32.000	4.00	314.500
15.400-15.899	32.000	4.00	315.000
15.900-16.399	32.000	4.00	315.500
16.400-16.899	32.000	4.00	316.000
16.900-17.399	32.000	4.00	316.500
17.400-17.899	32.000	4.00	317.000
17.900-18.399	32.000	4.00	317.500
18.400-19.499	32.000	4.00	318.000
19.500-20.799	32.000	4.00	319.000
5.000-5.249	40.000	4.00	404.700
5.250-5.499	40.000	4.00	405.000
5.500-5.749	40.000	4.00	405.200
5.750-5.999	40.000	4.00	405.500
6.000-6.249	40.000	4.00	405.700

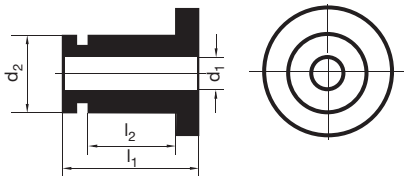
Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	Code-Nr.
6.250-6.449	40.000	4.00	406.000
6.450-6.749	40.000	4.00	406.200
6.750-6.999	40.000	4.00	406.500
7.000-7.299	40.000	4.00	406.700
7.300-7.599	40.000	4.00	407.000
7.600-7.799	40.000	4.00	407.300
7.800-7.999	40.000	4.00	407.500
8.000-8.299	40.000	4.00	407.700
8.300-8.699	40.000	4.00	408.000
8.700-8.999	40.000	4.00	408.400
9.000-9.299	40.000	4.00	408.700
9.300-9.699	40.000	4.00	409.000
9.700-9.999	40.000	4.00	409.400
10.000-10.299	40.000	4.00	409.700
10.300-10.799	40.000	4.00	410.000
10.800-11.299	40.000	4.00	410.500
11.300-11.799	40.000	4.00	411.000
11.800-12.399	40.000	4.00	411.500
12.400-12.899	40.000	4.00	412.000
12.900-13.399	40.000	4.00	412.500
13.400-13.899	40.000	4.00	413.000
13.900-14.399	40.000	4.00	413.500
14.400-14.899	40.000	4.00	414.000
14.900-15.399	40.000	4.00	414.500
15.400-15.899	40.000	4.00	415.000
15.900-16.399	40.000	4.00	415.500
16.400-16.899	40.000	4.00	416.000
16.900-17.399	40.000	4.00	416.500
17.400-17.899	40.000	4.00	417.000
17.900-18.399	40.000	4.00	417.500
18.400-19.499	40.000	4.00	418.000
19.500-20.799	40.000	4.00	419.000
20.800-21.799	40.000	4.00	420.000
21.800-22.799	40.000	4.00	421.000
22.800-23.999	40.000	4.00	422.000
24.000-24.899	40.000	4.00	423.000
24.900-25.899	40.000	4.00	424.000
25.900-27.000	40.000	4.00	425.000

Steady rest bushings Article no. 89606

WN

Discount group 123 • min. order quantity 5 pieces
special dimensions on request • d1 = gun drill nominal diameter



d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
1.850-1.999	20.000	20.00	12.00	201.800
2.000-2.099	20.000	20.00	12.00	201.900
2.100-2.199	20.000	20.00	12.00	202.000
2.200-2.299	20.000	20.00	12.00	202.100
2.300-2.399	20.000	20.00	12.00	202.200
2.400-2.499	20.000	20.00	12.00	202.300
2.500-2.599	20.000	20.00	12.00	202.400
2.600-2.699	20.000	20.00	12.00	202.500
2.700-2.799	20.000	20.00	12.00	202.600
2.800-2.899	20.000	20.00	12.00	202.700
2.900-3.099	20.000	20.00	12.00	202.800
3.100-3.359	20.000	20.00	12.00	203.000
3.360-3.459	20.000	20.00	12.00	203.200
3.460-3.559	20.000	20.00	12.00	203.300
3.560-3.799	20.000	20.00	12.00	203.400
3.800-3.959	20.000	20.00	12.00	203.600
3.960-4.259	20.000	20.00	12.00	203.700
4.260-4.499	20.000	20.00	12.00	204.000
4.500-4.749	20.000	20.00	12.00	204.200
4.750-4.999	20.000	20.00	12.00	204.500
5.000-5.249	20.000	20.00	12.00	204.700
5.250-5.499	20.000	20.00	12.00	205.000
5.500-5.749	20.000	20.00	12.00	205.200
5.750-5.999	20.000	20.00	12.00	205.500
6.000-6.249	20.000	20.00	12.00	205.700
6.250-6.449	20.000	20.00	12.00	206.000
6.450-6.749	20.000	20.00	12.00	206.200
6.750-6.999	20.000	20.00	12.00	206.500
7.000-7.299	20.000	20.00	12.00	206.700
7.300-7.599	20.000	20.00	12.00	207.000
7.600-7.799	20.000	20.00	12.00	207.300
7.800-7.999	20.000	20.00	12.00	207.500
8.000-8.299	20.000	20.00	12.00	207.700
8.300-8.699	20.000	20.00	12.00	208.000
8.700-8.999	20.000	20.00	12.00	208.400
9.000-9.299	20.000	20.00	12.00	208.700
9.300-9.699	20.000	20.00	12.00	209.000
9.700-9.999	20.000	20.00	12.00	209.400
10.000-10.299	20.000	20.00	12.00	209.700
10.300-10.799	20.000	20.00	12.00	210.000
10.800-11.299	20.000	20.00	12.00	210.500
11.300-11.799	20.000	20.00	12.00	211.000

Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
11.800-12.399	20.000	20.00	12.00	211.500
1.850-1.999	30.000	26.00	14.00	301.800
2.000-2.099	30.000	26.00	14.00	301.900
2.100-2.199	30.000	26.00	14.00	302.000
2.200-2.299	30.000	26.00	14.00	302.100
2.300-2.399	30.000	26.00	14.00	302.200
2.400-2.499	30.000	26.00	14.00	302.300
2.500-2.599	30.000	26.00	14.00	302.400
2.600-2.699	30.000	26.00	14.00	302.500
2.700-2.799	30.000	26.00	14.00	302.600
2.800-2.899	30.000	26.00	14.00	302.700
2.900-3.099	30.000	26.00	14.00	302.800
3.100-3.359	30.000	26.00	14.00	303.000
3.360-3.459	30.000	26.00	14.00	303.200
3.460-3.559	30.000	26.00	14.00	303.300
3.560-3.799	30.000	26.00	14.00	303.400
3.800-3.959	30.000	26.00	14.00	303.600
3.960-4.259	30.000	26.00	14.00	303.700
4.260-4.499	30.000	26.00	14.00	304.000
4.500-4.749	30.000	26.00	14.00	304.200
4.750-4.999	30.000	26.00	14.00	304.500
5.000-5.249	30.000	26.00	14.00	304.700
5.250-5.499	30.000	26.00	14.00	305.000
5.500-5.749	30.000	26.00	14.00	305.200
5.750-5.999	30.000	26.00	14.00	305.500
6.000-6.249	30.000	26.00	14.00	305.700
6.250-6.449	30.000	26.00	14.00	306.000
6.450-6.749	30.000	26.00	14.00	306.200
6.750-6.999	30.000	26.00	14.00	306.500
7.000-7.299	30.000	26.00	14.00	306.700
7.300-7.599	30.000	26.00	14.00	307.000
7.600-7.799	30.000	26.00	14.00	307.300
7.800-7.999	30.000	26.00	14.00	307.500
8.000-8.299	30.000	26.00	14.00	307.700
8.300-8.699	30.000	26.00	14.00	308.000
8.700-8.999	30.000	26.00	14.00	308.400
9.000-9.299	30.000	26.00	14.00	308.700
9.300-9.699	30.000	26.00	14.00	309.000
9.700-9.999	30.000	26.00	14.00	309.400
10.000-10.299	30.000	26.00	14.00	309.700
10.300-10.799	30.000	26.00	14.00	310.000
10.800-11.299	30.000	26.00	14.00	310.500
11.300-11.799	30.000	26.00	14.00	311.000
11.800-12.399	30.000	26.00	14.00	311.500
12.400-12.899	30.000	26.00	14.00	312.000
12.900-13.399	30.000	26.00	14.00	312.500
13.400-13.899	30.000	26.00	14.00	313.000
13.900-14.399	30.000	26.00	14.00	313.500
14.400-14.899	30.000	26.00	14.00	314.000
14.900-15.399	30.000	26.00	14.00	314.500
15.400-15.899	30.000	26.00	14.00	315.000
15.900-16.399	30.000	26.00	14.00	315.500
16.400-16.899	30.000	26.00	14.00	316.000
16.900-17.399	30.000	26.00	14.00	316.500
17.400-17.899	30.000	26.00	14.00	317.000
17.900-18.399	30.000	26.00	14.00	317.500
18.400-19.509	30.000	26.00	14.00	318.000
19.510-20.509	30.000	26.00	14.00	319.000
20.510-21.509	30.000	26.00	14.00	320.000
21.510-22.609	30.000	26.00	14.00	321.000
22.610-23.609	30.000	26.00	14.00	322.000
23.610-24.609	30.000	26.00	14.00	323.000
24.610-25.609	30.000	26.00	14.00	324.000
1.850-1.999	45.000	26.00	16.00	401.800
2.000-2.099	45.000	26.00	16.00	401.900
2.100-2.199	45.000	26.00	16.00	402.000
2.200-2.299	45.000	26.00	16.00	402.100
2.300-2.399	45.000	26.00	16.00	402.200
2.400-2.499	45.000	26.00	16.00	402.300
2.500-2.599	45.000	26.00	16.00	402.400
2.600-2.699	45.000	26.00	16.00	402.500
2.700-2.799	45.000	26.00	16.00	402.600

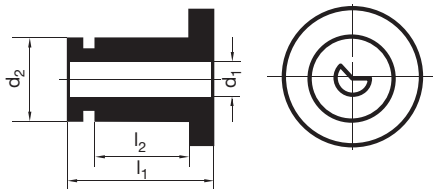
Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
2.800-2.899	45.000	26.00	16.00	402.700
2.900-3.099	45.000	26.00	16.00	402.800
3.100-3.359	45.000	26.00	16.00	403.000
3.360-3.459	45.000	26.00	16.00	403.200
3.460-3.559	45.000	26.00	16.00	403.300
3.560-3.799	45.000	26.00	16.00	403.400
3.800-3.959	45.000	26.00	16.00	403.600
3.960-4.259	45.000	26.00	16.00	403.700
4.260-4.499	45.000	26.00	16.00	404.000
4.500-4.749	45.000	26.00	16.00	404.200
4.750-4.999	45.000	26.00	16.00	404.500
5.000-5.249	45.000	26.00	16.00	404.700
5.250-5.499	45.000	26.00	16.00	405.000
5.500-5.749	45.000	26.00	16.00	405.200
5.750-5.999	45.000	26.00	16.00	405.500
6.000-6.249	45.000	26.00	16.00	405.700
6.250-6.449	45.000	26.00	16.00	406.000
6.450-6.749	45.000	26.00	16.00	406.200
6.750-6.999	45.000	26.00	16.00	406.500
7.000-7.299	45.000	26.00	16.00	406.700
7.300-7.599	45.000	26.00	16.00	407.000
7.600-7.799	45.000	26.00	16.00	407.300
7.800-7.999	45.000	26.00	16.00	407.500
8.000-8.299	45.000	26.00	16.00	407.700
8.300-8.699	45.000	26.00	16.00	408.000
8.700-8.999	45.000	26.00	16.00	408.400
9.000-9.299	45.000	26.00	16.00	408.700
9.300-9.699	45.000	26.00	16.00	409.000
9.700-9.999	45.000	26.00	16.00	409.400
10.000-10.299	45.000	26.00	16.00	409.700
10.300-10.799	45.000	26.00	16.00	410.000
10.800-11.299	45.000	26.00	16.00	410.500
11.300-11.799	45.000	26.00	16.00	411.000
11.800-12.399	45.000	26.00	16.00	411.500
12.400-12.899	45.000	26.00	16.00	412.000
12.900-13.399	45.000	26.00	16.00	412.500
13.400-13.899	45.000	26.00	16.00	413.000
13.900-14.399	45.000	26.00	16.00	413.500
14.400-14.899	45.000	26.00	16.00	414.000
14.900-15.399	45.000	26.00	16.00	414.500
15.400-15.899	45.000	26.00	16.00	415.000
15.900-16.399	45.000	26.00	16.00	415.500
16.400-16.899	45.000	26.00	16.00	416.000
16.900-17.399	45.000	26.00	16.00	416.500
17.400-17.899	45.000	26.00	16.00	417.000
17.900-18.399	45.000	26.00	16.00	417.500
18.400-19.509	45.000	26.00	16.00	418.000
19.510-20.509	45.000	26.00	16.00	419.000
20.510-21.509	45.000	26.00	16.00	420.000
21.510-22.609	45.000	26.00	16.00	421.000
22.610-23.609	45.000	26.00	16.00	422.000
23.610-24.609	45.000	26.00	16.00	423.000
24.610-25.609	45.000	26.00	16.00	424.000
25.610-26.609	45.000	26.00	16.00	425.000
26.610-27.609	45.000	26.00	16.00	426.000
27.610-28.609	45.000	26.00	16.00	427.000
28.610-29.609	45.000	26.00	16.00	428.000
29.610-30.609	45.000	26.00	16.00	429.000
30.610-32.609	45.000	26.00	16.00	430.000
32.610-34.699	45.000	26.00	16.00	432.000
34.700-36.699	45.000	26.00	16.00	434.000
34.700-36.699	55.000	26.00	14.50	534.000
36.700-38.699	55.000	26.00	14.50	536.000
38.700-42.699	55.000	26.00	14.50	538.000
42.700-45.699	55.000	26.00	14.50	542.000
45.700-48.999	55.000	26.00	14.50	545.000

Moulded steady set bushings for single-fluted gun drills Article no. 89607

WN

Discount group 123 • min. order quantity 5 pieces
special dimensions on request • d1 = gun drill nominal diameter



d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
2.000-2.099	20.000	20.00	12.00	201.900
2.100-2.199	20.000	20.00	12.00	202.000
2.200-2.299	20.000	20.00	12.00	202.100
2.300-2.399	20.000	20.00	12.00	202.200
2.400-2.499	20.000	20.00	12.00	202.300
2.500-2.599	20.000	20.00	12.00	202.400
2.600-2.699	20.000	20.00	12.00	202.500
2.700-2.799	20.000	20.00	12.00	202.600
2.800-2.899	20.000	20.00	12.00	202.700
2.900-3.099	20.000	20.00	12.00	202.800
3.100-3.359	20.000	20.00	12.00	203.000
3.360-3.459	20.000	20.00	12.00	203.200
3.460-3.559	20.000	20.00	12.00	203.300
3.560-3.799	20.000	20.00	12.00	203.400
3.800-3.959	20.000	20.00	12.00	203.600
3.960-4.259	20.000	20.00	12.00	203.700
4.260-4.499	20.000	20.00	12.00	204.000
4.500-4.749	20.000	20.00	12.00	204.200
4.750-4.999	20.000	20.00	12.00	204.500
5.000-5.249	20.000	20.00	12.00	204.700
5.250-5.499	20.000	20.00	12.00	205.000
5.500-5.749	20.000	20.00	12.00	205.200
5.750-5.999	20.000	20.00	12.00	205.500
6.000-6.249	20.000	20.00	12.00	205.700
6.250-6.449	20.000	20.00	12.00	206.000
6.450-6.749	20.000	20.00	12.00	206.200
6.750-6.999	20.000	20.00	12.00	206.500
7.000-7.299	20.000	20.00	12.00	206.700
7.300-7.599	20.000	20.00	12.00	207.000
7.600-7.799	20.000	20.00	12.00	207.300
7.800-7.999	20.000	20.00	12.00	207.500
8.000-8.299	20.000	20.00	12.00	207.700
8.300-8.699	20.000	20.00	12.00	208.000
8.700-8.999	20.000	20.00	12.00	208.400
9.000-9.299	20.000	20.00	12.00	208.700
9.300-9.699	20.000	20.00	12.00	209.000
9.700-9.999	20.000	20.00	12.00	209.400
10.000-10.299	20.000	20.00	12.00	209.700
10.300-10.799	20.000	20.00	12.00	210.000
10.800-11.299	20.000	20.00	12.00	210.500
11.300-11.799	20.000	20.00	12.00	211.000
11.800-12.399	20.000	20.00	12.00	211.500

Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
2.900-3.099	30.000	26.00	14.00	302.800
3.100-3.359	30.000	26.00	14.00	303.000
3.360-3.459	30.000	26.00	14.00	303.200
3.460-3.559	30.000	26.00	14.00	303.300
3.560-3.799	30.000	26.00	14.00	303.400
3.800-3.959	30.000	26.00	14.00	303.600
3.960-4.259	30.000	26.00	14.00	303.700
4.260-4.499	30.000	26.00	14.00	304.000
4.500-4.749	30.000	26.00	14.00	304.200
4.750-4.999	30.000	26.00	14.00	304.500
5.000-5.249	30.000	26.00	14.00	304.700
5.250-5.499	30.000	26.00	14.00	305.000
5.500-5.749	30.000	26.00	14.00	305.200
5.750-5.999	30.000	26.00	14.00	305.500
6.000-6.249	30.000	26.00	14.00	305.700
6.250-6.449	30.000	26.00	14.00	306.000
6.450-6.749	30.000	26.00	14.00	306.200
6.750-6.999	30.000	26.00	14.00	306.500
7.000-7.299	30.000	26.00	14.00	306.700
7.300-7.599	30.000	26.00	14.00	307.000
7.600-7.799	30.000	26.00	14.00	307.300
7.800-7.999	30.000	26.00	14.00	307.500
8.000-8.299	30.000	26.00	14.00	307.700
8.300-8.699	30.000	26.00	14.00	308.000
8.700-8.999	30.000	26.00	14.00	308.400
9.000-9.299	30.000	26.00	14.00	308.700
9.300-9.699	30.000	26.00	14.00	309.000
9.700-9.999	30.000	26.00	14.00	309.400
10.000-10.299	30.000	26.00	14.00	309.700
10.300-10.799	30.000	26.00	14.00	310.000
10.800-11.299	30.000	26.00	14.00	310.500
11.300-11.799	30.000	26.00	14.00	311.000
11.800-12.399	30.000	26.00	14.00	311.500
12.400-12.899	30.000	26.00	14.00	312.000
12.900-13.399	30.000	26.00	14.00	312.500
13.400-13.899	30.000	26.00	14.00	313.000
13.900-14.399	30.000	26.00	14.00	313.500
14.400-14.899	30.000	26.00	14.00	314.000
14.900-15.399	30.000	26.00	14.00	314.500
15.400-15.899	30.000	26.00	14.00	315.000
15.900-16.399	30.000	26.00	14.00	315.500
16.400-16.899	30.000	26.00	14.00	316.000
16.900-17.399	30.000	26.00	14.00	316.500
17.400-17.899	30.000	26.00	14.00	317.000
17.900-18.399	30.000	26.00	14.00	317.500
18.400-19.509	30.000	26.00	14.00	318.000
19.510-20.509	30.000	26.00	14.00	319.000
20.510-21.509	30.000	26.00	14.00	320.000
21.510-22.609	30.000	26.00	14.00	321.000
22.610-23.609	30.000	26.00	14.00	322.000
23.610-24.609	30.000	26.00	14.00	323.000
24.610-25.609	30.000	26.00	14.00	324.000
3.100-3.359	45.000	26.00	16.00	403.000
3.360-3.459	45.000	26.00	16.00	403.200
3.460-3.559	45.000	26.00	16.00	403.300
3.560-3.799	45.000	26.00	16.00	403.400
3.800-3.959	45.000	26.00	16.00	403.600
3.960-4.259	45.000	26.00	16.00	403.700
4.260-4.499	45.000	26.00	16.00	404.000
4.500-4.749	45.000	26.00	16.00	404.200
4.750-4.999	45.000	26.00	16.00	404.500
5.000-5.249	45.000	26.00	16.00	404.700
5.250-5.499	45.000	26.00	16.00	405.000
5.500-5.749	45.000	26.00	16.00	405.200
5.750-5.999	45.000	26.00	16.00	405.500
6.000-6.249	45.000	26.00	16.00	405.700
6.250-6.449	45.000	26.00	16.00	406.000
6.450-6.749	45.000	26.00	16.00	406.200
6.750-6.999	45.000	26.00	16.00	406.500
7.000-7.299	45.000	26.00	16.00	406.700
7.300-7.599	45.000	26.00	16.00	407.000
7.600-7.799	45.000	26.00	16.00	407.300

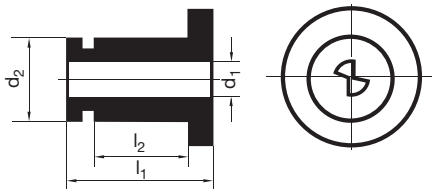
Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
7.800-7.999	45.000	26.00	16.00	407.500
8.000-8.299	45.000	26.00	16.00	407.700
8.300-8.699	45.000	26.00	16.00	408.000
8.700-8.999	45.000	26.00	16.00	408.400
9.000-9.299	45.000	26.00	16.00	408.700
9.300-9.699	45.000	26.00	16.00	409.000
9.700-9.999	45.000	26.00	16.00	409.400
10.000-10.299	45.000	26.00	16.00	409.700
10.300-10.799	45.000	26.00	16.00	410.000
10.800-11.299	45.000	26.00	16.00	410.500
11.300-11.799	45.000	26.00	16.00	411.000
11.800-12.399	45.000	26.00	16.00	411.500
12.400-12.899	45.000	26.00	16.00	412.000
12.900-13.399	45.000	26.00	16.00	412.500
13.400-13.899	45.000	26.00	16.00	413.000
13.900-14.399	45.000	26.00	16.00	413.500
14.400-14.899	45.000	26.00	16.00	414.000
14.900-15.399	45.000	26.00	16.00	414.500
15.400-15.899	45.000	26.00	16.00	415.000
15.900-16.399	45.000	26.00	16.00	415.500
16.400-16.899	45.000	26.00	16.00	416.000
16.900-17.399	45.000	26.00	16.00	416.500
17.400-17.899	45.000	26.00	16.00	417.000
17.900-18.399	45.000	26.00	16.00	417.500
18.400-19.509	45.000	26.00	16.00	418.000
19.510-20.509	45.000	26.00	16.00	419.000
20.510-21.509	45.000	26.00	16.00	420.000
21.510-22.609	45.000	26.00	16.00	421.000
22.610-23.609	45.000	26.00	16.00	422.000
23.610-24.609	45.000	26.00	16.00	423.000
24.610-25.609	45.000	26.00	16.00	424.000
25.610-26.609	45.000	26.00	16.00	425.000
26.610-27.609	45.000	26.00	16.00	426.000
27.610-28.609	45.000	26.00	16.00	427.000
28.610-29.609	45.000	26.00	16.00	428.000
29.610-30.609	45.000	26.00	16.00	429.000
30.610-32.609	45.000	26.00	16.00	430.000
32.610-34.699	45.000	26.00	16.00	432.000
34.700-36.699	45.000	26.00	16.00	434.000
34.700-36.699	55.000	26.00	14.50	534.000
36.700-38.699	55.000	26.00	14.50	536.000
38.700-42.699	55.000	26.00	14.50	538.000
42.700-45.699	55.000	26.00	14.50	542.000
45.700-48.999	55.000	26.00	14.50	545.000

Moulded steady rest bushings for two-fluted gun drills Article no. 89608

WN

Discount group 123 • min. order quantity 5 pieces
special dimensions on request • d1 = gun drill nominal diameter



d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
4.960-5.499	20.000	22.00	12.00	205.000
5.500-5.999	20.000	22.00	12.00	205.500
6.000-6.499	20.000	22.00	12.00	206.000
6.500-6.999	20.000	22.00	12.00	206.500
7.000-7.499	20.000	22.00	12.00	207.000
7.500-7.949	20.000	22.00	12.00	207.500
7.950-8.499	20.000	22.00	12.00	208.000
8.500-8.979	20.000	22.00	12.00	208.700
8.980-9.499	20.000	22.00	12.00	209.000
9.500-9.979	20.000	22.00	12.00	209.700
9.980-10.499	20.000	22.00	12.00	210.000
10.500-10.979	20.000	22.00	12.00	210.500
10.980-11.499	20.000	22.00	12.00	211.000
11.500-11.979	20.000	22.00	12.00	211.500
11.980-12.499	20.000	22.00	12.00	212.000
12.500-12.979	20.000	22.00	12.00	212.500
12.980-13.499	20.000	22.00	12.00	213.000
4.960-5.499	30.000	26.00	14.00	305.000
5.500-5.999	30.000	26.00	14.00	305.500
6.000-6.499	30.000	26.00	14.00	306.000
6.500-6.999	30.000	26.00	14.00	306.500
7.000-7.499	30.000	26.00	14.00	307.000
7.500-7.949	30.000	26.00	14.00	307.500
7.950-8.499	30.000	26.00	14.00	308.000
8.500-8.979	30.000	26.00	14.00	308.700
8.980-9.499	30.000	26.00	14.00	309.000
9.500-9.979	30.000	26.00	14.00	309.700
9.980-10.499	30.000	26.00	14.00	310.000
10.500-10.979	30.000	26.00	14.00	310.500
10.980-11.499	30.000	26.00	14.00	311.000
11.500-11.979	30.000	26.00	14.00	311.500
11.980-12.499	30.000	26.00	14.00	312.000
12.500-12.979	30.000	26.00	14.00	312.500
12.980-13.499	30.000	26.00	14.00	313.000
13.500-13.979	30.000	26.00	14.00	313.500
13.980-14.499	30.000	26.00	14.00	314.000
14.500-14.979	30.000	26.00	14.00	314.500
14.980-15.979	30.000	26.00	14.00	315.000
15.980-16.999	30.000	26.00	14.00	316.000
17.000-17.999	30.000	26.00	14.00	317.000
18.000-18.999	30.000	26.00	14.00	318.000
19.000-19.999	30.000	26.00	14.00	319.000

Accessories for deep hole drilling machines

d1 mm	d2 n6 mm	l1 mm	l2 mm	Code-Nr.
20.000-20.999	30.000	26.00	14.00	320.000
21.000-21.999	30.000	26.00	14.00	321.000
22.000-22.999	30.000	26.00	14.00	322.000
23.000-23.999	30.000	26.00	14.00	323.000
24.000-24.999	30.000	26.00	14.00	324.000
25.000-25.999	30.000	26.00	14.00	325.000
26.000-26.999	30.000	26.00	14.00	326.000
4.960-5.499	45.000	26.00	16.00	405.000
5.500-5.999	45.000	26.00	16.00	405.500
6.000-6.499	45.000	26.00	16.00	406.000
6.500-6.999	45.000	26.00	16.00	406.500
7.000-7.499	45.000	26.00	16.00	407.000
7.500-7.949	45.000	26.00	16.00	407.500
7.950-8.499	45.000	26.00	16.00	408.000
8.500-8.979	45.000	26.00	16.00	408.700
8.980-9.499	45.000	26.00	16.00	409.000
9.500-9.979	45.000	26.00	16.00	409.700
9.980-10.499	45.000	26.00	16.00	410.000
10.500-10.979	45.000	26.00	16.00	410.500
10.980-11.499	45.000	26.00	16.00	411.000
11.500-11.979	45.000	26.00	16.00	411.500
11.980-12.499	45.000	26.00	16.00	412.000
12.500-12.979	45.000	26.00	16.00	412.500
12.980-13.499	45.000	26.00	16.00	413.000
13.500-13.979	45.000	26.00	16.00	413.500
13.980-14.499	45.000	26.00	16.00	414.000
14.500-14.979	45.000	26.00	16.00	414.500
14.980-15.979	45.000	26.00	16.00	415.000
15.980-16.999	45.000	26.00	16.00	416.000
17.000-17.999	45.000	26.00	16.00	417.000
18.000-18.999	45.000	26.00	16.00	418.000
19.000-19.999	45.000	26.00	16.00	419.000
20.000-20.999	45.000	26.00	16.00	420.000
21.000-21.999	45.000	26.00	16.00	421.000
22.000-22.999	45.000	26.00	16.00	422.000
23.000-23.999	45.000	26.00	16.00	423.000
24.000-24.999	45.000	26.00	16.00	424.000
25.000-25.999	45.000	26.00	16.00	425.000
26.000-26.999	45.000	26.00	16.00	426.000
27.000-27.999	45.000	26.00	16.00	427.000
28.000-28.999	45.000	26.00	16.00	428.000
29.000-29.999	45.000	26.00	16.00	429.000

Grinding equipment for single-fluted gun drills

TBM 116

TBM 116 is a manually operated, universal grinding machine. Its compact design combined with Hartner's single-fluted gun drill grinding system and Hartner's double grinding wheel makes this a perfect unit to re-grind single-fluted gun drills. It is especially suitable for the re-grinding of a small to medium number of items of varying diameters and lengths. Furthermore, it also allows the fairly simple addition of transverse chip brea-kers to single-fluted gun drills as well as other modifications.

Supplied items:
Grinding machine with two high-powered light units as well as two 220 V sockets (grinding system and grinding wheel not included)

Machine data:
Input power requirements 380 V/50 Hz, Grinding wheel

TBV 116

The fixture is designed for the re-grinding of single-fluted gun drills in the diameter range from 3 mm to 30 mm. It is ideally suitable for standard and special point grinds. A minimum flute length is of no importance thanks to a short center sleeve. In addition, the fixture is supplied with a supporting bar for long tools. TBV 116 is therefore truely universal and can be applied on any commercial, manual tool grinding machine.

For the use with TBV 116 we recommend our double grinding wheel DSS 125.

Attention:
Single-fluted gun drills have a flute spacing angle of 120° and can therefore not be clamped in a collet in a separate unit. You could possibly destroy the tool.

TBV 216

The new TBV 216 universal grinding fixture for small diameter single-fluted gun drills from 1.0 to 6.0 mm and a maximum length of 350 mm is simple to handle and enables the re-grinding or modifying of single-fluted gun drills in only four ope-rations. Grinding is achieved with a 3-axis swivel mechansim, enabling the grinding of various point angles. It is possible to adjust and if necessary correct any angle individually.

We recommend the application of our single grinding wheel ESS 125.

Scope of delivery:
- A set of guide bushes with the diameters 1.0 / 1.5 / 2.0 / 2.5 / 3.0 / 3.5 mm
- Various adaptors
- Centering microscope
- Spotlight and magnifier

HARTNER

Fax inquiry / Order

☐ **Inquiry** ☐ **Order by Fax to: +49 7431 125 - 21547**

Customer no. | New customer | Order no.

Contact partner | Company | Contact

Hartner GmbH
P. O. Box 10 04 27
D-72425 Albstadt
Tel.: + 49 7431 125-0
Fax: +49 7431 125-21547
www.hartner.de

Street no. | Town/post code

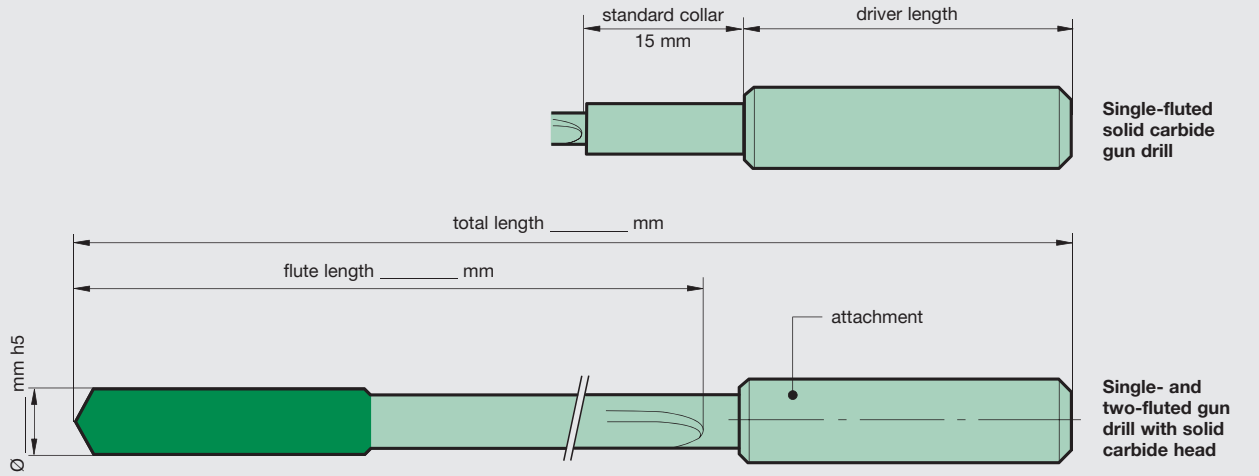
Telephone | Fax

Date | Signature

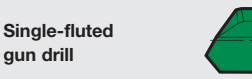
Deep hole gun drill: ☐ E 100 Single-fluted solid carbide gun drill — Head form: _____

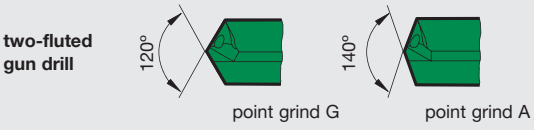
☐ E 80 Single-fluted gun drill with solid carbide head — Number required:_____ items

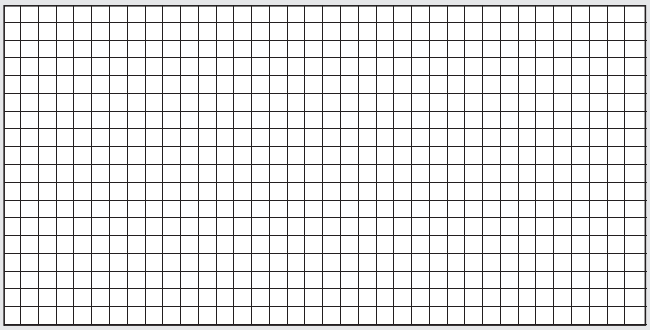
☐ Z 80 Two-fluted gun drill with sol. carb. head



Drawing of lay-out







Driver: ☐ no ☐ code no.: ☐ to enclosed drawing

Coating: ☐ TiN ☐ FIRE ☐ TiAlN ☐ AlTiN nano ☐ TiCN ☐ _____

Workpiece: drilling depth: _____ hole tolerance: _____ material: _____

☐ bling hole ☐ through hole ☐ cross drilling

Machine type: ☐ deep hole drilling machine ☐ conventional machine tool

Coolant: ☐ deep drilling oil ☐ soluble oil

pressure _____bar pressure _____bar

HARTNER

Fax inquiry / Order interchangeable inserts gun drill

☐ **Inquiry** ☐ **Order by Fax to: +49 7431 125 - 21547**

Contact partner

Hartner GmbH
P. O. Box 10 04 27
D-72425 Albstadt
Tel.: +49 7431 125-0
Fax: +49 7431 125-21547
www.hartner.de

Customer no. New customer

Company

Street no.

Telephone

Date

Order no.

Ansprechpartner

Town/post code

Fax

Signature

Workpiece

Material:

Description:

Quantity/Year:

Hole diameter:

Tolerance on diameter:

Drilling depth:

Surface quality required:

Protruding edge:
☐ No ☐ Yes mm

Additional information:

Machine

Machining centre:

Tool holder:

No. of spindles:

Deep drilling machine:

Tool holder:

No. of spindles:

Overall length of tool:

Coolant/lubrication:
☐ soluble oil ☐ neat oil

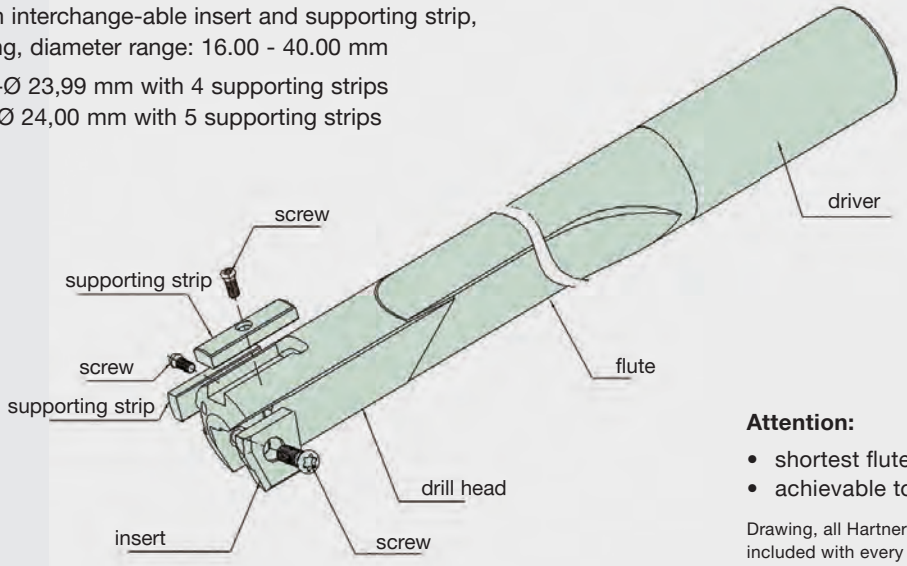
Pressure:
bar

Volume:
l/min

The Hartner E 800 for you application

Gun Drill with interchange-able insert and supporting strip, internal cooling, diameter range: 16.00 - 40.00 mm

- up to nom-Ø 23,99 mm with 4 supporting strips
- from nom-Ø 24,00 mm with 5 supporting strips



Attention:

- shortest flute length 15xD
- achievable tolerance on IT9/IT10

Drawing, all Hartner nos. and specifications included with every quote.

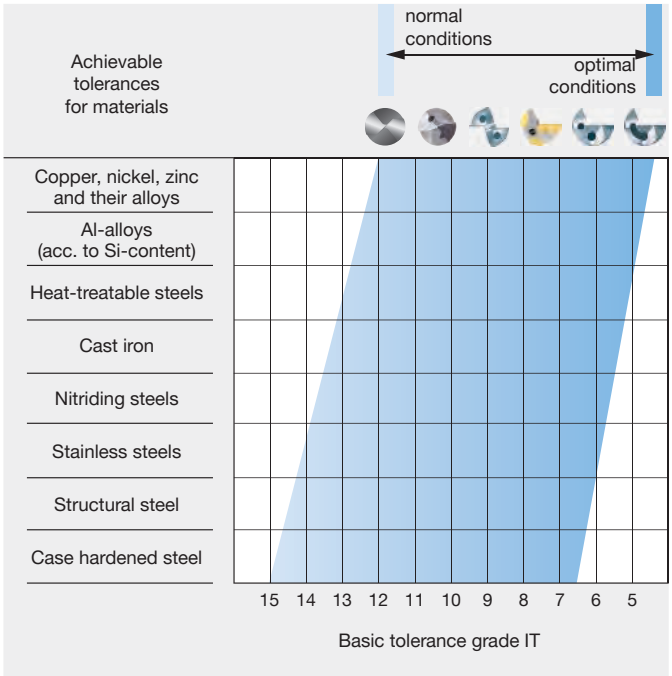
TECHNICAL SECTION

Quality features

In machining technology, if the drilling depth is 15xD or deeper, this is referred to as deep hole drilling.
– classical single-fluted gun drills made of solid carbide or with a brazed carbide head
– classical two-fluted gun drills with a brazed carbide head
– replacement system with replaceable solid carbide cutting edges and supporting strips
– spiralled solid carbide or HSS/HSS-E deep hole drills
The right tool is selected depending on the type of application and the required quality of the drilled hole.
The following diagrams provide guidance on which tool to choose:

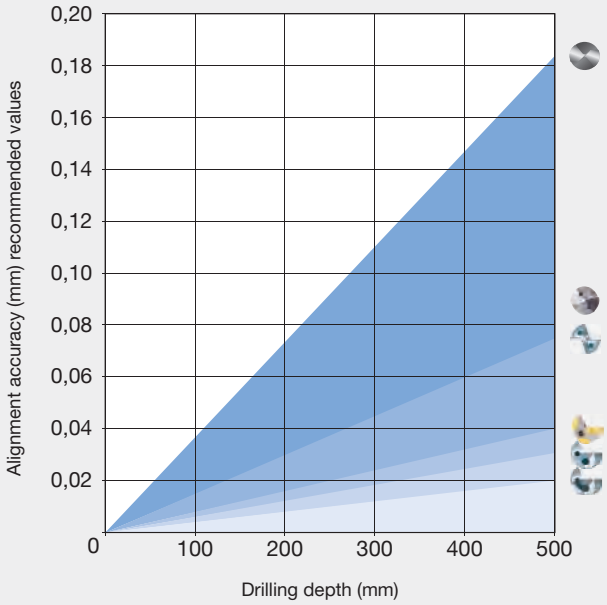
Basic tolerances

Depending on their shape and design, different types of tools result in different basic tolerances. The single-fluted drill creates extremely precise drilled holes. Under optimum conditions, it is possible to achieve tolerance grades of up to IT5 with a single-fluted gun drill.



Alignment accuracy

The straightness of hole describes a deviation in direction. This is influenced by the centring of the tool during spot drilling and depends on the shape and position of the pilot hole or drill bush. The properties of the material or workpiece as well as the stability of the tool and machine also influence the straightness.



Peak-to-valley height class		N12	N11	N10	N9	N8	N7	N6	N5	N4	N3
E 100/E 80 deep hole drilling											
E 800 deep hole drilling											
Z 80/TS 100 T deep hole drilling											
HSS/HSS-E deep hole drilling											
E 100/80/800 Pilot drilling											
Surface values	Rz (µm)	160	100	63	40	15.6	7.87	4.65	2.60	1.74	0.81
Roughness values	Ra (µm)	50	25	12.5	6.3	3.2	1.6	0.8	0.4	0.2	0.1

normal conditions (recommended values) ideal conditions

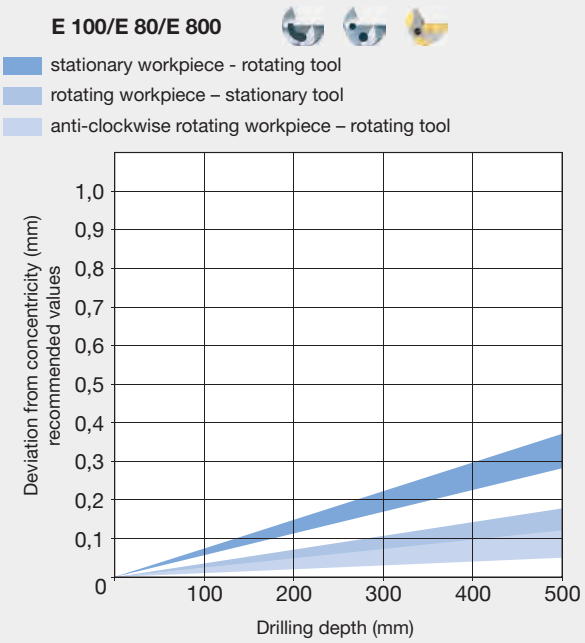
Surface quality

The roughness of the drilled hole is influenced by many factors. The most important of these are the material, the cooling lubricant and the type and geometry of the tool. When drilling with single-fluted drills, the guide pads smooth the bore wall further. This is not the case for drills with several cutting edges. The final quality of the surface is dependent on the surfaces of the tool (e.g. coating) or edge conditions (wear) on the primary and secondary cutting edges.

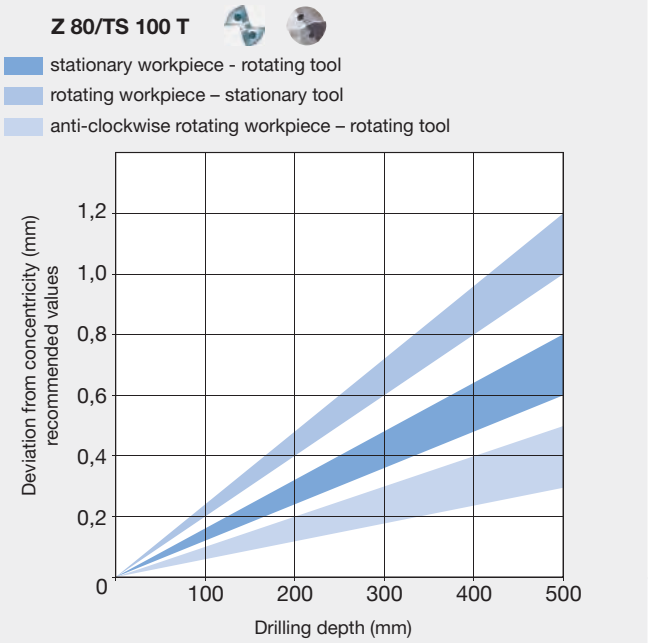
Deviation from concentricity

The deviation from concentricity describes a continuous displacement of the tool with increasing drilling depth. This curve is affected not only by the drill's geometric properties, but also by the cutting conditions, the material structure and the temperatures. Optimum results are achieved when machining with counter-rotating speeds of the workpiece and tool. A single-fluted drill achieves lower deviation from concentricity values than drills with several cutting edges.

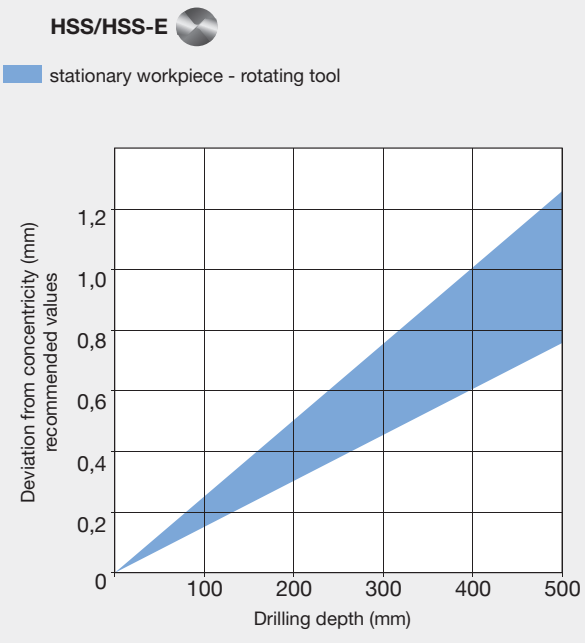
E 100/E 80/E 800



Z 80/TS 100 T



HSS/HSS-E



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Application of Hartner coatings

Material	ISO groups	E/Z	TS 100 T	HSS
C steels, Free-cutting steels, Mn Steels	P	TiN TiSiN TiAlSiN	TiSiN TiAlZrN FIRE	FIRE – –
Steel, low-alloyed	P	blank TiN FIRE	FIRE TiSiN TiAlZrN	FIRE TiN –
Steel, alloyed	P	FIRE TiAlSiN	FIRE TiAlSiN AlTiN nano	FIRE TiN –
Steel, hardened, <55 HRC	P	TiAlSiN FIRE TiAlN	TiAlSiN FIRE TiAlN	– – –
Seel, hardened, 55 – 65 HRC	P	TiAlSiN FIRE TiAlN	TiAlSiN FIRE TiAlN	– – –
Steel, stainless und acid-resistant	M	SuperA AlTiZrN TiAlSiN	AlTiN nano AlTiZrN TiSiN	AlTiZrN FIRE TiN
Cast iron	K	TiAlSiN TiSiN FIRE	TiAlSiN FIRE AlTiN nano	FIRE – –
Nickel-based alloys (i.e. Inconel)	S	AlTiN nano AlTiZrN TiSiN	AlTiN nano TiAlSiN FIRE	FIRE – –
Titanium / Titanium-alloys	S	bright ZrN AlTiN nano	ZrN AlTiN nano	FIRE –
Cobalt-chromium-alloys	S	AlTiN nano FIRE TiAlSiN	AlTiN nano TiAlSiN FIRE	– – –
Precious metals	S	AlTiN nano DLC	AlTiN nano	–
Alluminium-wrought-alloys	N	bright DLC –	bright DLC Diamant	bright DLC –
Alluminium-cast-alloys (<12% Silizium)	N	bright ZrN DLC	bright ZrN DLC	bright ZrN DLC
Alluminium-cast-alloys (≥12% Silizium)	N	Diamant TiAlSiN –	Diamant – –	– – –
Copper / bronze / brass	N	bright DLC CrN	CrN DLC	TiN –
Ceramics	N	Diamant TiAlSiN	Diamant	–
Plastics, not reinforced	N	bright	DLC	–
Plastics, fibre-reinforced	N	Diamant TiAlSiN	Diamant TiAlSiN	– –
Graphite	N	bright	–	–

Note: *The overview shows the general application recommendations for Hartner coatings. Prioritisation is from top to bottom.*

A brief introduction to the subject of deep hole drilling

In the machining world, drilling depths of 15 x D and deeper are regarded as deep hole drilling operations, whereby smaller drilling depths can naturally also be produced with gun drills. Advantage is taken of the positive side effects, as for example good surface quality, low deviation from concentricity and optimised alignment accuracy.

High pressure cooling –
has become a matter of course.

In recent years, internal cooling has established itself for all drilling tools. Coolants are now living up to their name and being supplied via coolant ducts to where they are urgently required. Considerable improvements in tool life and less breakages have been achieved by this measure for twist drills, taps etc. Every conventional machine tool currently on the market can be supplied with high pressure internal cooling and is therefore also suitable for deep hole drilling. The share of gun drills on machining centres, lathes etc. is forever gaining more importance. The process is therefore increasing in popularity in the machining world.

All gun drills must have support for the pilot hole. Gun drills must never operate at full speed without support n the machine shop.

Deep hole drilling is not a closed book, but can be mastered by anybody as long as certain conditions are adhered to. Recommended cutting rates for the application of Hartner gun drills can be found in the chapter application recommendations.

Application advice

- When using classical deep hole drills with a steel shank, E 80, E 800 and Z 80, to drill to depths greater than 40xD, we recommend the use of two or more deep hole drills, e.g. Ø 10x400 mm und Ø 9,95x800 mm.
- The E 100 M solid carbide deep hole drills and the brazed E 100 can achieve a maximum drilling depth of 80xD with only one tool.
- Deep hole drills for drilling to depths greater than 40xD should be introduced into the pilot hole with anti-clockwise rotation.
- When changing tools at a depth greater than 40xD, the tool can be damped by switching on the high-pressure internal cooling for approximately one second.
- For machining long-chipping materials, we recommend the use of Deep hole drills with polished flutes.
- As a general rule, we recommend setting the oil content of the emulsion to at least 8 %.
- Single-fluted gun drills for long-chipping aluminium should be ordered with a 180° point grind and coolant chamber.
- Firmly seated steady rest bushings dampen the drilling process and improve the quality of the bore.
- To avoid a step between the pilot hole and the deep hole, a smooth transition can be achieved with head form G and a pilot hole that is slightly undersized.
- In the case of long chip formation, a periodic interruption in the feed (without withdrawal) can facilitate the machining process.

The drilling process on conventional machines (BAZ)

The work steps for deep hole drilling

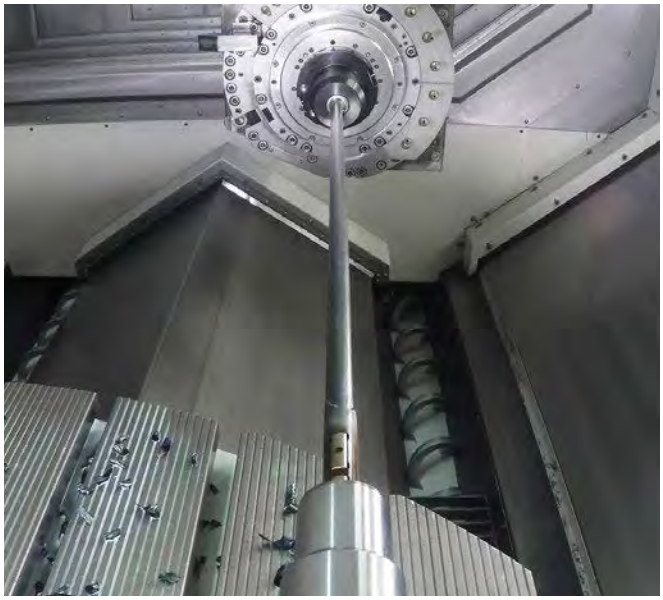
- production of pilot hole
- enter a low revolutions
- setting of coolant pressure and speed
- continuous drilling to required drilling depth without pecking
- switching off coolant supply after reaching the required hole depth
- retraction of the tool from the hole

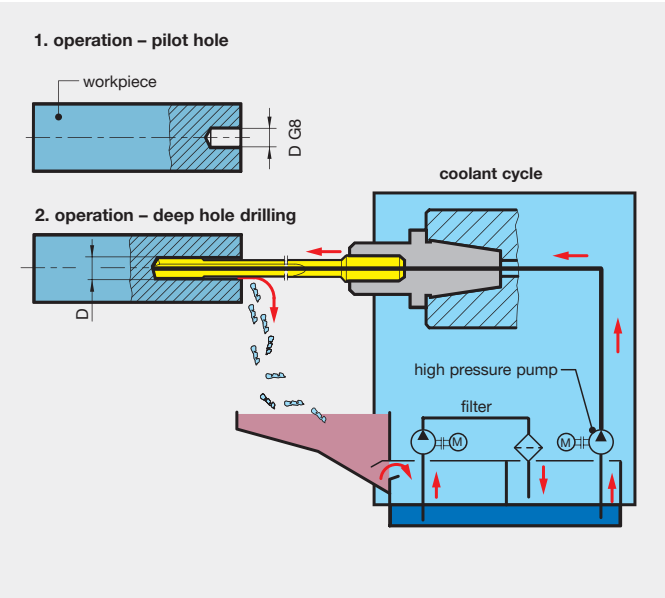
Cutting parameters can be reduced if cooling parameters are insufficient.
Pressure increase systems are also an option.

Procedure

In order to achieve optimal machining results when producing deep holes especially spotting on radii and/or on an uneven surface structure, we recommend the following machining steps:

1. Initial milling of the surface, e.g. with the TF 100 MULTI-MILL. The surface must be machined at right angles to the entry angle of the drilling operation.
2. Drilling of a cylindrical pilot hole, e.g. with the TS 100 U. Thanks to its point angle of 140° and its Ø tolerance m7, this drill is ideally suited for this machining step.
3. Drilling into the pilot hole with a speed of approximately 200 rpm and a feed rate of approximately 500 mm/min with anti-clockwise rotation.
4. Adjustment of the cooling lubricant pressure and the rotational speed.
5. Uninterrupted drilling to the required drilling depth without chip removal. When using deep hole drills with a very large length/diameter ratio (e.g. solid carbide single-fluted drills with flute lengths greater than 160 mm), we recommend drilling with reduced cutting parameters (approx. 75 % of the optimal cutting speed) to a drilling depth of around 25 mm.
6. For through holes with a straight exit, i.e. 90°, reduce the feed speed v_f to 50 % approximately 1 mm before breaking through.
7. For through holes with an inclined exit, reduce the feed speed v_f to 40 % approximately 1 mm before breaking through.
8. After reaching the required drilling depth, switch off the speed and cooling lubricant and retract the drill at a speed of no more than 5,000 mm/min.

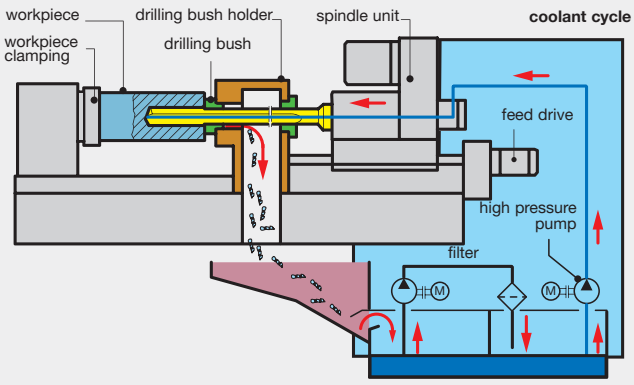




The drilling process on deep hole drilling machines

Where mass production, milling of very deep holes and high quality surface finishes are required, deep-hole drilling machines are used. A nearly endless range of drilling depth becomes available. The gun drill is guided by steady rest bushes. The accordion-like movement of the bushes allows a continuous drilling. „Drilling without pecking“.

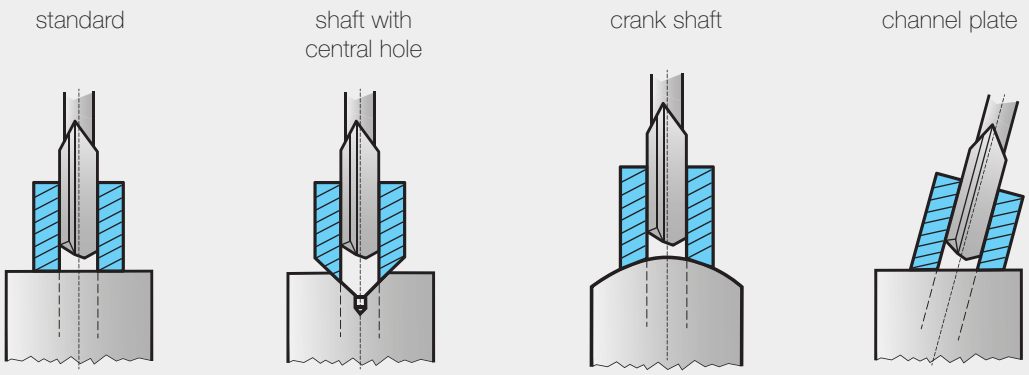
Pilot holes are not needed, thus reducing, time and costs for tool change. Offering a greater drilling depth (up to a couple of meters), and at the same time, an excellent drilling quality. High pressure pumps and a coolant filter system guarantuee maximum process security. The total length of the steady rest bushings and the drill bush support equals the so-called length loss, which is decisive for calculating the length of the tool.



Pilot hole and drill bush

Since the single-fluted gun drill is a tool with only one cutting edge and cannot centre itself automatically, the tool must be guided with a drill bush or pilot hole.
Self-centering two-fluted drills also have to be guided by drill bushes or pilot holes, however, as they could otherwise start to vibrate.

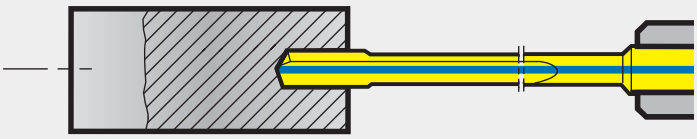
Example drill bush with art.no. 89600 (HSS) / 89601 (solid carbide)



To take into account when using drill bushes

- The drill bush must be in positive contact with the spot drilling contour.
- There should be as little play as possible between the drill bush and the tool.
- If the deep hole drill has a guide diameter, the drill bush should be at least long enough to guide both head types when spot drilling.
- The condition of the drill bush must be regularly checked to prevent any negative effects on the tool.
- We recommend HSS drill bushes for small series and solid carbide drill bushes for large series.

Example pilot drilling

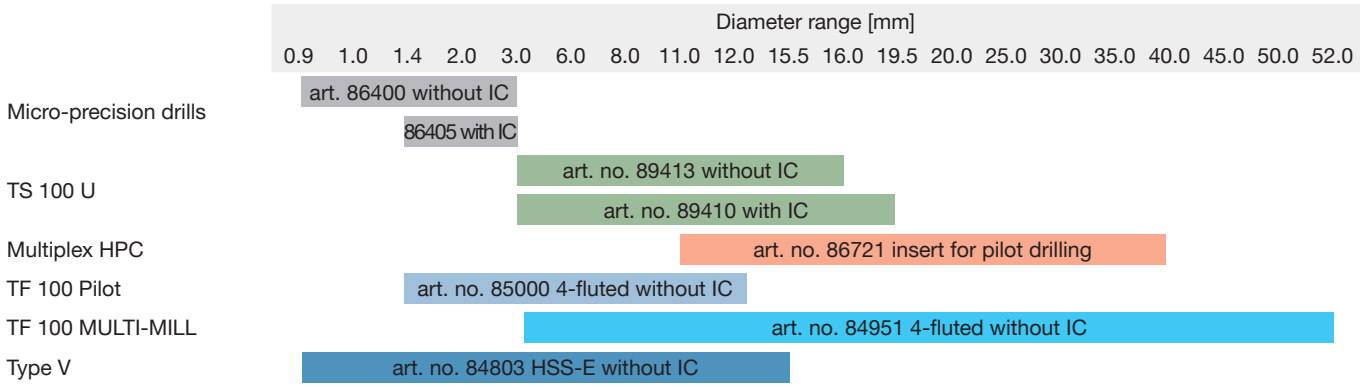


Guide valued for the pilot hole depth

conv. deep hole drills	Ø nom. follow-on tool				
drilling depth	Ø 0.900-1.799	Ø 1.800-3.999	Ø 4.000-7.999	Ø 8.000-11.999	Ø 12.000-52.000
up to 20xD	3.0xD	2.5xD	2.0xD	1.5xD	1.5xD
up to 30xD		3.0xD	2.5xD	2.0xD	
up to 40xD		4.0xD	3.0xD	2.5xD	

Pilot hole and drill bush

Range of applications for pilot tools



Micro-precision drills
- for pilot holes <Ø3.000/E 100, E 80
- for standard situations/flat spotting surface

TS 100 U
- universal pilot tool Ø3.000-19.500/E 100, E 80, ZB 80, E 800, RT 100 T
- for standard situations/flat spotting surface

Multiplex HPC
- insert pilot tool Ø11.000-40.000/E 100, E 80, ZB 80, E 800, RT 100 T
- for standard situations/flat spotting surface

TF 100 Pilot
- milling cutter for high-precision pilot holes Ø1.400-12.000/E 100, E 80, ZB 80, E 800, RT 100 T
- for standard and special situations/flat, angled, cubic or other spot drilling surfaces

TF 100 MULTI-MILL
- milling cutter for high-precision pilot holes Ø4.000-52.000/E 100, E 80, ZB 80, E 800, RT 100 T
- for standard and special situations/flat, angled, cubic or other spot drilling surfaces

Type V
- HSS pilot drills Ø0.900-15.500/HSS deep hole drills
- for standard situations/flat spotting surface

Please observe the following for pilot holes

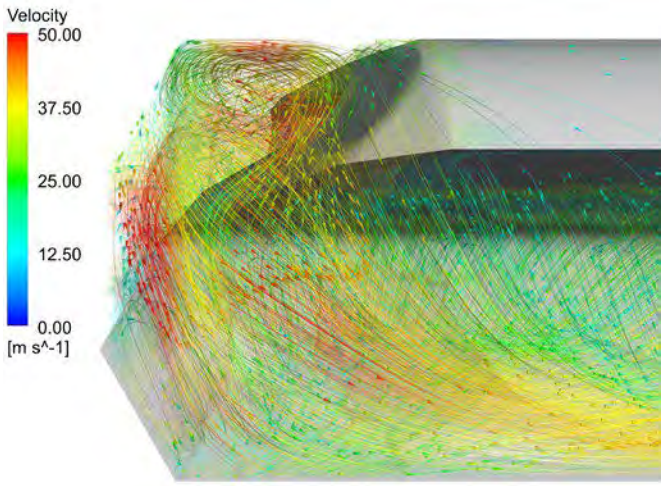
- The pilot hole diameter tolerance should be G8 and the nominal tool tolerance always Ø **m7**.
- If the single-fluted gun drill has a guide diameter, the pilot hole should be at least deep enough to support both head forms when spot drilling.
- Depending on the application, it may be advantageous if the pilot hole has an entry chamfer.
- If there are strict requirements regarding the position and concentricity of the deep drilled hole, then the pilot hole should be milled or be drilled on a lathe.

Important:
The quality of the drill bush and of the pilot hole has a very large influence on the deviation from concentricity and the tool life of the follow-on tool.

Cooling lubricant

Introduction

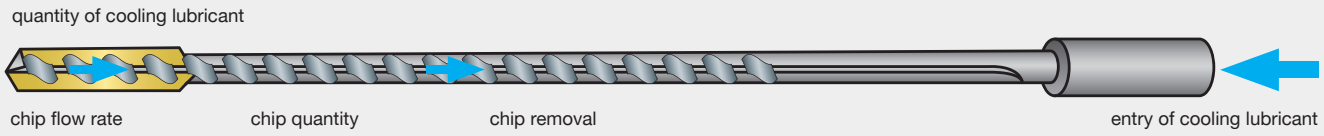
The cooling lubricant is one of the most important elements when it comes to drilling holes with an LxD ratio of more than 15xD and for drilling deep holes. The selection of the cooling lubricant, taking into account its properties and performance such as pressure and flow rate, is decisive for process performance and thus also for the quality of the drilled hole. If the cooling lubricant pressure is too high, it can result in waviness and a larger deviation from concentricity.



Function

The cooling lubricant (oil, emulsion, MQL, air) flushes the chips out of the bore and lubricates all the parts of the tool (head and cutting edges) that come into contact with the workpiece. Drilling takes place under high pressure. However, the pressure is "only" the sum of the amount of cooling lubricant produced and existing resistances such as cooling duct cross-section or tool length and chip mass. Due to the amount of cooling lubricant and the resistances mentioned, a flow velocity occurs from a hydraulic point of view. When used correctly, this minimises the time that the chip is in contact with the cutting edge, prevents the drill from clogging and thus has a direct influence on the machining process.

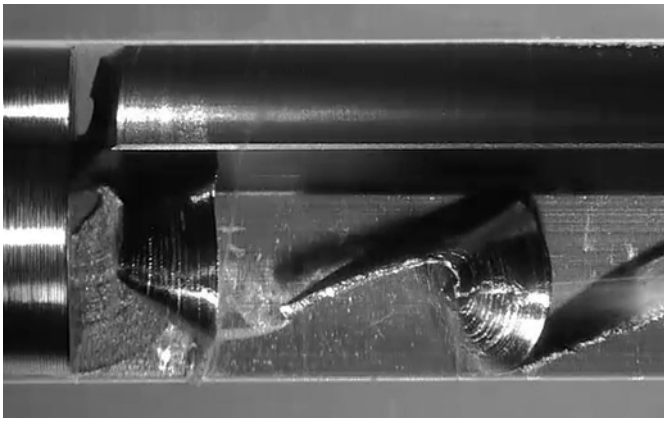
The lubricating properties of the cooling lubricant have a crucial effect on chip formation and the surface result. Appropriate additives such as EP additives (Extreme Pressure) ensure good sliding of the guide pads, which may be exposed to enormous surface pressure and rolling forces.



Filtration

If safe and reliable drilling processes are to be guaranteed, it is imperative to ensure that the cooling lubricant is sufficiently clean with reference to the tool diameter:

- < Ø 2.000 max. 15 µm
- Ø 2.000 up to ≤ Ø 6.000 max. 40 µm
- > Ø 6.000 up to 100 µm



Types of cooling lubricant

Soluble oil

Various types of water-miscible cooling lubricants are available, such as mineral, synthetic or natural compositions, and these, in addition to the selected oil proportion, significantly influence the drilling process. The ideal oil content for deep hole drilling is between 8 and 12 %. Lower values lead to a loss in performance or even to malfunctions.

Emulsion properties*

- At high pressures, EP additives (Extreme Pressure) should be used in the emulsion. Otherwise, foaming and an associated loss of lubrication may occur.
- Emulsions have a lower viscosity than oil, which means that pressures can be reduced by approximately 5 % to achieve comparable flushing properties.
- For materials that have a chrome content of more than 12 %, a tool life of less than 1.5 m must be expected.

Oil

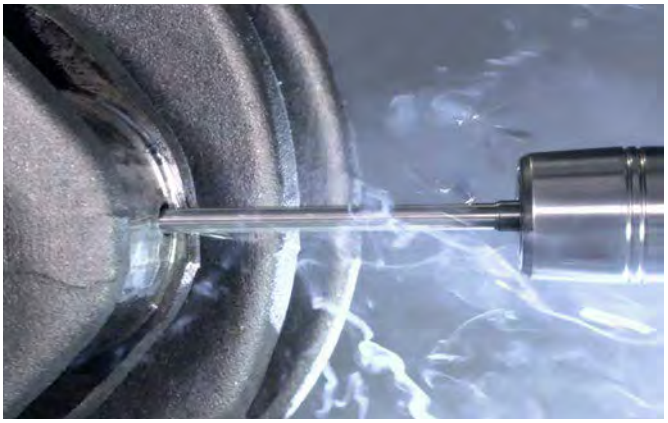
Like the emulsions, deep drilling oils differ in their mineral, synthetic and natural composition. The higher viscosity of deep drilling oils compared to emulsions partly determines the increased coolant resistance, which in the case of low-viscosity oils leads to high flow rates (small diameters) and in the case of high-viscosity oils to larger hydraulic forces (significant in the case of larger diameters). The viscosity and lubricating properties of oils are strongly dependent on temperature. Overheating > 50° C must be avoided in order to be able to drill reliably.

Oil properties*

- < Ø 2 mm 7-10 mm^2/s
- > Ø 2 mm 10-20 mm^2/s

MQL / Dry

Deep holes can be drilled dry or with MQL. The type of process depends on the material, diameter and drilling depth. The shape, size and mass of the chips are decisive.
Dry machining is only possible if dust-like chips are produced (e.g. with graphite or HM green compacts).

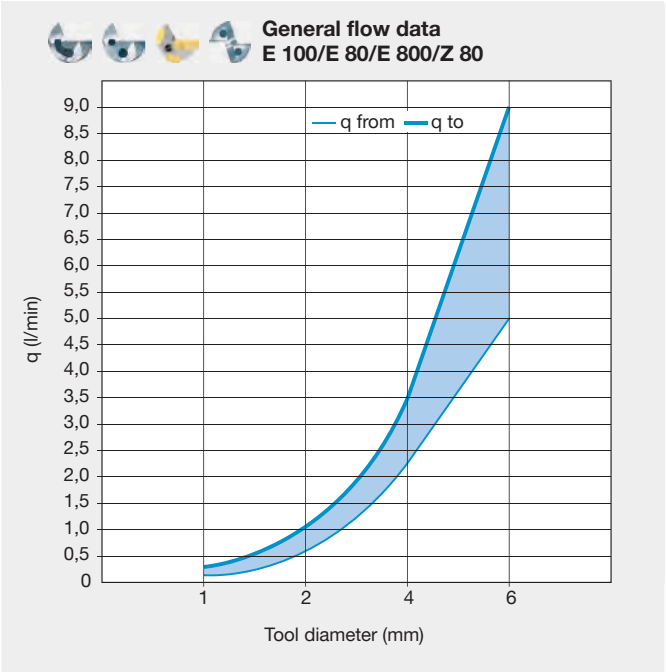


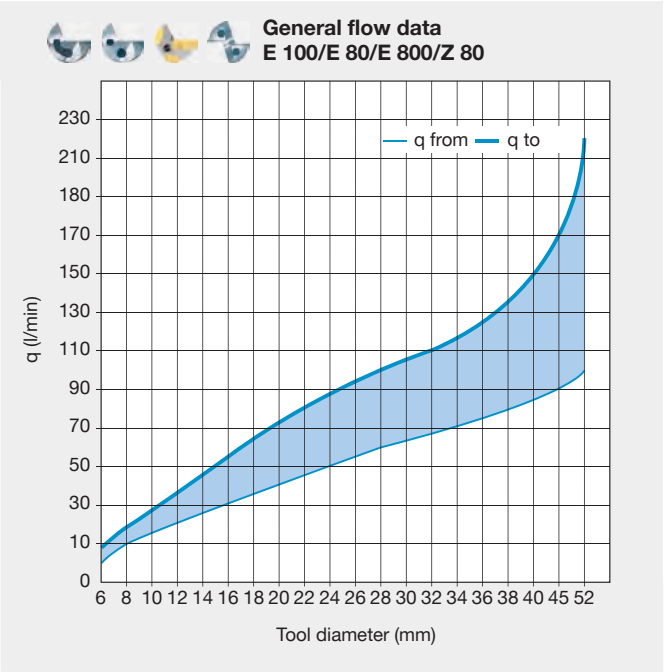
*No liability will be accepted in the case of deviations from the manufacturer's specifications

Cooling lubricant data

Please note:

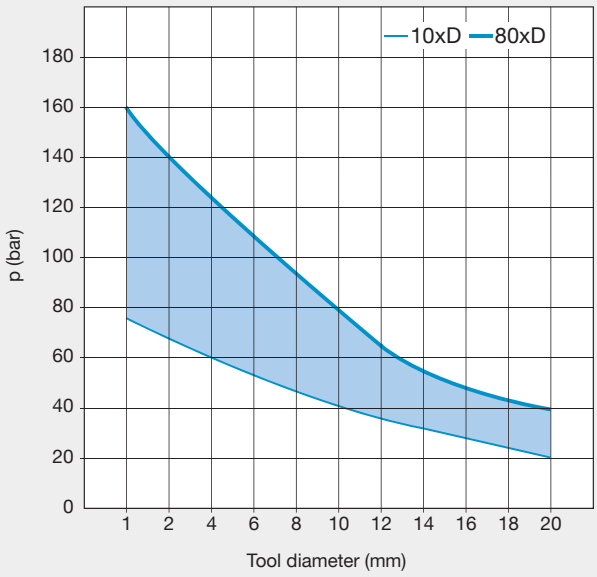
- All gun drills must be applied with internal cooling, either air, water or oil.
  Internal cooling ensures better chip removal.
- All gun drills can be applied with oil as the medium for internal cooling.
  In this case, however, a higher pressure is required than with emulsions in order to obtain the same amount of coolant.
- When MQL is applied with gun drills an increase in pressure may be necessary for smaller nominal diameters
  dependent on the pressure of the MQL system.
- If the cooling lubricant data is insufficient the cutting parameters may be reduced. Pressure boosting systems
  are also possible.
- With increased gun drill length a pressure increase has to be expected to transport the required coolant volume through
  the coolant ducts.



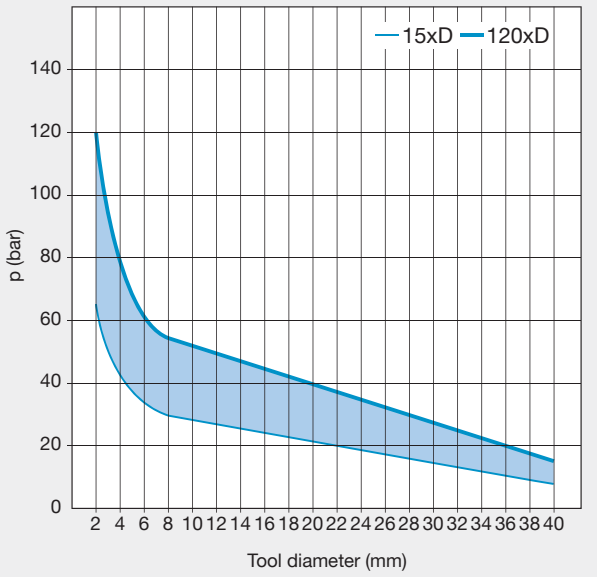


Cooling lubricant data

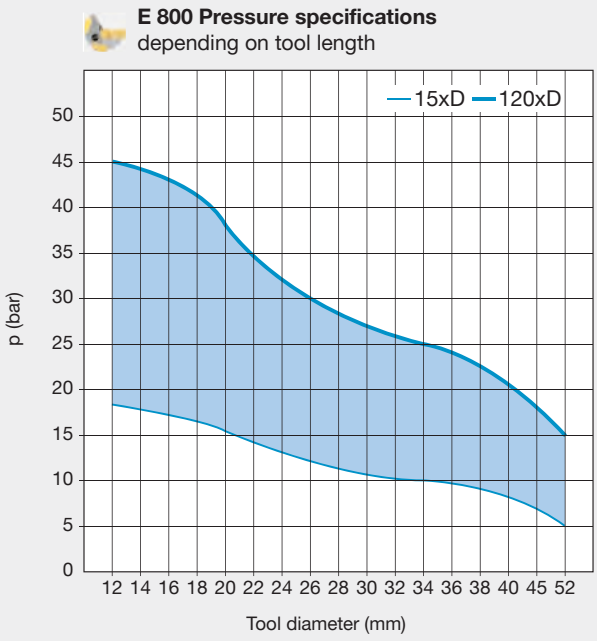
E 100 Pressure specifications
depending on tool length



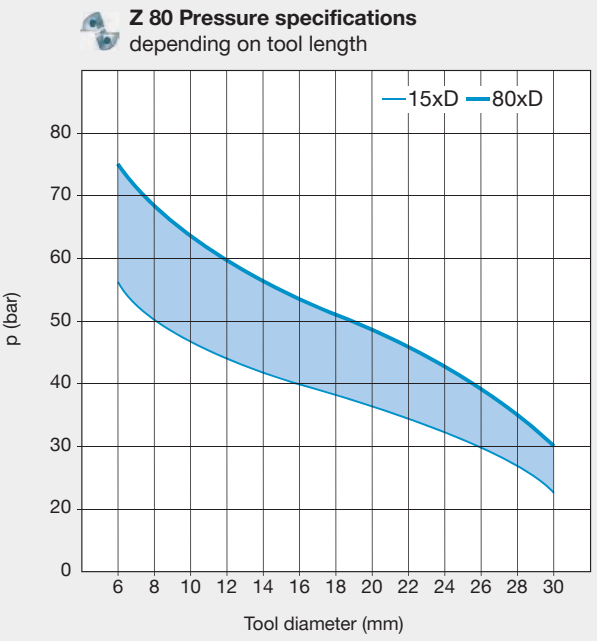
E 80 Pressure specifications
depending on tool length



E 800 Pressure specifications
depending on tool length



Z 80 Pressure specifications
depending on tool length

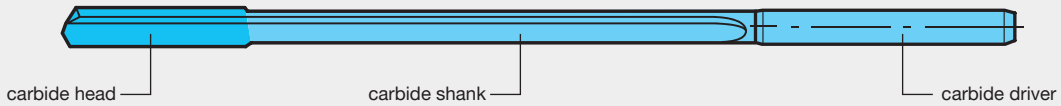


Characteristics

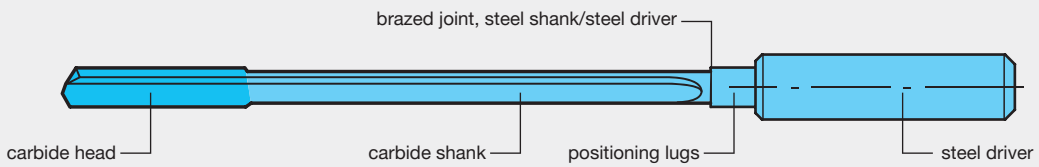
Range of applications

	Diameter range																		
	0.9	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	52.0
E 100 M		max. total length 615 mm																	
E 100		max. total length 615 mm																	
E 80				max. total length 3.600 mm															
Z 80						max. total length 1.000 mm													
E 800									max. total length 3.600 mm										

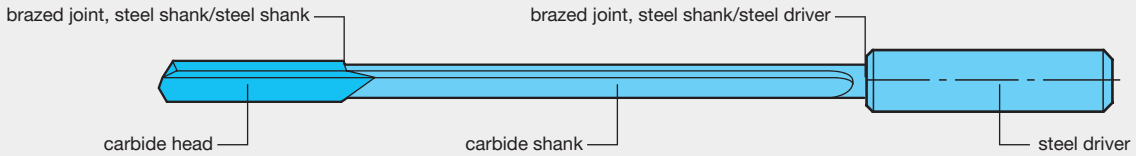
E 100 M



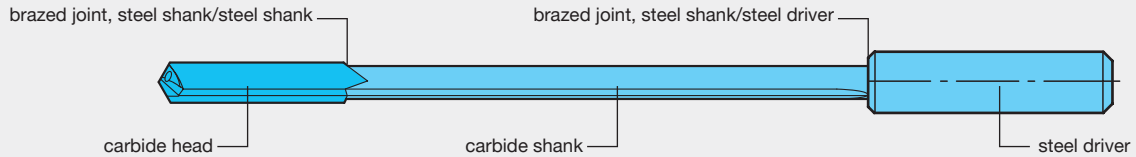
E 100



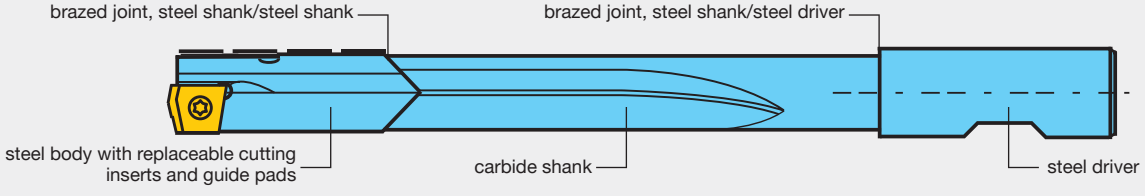
E 80



Z 80

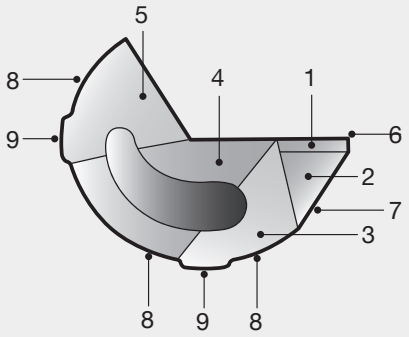


E 800

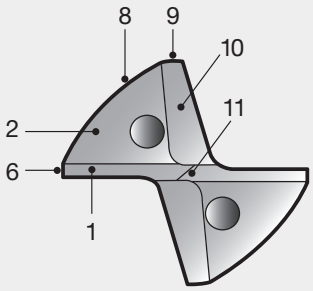


Characteristics

Characteristics – point grind E



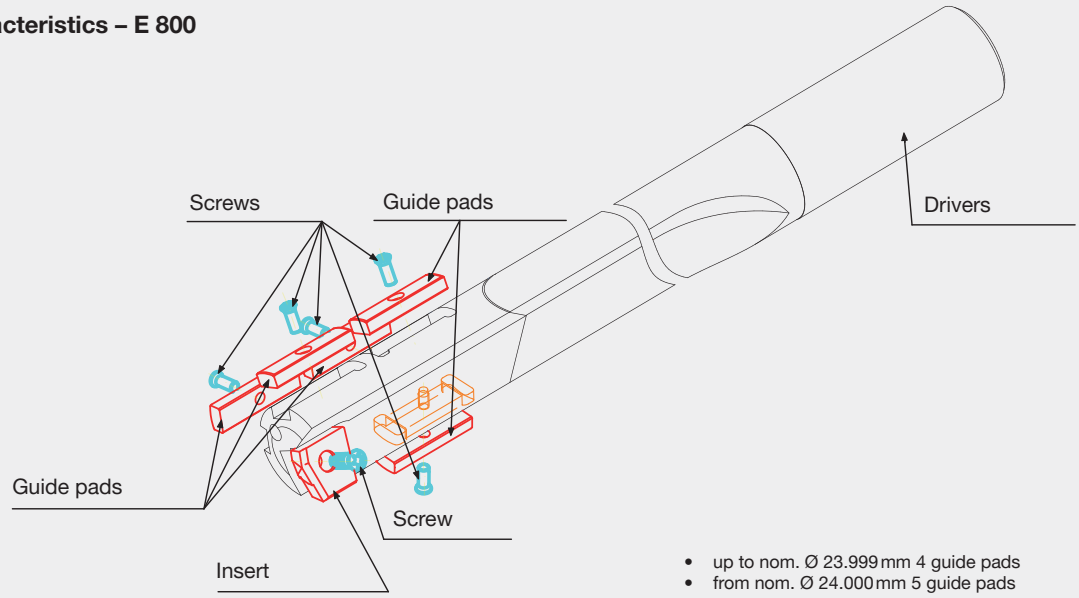
Characteristics – point grind Z



Explanation:

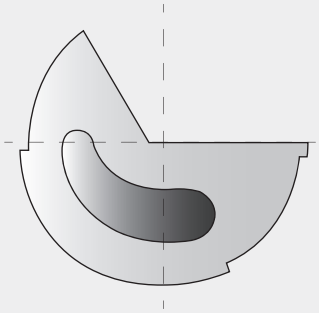
1 – Outer cutting edge, 1st flank
2 – Outer cutting edge, 2nd flank
3 – Flank, tip
4 – Inner cutting edge
5 – Oil chamber
6 – Secondary cutting edge (circular grinding chamfer)
7 – Primary clearance (oil pocket)
8 – Body clearance diameter
9 – Supporting strips (head form)
10 – Web thinning
11 – Chisel edge

Characteristics – E 800



- up to nom. Ø 23.999 mm 4 guide pads
- from nom. Ø 24.000 mm 5 guide pads

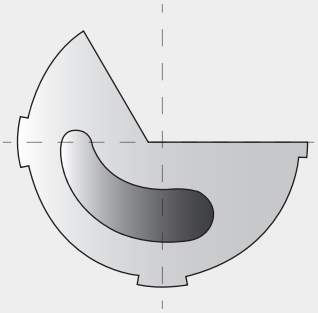
Special head forms



Head form G

Standard head form. Suitable for most materials and drilling tasks. With this form, the tool diameter cannot be measured once it has been manufactured.

- suitable for most drilling tasks
- for all materials
- low deviation from concentricity
- reduced tendency to jam
- tight hole tolerances

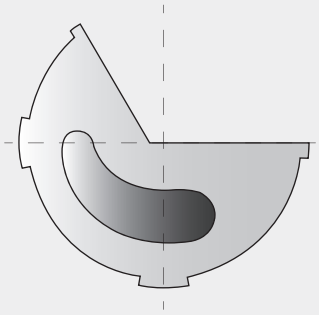


Head form C

This head form is preferred where drilling tolerances are tight with regard to drill hole diameter and surface quality.

- for all materials
- steel, stainless steel, aluminium
- low deviation from concentricity
- reduced tendency to jam

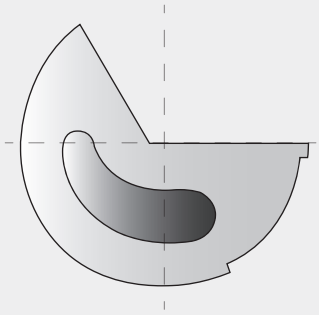
Special head forms



Head form A

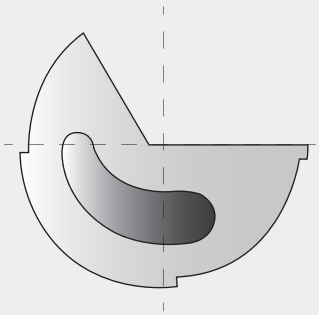
Head form for difficult drilling conditions when spot drilling and cross drilling. Machining of soft materials and/or where the lubrication performance of the cooling lubricant is poor. Used where tight drilling tolerances apply and as a guide part where extra long cutting heads are used.

- aluminium
- copper



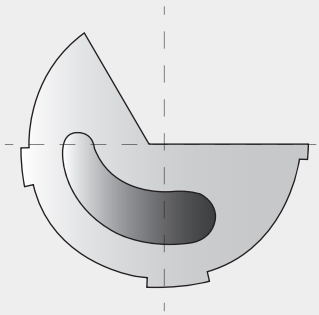
Head form D

This head form is used almost exclusively for soft materials such as grey cast iron, graphite etc. – especially in connection with tight drilling tolerances.



Head form E

Suitable for all materials, but for less stringent drilling tolerances.



Head form F

Head form for softer materials, lower friction and stable guidance, such as with aluminium.

This is just a small selection of our special head forms. Further special head forms for your particular application are available on enquiry.

Conventional deep hole drills

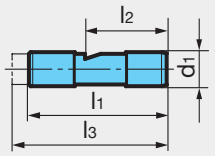
The range of drivers introduced below is available ex stock. However, it only represents a small selection of drivers from our complete range. We naturally also produce individual drivers of the highest precision to customer drawings.

Attention! E 100 requires drivers with positioning lugs. Further information on request.

Drivers for E 80

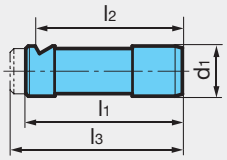
Drivers for deep drilling machines

1



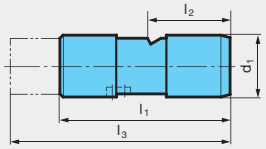
Code no.	d_1	l_1	l_2	l_3
1.1	10	40	24	-
1.2	10	40	24	45
1.3	10	40	24	55
1.4	16	45	31,2	-
1.5	25	70	34	-
1.6	25	70	34	78

2



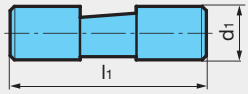
Code no.	d_1	l_1	l_2	l_3
2.1	16	50	47	-
2.2	16	50	47	55
2.3	16	50	47	70

3



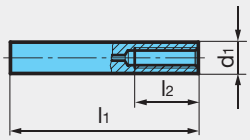
Code no.	d_1	l_1	l_2	l_3
3.1	25	70	34	-
3.2	25	70	34	100
3.3	25	70	34	105

4



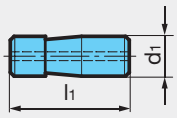
Code no.	d_1	l_1
4.1	19,05	70
4.2	12,7	70
4.3	25,4	70
4.4	31,75	70
4.5	38,1	70

5



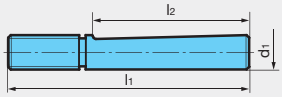
Code no.	d_1	l_1	l_2
5.1	10	60	20
5.2	16	80	28
5.3	25	100	50
5.4	10	100	20
5.5	10	110	24

6



Code no.	d_1	l_1
6.1	12,7	38
6.2	19,05	70
6.3	38,1	70

7

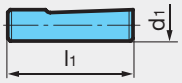


Code no.	d_1	l_1	l_2
7.1	16	112	73
7.2	20	126	82

Drivers to DIN 1835

form HE

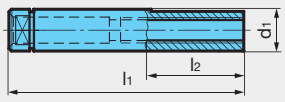
9



Code no.	d_1	l_1
9.1	8	36
9.2	10	40
9.3	12	45
9.4	16	48
9.5	20	50
9.6	25	56
9.7	32	60
9.8	31,75	70
9.9	38,1	70
9.10	40	70

Drivers to VDI-draft

12

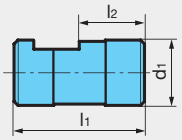


Code no.	d_1	l_1	l_2
12.1	10	68	40
12.2	16	90	40
12.3	25	112	50

also be used for deep hole drilling machines

Drivers to Speed-Bit-System

13



Code no.	d_1	l_1	l_2
13.1	16	40	14
13.2	25	50	25
13.3	35	60	20

also be used for deep hole drilling machines

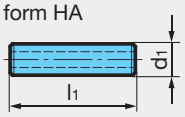
Conventional deep hole drills

Drivers for E 80

Drivers to DIN 6535

10

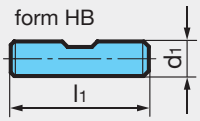
form HA



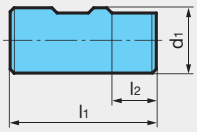
Code no.	d_1	l_1
10.1	8	36
10.2	10	40
10.3	12	45
10.4	16	48
10.5	20	50
10.6	25	56
10.7	32	60
10.8	25	70
10.9	40	70

8

form HB



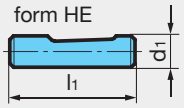
from code no. 8.6



Code no.	d_1	l_1	l_2
8.1	8	36	-
8.2	10	40	-
8.3	12	45	-
8.4	16	48	-
8.5	20	50	-
8.6	25	56	17
8.7	32	60	19
8.8	40	70	19
8.9	50	80	23
8.10	63	90	23

11

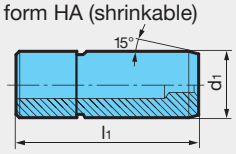
form HE



Code no.	d_1	l_1
11.1	8	36
11.2	10	40
11.3	12	45
11.4	16	48
11.5	20	50
11.6	25,4	70
11.7	25	56
11.8	32	60
11.9	40	70

16

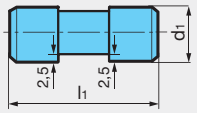
sim. form HA (shrinkable)



Code no.	d_1	l_1
16.1	10	50
16.2	16	64
16.3	20	70
16.4	25	81
16.5	32	92

17

sim. form HE



Code no.	d_1	l_1
17.1	19,05	70
17.2	25,4	70
17.3	31,75	70
17.4	38,1	70

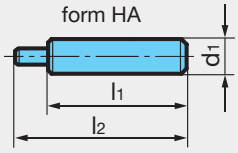
also be used for
deep hole drilling machines

Drivers for E 100

Drivers with positioning lugs to DIN 6535

18

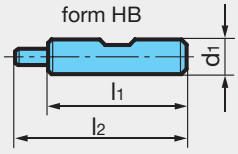
form HA



Code no.	d_1	l_1	l_2
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63

19

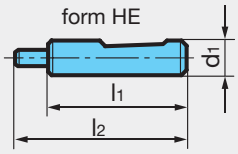
form HB



Code no.	d_1	l_1	l_2
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63

20

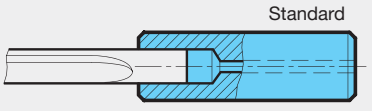
form HE



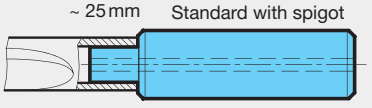
Code no.	d_1	l_1	l_2
4	4	28	40
6	6	36	51
10	10	40	55
12	12	45	60
16	16	48	63

Driver variations to suit gun drill tubes

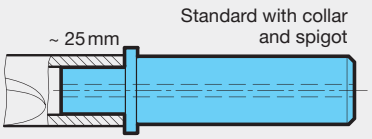
Solution for nom.-Ø < driver-Ø
(difference must be appr. 6 mm):
tube shank installed in driver



Solution for nom.-Ø ≠ driver-Ø
(close to parallel):
tube shank installed over spigot



Solution for nom.-Ø > driver-Ø:
tube shank installed over spigot,
inside-Ø of tube shank >driver-Ø,
tube shank fits against collar shoulder.



Re-grinding and re-tipping

Even modern high-performance tools will wear at some point due to the enormous stresses they have to withstand. Hartner reproduces the tool performance thanks to professional re-grinding.

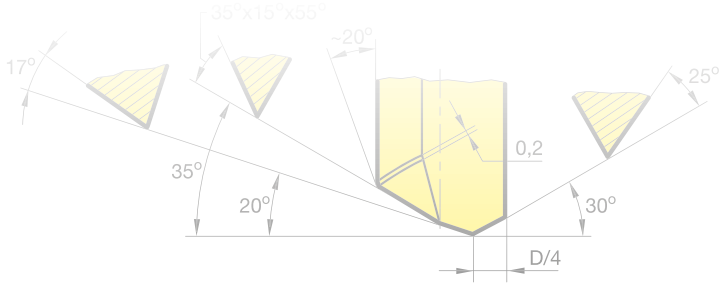
Thanks to the installation of identical machines and equipment in all re-grind centres a universal standard is ensured for gun drills of the highest quality.

Solid carbide deep hole drills or deep hole drills with a brazed head can be re-ground up to 10 times, depending on the head length and wear mark width.

The following points must be taken into account:

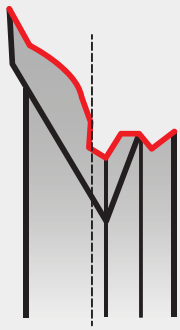
- The tool must be properly and cleanly re-ground, so that there are no traces of wear.
- The face of the tool must be smooth and shiny after re-grinding.
- At extra cost, the tools can also be coated after grinding.
- Deep hole drills with a brazed head can be fitted with a new one if the wear is severe or there is damage.
- Deep hole drills with positioning lugs are checked for concentricity after re-grinding and adjusted if necessary.
- Guideline values for the minimum head length when re-grinding, to ensure that the required quality of the drilled hole is achieved:

Diameter range	min. head length
Ø0.900 - Ø1.999	5 - 7 mm
Ø2.000 - Ø3.999	8 - 10 mm
Ø4.000 - Ø16.999	10 - 14 mm
Ø17.000 - Ø25.999	14 - 16 mm
Ø26.000 - Ø40.000	16 - 18 mm

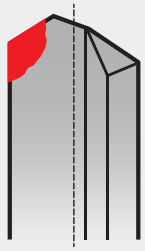
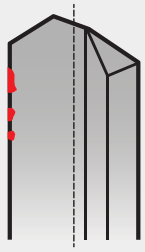


1	- 25°	+ 30°	0°	
2	+ 20°	+ 17°	0°	D/4
3	+ 35°	+ 15°	+ 55°	

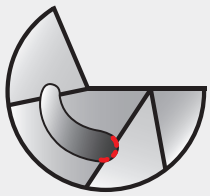
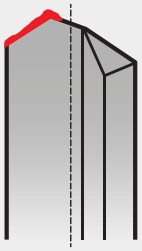
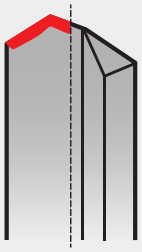
Application hints/Troubleshooting

Problem	Cause		Remedy
1. Tool breakage during spotting operation	Tool	- blunt cutting edge - incorrect point geometry - excessive feed rate - spotting at rapid feed rate - pre-damaged tool (breakage etc.) - too high length/diameter relation (LxD)	- re-grinding - correct point geometry - reduce feed rate - select drill feed - regrind- if necessary new tool - use several tools / support
	Pilot hole	- too small diameter - too large diameter - too poor drill hole quality (worn tool) - incorrect drilling method	- different tool (bigger Ø) - different tool (smaller Ø) - use new tool - correct programme
	Drill bush	- worn - broken - insufficient contact pressure /lifts off when spotting and chips get jammed - gap between bushes and workpiece / chips get entangled, chip jam	- new drill bush - new drill bush - increase contact pressure - correct position drill bushes
	Workpiece	- clamping not correct	- clamp workpiece correctly
	KSS	- coolant pressure too low, blockage - medium too contaminated --> blockage	- increase coolant pressure - control filtering
2. Tool breaks on the shank (drivers)	Tool	- too high length/diameter relation (LxD)	- use several tools / support
	Workpiece	- axis position of hole incorrect	- control workpiece clamping
	Machine	- machine to workpiece offset - drilling depth too deep (programming error)	- control offset and correct if necessary - control programming

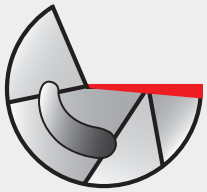
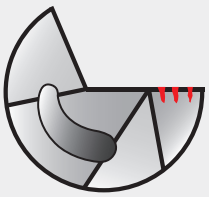
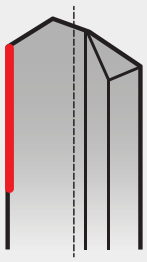
Application hints/Troubleshooting

Problem	Cause		Remedy
3. Tube bent/displaced 	Tool	- too high length / diameter relation (LxD) - excessive cutting forces (spec. torque)	- use several tools / support - reduce cutting data
	KSS	- coolant pressure too low, chip jam	- increase coolant pressure
4. Tool breaks/flakes off 	Tool	- overheating during grinding - side cutting edge (circular land) too blunt - tool not firmly clamped, oscillates axially - tool jams, flakes off during withdrawal - maximum tool life exceeded - machining performance too high - interrupted cut - deviation from concentricity too large	- correct parameters during grinding - control edge rounding on side cutting edge - optimise workpiece clamping - change cutting edge geometry or head form - shorten tool change intervals - reduce cutting data - reduce feed rates - check and correct concentricity if possible
	Pilot hole	- too large diameter (excessive play)	- different tool (smaller Ø)
	Drill bush	- too large diameter (excessive play)	- different drilling bush (smaller Ø)
	Workpiece	- insufficient clamping	- clamp workpiece correctly
5. Crumbling on round land 	Tool	- interrupted cut	- reduce feed rates
	Pilot hole	- too large diameter (excessive play)	- different tool (smaller Ø)
	Drill bush	- too large diameter (excessive play) - gap between bushes and workpiece too large	- different drilling bush (smaller Ø) - reduce gap (drilling bush should ideally be in contact)
	Workpiece	- non-rigid conditions / insufficient workpiece clamping - transverse holes non closed (coolant loss)	- clamp workpiece correctly - seal transverse holes (Hartner sealing plugs)
	KSS	- unsuitable coolant for abrasive material	- choose suitable coolant, increase oil content of the emulsion / use oil

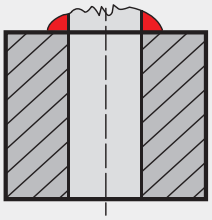
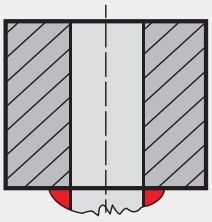
Application hints/Troubleshooting

Problem	Cause		Remedy
6. Crumbling on coolant duct 	Tool	- clearance angle too small - angle of oil space too small (insufficient oil flow) - material adhesions on face	- increase clearance angle - increase/adjust angle of oil space - tool coating if necessary
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion (material deposits) - impure coolant due to small chips or other contamination	- choose suitable coolant, increase oil content of the emulsion / use oil - check filtering of the coolant, improve/ refine if necessary
7. Build-up on cutting edges 	Tool	- cutting speed too low - edge preparation / rounding of cutting edges too large - bright cutting edges - unsuitable cutting material - unsuitable coating	- increase cutting speed - reduce edge preparation / rounding of cutting edges - tool coating if necessary - suitable cutting material - choose different type of coating
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion	- choose suitable coolant, increase oil content of the emulsion / use oil
8. Heavy crater wear 	Tool	- cutting speed too high - unsuitable chip shape - unsuitable cutting material	- reduce cutting speed - adjust point geometry - choose suitable cutting material, tool coating if necessary
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion - coolant pressure / flow too low	- choose suitable coolant, increase oil content of the emulsion / use oil - increase coolant pressure / flow

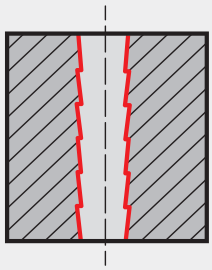
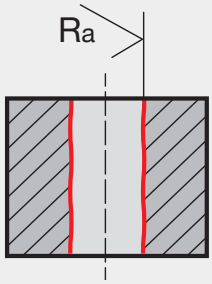
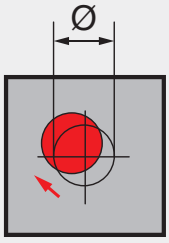
Application hints/Troubleshooting

Problem	Cause		Remedy
9. Wear at flank	Tool	- cutting speed too high - chip brakes too strongly at the face - feed rate to small - clearance angle too small	- reduce cutting speed - remove coating on face - increase the feed rate - increase clearance angle
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion	- choose suitable coolant, increase oil content of the emulsion / use oil
10. Comb cracks/chipping	Tool	- excessive cutting forces - interrupted cut - wrong type of carbide selected - excessive cutting forces	- reduce cutting data - reduce feed rate - choose different type of carbide - reduce cutting data / change point geometry (angle of oil space)
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion (too high temperatures due to insufficient lubrication)	- choose suitable coolant, increase oil content of the emulsion / use oil
11. Land wears	Tool	- deviation from concentricity too large - back taper too small - edge preparation/ rounding of cutting edges too large - unsuitable point geometry for oil space (flow rate too low)	- check and correct concentricity if possible - enlarge back taper - reduce edge preparation / rounding of cutting edges - adjust oil space geometry (angle / recess / groove / 2. area)
	Workpiece	- non-rigid conditions / insufficient work-piece clamping	- clamp workpiece correctly
	KSS	- unsuitable coolant, improper oil (viscosity) or too thin emulsion	- choose suitable coolant, increase oil content of the emulsion / use oil

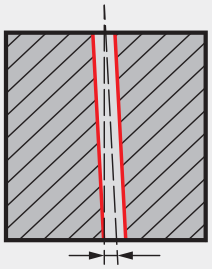
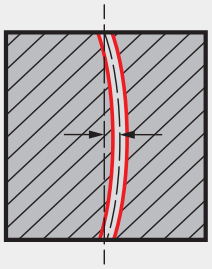
Application hints/Troubleshooting

Problem	Cause		Remedy
12. Wear on head form 	Tool	- deviation from concentricity too large - interrupted cut - wrong type of carbide selected - back taper too small - wrong coating selected	- check and correct concentricity if possible - reduce feed rates - correct carbide selection - enlarge back taper - correct coating selection
	Workpiece	- non-rigid conditions / insufficient workpiece clamping	- clamp workpiece correctly
	KSS	- unsuitable coolant for abrasive material	- choose suitable coolant, increase oil content of the emulsion / use oil
13. Large drill burr 	Tool	- excessive feed rate during spotting - maximum tool life exceeded (tool is blunt) - edge preparation / rounding of cutting edges too large - clearance angle too small	- reduce feed rate during spotting - shorten tool change intervals - reduce edge preparation / rounding of cutting edges - increase clearance angle
	Pilot hole	- too large diameter (excessive play)	- different tool (smaller Ø)
	Drill bush	- too large diameter (excessive play)	- different drilling bush (smaller Ø)
14. Larger drill burr 	Tool	- excessive feed rate during drilling - maximum tool life exceeded (tool is blunt) - edge preparation / rounding of cutting edges too large	- reduce feed rate during drilling - shorten tool change intervals - reduce edge preparation / rounding of cutting edges

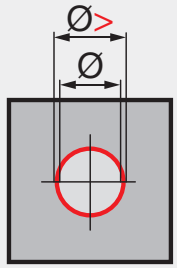
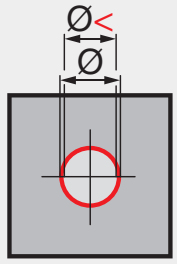
Application hints/Troubleshooting

Problem	Cause		Remedy
15. Tool drills in steps 	Tool	- drill head does not sit axially centered on the drill pipe (E 80/E 800) - coaxiality between head and shaft is too large	- re-braze the head / new tool - check coaxiality / use new tool
	Machine	- axis offset between spindle mount and drill bushes or pilot hole too large	- correct axis shifting, optimal is 0.02 mm offset
	KSS	- coolant pressure too high	- reduce coolant pressure
16. Unsatisfactory surface quality 	Tool	- cutting edge broken - chamfer of side cutting edge (circular land) too large - weakly formed warping chamfer - too little pressure on the rear guide pads - deviation from concentricity too large - wrong coating selected	- regrind the tool - correct tool design - optimise warping chamfer - increase pressure by point geometry or by peeling chamfer/corner radius - check and correct concentricity if possible - correct coating selection
	Workpiece	- non-rigid conditions / insufficient work-piece clamping	- clamp workpiece correctly
	KSS	- coolant type / emulsion not sufficient - coolant qauntity not sufficient	- use oil if possible - increase coolant quantity (volume/pressure)
17. Centre offset 	Tool	- deviation from concentricity too large	- check and correct concentricity if possible
	Pilot hole	- spotting on transverse area - wrong tool design	- apply pilot hole with milling cutter - optimize LxD / check tool-Ø
	Drill bush	- spotting on transverse area - worn drilling bush (inner Ø too large)	- use corrected drill bush - use new drill bush
	Workpiece	- non-rigid conditions / insufficient work-piece clamping	- clamp workpiece correctly
	Machine	- axis offset between spindle mount and drill bushes / pilot hole too large	- correct axis shifting, optimal is 0.02 mm offset

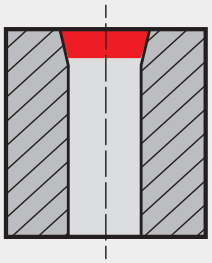
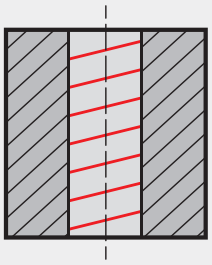
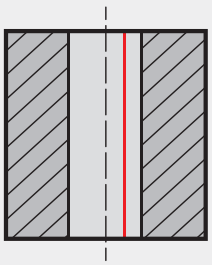
Application hints/Troubleshooting

Problem	Cause		Remedy
18. Large drilling path	Tool	- blunt cutting edge - incorrect point geometry - wrong head form - excessive feed rate - insufficient guidance - deviation from concentricity too large	- re-grinding - correct point geometry - correct head form - reduce feed rate - use long head section - check and correct concentricity if possible
	Pilot hole	- displacement of pilot hole - pilot hole non-circular	- check pilot hole if necessary different tool - adjust pilot tool
	Drill bush	- unsatisfactory drill bushing / drill bushing to drill bushing holder not correct	- change drilling bush if necessary also drill bush holder
	Workpiece	- non-rigid conditions / insufficient workpiece clamping - unfavourable drilling position / very thin walls - workpiece overheated (sharp rise in temperature)	- clamp workpiece correctly - consider drilling position if necessary correct - reduce cutting data
	Machine	- axis offset between spindle mount and drill bushes / pilot hole too large	- correct axis shifting, optimal is 0.02 mm offset
19. Unsatisfactory straightness of hole	Tool	- blunt cutting edge - incorrect point geometry - wrong head form - excessive feed rate - insufficient guidance - deviation from concentricity too large - wrong coating selected - too high length/diameter relation (LxD)	- re-grinding - correct point geometry - correct head form - reduce feed rate - use long head section - check and correct concentricity if possible - correct coating selection - use several tools / support
	Workpiece	- non-rigid conditions / insufficient workpiece clamping - unfavourable drilling position / very thin walls - workpiece overheated (sharp rise in temperature)	- clamp workpiece correctly - consider drilling position if necessary correct - reduce cutting data
	Machine	- workpiece without anti-clockwise rotating - axis offset between spindle mount and drill bushes / pilot hole too large	- if mechanically possible, drilling with anti-clockwise rotating - correct axis shifting, optimal is 0.02 mm offset

Application hints/Troubleshooting

Problem	Cause		Remedy
20. Hole too large	Tool	- too much pressure on the side cutting edge - deviation from concentricity too large	- change point geometry/ reduce pressure on the side cutting edge (change D/4 to D/3) - check and correct concentricity if possible
	KSS	- coolant pressure too high	- reduce coolant pressure
21. Hole too tight	Tool	- too little pressure on the side cutting edge - wrong head form - tool reground too much (often) (back taper)	- change point geometry / increase pressure on side cutting edge (change D/3 to D/4) - correct head form (form “C”) - use new tool
			
22. Chip jam/tool is blocked	Tool	- ratio of cutting speed to feed rate does not fit - unsuitable point geometrie - flow chips - flow chips with coated tools - unsuitable point geometry for oil space (flow rate too low) - tool clamping leaking (coolant loss)	- correct/adjust ratio of cutting speed to feed - adjust point geometry to favor chip breaking - if necessary program Hiccup/Pecking - remove coating on face - adjust oil space geometry angle / recess / groove / 2. area - optimise workpiece clamping
	KSS	- coolant qauntity not sufficient	- increase coolant quantity (volume / pressure))

Application hints/Troubleshooting

Problem	Cause		Remedy
23. Large drilling width 	Tool	- excessive feed rate during spotting	- reduce feed rate during spotting
	Pilot hole	- displacement of pilot hole / non-circular	- check pilot hole if necessary use different tool
	Drill bush	- unsatisfactory drill bushing / drill bushing to drill bushing holder not correct	- change drill bush if necessary also drill bush holder
	Workpiece	- non-rigid conditions / insufficient workpiece clamping, vibrations during spotting	- clamp workpiece correctly
24. Spiralling 	Tool	- machining performance too high - blunt cutting edge - drill head does not sit axially centered on the drill pipe (E 80/E 800) - coaxiality between head and shaft is too large - wrong head form	- reduce cutting data - regrind tool / if necessary change - re-braze the head / new tool - check coaxiality / use new tool - correct head form
	Workpiece	- non-rigid conditions / insufficient workpiece clamping, vibrations during spotting	- clamp workpiece correctly / place vibration damper
25. Tool leaves retraction marks 	Tool	- feed rate too high when pulling out - cutting edges too sharp - deviation from concentricity too large - wrong head form	- reduce feed rate - cutting edge rounding - check and correct concentricity if possible - correct head form
	Workpiece	- non-rigid conditions / insufficient workpiece clamping	- clamp workpiece correctly
	Machine	- axis offset between spindle mount and drill bushes / pilot hole too large	- correct axis shifting, optimal is 0.02 mm offset

APPLICATION RECOMMENDATIONS FOR GUN DRILLS

The sequence of operations for deep hole drilling

ATTENTION: All deep hole drills must have support for the pilot hole.
Deep hole drills must never operate at full speed without support in the machine shop.

- Production of pilot hole (L ≈ 3 x D, tolerance H8)
- Enter at low revolutions, approx. 200 rev./min, feed rate approx. 500 mm/min.
  With tools for drilling depths in excess than 40xD enter the pilot hole revolving in left hand direction.
- At cutting speeds higher than 120 m/min we recommend to advance to final speed in several steps.
- Setting of coolant pressure and revolutions
- Uninterrupted drilling to required drilling depth without wood pecking.
  When applying gun drills with increased lenght-diameter-ratio, we recommend machining with reduced cutting parameters (approx. 75% of the optimal cutting speed) up to a drilling depth of approx. 25 mm.
- Switching off coolant supply after reaching the required hole depth
- Withdrawal in top gear with stationary spindle
- For E 100 gun drills > 50xD please note: up to drilling depth 50xD the feed has to be reduced to 60%

Application advice

- For drilling depths in excess than 40 x D on conventional CNC-Machines we recommend the use of two or more gun drills, e. g. Ø 10 x 400 mm and Ø 9.95 x 800 mm.
- Gun drills for drilling depths of more than 40 x D should enter the pilot hole revolving in the left hand direction.
- When changing tools for drilling depths of more than 40 x D, the tool can be damped by switching on coolant supply for just one second.
- For machining of long-chipping materials we recommend the use of gun drills with polished flutes.
- Generally we recommend the use of soluble oil with a minimum oil content of 10 %.
- Single-fluted gun drills for long-chipping aluminium should be supplied with point grind 180° and coolant chamber.
- When spotting in aluminium with an Si-content of less than 1%, i. e. with recommended cutting rates v_C > 160 m/min we recommend to advance to the final speed in several steps.
  In addition, a deeper pilot hole of approximately 3 x D should be produced.

Recommended tools for pilot hole

TS 100 U, e.g.: article no. 89410

TF 100 MULTI-MILL, e.g.: article no. 84950

Single-fluted gun drills E 100

Correction of length diameter ratio:

< 25xD	100 %	< 45xD	90 %	< 65xD	75 %
< 80xD	60 %	< 150xD	50 %		

Machining group	○	a A	f (mm/rev) with nom. Ø											
	v_c (m/min)		1	2	3	4	5	6	7	8	10	12	14	16
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB	90	95	0.004	0.010	0.020	0.025	0.030	0.035	0.040	0.040	0.050	0.060	0.065	0.075
P1.1.2 Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB	80	85	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.065
P1.1.3 Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB	80	85	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.065
P1.1.4 Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB	75	80	0.003	0.009	0.015	0.020	0.025	0.030	0.030	0.035	0.045	0.050	0.055	0.060
P1.1.5 Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB	75	80	0.003	0.009	0.015	0.020	0.025	0.030	0.030	0.035	0.045	0.050	0.055	0.060
P1.1.6 Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB	70	75	0.003	0.008	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.045	0.050	0.060
P1.1.7 Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB	70	70	0.003	0.008	0.015	0.020	0.020	0.025	0.030	0.030	0.040	0.045	0.050	0.055
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB	75	80	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.035	0.045	0.050	0.060	0.065
P2.1.2 Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB	75	80	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.035	0.045	0.050	0.060	0.065
P2.1.3 Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB	65	65	0.003	0.008	0.015	0.020	0.020	0.025	0.030	0.030	0.035	0.045	0.050	0.055
P2.1.4 Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB	55	60	0.002	0.007	0.015	0.015	0.020	0.020	0.025	0.030	0.035	0.040	0.045	0.050
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB	60	65	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.035	0.045	0.050	0.060	0.065
P3.1.2 High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB	50	55	0.003	0.008	0.015	0.020	0.020	0.025	0.030	0.030	0.035	0.045	0.050	0.055
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives	50	55	0.003	0.008	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.045	0.050	0.060
M1.1.2 Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB	45	45	0.003	0.007	0.015	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.045	0.050
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB	45	45	0.002	0.007	0.015	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.045	0.050
M2.1.1 Stainless steel, austenitic, quenched, 180 HB	40	40	0.002	0.006	0.011	0.015	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.045
M2.2.1 Duplex steel, high-strength stainless steels	35	35	0.002	0.005	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.030	0.035	0.035
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB	80	85	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
K1.1.2 Grey cast iron, pearlitic/martensitic, 260 HB	70	70	0.005	0.015	0.025	0.035	0.040	0.045	0.050	0.055	0.070	0.080	0.090	0.100
K1.2.1 Cast iron with spheroidal graphite, ferritic, 160 HB	70	70	0.005	0.015	0.025	0.035	0.040	0.045	0.050	0.055	0.070	0.080	0.090	0.100
K1.2.2 Cast iron with spheroidal graphite, pearlitic, 250 HB	65	65	0.005	0.015	0.025	0.030	0.035	0.045	0.050	0.055	0.065	0.075	0.085	0.095
K1.3.1 Malleable cast iron, ferritic, 130 HB	65	65	0.005	0.015	0.025	0.030	0.035	0.045	0.050	0.055	0.065	0.075	0.085	0.095
K1.3.2 Malleable cast iron, pearlitic, 230 HB	55	60	0.004	0.012	0.020	0.025	0.030	0.035	0.040	0.045	0.055	0.065	0.075	0.080
K2.1.1 Vermicular graphite cast iron (GJV)	65	70	0.004	0.012	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.070	0.080	0.085
K2.2.1 Austenitic-ferritic spheroidal graphite cast iron (ADI)	50	50	0.003	0.009	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.065
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB	100	105	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
N1.1.2 Wrought aluminium alloys, hardened, 100 HB	100	105	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB	160	170	0.025	0.075	0.135	0.170	0.200	0.235	0.265	0.295	0.350	0.405	0.460	0.510
N2.1.2 Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	160	170	0.025	0.075	0.135	0.170	0.200	0.235	0.265	0.295	0.350	0.405	0.460	0.510
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	135	145	0.020	0.060	0.115	0.145	0.170	0.200	0.225	0.250	0.295	0.345	0.390	0.435
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 %	80	85	0.008	0.025	0.045	0.055	0.065	0.075	0.085	0.095	0.115	0.135	0.150	0.165
N3.1.2 Copper and copper alloys: CuZn, CuSnZn	70	70	0.007	0.020	0.035	0.045	0.055	0.065	0.075	0.080	0.100	0.115	0.130	0.140
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	65	65	0.007	0.020	0.035	0.045	0.055	0.060	0.070	0.075	0.090	0.105	0.120	0.135
N4.1.1 Non-metallic materials: Duroplastics, fibre-reinforced plastics	60	65	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
N4.1.2 Non-metallic materials: Hard rubber, wood, etc.	60	65	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
N4.1.3 Non-metallic materials: Graphite	60	65	0.006	0.015	0.030	0.040	0.045	0.055	0.060	0.065	0.080	0.095	0.105	0.115
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB	40	40	0.002	0.005	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.030	0.035	0.035
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB	30	35	0.002	0.004	0.008	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.030	0.030
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	25	25	0.001	0.004	0.007	0.009	0.011	0.012	0.015	0.015	0.020	0.020	0.025	0.025
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	20	25	0.001	0.004	0.007	0.008	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.025
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	20	20	0.001	0.003	0.006	0.008	0.009	0.011	0.012	0.015	0.015	0.020	0.020	0.025
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	30	30	0.001	0.004	0.008	0.010	0.011	0.015	0.015	0.015	0.020	0.025	0.025	0.030
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	25	30	0.001	0.004	0.007	0.009	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.025
H1.1.1 Hardened steel, hardened and tempered, < 55 HRC	30	30	0.002	0.005	0.010	0.012	0.015	0.015	0.020	0.020	0.025	0.030	0.035	0.035
H1.1.2 Hardened steel, hardened and tempered, < 60 HRC	20	20	0.001	0.004	0.008	0.010	0.011	0.015	0.015	0.015	0.020	0.025	0.025	0.030
H1.1.3 Hardened steel, hardened and tempered, > 60 HRC	20	20	0.001	0.004	0.007	0.009	0.011	0.012	0.015	0.015	0.020	0.020	0.025	0.025
H2.1.1 Chilled cast iron, 400 HB	20	20	0.001	0.004	0.008	0.010	0.011	0.015	0.015	0.015	0.020	0.025	0.025	0.030
H2.1.2 Chilled cast iron, hardened and tempered, < 55 HRC	15	15	0.001	0.003	0.005	0.007	0.008	0.009	0.011	0.012	0.015	0.015	0.020	0.020

Single-fluted gun drills E 80, E 80 XXL

Machining group	◯	T C	f (mm/rev) with nom. Ø								
	v_c (m/min)		4	8	10	12	14	16	20	25	32
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB	80	85	0.020	0.040	0.045	0.050	0.060	0.065	0.080	0.095	0.110
P1.1.2 Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB	70	75	0.020	0.035	0.040	0.045	0.055	0.060	0.070	0.085	0.100
P1.1.3 Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB	70	75	0.020	0.035	0.040	0.045	0.055	0.060	0.070	0.085	0.100
P1.1.4 Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB	70	70	0.020	0.030	0.040	0.045	0.050	0.055	0.065	0.080	0.095
P1.1.5 Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB	70	70	0.020	0.030	0.040	0.045	0.050	0.055	0.065	0.080	0.095
P1.1.6 Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB	65	65	0.015	0.030	0.035	0.040	0.045	0.050	0.065	0.075	0.090
P1.1.7 Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB	60	65	0.015	0.030	0.035	0.040	0.045	0.050	0.060	0.070	0.085
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB	70	75	0.020	0.035	0.040	0.045	0.050	0.060	0.070	0.085	0.100
P2.1.2 Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB	70	75	0.020	0.035	0.040	0.045	0.050	0.060	0.070	0.085	0.100
P2.1.3 Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB	60	60	0.015	0.030	0.035	0.040	0.045	0.050	0.060	0.070	0.085
P2.1.4 Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB	55	55	0.015	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.075
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB	60	65	0.020	0.035	0.040	0.045	0.050	0.060	0.070	0.085	0.100
P3.1.2 High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB	50	55	0.015	0.030	0.035	0.040	0.045	0.050	0.060	0.070	0.085
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives	50	55	0.015	0.025	0.030	0.035	0.040	0.045	0.050	0.060	0.075
M1.1.2 Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB	45	45	0.015	0.025	0.025	0.030	0.035	0.040	0.045	0.055	0.065
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB	45	45	0.012	0.020	0.025	0.030	0.035	0.035	0.045	0.055	0.060
M2.1.1 Stainless steel, austenitic, quenched, 180 HB	40	40	0.012	0.020	0.025	0.030	0.035	0.035	0.045	0.050	0.060
M2.2.1 Duplex steel, high-strength stainless steels	35	35	0.010	0.020	0.020	0.025	0.030	0.030	0.035	0.045	0.050
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB	80	85	0.030	0.050	0.060	0.070	0.080	0.085	0.105	0.125	0.145
K1.1.2 Grey cast iron, pearlitic/martensitic, 260 HB	70	70	0.025	0.045	0.050	0.060	0.065	0.075	0.090	0.105	0.125
K1.2.1 Cast iron with spheroidal graphite, ferritic, 160 HB	70	70	0.025	0.045	0.050	0.060	0.065	0.075	0.090	0.105	0.125
K1.2.2 Cast iron with spheroidal graphite, pearlitic, 250 HB	65	65	0.025	0.040	0.050	0.055	0.065	0.070	0.085	0.100	0.115
K1.3.1 Malleable cast iron, ferritic, 130 HB	65	65	0.025	0.040	0.050	0.055	0.065	0.070	0.085	0.100	0.115
K1.3.2 Malleable cast iron, pearlitic, 230 HB	55	60	0.020	0.035	0.040	0.050	0.055	0.060	0.075	0.085	0.105
K2.1.1 Vermicular graphite cast iron (GJV)	65	70	0.025	0.040	0.050	0.060	0.065	0.075	0.085	0.105	0.120
K2.2.1 Austenitic-ferritic spheroidal graphite cast iron (ADI)	50	50	0.020	0.030	0.040	0.045	0.050	0.055	0.065	0.080	0.090
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB	80	85	0.035	0.060	0.070	0.080	0.090	0.100	0.120	0.145	0.170
N1.1.2 Wrought aluminium alloys, hardened, 100 HB	80	85	0.035	0.060	0.070	0.080	0.090	0.100	0.120	0.145	0.170
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB	120	125	0.095	0.165	0.200	0.230	0.260	0.290	0.350	0.415	0.490
N2.1.2 Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	120	125	0.095	0.165	0.200	0.230	0.260	0.290	0.350	0.415	0.490
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	100	105	0.080	0.140	0.170	0.195	0.225	0.250	0.295	0.355	0.415
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 %	70	75	0.040	0.065	0.080	0.095	0.105	0.115	0.140	0.165	0.195
N3.1.2 Copper and copper alloys: CuZn, CuSnZn	60	60	0.035	0.055	0.070	0.080	0.090	0.100	0.120	0.140	0.165
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	55	60	0.030	0.055	0.065	0.075	0.085	0.095	0.110	0.135	0.155
N4.1.1 Non-metallic materials: Duroplastics, fibre-reinforced plastics	60	65	0.025	0.040	0.050	0.060	0.065	0.075	0.085	0.105	0.120
N4.1.2 Non-metallic materials: Hard rubber, wood, etc.	60	65	0.025	0.040	0.050	0.060	0.065	0.075	0.085	0.105	0.120
N4.1.3 Non-metallic materials: Graphite	60	65	0.025	0.040	0.050	0.060	0.065	0.075	0.085	0.105	0.120
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB	40	40	0.010	0.015	0.020	0.025	0.025	0.030	0.035	0.040	0.050
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB	30	35	0.008	0.015	0.015	0.020	0.020	0.025	0.030	0.035	0.040
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	25	25	0.007	0.015	0.015	0.015	0.020	0.020	0.025	0.030	0.035
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	20	25	0.007	0.012	0.015	0.015	0.020	0.020	0.025	0.030	0.035
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	20	20	0.006	0.011	0.015	0.015	0.015	0.020	0.025	0.025	0.030
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	30	30	0.007	0.015	0.015	0.015	0.020	0.020	0.025	0.030	0.035
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	25	30	0.006	0.011	0.015	0.015	0.020	0.020	0.025	0.030	0.035
H1.1.1 Hardened steel, hardened and tempered, < 55 HRC	30	30	0.007	0.015	0.015	0.015	0.020	0.020	0.025	0.030	0.035
H1.1.2 Hardened steel, hardened and tempered, < 60 HRC	20	20	0.006	0.010	0.012	0.015	0.015	0.015	0.020	0.025	0.030
H1.1.3 Hardened steel, hardened and tempered, > 60 HRC	20	20	0.005	0.009	0.011	0.015	0.015	0.015	0.020	0.025	0.030
H2.1.1 Chilled cast iron, 400 HB	20	20	0.007	0.015	0.015	0.015	0.020	0.020	0.025	0.030	0.035
H2.1.2 Chilled cast iron, hardened and tempered, < 55 HRC	15	15	0.005	0.009	0.011	0.012	0.015	0.015	0.020	0.020	0.025

Two-fluted gun drills Z 80

Machining group	◯	f (mm/rev) with nom. Ø										
	v_c (m/min)	6	8	10	12	14	16	18	20	24	28	32
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB												
P1.1.2 Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB												
P1.1.3 Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB												
P1.1.4 Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB												
P1.1.5 Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB												
P1.1.6 Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB												
P1.1.7 Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB												
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB												
P2.1.2 Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB												
P2.1.3 Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB												
P2.1.4 Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB												
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB												
P3.1.2 High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB												
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives												
M1.1.2 Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB												
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB												
M2.1.1 Stainless steel, austenitic, quenched, 180 HB												
M2.2.1 Duplex steel, high-strength stainless steels												
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB	80	0.053	0.070	0.085	0.101	0.118	0.137	0.150	0.172	0.197	0.223	0.258
K1.1.2 Grey cast iron, pearlitic/martensitic, 260 HB	68	0.045	0.060	0.072	0.086	0.100	0.117	0.127	0.146	0.168	0.189	0.219
K1.2.1 Cast iron with spheroidal graphite, ferritic, 160 HB	68	0.045	0.060	0.072	0.086	0.100	0.117	0.127	0.146	0.168	0.189	0.219
K1.2.2 Cast iron with spheroidal graphite, pearlitic, 250 HB	64	0.043	0.056	0.068	0.081	0.094	0.110	0.120	0.138	0.158	0.178	0.206
K1.3.1 Malleable cast iron, ferritic, 130 HB	64	0.043	0.056	0.068	0.081	0.094	0.110	0.120	0.138	0.158	0.178	0.206
K1.3.2 Malleable cast iron, pearlitic, 230 HB	56	0.037	0.049	0.060	0.071	0.082	0.096	0.105	0.121	0.138	0.156	0.180
K2.1.1 Vermicular graphite cast iron (GJV)	65	0.056	0.063	0.070	0.077	0.084	0.098	0.112	0.126	0.140	0.154	0.168
K2.2.1 Austenitic-ferritic spheroidal graphite cast iron (ADI)	49	0.042	0.047	0.053	0.058	0.063	0.074	0.084	0.095	0.105	0.116	0.126
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB	100	0.090	0.100	0.120	0.135	0.140	0.150	0.160	0.170	0.180	0.200	0.240
N1.1.2 Wrought aluminium alloys, hardened, 100 HB	100	0.090	0.100	0.120	0.135	0.140	0.150	0.160	0.170	0.180	0.200	0.240
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB	140	0.120	0.160	0.180	0.220	0.250	0.270	0.290	0.310	0.350	0.400	0.450
N2.1.2 Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	140	0.120	0.160	0.180	0.220	0.250	0.270	0.290	0.310	0.350	0.400	0.450
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	119	0.102	0.136	0.153	0.187	0.213	0.230	0.247	0.264	0.298	0.340	0.383
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 %	80	0.070	0.090	0.110	0.130	0.140	0.155	0.170	0.185	0.198	0.210	0.230
N3.1.2 Copper and copper alloys: CuZn, CuSnZn	68	0.060	0.077	0.094	0.111	0.119	0.132	0.145	0.157	0.168	0.179	0.196
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	64	0.056	0.072	0.088	0.104	0.112	0.124	0.136	0.148	0.158	0.168	0.184
N4.1.1 Non-metallic materials: Duroplastics, fibre-reinforced plastics	50	0.030	0.040	0.050	0.060	0.065	0.070	0.080	0.090	0.100	0.110	0.120
N4.1.2 Non-metallic materials: Hard rubber, wood, etc.	50	0.030	0.040	0.050	0.060	0.065	0.070	0.080	0.090	0.100	0.110	0.120
N4.1.3 Non-metallic materials: Graphite	50	0.030	0.040	0.050	0.060	0.065	0.070	0.080	0.090	0.100	0.110	0.120
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB												
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB												
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB												
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB												
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB												
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²												
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²												
H1.1.1 Hardened steel, hardened and tempered, < 55 HRC												
H1.1.2 Hardened steel, hardened and tempered, < 60 HRC												
H1.1.3 Hardened steel, hardened and tempered, > 60 HRC												
H2.1.1 Chilled cast iron, 400 HB												
H2.1.2 Chilled cast iron, hardened and tempered, < 55 HRC												

Single-fluted gun drills with indexable inserts E 800

Machining group	T	f (mm/rev) with nom. Ø						
	v_c (m/min)	12	14	16	18	20	25	32
P1.1.1 Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB	80	0.065	0.070	0.080	0.090	0.095	0.115	0.135
P1.1.2 Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB	70	0.055	0.065	0.070	0.080	0.085	0.105	0.120
P1.1.3 Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB	70	0.055	0.065	0.070	0.080	0.085	0.105	0.120
P1.1.4 Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB	70	0.055	0.060	0.070	0.075	0.080	0.095	0.115
P1.1.5 Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB	70	0.055	0.060	0.070	0.075	0.080	0.095	0.115
P1.1.6 Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB	65	0.050	0.060	0.065	0.070	0.075	0.090	0.110
P1.1.7 Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB	60	0.050	0.055	0.060	0.065	0.070	0.085	0.100
P2.1.1 Low-alloy steel, annealed, Rm 610 N/mm², 180 HB	70	0.580	0.655	0.730	0.800	0.870	1.040	1.225
P2.1.2 Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB	70	0.580	0.655	0.730	0.800	0.870	1.040	1.225
P2.1.3 Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB	60	0.490	0.555	0.620	0.680	0.740	0.885	1.040
P2.1.4 Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB	55	0.435	0.490	0.545	0.600	0.655	0.780	0.915
P3.1.1 High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB	60	0.050	0.060	0.065	0.070	0.080	0.095	0.110
P3.1.2 High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB	50	0.045	0.050	0.055	0.060	0.065	0.080	0.095
M1.1.1 Stainless steel, ferritic/martensitic, with machining additives	50	0.045	0.050	0.060	0.065	0.070	0.085	0.100
M1.1.2 Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB	45	0.040	0.045	0.050	0.060	0.065	0.075	0.090
M1.1.3 Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB	45	0.040	0.045	0.050	0.055	0.060	0.070	0.085
M2.1.1 Stainless steel, austenitic, quenched, 180 HB	40	0.040	0.045	0.050	0.055	0.060	0.075	0.085
M2.2.1 Duplex steel, high-strength stainless steels	35	0.035	0.040	0.045	0.050	0.050	0.060	0.075
K1.1.1 Grey cast iron, pearlitic/ferritic, 180 HB	80	0.080	0.090	0.100	0.110	0.120	0.145	0.170
K1.1.2 Grey cast iron, pearlitic/martensitic, 260 HB	70	0.070	0.080	0.085	0.095	0.105	0.125	0.145
K1.2.1 Cast iron with spheroidal graphite, ferritic, 160 HB	70	0.070	0.080	0.085	0.095	0.105	0.125	0.145
K1.2.2 Cast iron with spheroidal graphite, pearlitic, 250 HB	65	0.065	0.075	0.080	0.090	0.100	0.115	0.135
K1.3.1 Malleable cast iron, ferritic, 130 HB	65	0.065	0.075	0.080	0.090	0.100	0.115	0.135
K1.3.2 Malleable cast iron, pearlitic, 230 HB	55	0.055	0.065	0.070	0.080	0.085	0.100	0.120
K2.1.1 Vermicular graphite cast iron (GJV)	65	0.070	0.080	0.085	0.095	0.105	0.125	0.145
K2.2.1 Austenitic-ferritic spheroidal graphite cast iron (ADI)	50	0.050	0.060	0.065	0.070	0.080	0.095	0.110
N1.1.1 Wrought aluminium alloys, non-hardened, 60 HB	80	0.100	0.110	0.125	0.135	0.150	0.175	0.210
N1.1.2 Wrought aluminium alloys, hardened, 100 HB	80	0.100	0.110	0.125	0.135	0.150	0.175	0.210
N2.1.1 Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB	120	0.175	0.195	0.220	0.240	0.260	0.310	0.365
N2.1.2 Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB	120	0.175	0.195	0.220	0.240	0.260	0.310	0.365
N2.1.3 Aluminium casting alloys, non-hardened, > 12 % Si, 130 HB	100	0.150	0.165	0.185	0.205	0.220	0.265	0.310
N3.1.1 Copper and copper alloys: Free-machining alloy, Pb > 1 %	70	0.095	0.105	0.115	0.130	0.140	0.165	0.195
N3.1.2 Copper and copper alloys: CuZn, CuSnZn	60	0.080	0.090	0.100	0.110	0.120	0.140	0.165
N3.1.3 Copper and copper alloys: CuSn, lead-free copper and copper electrolyte	55	0.075	0.085	0.095	0.100	0.110	0.135	0.155
N4.1.1 Non-metallic materials: Duroplastics, fibre-reinforced plastics	60	0.070	0.080	0.085	0.095	0.105	0.125	0.145
N4.1.2 Non-metallic materials: Hard rubber, wood, etc.	60	0.070	0.080	0.085	0.095	0.105	0.125	0.145
N4.1.3 Non-metallic materials: Graphite	60	0.070	0.080	0.085	0.095	0.105	0.125	0.145
S1.1.1 Heat-resistant alloys, Fe-based, annealed, 200 HB	40	0.035	0.040	0.045	0.050	0.050	0.060	0.075
S1.1.2 Heat-resistant alloys, Fe-based, hardened, 280 HB	30	0.030	0.035	0.035	0.040	0.045	0.055	0.060
S1.1.3 Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB	25	0.025	0.030	0.035	0.035	0.040	0.045	0.055
S1.1.4 Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB	20	0.025	0.025	0.030	0.035	0.035	0.045	0.050
S1.1.5 Heat-resistant alloys, Ni- or Co-based, cast, 320 HB	20	0.025	0.025	0.030	0.030	0.035	0.040	0.050
S2.1.1 Titanium alloys, pure titanium, Rm 400 N/mm²	30	0.030	0.035	0.035	0.040	0.045	0.050	0.060
S2.1.2 Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²	25	0.025	0.030	0.035	0.035	0.040	0.045	0.055
H1.1.1 Hardened steel, hardened and tempered, < 55 HRC	30	0.030	0.035	0.035	0.040	0.045	0.050	0.060
H1.1.2 Hardened steel, hardened and tempered, < 60 HRC	20	0.025	0.025	0.030	0.030	0.035	0.040	0.050
H1.1.3 Hardened steel, hardened and tempered, > 60 HRC	20	0.020	0.025	0.025	0.030	0.035	0.040	0.045
H2.1.1 Chilled cast iron, 400 HB	20	0.030	0.035	0.035	0.040	0.045	0.050	0.060
H2.1.2 Chilled cast iron, hardened and tempered, < 55 HRC	15	0.020	0.025	0.025	0.030	0.030	0.035	0.045

Material examples cutting data tables

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
P1.1.1 **P1.1.2**	Unalloyed steel, annealed, 0.15 % C, Rm 420 N/mm², 125 HB Unalloyed steel, heat-treated, 0.15 % C, Rm 420 N/mm², 125 HB			
1.0037	St 37-2	S235JR	-	E24-2
1.0038	St 37-3	S275J2G3	A570.36	E28-3
1.0045	S 355 JR	S 1207	-	E36-2
1.0050	St 50-2	E 295	A570 Gr. 50	A50-2
1.0060	St 60-2	-	A572 Gr. 65	A60-2
1.0114	S 235 J0	S 235 J0	-	E24-3
1.0143	S 275 J0	S 275 J0	-	E28-3
1.0144	St 44-3 N	S 275 J2 G3	A573 Gr. 81	E28-3
1.0149	Ro St 44-2	S 275 J0 H	-	-
1.0301	C10	C10	1010	34C10, XC10
1.0330	St 12	Fe P01	-	DC 01/Fe P01
1.0338	St4	Fe P04	A620(1008)	Fe 14
1.0401	C15	-	1015	C18RR, XC18
1.0402	C22	1 C 22	1020	C20
1.0443	GS-45		A2765-35	E23-45M
1.0539	S355NH			TSE355-4
1.0545	S355N			E355R
1.0546	S355NL			E355FP
1.0547	S355J0H			TSE355-3
1.0549	S355NLH			
1.0553	St52-3U		A14880-40	320-560M
1.0562	St E 355		A633 Gr. C	FeE355KGN
1.0570	St 52-3	S355JR	1	E36-3
1.0715	9SMn28		1213	S250
1.0718	9SMnPb28		12L13	S250Pb
1.0721	10S20		1108	10S20
1.0722	10SPb20		11L08	10PbF2
1.0736	9SMn36		1215	S300
1.0737	9SMnPb36		12L14	S300Pb
1.0972	S315MC			E315D
1.0976	S355MC			E355D
1.0982	S460MC			
1.0984	S500MC			E490D
1.0986	S500MC			E560D
1.1121	Ck10		1010	XC10
1.1141	Ck15	32C	1015	XC15
1.1151	C22E		1020	2C22
1.8900	StE380		A572-60	
P1.1.3 **P1.1.4**	Unalloyed steel, annealed, 0.45 % C, Rm 640 N/mm², 190 HB Unalloyed steel, heat-treated, 0.45 % C, Rm 640 N/mm², 190 HB			
1.0501	C35		1035	1C35
1.0503	C45		1045	XC42H1TS
1.0511	C40		1040	1C40
1.0540	C50			
1.0551	GS-52		A2770-36	280-480M
1.0553	St52-3U		A14880-40	320-560M
1.0577	S 355 J 2 G 4		A738	A52FP
1.0726	35S20	8M	1140	35MF6
1.0727	45S20		1146	45MF4
1.1157	40Mn4	15	1039	40M5
1.1158	C25E		1025	XC25
1.1166	34Mn5		1536	
1.1167	36Mn5		1335	40M5
1.1170	28Mn6	14A	1330	20M5
1.1178	C30E			XC32
1.1180	C35R		1035	3C35
1.1181	C35E		1035	XC38
1.1191	Ck45		1045	XC45
1.1206	C50E		1050	2C50
1.1213	Cf53		1050	XC48HTS

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
P1.1.5	Unalloyed steel, heat-treated, 0.45 % C, Rm 850 N/mm², 250 HB			
1.0501	C35		1035	1C35
1.0503	C45		1045	XC42H1TS
1.0614	C76D		1074	XC75
1.0616	C86D		1086	XC80
1.0618	C92D		1095	XC90
1.0726	35S20	8M	1140	35MF6
1.1157	40Mn4	15	1039	40M5
1.1165	30Mn5		1036	35M5
1.1167	36Mn5		1335	40M5
1.1186	C40E		1040	2C40
1.1191	Ck45		1045	2C45
1.1201	C45R		1049	3C45
1.1213	Cf53		1050	XC48HTS
1.7242	18CrMo4			
1.7337	16CrMo4-4		A387 Gr.12	
1.7362	12CrMo195			Z10CD5-05
P1.1.6	Unalloyed steel, annealed, 0.75 % C, Rm 915 N/mm², 270 HB			
1.0603	C67		107	XC65
1.0605	C75		1075	
1.1203	Ck55		1055	2C55
1.1209	C55R		1055	3C55
1.1221	Ck60	43D	1060	2C60
1.1231	C67E		1070	XC68
1.1248	C75E		1074	XC75
1.1269	C85E		1086	XC90
1.1274	Ck 101	C 100S	1095	XC100
1.1545	C 105 W1	C 105U	W1	Y1 105
1.1663	C125W		W112	Y2120
P1.1.7	Unalloyed steel, heat-treated, 0.75 % C, Rm 1020 N/mm², 300 HB			
1.0070	St 70-2		1055	A70-2
1.0535	C55		1055	1C55
1.0601	C60	43D	1060	1C60
1.1203	Ck55		1055	2C55
1.1221	Ck60	43D	1060	2C60
1.1274	Ck 101	C 100S	1095	XC100
1.1545	C 105 W1	C 105U	W1	Y1 105
1.1663	C125W		W112	Y2120
1.5120	38MnSi4			
1.5710	36NiCr6	111A	3135	35NC6
1.7701	51CrMoV4			
P2.1.1	Low-alloy steel, annealed, Rm 610 N/mm², 180 HB			
1.0904	55Si7	45	9255	55S7
1.0961	60SiCr7		9262	60SC6
1.2067	102CR6	100CR6	L3	Y100C6
1.2108	90CrSi5		L1	
1.2210	115CrV3		L2	100C3
1.2241	51CrV4			
1.2330	35CrMo4		4135	34CD4
1.2419	105WCr6			105WC13
1.2510	100MnCrW4		O1	90 MWCV 5
1.2542	45WCrV7		S1	
1.2550	60WCrV7		S1	55WC20
1.2713	55NiCrMoV6		L6	55NCDV7
1.2721	50NiCr13		L6	55NCV6
1.2842	90MnCrV8		O2	90MV8
1.3501	100Cr2		E50100	
1.3505	100Cr6	31	52100	100C6
1.5024	46Si7			45S7
1.5025	51Si7	50Si7	9259H	51S7
1.5027	60Si7	60Si7	9260	60S7
1.5028	65Si7		9260H	
1.5415	15Mo3		A204Gr.A	15D3

Material examples cutting data tables

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
P2.1.1	Low-alloy steel, annealed, Rm 610 N/mm², 180 HB			
1.5419	20Mo4		4419	
1.5423	16Mo5		4520	
1.5622	14Ni6		A350-LF5	16N6
1.5732	14NilCr10		3415	14NC11
1.5752	14NiCr14	36A	3310	12NC15
1.6511	36CrNiMo4	110	9840	40NCD3
1.6523	21NiCrMo2	362	8620	20NCD2
1.6546	40NiCrMo2-2		8740	
1.6566	17NiCrMo6-4			
1.6587	17CrNiMo6			18NCD6
1.6657	10NiCrMo13-4			
1.7015	10Cr3		5015	12C3
1.7033	34Cr4	18B	5132	32C4
1.7035	41Cr4	18	5140	42C4
1.7131	16MnCr5		5115	16MC5
1.7139	16MnCrS5			
1.7176	55Cr3	48	5155	55C3
1.7225	42CrMo4	42 CrMo 4	4140	42 CD 4
1.7228	55NiCrMoV6G	33		
1.7380	10CrMo9-10		A182F22	12CD9-10
1.7715	14MoV6-3			
1.8159	50CrV4	47	6150	50CrV4
1.8161	58CrV4			
1.8509	41CrAlMo7	41B	A355A	40CAD6-12
1.8523	39CrMoV13-9	40C		
P2.1.2	Low-alloy steel, heat-treated, Rm 930 N/mm², 275 HB			
1.5415	15Mo3		A204Gr.A	15D3
1.5423	16Mo5		4520	
1.5622	14Ni6		A350-LF5	16N6
1.5732	14NilCr10		3415	14NC11
1.5752	14NiCr14	36A	3310	12NC15
1.5755	31NiCr14			18NC13
1.6565	40NiCrMo6	24	4340	35NCD6
1.6587	17CrNiMo6			18NCD6
1.6657	10NiCrMo13-4			
1.6957	26NiCrMoV14-5			
1.7015	10Cr3		5015	12C3
1.7262	15CrMo5			12CD4
1.7335	13CrMo4-4		A182-F11	15CD4-5
1.7380	10CrMo9-10		A182F22	12CD9-10
1.7715	14MoV6-3			
1.7733	24CrMoV55			20CDV6
1.7755	GS-45CrMoV10-4			
1.8070	21CrMoV511			
P2.1.3	Low-alloy steel, heat-treated, Rm 1020 N/mm², 300 HB			
1.1730	C45W3		C45W	XC48
1.2332	47CrMo4	19A	4142	42CD4
1.5736	36NiCr10		3435	30NC11
1.6523	21NiCrMo2	362	8620	20NCD2
1.7033	34Cr4	18B	5132	32C4
1.7218	25CrMo4		4130	25CD4
1.8515	32CrMo12	40B		30CD12
P2.1.4	Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB			
1.0904	55Si7	45	9255	55S7
1.0961	60SiCr7		9262	60SC6
1.2067	100Cr6		L3	Y100C6
1.2419	105WCr6			105WC13
1.2542	45WCrV7		S1	
1.2713	55NiCrMoV6		L6	55NCDV7
1.4882	X50CrMnNiNbN219			Z50CMNNb21-09
1.5120	38MnSi4			

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
P2.1.4	Low-alloy steel, heat-treated, Rm 1190 N/mm², 350 HB			
1.5710	36NiCr6	111A	3135	35NC6
1.5755	31NiCr14			18NC13
1.6511	36CrNiMo4	110	9840	40NCD3
1.6546	40NiCrMo2-2		8740	
1.7035	41Cr4	18	5140	42C4
1.7176	55Cr3	48	5155	55C3
1.7220	34CrMo4		4135	35CD4
1.7223	41CrMo4		4142	
1.7225	42CrMo4	42 CrMo 4	4140	42 CD 4
1.7361	32CrMo12	40B		30CD12
1.8159	50CrV4	47	6150	50CrV4
1.8161	58CrV4			
1.8509	41CrAlMo7	41B	A355A	40CAD6-12
1.8523	39CrMoV13-9	40C		
P3.1.1	High-alloy steel and tool steel, annealed, Rm 680 N/mm², 200 HB			
1.2080	X210Cr12	X210Cr12	D3	Z200C12
1.2162	21MnCr5			20MC5
1.2311	40CrMnMo7			40CMD8
1.2312	40CrMnMoS8.6		P20+S	40CMD8S
1.2316	X36CrMo17	X38CrMo16		
1.2343	X38CrMoV5-1		H11	Z38CDV5
1.2344	X40CrMoV5-1		H13	Z40CDV5
1.2363	X100CrMoV5-1		A2	Z100CDV5
1.2379	X155CrVMo121		D2	Z160CDV12
1.2436	X210CrW12		D4(D6)	Z200CD12
1.2510	100MnCrW4		O1	90 MWCV 5
1.2581	X30WCrV9-3		H21	Z30WCV9
1.2601	X165CrMoV12			
1.2606	X37CrMoW51		H12	Z35CWDV5
1.2764	X19NiCrMo4			
1.2767	X45NiCrMo4			45NCD16
1.2842	90MnCrV8		O2	90MV8
1.3243	S6-5-2-5		T15	KCV06-05-05-04-02
1.3249	S18-1-2-5		T4	Z80WKCV18-05-04
1.3343	S6-5-2		M2	Z85WDCV
1.3348	S2-9-2		M7	Z100DCWV09-04-02
1.3355	S18-0-1		T1	Z80WCV18-4-01
1.4718	X45CrSi9-3	52	HNV3	Z45CS9
1.5662	X8Ni9		ASMA353	9Ni
1.5680	12Ni19		2515	Z18N5
P3.1.2	High-alloy steel and tool steel, hardened and tempered, Rm 1100 N/mm², 325 HB			
1.2080	X210Cr12	X210Cr12	D3	Z200C12
1.2344	X40CrMoV5-1		H13	Z40CDV5
1.2363	X100CrMoV5-1		A2	Z100CDV5
1.2436	X210CrW12		D4(D6)	Z200CD12
1.2581	X30WCrV9-3		H21	Z30WCV9
1.2601	X165CrMoV12			
1.2714	55NiCrMoV7		6F3/L6	55NiCrMoV7
1.3202	S12-1-4-5			
1.3207	S10-4-3-10			Z130WKCDV
1.3243	S6-5-2-5		T15	KCV06-05-05-04-02
1.3246	S7-4-2-5		M35	Z110WKCDV07-05-04
1.3247	S2-10-1-8		M42	Z110DKCWV09-08-04
1.3255	S18-1-2-5		T4	Z80WKCV18-05-04
1.3343	S6-5-2		M2	Z85WDCV
1.3348	S2-9-2		M7	Z100DCWV09-04-02
1.3355	S18-0-1		T1	Z80WCV18-4-01
1.4718	X45CrSi9-3	52	HNV3	Z45CS9
1.4935	X20CrMoWV121		422	
1.5680	12Ni19		2515	Z18N5

Material examples cutting data tables

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
M1.1.1	Stainless steel, ferritic/martensitic, with machining additives			
1.4005	X12CrS13		416	Z11CF13
1.4029	X29CrS13			
1.4035	X46CrS13			
1.4104	X14CrMoS17		430F	Z10CF17
1.4105	X6CrMoS17			
1.4523	X2CrMoTiS18-2			
M1.1.2	Stainless steel, ferritic/martensitic, annealed, Rm 680 N/mm², 200 HB			
1.4000	X6Cr13		403	Z6C13
1.4001	X7Cr14		410 S	Z8C13
1.4002	X6CrAl13		405	Z6CA13
1.4006	X12Cr13	56A	410	Z10C13
1.4016	X6Cr17	X8Cr17	430	Z8C17
1.4027	GX20Cr14			Z20C13M
1.4028	X30Cr13		420	Z30C13
1.4034	X46Cr13			Z40C14
1.4057	X19CrNi17-2	57	431	Z15CN16-02
1.4086	GX120Cr29			
1.4112	X90CrMoV18		440B	
1.4113	X6CrMo17		434	Z8CD17-01
1.4313	X3CrNi13-4		CA6-NM	Z4CND13-04M
1.4340	GX40CrNi274			
1.4417	X2CrNiM0Si195		S31500	
1.4418	X4CrNiMo165			Z6CND16-04-01
1.4510	X6CrTi17		XM8	Z4CT17
1.4511	X6CrNb17			Z4CNb17
1.4512	X6CrTi12		409	Z3CT12
1.4720	X20CrMo13			
1.4724	X10CrA113		405	Z10C13
1.4742	X10CrA118	60	430	Z10CAS18
1.4747	X80CrNiSi20	59	HNV6	Z80CSN20-02
1.4749	X18CrN28		446	
1.4762	X10CrA124		446	Z10CAS24
1.4871	X53CrMnNiN21-9		EV8	Z52CMN21-09
M1.1.3	Stainless steel, ferritic/martensitic, heat-treated, Rm 810 N/mm², 240 HB			
1.4000	X6Cr13		403	Z6C13
1.4001	X7Cr14		410 S	Z8C13
1.4006	X12Cr13	56A	410	Z10C13
1.4016	X6Cr17	X8Cr17	430	Z8C17
1.4021	X20Cr13		420	Z20C13
1.4027	GX20Cr14			Z20C13M
1.4031	X40Cr13		420	Z40C14
1.4034	X46Cr13			Z40C14
1.4057	X19CrNi17-2	57	431	Z15CN16-02
1.4113	X6CrMo17		434	Z8CD17-01
1.4313	X3CrNi13-4		CA6-NM	Z4CND13-04M
1.4544	A 700		321	Z 10 CNT 18 11
1.4546	X5CrNiNb18-10		348	
M2.1.1	Stainless steel, austenitic, quenched, 180 HB			
1.4020	X13MnNiN18-13-2			
1.4301	X5CrNi18-10		304	Z5CN18-09
1.4303	X4CrNi18-12			
1.4305	X8CrNiS18-9	58M	303	Z8CNF18-09
1.4306	X2CrNi19-11	X3CrNi1810KD	304L	Z2CN18-09
1.4307	X2CrNi18-9			
1.4310	X10CrNi18-8		301	Z12CN17-07
1.4311	X2CrNiN18-10		304LN	Z2CN18-10
1.4315	X5CrNiN19-9			
1.4318	X2CrNiN18-7			

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
M2.1.1	Stainless steel, austenitic, quenched, 180 HB			
1.4325	X9CrNi18-9			
1.4335	X1CrNi25-21			
1.4361	X1CrNiSi18-15-4			
1.4369	X11CrNiMnN19-8-6			
1.4371	X2CrMnNiN17-7-5		202	Z8CMN18-08-05
1.4372	X12CrMnNiN17-7-5			
1.4373	X12CrMnNiN18-9-5			
1.4376	X8CrMnNi19-6-3			
1.4378	X6CrMnNiN8-13-3			
1.4401	X5CrNiMo17-12-2		316	Z3CND17-11-01
1.4404	X2CrNiMo17-12-2		316L	Z2CND17-12
1.4406	X2CrNiMoN17-11-2		316LN	Z2CND17-12AZ
1.4432	X2CrNiMo17-12-3			
1.4434	X2CrNiMoN18-12-4			
1.4435	X2CrNiMo18-14-3		316L	Z3CND17-12-03
1.4438	X2CrNiMo18-15-4		317L	Z2CND19-15-04
1.4439	X2CrNiMoN17-13-5		(s31726)	Z3CND18-14-06AZ
1.4449	X2CrNiMo18-12-3		317	
1.4466	X1CrNiMoN25-22-2			
1.4529	X1NiCrMoCuN25-20-7			
1.4539	X1NiCrMoCu25-20-5			Z2NCDU25-20
1.4541	X6CrNiTi18-10		321	Z6CNT18-10
1.4547	X1CrNiMoCuN20-18-7		S31254	
1.4550	X6CrNiNb18-10	58F	347	Z6CNNb18-10
1.4558	X2NiCrAlTi32-20			
1.4560	X3CrNiCu19-9-2			
1.4563	X1NiCrMoCu31-27-4			
1.4565	X2CrNiMnMoN25-18-6- 5			
1.4567	X3CrNiCu18-9-4			
1.4570	X6CrNiCuS18-9-2			
1.4571	X6CrNiMoTi17-12-2	58J	316Ti	Z6NDT17-12
1.4578	X3CrNiCuMo17-11-3-2			
1.4580	X6CrNiMoNb17-12-2			
1.4597	X8CrMnCuNB17-8-3			
1.4598	X2CrNiMoCuS17-10-2			
1.4615	X3CrMnNiCu15-8-5-3			
1.4618	X9CrMnNiCu17-8-5-2			
1.4640	X5CrNiCu19-6-2			
1.4646	X6CrMnNiCuN18-12-4-2			
1.4650	X2CrNiCu19-10			
1.4652	X1CrNiMoCuN24-22-8			
1.4659	X1CrNiMoCuNW24-22-6			
M2.1.1	Duplex steel, high-strength stainless steels			
1.4062	X2CrNiN22-2			
1.4669	X1CrNiMoCuN25-25-5			
1.4424	X2CrNiMo20-7-2			
1.4362	X2CrNiN23-4		S32304	Z2CN23-04AZ
1.4162	X2CrMnNiMoN25-18-6-5			
1.4482	X2CrMnNiMoN22-5-3			
1.4462	X2CrNiMoN22-5-3			Z3CND22-05Az
1.4662	X1CrNiMoCuN26-25-5			
1.4507	X2CrNiMoCuN25-6-3			
1.4460	X1CrNiMoCuN20-18-7		329	
1.4410	X2CrNiMoN25-7-4			Z5CND20-12M
1.4501	X2CrNiMoCuWN25-7-4			
1.4477	X2CrNiMoCuN25-6-3			
1.4658	X1NiCrMoCu25-20-5			

Material examples cutting data tables

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
K1.1.1	Grey cast iron, pearlitic/ferritic, 180 HB			
0.6010	GG10	GJL-100	A48 20 B	Ft 10 D
0.6015	GG15	GJL-150	A48 25 B	Ft 15 D
0.6020	GG20	GJL-200	A48 30 B	Ft 20 D
0.6025	GG25	GJL-250	A48 40 B	Ft 25 D
0.6660	GGL-NiCr 20 2	GJLA-XNiCr 20-2	1050/700/7	L-NC 202
K1.1.2	Grey cast iron, pearlitic/martensitic, 260 HB			
0.6025	GG25	GJL-250	A48 40 B	Ft 25 D
0.6030	GG30	GJL-300	A48 45 B	Ft 30 D
0.6035	GG35	GJL-350	A48 50 B	Ft 35 D
0.6040	GG40	GJL-400	A48 60 B	Ft 40 D
K1.2.1	Cast iron with spheroidal graphite, ferritic, 160 HB			
0.7033	GGG35.3	GJS-350-22-LT	-	FGS 370-17
0.7040	GGG40	GJS-400-15	60-40-18	FCS 400-12
0.7043	GGG40.3	GJS-400-18-LT	60-40-18	FGS 370-17
K1.2.2	Cast iron with spheroidal graphite, pearlitic, 250 HB			
0.7050	GGG50	GJS-500-7	80-55-06	FGS 500-7
0.7060	GGG60	GJS-600-3	80-55-06	FGS 600-3
0.7070	GGG70	GJS-700-2	100-70-03	FGS 700-2
0.7652	GGG NiMn 13-7	GJSA-XNiMn 13-7	-	FGS Ni13 Mn7
0.7660	GGG NiCr 20-2	GJSA-XNiCr 20-2	A436 D2	FGS Ni20 Cr2
K1.3.1	Malleable cast iron, ferritic, 130 HB			
0.8135	GTS-35	GJMB350-10	32510	MN 35-10
K1.3.2	Malleable cast iron, pearlitic, 230 HB			
0.8145	GTS-45	GJMB450-6	A220-40010	MN 450
0.8155	GTS-55	GJMB-550-4	50005	MP 50-5
0.8165	GTS-65	GJMB-650-2	70003	MN 650-3
0.8170	GTS-70	GJMB-700-2	90001	MN 700-2
K2.1.1	Vermicular graphite cast iron (GJV)			
5.2100	GJV-300			
5.2201	GJV-400			
5.2301	GJV-500			
K2.2.1	Austenitic-ferritic spheroidal graphite cast iron (ADI)			
5.3400	GJS-800-10			
5.3402	GJS-900-8			
5.3403	GJS-1050-6			

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
N1.1.1	Wrought aluminium alloys, non-hardened, 60 HB			
3.0205	Al99		Al99	
3.0255	Al99.5		1000	A59050C
3.3206	AlMgSi0.5	AW-6060		
3.3315	AlMg1			
N1.1.2	Wrought aluminium alloys, hardened, 100 HB			
3.1325	AlCuMg1			
3.1655	AlCuSiPb			
3.2315	AlMgSi1			
3.4345	AlZnMgCuO,5		7050	AZ4GU/9051
3.4365	AlZnMgCu1,5		7075	7075
N2.1.1	Aluminium casting alloys, non-hardened, ≤ 12 % Si, 75 HB			
3.2163	AlSi9Cu3			
3.2382	AlSi10Mg			
3.2383	AlSi0Mg(Cu)		A360.2	
3.2581	AlSi12			
3.3561	AlMg5			
N2.1.2	Aluminium casting alloys, hardened, ≤ 12 % Si, 90 HB			
2.1871	AlCu4TiMg			
3.1754	AlCu4Ni2Mg			
3.2371	AlSi7Mg		4218B	
3.2373	AlSI9MGWA		SC64D	A-S7G
3.2381	AlSi10Mg			
3.5106	MgAg3SE2Zr1		QE22	
N3.1.1	Copper and copper alloys: Free-machining alloy, Pb > 1 %			
2.0375	CuZn36Pb3			
2.1090	CuSn75pb		C93200	U-E7Z5pb4
2.1096	CuSn5ZnPb		c83600	
2.1098	CuSn2Znpb		C83600	
2.1182	CuPb15Sn		C23000	U-pb15E8
N3.1.2	Copper and copper alloys: CuZn, CuSnZn, 90 HB			
2.0240	CuZn15			
2.0321	CuZn37		C27200	CuZn36,CuZn37
2.0590	CuZn40Fe			
2.0592	CuZn35Al1		C86500	HTB1
2.0596	CuZn34Al2		C86200	U-Z36N3
2.1293	CuCrZr		C18200	U-Cr0-8Zr
N3.1.3	Copper and copper alloys: CuSn, lead-free copper and copper electrolyte			
2.0060	E-Cu57			
2.0966	CuAl10Ni5Fe4		C63000	U-A10N
2.0975	CuAl10Ni		B-148-52	
2.1050	CuSn10		c90700	
2.1052	G-CuSn12		C90800	UE12P
2.1292	G-CuCrF35		C81500	

Material examples cutting data tables

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
S1.1.1	Heat-resistant alloys, Fe-based, annealed, 200 HB			
1.4558	X2NiCrAlTi3220		N08800	
1.4562	X1NiCrMoCu32287		N08031	
1.4563	X1NiCrMoCuN31274		N08028	Z1NCDU31-27-03
1.4864	X12NiCrSi36-16		330	Z12NCS37-18
1.4865	GX40NiCrSi38-18			
1.4958	X5NiCrAlTi3120			
S1.1.2	Heat-resistant alloys, Fe-based, hardened, 280 HB			
1.4977	X40CoCrNi2020			Z42CNKDWNb
S1.1.3	Heat-resistant alloys, Ni- or Co-based, annealed, 250 HB			
2.4360	NiCu30Fe			NU30
2.4603	NiCr 30 FeMo		5390A	NC22FeD
2.4610	NiMo16cR16Ti			
2.4630	NiCr20Ti			NC20T
2.4631	NiCr20TiAl			NC20TA
2.4642	NiC29Fe			Nnc30Fe
2.4856	NiCr22Mo9Nb			NC22FeDNb
S1.1.4	Heat-resistant alloys, Ni- or Co-based, hardened, 350 HB			
2.4375	NiCu30Al		4676	NU30AT
2.4662	NiFe35Cr14MoTi		5660	ZSNCDT42
2.4668	NiCr19Fe19NbMo		5383	NC19eNB
2.4670	S-NiCr13A16MoNb		5391	NC12AD
2.4694	NiCr16fE7TiAl			
2.4955	NiFe25Cr20NbTi			
2.4964	CoCr20W15Ni		5772	KC20WN
S1.1.5	Heat-resistant alloys, Ni- or Co-based, cast, 320 HB			
2.4669	NiCr15Fe7TiAl			NC15TNbA
2.4685	G-NiMo28			
2.4810	G-NiMo30			
2.4973	NiCr19Co11MoTi		AMS 5399	NC19KDT
3.7115	TiAl5Sn2			
S2.1.1	Titanium alloys, pure titanium, Rm 400 N/mm²			
2.4674	NiCo15Cr10MoAlTi		AMS 5397	
3.7025	Ti1		R50250	
3.7225	Ti1pd		R52250	
S2.1.2	Titanium alloys, Alpha and Beta alloys, hardened, Rm 1050 N/mm²			
3.7124	TiCu2			
3.7145	TiAl6Sn2Zr4Mo2Si		R54620	
3.7165	TiAl6V4		AMS R56400	T-A6V
3.7185	TiAl4Mo4Sn2			
3.7195	TiAl3V2.5			

Mat. no.	DIN	EN	AISI/ASTM/SAE	AFNOR
H1.1.1 **H1.1.2** **H1.1.3**	Hardened steel, hardened and tempered, < 55 HRC Hardened steel, hardened and tempered, < 60 HRC Hardened steel, hardened and tempered, > 60 HRC			
1.1231	Ck 67	C 67S	1070	XC 68
1.1248	Ck 75	C 75S	1078, 1080	XC 75
1.1274	Ck 101	C 100S	1095	XC100
1.1545	C 105 W1	C 105U	W1	Y1 105
1.1730	C 45 W3			
1.2067	102CR6	100CR6		
1.2343	X37CrMoV5-1			
1.2361	X91CrMoV18			
1.2379	X155CrMoV12-1			
1.2762	75CrMoNiW67			
1.3401	GX120Mn12		A128(A)	Z120M12
1.6746	32NiCrMo14-5	32nIcRm0145		35NCD14
1.7131	16MnCr5			
1.7176	55Cr3	48	5155	55C3
1.7225	42CrMo4	42 CrMo 4	4140	42 CD 4
H2.1.1	Chilled cast iron, 400 HB			
0.9620	GX260NiCr42	GJN-HV520	A532 IB	FB Ni4 Cr2 BC
0.9625	GX330NiCr42	GJN-HV550	A532 IA	FB Ni4 Cr2 HC
0.9630	GX300 CrNiSi 9 5 2	GJN-HV600	A532 ID	FB Cr9 Ni5
0.9640	GX300CrMoNi1521			
0.9650	GX260Cr27			
0.9655	GX300CrNMo271			
1.4841	X15CrNiSi25-20	X 15 CrNiSi 25 20	310	Z15CNS25-20
H2.1.2	Chilled cast iron, hardened and tempered, < 55 HRC			
0.9635	GX300 CrMo 15 3			
0.9645	GX260 CrMoNi 20 21			

Notes

Notes

THE HARTNER PROGRAMME

▼ DRILLING TOOLS

▼ MULTISTEP

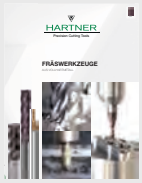
▼ COUNTERSINKS

▼ MICRO-PRECISION DRILLS

▼ THREADING TOOLS

▼ TS-DRILLS

▼ THREAD MILLING CUTTERS



▼ SOLID CARBIDE MILLING CUTTERS

▼ REAMERS

▼ MULTIPLEX

▼ MULTIPLEX HPC

▼ TM VENDING MACHINES

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