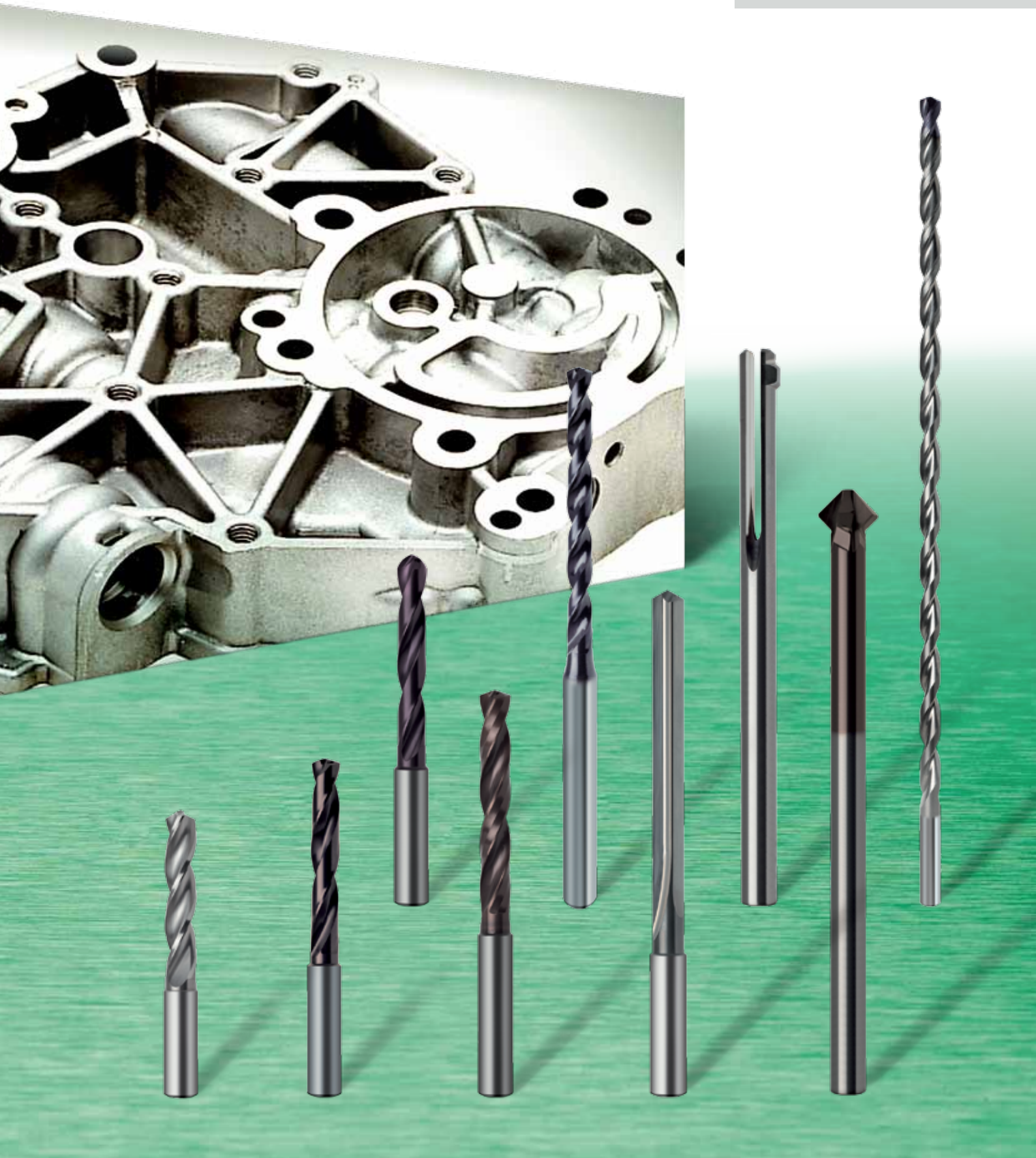
HARTNER

Precision Cutting Tools

Highlights

Solid Carbide Tools for
High-Performance Machining

2012



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Quick reference

TS 100 T -spiral fluted deep hole drills

TS 100 INOX -for stainless steel

TS 100 H -for high-tensile materials

TS 100 R -for cast materials

TS 150 GG -for cast iron and aluminium

TS 3 G -the three-fluted specialist

Micro-precision drills

De-burring fork

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Quick reference

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TS 100 T - Spiral-Fluted Deep Hole Drills

The spiral-fluted deep hole drills TS 100 T are available as standard drills for drilling depths up to 15 x D, 20 x D, 25 x D, 30 x D and 40 x D. The TS 100 T range is optimised for conventional cooling and offers an outstanding cost-performance-ratio as well as immediate availability. Moreover, the TS 100 T drills permit highest cutting and feed rates and subsequently achieve a considerable reduction in machining time.

These advantages are achieved thanks to the following attributes:

Optimised flute geometry
The spiral-flute deep hole drills possess a special flute geometry that is optimised to the specific demand for optimal chip evacuation from the deep hole.

Maximised coolant duct profile
To provide the cutting edge with an optimum coolant supply, the tools possess a maximised coolant duct profile. It ensures an effecient coolant supply to the cutting edge as well as excellent chip evacuation.

Problem-free swarf
The factors described above – in combination with the cutting parameters optimally adapted to the application task – result in chips that are evacuated problem-free even from deep holes. Chip congestion and a subsequent jamming of the tool is effectively prevented.

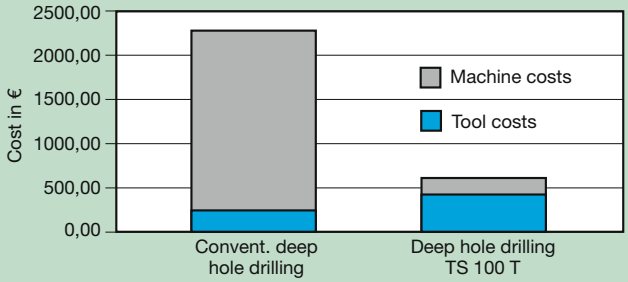
Wear resistant cutting edges
Thanks to the TiAlN-tip coating, the cutting edges, that are exposed to maximum forces, are protected against wear.

Reinforced shank for high precision clamping
Drills from the TS 100 T ex stock-range have a reinforced shank to DIN 6535 HA, tolerance h6. This enables the powerful clamping of the tools with hydraulic expansion chucks and shrink chucks. The combination TS 100 T plus hydraulic expansion or shrink chuck guarantees highest concentricity, extreme clamping forces, minimal imbalance and optimal efficiency.

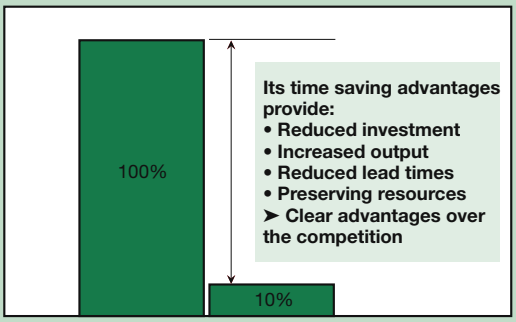
Intermediate diameters/MQL-suitability
In addition to the ex stock-range, Hartner still offers TS 100 T drills as special tools to specific customer requirements. We realise intermediate diameters with maximum drilling depths up to 40 x D or a total length up to max. 400 mm. Please use the request form on page 22!
The modification of the shank to the MQL shank end makes the ex stock-range suitable for MQL machining.

High-pressure cooling - now a matter of course
As in recent years internal cooling has prevailed with drilling tools, today every conventional machine tool is offered with high-pressure internal cooling and is therefore also suitable for deep hole drilling.

Production cost
machining example: drilling oil holes in crank shaft

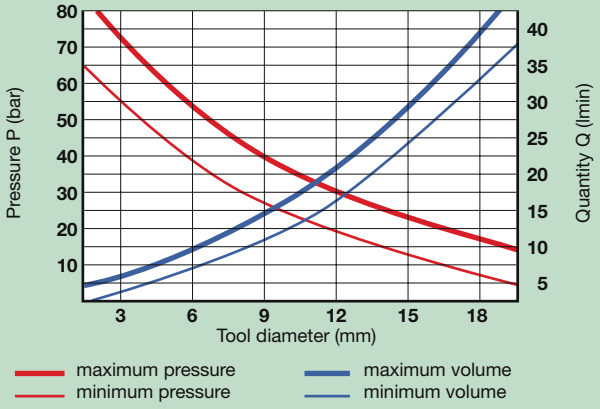


Machining time



Ultimate cost-efficiency:
Applied on machining centres, where the drilling operation is a time relevant criterion, TS 100 T can display its superiority. Its high feed rates lead to a shorter production time, its long tool life reduces the number of tool changes.

Coolant parameters TS 100 T
(Recommendations for soluble oil)



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TS 100 T - Spiral-Fluted Deep Hole Drills

Order no. 86509

Spiral-fluted deep hole drill for drilling depths up to 15xD in unalloyed and alloyed steels, especially crankshaft steel. Optimised flute and coolant duct geometry together with bright finish and particularly smooth flutes provide optimal chip evacuation from deep holes.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	TS 100 T
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	135
Tolerance	h7

Order no. 86511

Spiral-fluted deep hole drill for drilling depths up to 20xD in unalloyed and alloyed steels, especially crankshaft steel. Optimised flute and coolant duct geometry together with bright finish and particularly smooth flutes provide optimal chip evacuation from deep holes.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	TS 100 T
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	135
Tolerance	h7

Order no. 86512

Spiral-fluted deep hole drill for drilling depths up to 25xD in unalloyed and alloyed steels, especially crankshaft steel. Optimised flute and coolant duct geometry together with bright finish and particularly smooth flutes provide optimal chip evacuation from deep holes.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	TS 100 T
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	135
Tolerance	h7

Order no. 86513

Spiral-fluted deep hole drill for drilling depths up to 30xD in unalloyed and alloyed steels, especially crankshaft steel. Optimised flute and coolant duct geometry together with bright finish and particularly smooth flutes provide optimal chip evacuation from deep holes.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	TS 100 T
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	135
Tolerance	h7

A TiAlN-tip-coated

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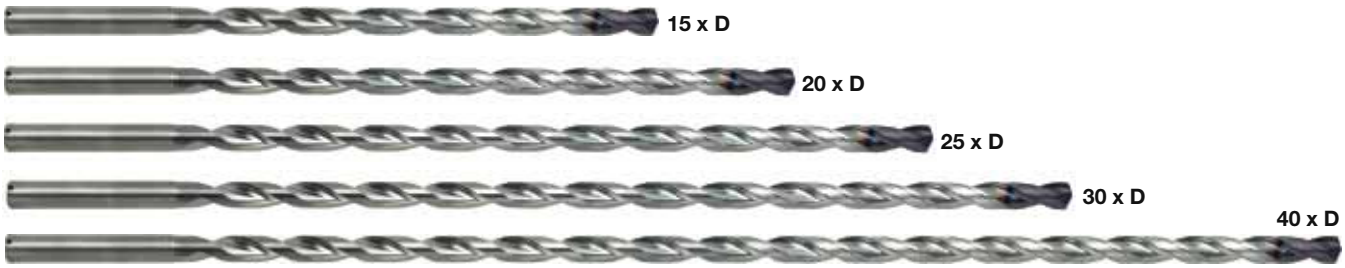
TS 100 T - Spiral-Fluted Deep Hole Drills

Order no. 86514

Spiral-fluted deep hole drill for drilling depths up to 40xD in unalloyed and alloyed steels, especially crankshaft steel. Optimised flute and coolant duct geometry together with bright finish and particularly smooth flutes provide optimal chip evacuation from deep holes.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	TS 100 T
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
point angle°	135
Tolerance	h7

Regrinding and recoating



	regrinding and recoating for article no. 86509, 86511, 86512, 86513 and 86514
d1 mm	Availability
3.000 - 6.000	●
6.350 - 7.000	●
7.140 - 8.000	●
8.500 - 10.000	●
12.000	●
14.000	●

A TiAlN-tip-coated

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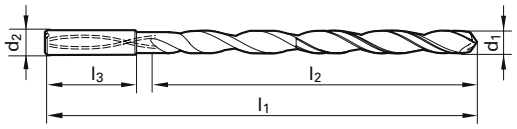
TS 100 T - Spiral-Fluted Deep Hole Drills 15 x D



					86509
					Solid carbide
					165
					■
					HA
					Ⓐ
d1h7	d2h6	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3,000	6,000	95,00	55,00	36,00	●
3,170	6,000	106,00	67,00	36,00	●
3,500	6,000	116,00	76,00	36,00	●
3,570	6,000	116,00	76,00	36,00	●
3,970	6,000	116,00	76,00	36,00	●
4,000	6,000	116,00	76,00	36,00	●
4,370	6,000	133,00	93,00	36,00	●
4,500	6,000	133,00	93,00	36,00	●
4,760	6,000	133,00	93,00	36,00	●
5,000	6,000	133,00	93,00	36,00	●
5,100	6,000	150,00	110,00	36,00	●
5,160	6,000	150,00	110,00	36,00	●
5,410	6,000	150,00	110,00	36,00	●
5,500	6,000	150,00	110,00	36,00	●
5,560	6,000	150,00	110,00	36,00	●
5,950	6,000	150,00	110,00	36,00	●
6,000	6,000	150,00	110,00	36,00	●
6,350	8,000	167,00	127,00	36,00	●
6,500	8,000	167,00	127,00	36,00	●
6,750	8,000	167,00	127,00	36,00	●
7,000	8,000	167,00	127,00	36,00	●
7,140	8,000	183,00	143,00	36,00	●
7,500	8,000	183,00	143,00	36,00	●
7,540	8,000	183,00	143,00	36,00	●
7,940	8,000	183,00	143,00	36,00	●
8,000	8,000	183,00	143,00	36,00	●
8,330	10,000	204,00	160,00	40,00	●
8,500	10,000	204,00	160,00	40,00	●
9,000	10,000	204,00	160,00	40,00	●
9,130	10,000	221,00	177,00	40,00	●
9,520	10,000	221,00	177,00	40,00	●
9,920	10,000	221,00	177,00	40,00	●
10,000	10,000	221,00	177,00	40,00	●
10,320	12,000	247,00	198,00	45,00	●
10,720	12,000	247,00	198,00	45,00	●
11,000	12,000	247,00	198,00	45,00	●
11,110	12,000	263,00	214,00	45,00	●
11,510	12,000	263,00	214,00	45,00	●
11,910	12,000	263,00	214,00	45,00	●
12,000	12,000	263,00	214,00	45,00	●
12,300	14,000	297,00	248,00	45,00	●
12,700	14,000	297,00	248,00	45,00	●
13,100	14,000	297,00	248,00	45,00	●
13,490	14,000	297,00	248,00	45,00	●
13,890	14,000	297,00	248,00	45,00	●
14,000	14,000	297,00	248,00	45,00	●

Ⓐ TiAlN-tip-coated ■ with internal cooling

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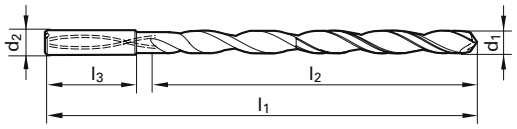
TS 100 T - Spiral-Fluted Deep Hole Drills 20 x D

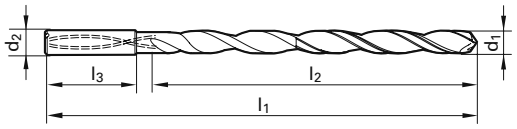


					86511
					Solid carbide
					165
					■
					HA
					Ⓐ
d1h7	d2h6	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.000	6.000	110.00	70.00	36.00	●
3.170	6.000	123.00	83.00	36.00	●
3.500	6.000	136.00	96.00	36.00	●
3.970	6.000	136.00	96.00	36.00	●
4.000	6.000	136.00	96.00	36.00	●
4.500	6.000	158.00	118.00	36.00	●
4.760	6.000	158.00	118.00	36.00	●
5.000	6.000	158.00	118.00	36.00	●
5.500	6.000	180.00	140.00	36.00	●
5.560	6.000	180.00	140.00	36.00	●
6.000	6.000	180.00	140.00	36.00	●
6.350	8.000	202.00	162.00	36.00	●
6.500	8.000	202.00	162.00	36.00	●
7.000	8.000	202.00	162.00	36.00	●
7.140	8.000	223.00	183.00	36.00	●
7.500	8.000	223.00	183.00	36.00	●
8.000	8.000	223.00	183.00	36.00	●
8.500	10.000	249.00	205.00	40.00	●
9.000	10.000	249.00	205.00	40.00	●
9.920	10.000	271.00	227.00	40.00	●
10.000	10.000	271.00	227.00	40.00	●
11.000	12.000	302.00	253.00	45.00	●
12.000	12.000	323.00	274.00	45.00	●
12.300	14.000	367.00	318.00	45.00	●
13.100	14.000	367.00	318.00	45.00	●
13.490	14.000	367.00	318.00	45.00	●
13.890	14.000	367.00	318.00	45.00	●
14.000	14.000	367.00	318.00	45.00	●

Ⓐ TiAlN-tip-coated ■ with internal cooling

HARTNER

TS 100 T - Spiral-Fluted Deep Hole Drills 25 x D



					86512
					Solid carbide
					165
					■
					HA
					A
d1h7	d2h6	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.000	6.000	125.00	85.00	36.00	●
3.170	6.000	141.00	101.00	36.00	●
3.500	6.000	156.00	116.00	36.00	●
3.970	6.000	156.00	116.00	36.00	●
4.000	6.000	156.00	116.00	36.00	●
4.500	6.000	183.00	143.00	36.00	●
4.760	6.000	183.00	143.00	36.00	●
5.000	6.000	183.00	143.00	36.00	●
5.500	6.000	210.00	170.00	36.00	●
5.560	6.000	210.00	170.00	36.00	●
6.000	6.000	210.00	170.00	36.00	●
6.350	8.000	237.00	197.00	36.00	●
6.500	8.000	237.00	197.00	36.00	●
7.000	8.000	237.00	197.00	36.00	●
7.140	8.000	263.00	223.00	36.00	●
7.500	8.000	263.00	223.00	36.00	●
8.000	8.000	263.00	223.00	36.00	●
8.500	10.000	294.00	250.00	40.00	●
9.000	10.000	294.00	250.00	40.00	●
9.920	10.000	321.00	277.00	40.00	●
10.000	10.000	321.00	277.00	40.00	●
10.320	12.000	359.00	310.00	45.00	●
11.000	12.000	359.00	310.00	45.00	●
11.510	12.000	386.00	337.00	45.00	●
11.910	12.000	386.00	337.00	45.00	●
12.000	12.000	386.00	337.00	45.00	●

A TiAlN-tip-coated ■ with internal cooling

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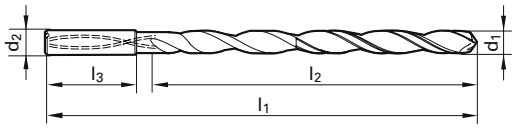
TS 100 T - Spiral-Fluted Deep Hole Drills 30 x D



					86513
					Solid carbide
					165
					■
					HA
					Ⓐ
d1h7	d2h6	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.000	6.000	140.00	100.00	36.00	●
3.170	6.000	158.00	118.00	36.00	●
3.500	6.000	176.00	136.00	36.00	●
3.970	6.000	176.00	136.00	36.00	●
4.000	6.000	176.00	136.00	36.00	●
4.500	6.000	208.00	168.00	36.00	●
4.760	6.000	208.00	168.00	36.00	●
5.000	6.000	208.00	168.00	36.00	●
5.500	6.000	240.00	200.00	36.00	●
5.560	6.000	240.00	200.00	36.00	●
6.000	6.000	240.00	200.00	36.00	●
6.350	8.000	272.00	232.00	36.00	●
6.500	8.000	272.00	232.00	36.00	●
7.000	8.000	272.00	232.00	36.00	●
7.140	8.000	303.00	263.00	36.00	●
7.500	8.000	303.00	263.00	36.00	●
8.000	8.000	303.00	263.00	36.00	●
8.500	10.000	339.00	295.00	40.00	●
9.000	10.000	339.00	295.00	40.00	●
9.920	10.000	371.00	327.00	40.00	●
10.000	10.000	371.00	327.00	40.00	●

Ⓐ TiAlN-tip-coated ■ with internal cooling

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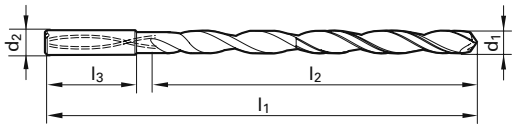
TS 100 T - Spiral-Fluted Deep Hole Drills 40 x D



					86514
					Solid carbide
					165
					■
					HA
					A
d1h7	d2h6	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.000	6.000	170.00	130.00	36.00	●
3.170	6.000	193.00	153.00	36.00	●
3.500	6.000	193.00	153.00	36.00	●
3.570	6.000	216.00	176.00	36.00	●
3.970	6.000	216.00	176.00	36.00	●
4.000	6.000	216.00	176.00	36.00	●
4.370	6.000	238.00	198.00	36.00	●
4.500	6.000	238.00	198.00	36.00	●
4.760	6.000	258.00	218.00	36.00	●
5.000	6.000	258.00	218.00	36.00	●
5.100	6.000	280.00	240.00	36.00	●
5.160	6.000	280.00	240.00	36.00	●
5.410	6.000	280.00	240.00	36.00	●
5.500	6.000	280.00	240.00	36.00	●
5.560	6.000	300.00	260.00	36.00	●
5.950	6.000	300.00	260.00	36.00	●
6.000	6.000	300.00	260.00	36.00	●
6.350	8.000	322.00	282.00	36.00	●
6.500	8.000	322.00	282.00	36.00	●
6.750	8.000	342.00	302.00	36.00	●
7.000	8.000	342.00	302.00	36.00	●
7.140	8.000	363.00	323.00	36.00	●
7.500	8.000	363.00	323.00	36.00	●
7.540	8.000	383.00	343.00	36.00	●
7.940	8.000	383.00	343.00	36.00	●
8.000	8.000	383.00	343.00	36.00	●

A TiAlN-tip-coated ■ with internal cooling

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TS 100 T - Application recommendations

Procedure:
- Initial milling of surface. The surface must be machined at right angles to the entry angle of the drilling operation.
- Production of a cylindrical pilot hole (tolerance F9) with a minimum drilling depth of 1 x D.
- Entry in the pilot hole at a speed of approx. 300 rev./min and with a feed rate of approx. 500 mm/min.
- Setting of coolant pressure and speed.
- Continuous drilling to complete hole depth without wood pecking.
- For through holes with oblique exit, reduce the feed rate vf to 40% approx. 1 mm prior to break-through.
- After reaching hole depth stop machine spindle and coolant supply, withdrawal in top gear.

Order-no.
Standard/DIN
Tool material
Carbide grade
Surface finish
Coolant

Tools with bold feed column no. are preferred choice.

Drill Ø mm	Feed column no. 1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
2,50	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3,15	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.160
4,00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
5,00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6,30	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8,00	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10,00	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12,50	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16,00	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630

TS 100 T - on deep hole drilling machines
After checking the clamping and the total length, the application of TS 100 T is possible on deep hole drilling machines with a guide bush.

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.

Material group	Material examples Figures in bold = material no. to DIN EN 10 027	Tens.str. N/mm²	Hardness	Coolant
Common structural steels	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		○
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		○
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		○
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		○
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		○
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		○
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		○
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		○
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		○
Unalloyed case hard. steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		○
Alloyed case hardened steels	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●
Nitriding steels	**1.8504** 34CrAl6	≤1000		○
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		○
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●
austenitic	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●
martensitic	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●
Hardened steels	–		≤48 HRC	●
			≤66 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	○ ○
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	○ ○
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	○
malleable cast iron	**0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	○
Chilled cast iron	–		≤350 HB	○
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		○
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		○
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		○
≤ 24 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		○
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		○
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		○
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		○
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		○ ●
	2.0790 CuNi18Zn19Pb	≤850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●
Duroplastics	Epoxy resin, Resopal, Pertinax, Moltopren	≤150		○
Thermoplastics	Plexiglas,s Hostalen, Novodur, Makralon	≤100		○ ○
New cast materials GGV	**EN-GJV250** (GGV25), **EN-GJV350** (GGV35)		≤220 HB	○ ○
	EN-GJV400 (GGV40), **EN-GJV500** (GGV50), SiMo 6		≤300 HB	○ ○
New cast materials ADI	**EN-GJS-800-8** (ADI800), **EN-GJS-1000-5** (ADI1000)	≤1000		○ ○
	EN-GJS-1200-2 (ADI1200), **EN-GJS-1400-1** (ADI1400)	≤1400		○ ○
Kevlar	Kevlar	≤1000		○
Glass, carbon concentr. plastics	GFK/CFK	≤1000		○

Ⓐ TiAlN-tip-coated

HARTNER

TS 100 T - Application recommendations

≤15xD

86509	
Hartner std.	
Sol. carb.	
K/P	
A	
40 bar	MQL

v_c m/min	Feed col. no.	v_c m/min	Feed col. no.
110	8		
110	8		
120	8		
120	8		
110	6		
110	8		
100	7		
110	7	80	7
110	6	80	7
110	8		
110	7	80	6-7
110	6	80	6-7
100	5		
80	5		
100	6-7		
80	5		
50	5		
50	5		
100	5		
70	2-3		
100	5		
50	4		
30	2		
140	8		
100	8		
140	8		
100	8		
120	1		
120	8		
100	6		
100	6		
90	8	90	8

≤20xD

86511	
Hartner std.	
Sol. carb.	
K/P	
A	
40 bar	MQL

v_c m/min	Feed col. no.	v_c m/min	Feed col. no.
110	**8**		
110	**8**		
120	**8**		
120	**8**		
110	**6**		
110	**8**		
100	**7**		
110	**7**	80	7
110	**6**	80	7
110	**8**		
110	**7**	80	6-7
110	**6**	80	6-7
100	**5**		
80	**5**		
100	**6**		
80	**5**		
50	**5**		
50	**5**		
100	**5**		
60	**3**		
100	**5**		
50	**4**		
30	**2**		
140	**8**		
100	**8**		
140	**8**		
100	**8**		
120	**1**		
120	**8**		
100	**6**		
100	**6**		
90	**8**	90	8

≤25xD

86512	
Hartner std.	
Sol. carb.	
K/P	
A	
40 bar	MQL

v_c m/min	Feed col. no.	v_c m/min	Feed col. no.
100	**8**		
100	**8**		
120	**8**		
100	**8**		
110	**6**		
100	**8**		
100	**7**		
100	**7**	70	7
100	**6**	70	7
100	**8**		
100	**7**	70	6-7
100	**6**	70	6-7
80	**5**		
60	**5**		
90	**6**		
70	**4**		
50	**4**		
50	**4**		
100	**5**		
60	**3**		
100	**5**		
50	**4**		
30	**2**		
130	**8**		
90	**8**		
130	**8**		
90	**8**		
120	**1**		
110	**8**		
90	**6**		
90	**6**		
80	**8**	80	8

≤30xD

86513	
Hartner std.	
Sol. carb.	
K/P	
A	
40 bar	MQL

v_c m/min	Feed col. no.	v_c m/min	Feed col. no.
80	**7**		
80	**7**		
100	**8**		
100	**8**		
110	**6**		
80	**7**		
80	**7**		
80	**7**	60	6-7
80	**6**	60	7
80	**7**		
80	**6**	60	6-7
80	**6**	60	6-7
80	**5**		
60	**5**		
80	**6**		
70	**4**		
50	**4**		
50	**4**		
80	**5**		
60	**3**		
80	**5**		
50	**4**		
30	**2**		
120	**8**		
80	**8**		
120	**8**		
80	**8**	65	8
120	**1**		
100	**8**		
80	**6**		
80	**6**		
70	**8**	70	8

≤40xD

86514	
Hartner std.	
Sol. carb.	
K/P	
A	
40 bar	

v_c m/min	Feed col. no.
80	7
80	7
100	8
100	8
110	6
80	7
80	7
80	6-7
80	6
80	7
80	6
80	6
80	5
60	5
80	6-7
70	4
50	4
50	4
80	5
70	2-3
80	5
50	4
30	2
120	8
80	8
120	8
80	8
120	1
100	8
80	6
80	6
70	8

TS 100 INOX - Solutions for the machining of stainless steels

Stainless steels and their attributes

Stainless or acid-resistant steels have a very high chromium content > 12 %, an excellent resistance against chemically aggressive substances and corrosion. The chromium creates a micro oxygen diffusing chromium dioxide coating on the surface, that prevents in-depth corrosion.
Most stainless steels are from the austenitic group of steels. Next to chromium, nickel is the most important constituent of the structure, often molybdenum is also added to optimise the mechanical characteristics. The range of application of austenitic steels is the food industry, power plants and energy supply, ship building and the petrochemical industry, but increasingly also applications in architecture for wall cladding and roofing. Typical materials are 1.4301 (X5CrNi 18 10 / V2A), 1.4541 (X6CrNiTi 18 10), 1.4571 (X6CrNiMoTi 17 12 2 / V4A) or 1.4311 (X2CrNiN 18 10).

Properties and attributes when machining

When machining stainless or acid-resistant steels, the following properties should be noted: These materials tend to work harden, are very poor conductors of heat and display a high toughness and shear elongation. The high toughness leads to a very heavy cutting load especially when drilling and when producing threads. In addition, the mechanical properties of stainless or acid-resistant steels produce unfavourable chips that tend to stick and jam.

Optimal machining and tool selection

Stainless or acid-resistant steels, due to their properties and attributes, require sharp tools with their back taper and clearance angle configured in such a way that the high elastic deformation does not lead to a jamming of the tool when machining.
High feed rates result in an optimal dissipation of heat via the chips, a very good cooling lubrication - ideally via internal cooling - supports the removal of heat as well as chip evacuation and, in addition, counteracts the work hardening. As coolant we recommend high-performance cutting oil, but at least 8 % soluble oil. In addition, pecking may be necessary during machining.
A relatively low cutting speed should be chosen and can greatly depend on the material composition. Machining tests are paramount for selecting the optimal cutting speed.
Due to the high work load, particular attention must be paid to maximum rigidity of the machine as well as the workpiece and tool clamping. Always select the shortest possible tool for your machining task.

TS 100 INOX - TS-Drills with oil feed

Order no. 89450

For stainless, acid- and heat-resistant steels, titanium and Ti-alloys, Inconel, Hastelloy and Monel, high alloyed steels as well as aluminium alloys. For drilling depths up to 3 x D. Advantages: Highest speed and feed rates (see Technical Part). Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch
flat for application in shrink fit/hydraulic chucks.

Standard	DIN 6537K
Tool material	Solid carbide
Surface	a
Type	TS 100 INOX
Shank form	HA
Cutting direction	right-hand
Point grinding	facet point
Point angle°	140
Tolerance	m7

Order no. 89550

For stainless, acid- and heat-resistant steels, titanium and Ti-alloys, Inconel, Hastelloy and Monel, high alloyed steels as well as aluminium alloys. For drilling depths up to 3 x D. Advantages: Highest speed and feed rates (see Technical Part). Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use: Powerful machines. No play in spindle bearings. Alignment accurate holders. Max. concentricity error of clamped tools 0,02 mm. Chatterfree, mechanical feeds.

Standard	DIN 6537K
Tool material	Solid carbide
Surface	a
Type	TS 100 INOX
Shank form	HE
Cutting direction	right-hand
Point grinding	facet point
Point angle°	140
Tolerance	m7

Order no. 89451

For stainless, acid- and heat-resistant steels, titanium and Ti-alloys, Inconel, Hastelloy and Monel, high alloyed steels as well as aluminium alloys. For drilling depths up to 5 x D. Advantages: Highest speed and feed rates (see Technical Part). Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders.Max. concentricity error of clamped
tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch
flat for application in shrink fit/hydraulic chucks.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	a
Type	TS 100 INOX
Shank form	HA
Cutting direction	right-hand
Point grinding	facet point
Point angle°	140
Tolerance	m7

Order no. 89551

For stainless, acid- and heat-resistant steels, titanium and Ti-alloys, Inconel, Hastelloy and Monel, high alloyed steels as well as aluminium alloys. For drilling depths up to 5 x D. Advantages: Highest speed and feed rates (see Technical Part). Maximum tool life and high process reliability thanks to the special geometry.

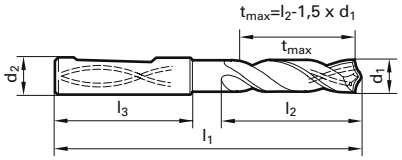
Preconditions for use: Powerful machines. No play in spindle bearings. Alignment accurate holders. Max. concentricity error of clamped tools 0,02 mm. Chatterfree, mechanical feeds.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	a
Type	TS 100 INOX
Shank form	HE
Cutting direction	right-hand
Point grinding	facet point
Point angle°	140
Tolerance	m7

a AlTiN nano-coated

HARTNER

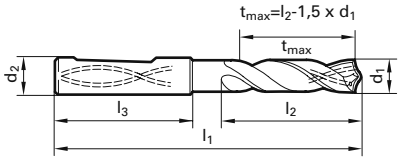
TS 100 INOX - TS-Drills with oil feed



					89450	89550
					Solid carbide	
					121	121
					HA	HE
					TS 100 INOX	TS 100 INOX
					a	a
d1	d2	l1	l2	l3	Availability	
mm	mm	mm	mm	mm		
3.000	6.000	62.00	20.00	36.00	●	●
3.100	6.000	62.00	20.00	36.00	●	●
3.170	6.000	62.00	20.00	36.00	●	●
3.200	6.000	62.00	20.00	36.00	●	●
3.250	6.000	62.00	20.00	36.00	●	●
3.300	6.000	62.00	20.00	36.00	●	●
3.400	6.000	62.00	20.00	36.00	●	●
3.500	6.000	62.00	20.00	36.00	●	●
3.570	6.000	62.00	20.00	36.00	●	●
3.600	6.000	62.00	20.00	36.00	●	●
3.700	6.000	62.00	20.00	36.00	●	●
3.800	6.000	66.00	24.00	36.00	●	●
3.900	6.000	66.00	24.00	36.00	●	●
3.970	6.000	66.00	24.00	36.00	●	●
4.000	6.000	66.00	24.00	36.00	●	●
4.100	6.000	66.00	24.00	36.00	●	●
4.200	6.000	66.00	24.00	36.00	●	●
4.300	6.000	66.00	24.00	36.00	●	●
4.370	6.000	66.00	24.00	36.00	●	●
4.400	6.000	66.00	24.00	36.00	●	●
4.500	6.000	66.00	24.00	36.00	●	●
4.600	6.000	66.00	24.00	36.00	●	●
4.650	6.000	66.00	24.00	36.00	●	●
4.700	6.000	66.00	24.00	36.00	●	●
4.760	6.000	66.00	28.00	36.00	●	●
4.800	6.000	66.00	28.00	36.00	●	●
4.900	6.000	66.00	28.00	36.00	●	●
5.000	6.000	66.00	28.00	36.00	●	●
5.100	6.000	66.00	28.00	36.00	●	●
5.160	6.000	66.00	28.00	36.00	●	●
5.200	6.000	66.00	28.00	36.00	●	●
5.300	6.000	66.00	28.00	36.00	●	●
5.400	6.000	66.00	28.00	36.00	●	●
5.500	6.000	66.00	28.00	36.00	●	●
5.550	6.000	66.00	28.00	36.00	●	●
5.560	6.000	66.00	28.00	36.00	●	●
5.600	6.000	66.00	28.00	36.00	●	●
5.700	6.000	66.00	28.00	36.00	●	●
5.800	6.000	66.00	28.00	36.00	●	●
5.900	6.000	66.00	28.00	36.00	●	●
5.950	6.000	66.00	28.00	36.00	●	●
6.000	6.000	66.00	28.00	36.00	●	●
6.100	8.000	79.00	34.00	36.00	●	●
6.200	8.000	79.00	34.00	36.00	●	●
6.300	8.000	79.00	34.00	36.00	●	●
6.350	8.000	79.00	34.00	36.00	●	●
6.400	8.000	79.00	34.00	36.00	●	●
6.500	8.000	79.00	34.00	36.00	●	●
6.600	8.000	79.00	34.00	36.00	●	●
6.700	8.000	79.00	34.00	36.00	●	●
6.750	8.000	79.00	34.00	36.00	●	●
6.800	8.000	79.00	34.00	36.00	●	●
6.900	8.000	79.00	34.00	36.00	●	●
7.000	8.000	79.00	34.00	36.00	●	●
7.100	8.000	79.00	41.00	36.00	●	●
7.140	8.000	79.00	41.00	36.00	●	●
7.200	8.000	79.00	41.00	36.00	●	●

a AlTiN nano-coated

TS 100 INOX - TS-Drills with oil feed



					89450	89550
					Solid carbide	
					121	121
					HA	HE
					TS 100 INOX	TS 100 INOX
					a	a
d1	d2	l1	l2	l3	Availability	
mm	mm	mm	mm	mm		
7.300	8.000	79.00	41.00	36.00	●	●
7.400	8.000	79.00	41.00	36.00	●	●
7.500	8.000	79.00	41.00	36.00	●	●
7.540	8.000	79.00	41.00	36.00	●	●
7.600	8.000	79.00	41.00	36.00	●	●
7.700	8.000	79.00	41.00	36.00	●	●
7.800	8.000	79.00	41.00	36.00	●	●
7.900	8.000	79.00	41.00	36.00	●	●
7.940	8.000	79.00	41.00	36.00	●	●
8.000	8.000	79.00	41.00	36.00	●	●
8.100	10.000	89.00	47.00	40.00	●	●
8.200	10.000	89.00	47.00	40.00	●	●
8.300	10.000	89.00	47.00	40.00	●	●
8.330	10.000	89.00	47.00	40.00	●	●
8.400	10.000	89.00	47.00	40.00	●	●
8.500	10.000	89.00	47.00	40.00	●	●
8.600	10.000	89.00	47.00	40.00	●	●
8.700	10.000	89.00	47.00	40.00	●	●
8.730	10.000	89.00	47.00	40.00	●	●
8.800	10.000	89.00	47.00	40.00	●	●
8.900	10.000	89.00	47.00	40.00	●	●
9.000	10.000	89.00	47.00	40.00	●	●
9.100	10.000	89.00	47.00	40.00	●	●
9.130	10.000	89.00	47.00	40.00	●	●
9.200	10.000	89.00	47.00	40.00	●	●
9.250	10.000	89.00	47.00	40.00	●	●
9.300	10.000	89.00	47.00	40.00	●	●
9.400	10.000	89.00	47.00	40.00	●	●
9.500	10.000	89.00	47.00	40.00	●	●
9.520	10.000	89.00	47.00	40.00	●	●
9.600	10.000	89.00	47.00	40.00	●	●
9.700	10.000	89.00	47.00	40.00	●	●
9.800	10.000	89.00	47.00	40.00	●	●
9.900	10.000	89.00	47.00	40.00	●	●
9.920	10.000	89.00	47.00	40.00	●	●
10.000	10.000	89.00	47.00	40.00	●	●
10.100	12.000	102.00	55.00	45.00	●	●
10.200	12.000	102.00	55.00	45.00	●	●
10.300	12.000	102.00	55.00	45.00	●	●
10.320	12.000	102.00	55.00	45.00	●	●
10.400	12.000	102.00	55.00	45.00	●	●
10.500	12.000	102.00	55.00	45.00	●	●
10.600	12.000	102.00	55.00	45.00	●	●
10.700	12.000	102.00	55.00	45.00	●	●
10.800	12.000	102.00	55.00	45.00	●	●
10.900	12.000	102.00	55.00	45.00	●	●
11.000	12.000	102.00	55.00	45.00	●	●
11.100	12.000	102.00	55.00	45.00	●	●
11.110	12.000	102.00	55.00	45.00	●	●
11.200	12.000	102.00	55.00	45.00	●	●
11.300	12.000	102.00	55.00	45.00	●	●
11.400	12.000	102.00	55.00	45.00	●	●
11.500	12.000	102.00	55.00	45.00	●	●
11.600	12.000	102.00	55.00	45.00	●	●
11.700	12.000	102.00	55.00	45.00	●	●
11.800	12.000	102.00	55.00	45.00	●	●
11.900	12.000	102.00	55.00	45.00	●	●

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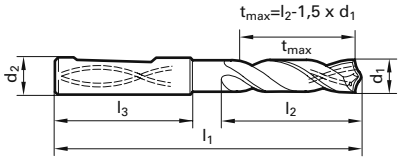
TS 100 INOX - TS-Drills with oil feed



d1	d2	l1	l2	l3	89450	89550
					Solid carbide	
					121	121
					HA	HE
					TS 100 INOX	TS 100 INOX
					a	a
mm	mm	mm	mm	mm	Availability	
11.910	12.000	102.00	55.00	45.00	●	●
12.000	12.000	102.00	55.00	45.00	●	●
12.200	14.000	107.00	60.00	45.00	●	●
12.500	14.000	107.00	60.00	45.00	●	●
12.700	14.000	107.00	60.00	45.00	●	●
12.800	14.000	107.00	60.00	45.00	●	●
13.000	14.000	107.00	60.00	45.00	●	●
13.300	14.000	107.00	60.00	45.00	●	●
13.500	14.000	107.00	60.00	45.00	●	●
13.700	14.000	107.00	60.00	45.00	●	●
14.000	14.000	107.00	60.00	45.00	●	●
14.200	16.000	115.00	65.00	48.00	●	●
14.290	16.000	115.00	65.00	48.00	●	●
14.300	16.000	115.00	65.00	48.00	●	●
14.500	16.000	115.00	65.00	48.00	●	●
14.700	16.000	115.00	65.00	48.00	●	●
15.000	16.000	115.00	65.00	48.00	●	●
15.200	16.000	115.00	65.00	48.00	●	●
15.300	16.000	115.00	65.00	48.00	●	●
15.500	16.000	115.00	65.00	48.00	●	●
15.700	16.000	115.00	65.00	48.00	●	●
16.000	16.000	115.00	65.00	48.00	●	●
16.300	18.000	123.00	73.00	48.00	●	●
16.500	18.000	123.00	73.00	48.00	●	●
16.900	18.000	123.00	73.00	48.00	●	●
17.000	18.000	123.00	73.00	48.00	●	●
17.300	18.000	123.00	73.00	48.00	●	●
17.500	18.000	123.00	73.00	48.00	●	●
18.000	18.000	123.00	73.00	48.00	●	●
18.500	20.000	131.00	79.00	50.00	●	●
18.900	20.000	131.00	79.00	50.00	●	●
19.000	20.000	131.00	79.00	50.00	●	●
19.300	20.000	131.00	79.00	50.00	●	●
19.500	20.000	131.00	79.00	50.00	●	●
20.000	20.000	131.00	79.00	50.00	●	●

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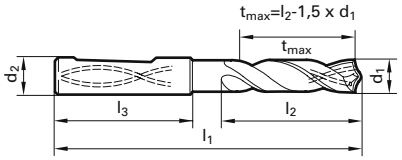
TS 100 INOX - TS-Drills with oil feed



					89451	89551
					Solid carbide	
					121	121
					HA	HE
					TS 100 INOX	TS 100 INOX
					a	a
d1	d2	l1	l2	l3	Availability	
mm	mm	mm	mm	mm		
3.000	6.000	66.00	28.00	36.00	●	●
3.100	6.000	66.00	28.00	36.00	●	●
3.170	6.000	66.00	28.00	36.00	●	●
3.200	6.000	66.00	28.00	36.00	●	●
3.250	6.000	66.00	28.00	36.00	●	●
3.300	6.000	66.00	28.00	36.00	●	●
3.400	6.000	66.00	28.00	36.00	●	●
3.500	6.000	66.00	28.00	36.00	●	●
3.570	6.000	66.00	28.00	36.00	●	●
3.600	6.000	66.00	28.00	36.00	●	●
3.700	6.000	66.00	28.00	36.00	●	●
3.800	6.000	74.00	36.00	36.00	●	●
3.900	6.000	74.00	36.00	36.00	●	●
3.970	6.000	74.00	36.00	36.00	●	●
4.000	6.000	74.00	36.00	36.00	●	●
4.100	6.000	74.00	36.00	36.00	●	●
4.200	6.000	74.00	36.00	36.00	●	●
4.300	6.000	74.00	36.00	36.00	●	●
4.370	6.000	74.00	36.00	36.00	●	●
4.400	6.000	74.00	36.00	36.00	●	●
4.500	6.000	74.00	36.00	36.00	●	●
4.600	6.000	74.00	36.00	36.00	●	●
4.650	6.000	74.00	36.00	36.00	●	●
4.700	6.000	74.00	36.00	36.00	●	●
4.760	6.000	82.00	44.00	36.00	●	●
4.800	6.000	82.00	44.00	36.00	●	●
4.900	6.000	82.00	44.00	36.00	●	●
5.000	6.000	82.00	44.00	36.00	●	●
5.100	6.000	82.00	44.00	36.00	●	●
5.160	6.000	82.00	44.00	36.00	●	●
5.200	6.000	82.00	44.00	36.00	●	●
5.300	6.000	82.00	44.00	36.00	●	●
5.400	6.000	82.00	44.00	36.00	●	●
5.500	6.000	82.00	44.00	36.00	●	●
5.550	6.000	82.00	44.00	36.00	●	●
5.560	6.000	82.00	44.00	36.00	●	●
5.600	6.000	82.00	44.00	36.00	●	●
5.700	6.000	82.00	44.00	36.00	●	●
5.800	6.000	82.00	44.00	36.00	●	●
5.900	6.000	82.00	44.00	36.00	●	●
5.950	6.000	82.00	44.00	36.00	●	●
6.000	6.000	82.00	44.00	36.00	●	●
6.100	8.000	91.00	53.00	36.00	●	●
6.200	8.000	91.00	53.00	36.00	●	●
6.300	8.000	91.00	53.00	36.00	●	●
6.350	8.000	91.00	53.00	36.00	●	●
6.400	8.000	91.00	53.00	36.00	●	●
6.500	8.000	91.00	53.00	36.00	●	●
6.600	8.000	91.00	53.00	36.00	●	●
6.700	8.000	91.00	53.00	36.00	●	●
6.750	8.000	91.00	53.00	36.00	●	●
6.800	8.000	91.00	53.00	36.00	●	●
6.900	8.000	91.00	53.00	36.00	●	●
7.000	8.000	91.00	53.00	36.00	●	●
7.100	8.000	91.00	53.00	36.00	●	●
7.140	8.000	91.00	53.00	36.00	●	●
7.200	8.000	91.00	53.00	36.00	●	●

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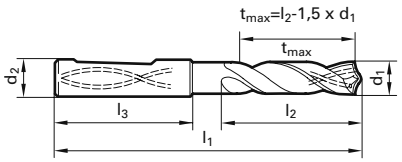
TS 100 INOX - TS-Drills with oil feed



					89451	89551
					Solid carbide	
					121	121
					HA	HE
					TS 100 INOX	TS 100 INOX
					a	a
d1	d2	l1	l2	l3	Availability	
mm	mm	mm	mm	mm		
7.300	8.000	91.00	53.00	36.00	●	●
7.400	8.000	91.00	53.00	36.00	●	●
7.500	8.000	91.00	53.00	36.00	●	●
7.540	8.000	91.00	53.00	36.00	●	●
7.600	8.000	91.00	53.00	36.00	●	●
7.700	8.000	91.00	53.00	36.00	●	●
7.800	8.000	91.00	53.00	36.00	●	●
7.900	8.000	91.00	53.00	36.00	●	●
7.940	8.000	91.00	53.00	36.00	●	●
8.000	8.000	91.00	53.00	36.00	●	●
8.100	10.000	103.00	61.00	40.00	●	●
8.200	10.000	103.00	61.00	40.00	●	●
8.300	10.000	103.00	61.00	40.00	●	●
8.330	10.000	103.00	61.00	40.00	●	●
8.400	10.000	103.00	61.00	40.00	●	●
8.500	10.000	103.00	61.00	40.00	●	●
8.600	10.000	103.00	61.00	40.00	●	●
8.700	10.000	103.00	61.00	40.00	●	●
8.730	10.000	103.00	61.00	40.00	●	●
8.800	10.000	103.00	61.00	40.00	●	●
8.900	10.000	103.00	61.00	40.00	●	●
9.000	10.000	103.00	61.00	40.00	●	●
9.100	10.000	103.00	61.00	40.00	●	●
9.130	10.000	103.00	61.00	40.00	●	●
9.200	10.000	103.00	61.00	40.00	●	●
9.250	10.000	103.00	61.00	40.00	●	●
9.300	10.000	103.00	61.00	40.00	●	●
9.400	10.000	103.00	61.00	40.00	●	●
9.500	10.000	103.00	61.00	40.00	●	●
9.520	10.000	103.00	61.00	40.00	●	●
9.600	10.000	103.00	61.00	40.00	●	●
9.700	10.000	103.00	61.00	40.00	●	●
9.800	10.000	103.00	61.00	40.00	●	●
9.900	10.000	103.00	61.00	40.00	●	●
9.920	10.000	103.00	61.00	40.00	●	●
10.000	10.000	103.00	61.00	40.00	●	●
10.100	12.000	118.00	71.00	45.00	●	●
10.200	12.000	118.00	71.00	45.00	●	●
10.300	12.000	118.00	71.00	45.00	●	●
10.320	12.000	118.00	71.00	45.00	●	●
10.400	12.000	118.00	71.00	45.00	●	●
10.500	12.000	118.00	71.00	45.00	●	●
10.600	12.000	118.00	71.00	45.00	●	●
10.700	12.000	118.00	71.00	45.00	●	●
10.800	12.000	118.00	71.00	45.00	●	●
10.900	12.000	118.00	71.00	45.00	●	●
11.000	12.000	118.00	71.00	45.00	●	●
11.100	12.000	118.00	71.00	45.00	●	●
11.110	12.000	118.00	71.00	45.00	●	●
11.200	12.000	118.00	71.00	45.00	●	●
11.300	12.000	118.00	71.00	45.00	●	●
11.400	12.000	118.00	71.00	45.00	●	●
11.500	12.000	118.00	71.00	45.00	●	●
11.600	12.000	118.00	71.00	45.00	●	●
11.700	12.000	118.00	71.00	45.00	●	●
11.800	12.000	118.00	71.00	45.00	●	●
11.900	12.000	118.00	71.00	45.00	●	●

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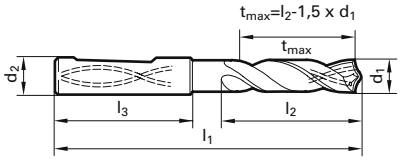
TS 100 INOX - TS-Drills with oil feed



d1	d2	l1	l2	l3	89451	89551
					Solid carbide	
					121 HA TS 100 INOX a	121 HE TS 100 INOX a
mm	mm	mm	mm	mm	Availability	
11.910	12.000	118.00	71.00	45.00	●	●
12.000	12.000	118.00	71.00	45.00	●	●
12.200	14.000	124.00	77.00	45.00	●	●
12.500	14.000	124.00	77.00	45.00	●	●
12.700	14.000	124.00	77.00	45.00	●	●
12.800	14.000	124.00	77.00	45.00	●	●
13.000	14.000	124.00	77.00	45.00	●	●
13.300	14.000	124.00	77.00	45.00	●	●
13.500	14.000	124.00	77.00	45.00	●	●
13.700	14.000	124.00	77.00	45.00	●	●
14.000	14.000	124.00	77.00	45.00	●	●
14.200	16.000	133.00	83.00	48.00	●	●
14.290	16.000	133.00	83.00	48.00	●	●
14.300	16.000	133.00	83.00	48.00	●	●
14.500	16.000	133.00	83.00	48.00	●	●
14.700	16.000	133.00	83.00	48.00	●	●
15.000	16.000	133.00	83.00	48.00	●	●
15.200	16.000	133.00	83.00	48.00	●	●
15.300	16.000	133.00	83.00	48.00	●	●
15.500	16.000	133.00	83.00	48.00	●	●
15.700	16.000	133.00	83.00	48.00	●	●
16.000	16.000	133.00	83.00	48.00	●	●
16.300	18.000	143.00	93.00	48.00	●	●
16.500	18.000	143.00	93.00	48.00	●	●
16.900	18.000	143.00	93.00	48.00	●	●
17.000	18.000	143.00	93.00	48.00	●	●
17.300	18.000	143.00	93.00	48.00	●	●
17.500	18.000	143.00	93.00	48.00	●	●
18.000	18.000	143.00	93.00	48.00	●	●
18.500	20.000	153.00	101.00	50.00	●	●
18.900	20.000	153.00	101.00	50.00	●	●
19.000	20.000	153.00	101.00	50.00	●	●
19.050	20.000	153.00	101.00	50.00	●	●
19.300	20.000	153.00	101.00	50.00	●	●
19.500	20.000	153.00	101.00	50.00	●	●
20.000	20.000	153.00	101.00	50.00	●	●

a AlTiN nano-coated

HARTNER

Application recommendations for INOX Drills

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

General hints for solid carbide drills:
Powerful machines, no play in spindle bearings, alignment accurate tool holders. Max. concentricity error of clamped tools 0.02 mm, high coolant pressures. We recommend the application of hydraulic chucks or shrink fit chucks.

Coolant hints for solid carbide drills:
We recommend lubrication by soluble oil or neat oil.
Under special conditions cooling just by air is possible. But instead of air cooling we would always prefer minimal quantity lubrication, that the tools are especially suited for. With MQL we recommend the conical shank end and the Hartner MQL components. Please contact our technical service department for further information.

Order-no. R
Standard/DIN
Tool material
Carbide grade
Surface finish
Type
Shank type
Coolant

Drill Ø mm	Feed column no.								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	f (mm/rev)								
2.50	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3.15	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.160
4.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
5.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6.30	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8.00	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10.00	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12.50	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16.00	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630
20.00	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.630
25.00	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800

Coolant
● soluble oil
● oil
○ air

Material group	Material examples, new description (old description in brackets) Figures in bold = material no. to DIN EN	Tensile strength MPa (N/mm²)	Hardness	Coolant
Common structural steels	**1.0035** S185(St33),**1.0486** P275N(StE285),**1.0345** P235GH(H1),**1.0425** P265GH(H2)	≤500		○
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	>500-850		○
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		○
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	850-1000		○
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30)	≤ 700		○
	1.0503 C45, **1.1191** C45E (Ck45)	700-850		○
	1.0601 C60, **1.1221** C60E (Ck60)	850-1000		○
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	850-≤1000		○
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	1000-1200		○
Unalloyed case hardened steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤750		○
Alloyed case hardened steels	**1.7043** 38Cr4	850-≤1000		●
	1.5752 15NiCr13 (15NiCr13), **1.7131** 16MnCr5, **1.7264** 20CrMo5	1000-1200		●
Nitriding steels	**1.8504** 34CrAl6	≥850-≤1000		○
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	>1000-1200		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		○
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	>850-1000		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≥650-1000		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤330 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤850		●
austenitic	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤850		●
martensitic	**1.4057** X20CrNi 17 2 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤850		●
Hardened steels	–		≤40-48 HRC	●
			>48-60 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●
Cast iron	**0.6010** EN-GJL-100(GG10), **0.6020** EN-GJL-200(GG20)		≤240 HB	○ ○
	0.6025 EN-GJL-250(GG25), **0.6035** EN-GJL-350(GG35)		<300 HB	○ ○
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7(GGG50), **0.8035** EN-GJMW-350-4(GTW35)		≤240 HB	○
malleable cast iron	**0.7070** EN-GJS-700-2(GGG70), **0.8170** EN-GJMB-700-2(GTS70)		<300 HB	○
Chilled cast iron	–		≤350 HB	○
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	>850-1200		●
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		○
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤450		○
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		○
> 10 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤450		○
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤400		○
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		○
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		○
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		○ ●
	2.0790 CuNi18Zn19Pb	>600-850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	>850-1000		●

ⓐ AlTiN nano-coated ■ with internal cooling

Application recommendations for INOX Drills

≤3×D ≤5×D

89450	89550	89451	89551
6537K	6537K	6537L	6537L
Solid carbide	Solid carbide	Solid carbide	Solid carbide
K/P	K/P	K/P	K/P
a	a	a	a
TS 100 INOX	TS 100 INOX	TS 100 INOX	TS 100 INOX
HA	HE	HA	HE
■	■	■	■

d1 ≤ 10 mm

v_c m/min	Feed column no.			
80	5	5	5	5
60	3	3	3	3
80	5	5	5	5
30	2	2	2	2
35	2	2	2	2

≤3×D ≤5×D

89450	89550	89451	89551
6537K	6537K	6537L	6537L
Solid carbide	Solid carbide	Solid carbide	Solid carbide
K/P	K/P	K/P	K/P
a	a	a	a
TS 100 INOX	TS 100 INOX	TS 100 INOX	TS 100 INOX
HA	HE	HA	HE
■	■	■	■

d1 > 10 mm

v_c m/min	Feed column no.			
80	5	5	5	5
60	2	2	2	2
80	5	5	5	5
30	2	2	2	2
35	2	2	2	2

HARTNER

Questionnaire TS 100 INOX

☐ **Order** ☐ **Inquiry**

Contact for questions

Name/customer no. if available | New customer

Order no.

Street no.

Town/post code

Telephone

Fax

Date

Signature

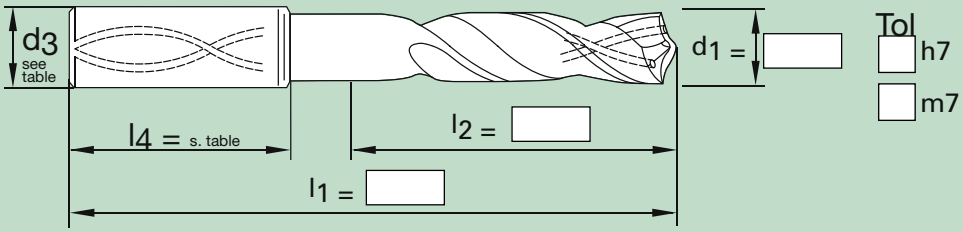
Quantity

Tool type

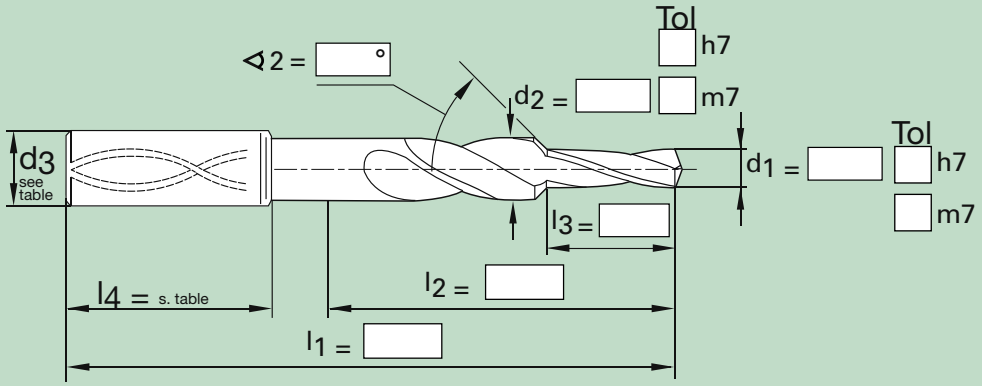
☐ 

TS 100 INOX (spiral-fluted)

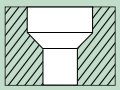
Dimensions



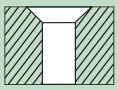
Step version



Machining

☐ 

Drill and counterbore

☐ 

Drill and chamfer

Shank form

☐ 

HA

☐ 

HE

Internal cooling

☐ 

Yes

☐ 

No

Coating

☐ nanoA ☐ bright

HARTNER

TS 100 H - The specialist for demanding applications

HEAT-RESISTANT

The TS 100 H comes with a new developed, extremely robust cutting edge geometry, that considerably reduces the thermic load to the drill point machining high tensile materials and special alloys.

EXTREME HARD

Additionally, the TS 100 H is protected highly effective against wear by the extremely hard and heat-resistant TiAlSiN-coating.

The new, in-house developed TiAlSiN-coating is one of the hardest nitride-based coatings in the market. Thanks to its nano-composite structure with a layer composition of TiAlN and SiN it achieves the extreme hardness of 5500 HV.

HIGH WEAR-RESISTANCE

The new Hartner TS 100 H is the perfect solution for the process-reliable and economic machining of difficult-to-machine, high tensile materials and special alloys.

Its excellent results from the perfectly tuned package with robust cutting edge geometry, special solid carbide and new, extremely hard TiAlSiN-coating.

So it is the optimal solution for applications in the automotive industry, the aerospace technology, the energy and the chemical industry.

TS 100 H - TS-Drills

Order no. 89422

For heat-treatable and alloyed steels with tensile strengths up to 1200 N/mm², hardened steels from 40 to 48 HRC, Inconel, Hastelloy and Monel. For drilling depths up to 3 x D.
Advantages: Highest speed and feed rates. Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use: Powerful machines. No play in spindle bearings. Alignment accurate holders. Max. concentricity error of clamped tools 0,02 mm. Chatterfree, mechanical feeds.The tool is available without whistle notch flat for application in shrink fit or hydraulic chucks.

Standard	DIN 6537K
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

Order no. 89423

For heat-treatable and alloyed steels with tensile strengths up to 1200 N/mm², hardened steels from 40 to 48 HRC, Inconel, Hastelloy and Monel. For drilling depths up to 3 x D.
Advantages: Highest speed and feed rates. Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped
tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch
flat for application in shrink fit/hydraulic chucks.

Standard	DIN 6537K
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

Order no. 89424

For heat-treatable and alloyed steels with tensile strengths up to 1200 N/mm², hardened steels from 40 to 48 HRC, Inconel, Hastelloy and Monel. For drilling depths up to 3 x D.
Advantages: Highest speed and feed rates. Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use: Powerful machines. No play in spindle bearings. Alignment accurate holders. Max. concentricity error of clamped tools 0,02 mm. Chatterfree, mechanical feeds.

Standard	DIN 6537K
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HE
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

Order no. 89425

For heat-treatable and alloyed steels with tensile strengths up to 1200 N/mm², hardened steels from 40 to 48 HRC, Inconel, Hastelloy and Monel. For drilling depths up to 5 x D.
Advantages: Highest speed and feed rates. Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped
tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch
flat for application in shrink fit/hydraulic chucks.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

(Y) TiAlSiN-coated

TS 100 H - TS-Drills

Order no. 89426

For heat-treatable and alloyed steels with tensile strengths up to 1200 N/mm², hardened steels from 40 to 48 HRC, Inconel, Hastelloy and Monel. For drilling depths up to 5 x D.
Advantages: Highest speed and feed rates. Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use: Powerful machines. No play in spindle bearings. Alignment accurate holders. Max. concentricity error of clamped tools 0,02 mm. Chatterfree, mechanical feeds.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HE
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

Order no. 89427

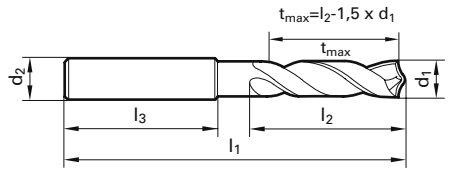
For stainless, acid- and heat-resistant steels, titanium and Ti-alloys, Inconel, Hastelloy and Monel, high alloyed steels as well as aluminium alloys. For drilling depths up to 7 x D.
Advantages: Highest speed and feed rates (see Technical Part). Maximum tool life and high process reliability thanks to the special geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped
tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch
flat for application in shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	(Y)
Type	TS 100 H
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	140
Tolerance	m7

(Y) TiAlSiN-coated

TS 100 H - TS-Drills without oil feed

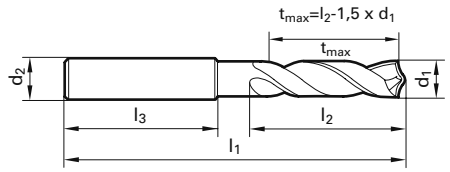


d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	89422 Solid carbide 121 HA TS 100 H Ⓨ Availability
3.000	6.000	62.00	20.00	36.00	●
3.100	6.000	62.00	20.00	36.00	●
3.170	6.000	62.00	20.00	36.00	●
3.200	6.000	62.00	20.00	36.00	●
3.250	6.000	62.00	20.00	36.00	●
3.300	6.000	62.00	20.00	36.00	●
3.400	6.000	62.00	20.00	36.00	●
3.500	6.000	62.00	20.00	36.00	●
3.570	6.000	62.00	20.00	36.00	●
3.600	6.000	62.00	20.00	36.00	●
3.700	6.000	62.00	20.00	36.00	●
3.800	6.000	66.00	24.00	36.00	●
3.900	6.000	66.00	24.00	36.00	●
3.970	6.000	66.00	24.00	36.00	●
4.000	6.000	66.00	24.00	36.00	●
4.100	6.000	66.00	24.00	36.00	●
4.200	6.000	66.00	24.00	36.00	●
4.300	6.000	66.00	24.00	36.00	●
4.370	6.000	66.00	24.00	36.00	●
4.400	6.000	66.00	24.00	36.00	●
4.500	6.000	66.00	24.00	36.00	●
4.600	6.000	66.00	24.00	36.00	●
4.650	6.000	66.00	24.00	36.00	●
4.700	6.000	66.00	24.00	36.00	●
4.760	6.000	66.00	28.00	36.00	●
4.800	6.000	66.00	28.00	36.00	●
4.900	6.000	66.00	28.00	36.00	●
5.000	6.000	66.00	28.00	36.00	●
5.100	6.000	66.00	28.00	36.00	●
5.160	6.000	66.00	28.00	36.00	●
5.200	6.000	66.00	28.00	36.00	●
5.300	6.000	66.00	28.00	36.00	●
5.400	6.000	66.00	28.00	36.00	●
5.500	6.000	66.00	28.00	36.00	●
5.550	6.000	66.00	28.00	36.00	●
5.560	6.000	66.00	28.00	36.00	●
5.600	6.000	66.00	28.00	36.00	●
5.700	6.000	66.00	28.00	36.00	●
5.800	6.000	66.00	28.00	36.00	●
5.900	6.000	66.00	28.00	36.00	●
5.950	6.000	66.00	28.00	36.00	●
6.000	6.000	66.00	28.00	36.00	●
6.100	8.000	79.00	34.00	36.00	●
6.200	8.000	79.00	34.00	36.00	●
6.300	8.000	79.00	34.00	36.00	●
6.350	8.000	79.00	34.00	36.00	●
6.400	8.000	79.00	34.00	36.00	●
6.500	8.000	79.00	34.00	36.00	●
6.600	8.000	79.00	34.00	36.00	●
6.700	8.000	79.00	34.00	36.00	●
6.750	8.000	79.00	34.00	36.00	●
6.800	8.000	79.00	34.00	36.00	●
6.900	8.000	79.00	34.00	36.00	●
7.000	8.000	79.00	34.00	36.00	●
7.100	8.000	79.00	41.00	36.00	●
7.140	8.000	79.00	41.00	36.00	●
7.200	8.000	79.00	41.00	36.00	●

Ⓨ TiAlSiN-coated

HARTNER

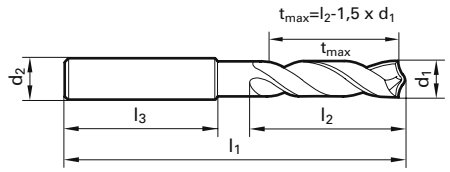
TS 100 H - TS-Drills without oil feed



d1	d2	l1	l2	l3	89422
					Solid carbide
					121
					HA
					TS 100 H
					Y
mm	mm	mm	mm	mm	Availability
7.300	8.000	79.00	41.00	36.00	●
7.400	8.000	79.00	41.00	36.00	●
7.500	8.000	79.00	41.00	36.00	●
7.540	8.000	79.00	41.00	36.00	●
7.600	8.000	79.00	41.00	36.00	●
7.700	8.000	79.00	41.00	36.00	●
7.800	8.000	79.00	41.00	36.00	●
7.900	8.000	79.00	41.00	36.00	●
7.940	8.000	79.00	41.00	36.00	●
8.000	8.000	79.00	41.00	36.00	●
8.100	10.000	89.00	47.00	40.00	●
8.200	10.000	89.00	47.00	40.00	●
8.300	10.000	89.00	47.00	40.00	●
8.330	10.000	89.00	47.00	40.00	●
8.400	10.000	89.00	47.00	40.00	●
8.500	10.000	89.00	47.00	40.00	●
8.600	10.000	89.00	47.00	40.00	●
8.700	10.000	89.00	47.00	40.00	●
8.730	10.000	89.00	47.00	40.00	●
8.800	10.000	89.00	47.00	40.00	●
8.900	10.000	89.00	47.00	40.00	●
9.000	10.000	89.00	47.00	40.00	●
9.100	10.000	89.00	47.00	40.00	●
9.130	10.000	89.00	47.00	40.00	●
9.200	10.000	89.00	47.00	40.00	●
9.250	10.000	89.00	47.00	40.00	●
9.300	10.000	89.00	47.00	40.00	●
9.400	10.000	89.00	47.00	40.00	●
9.500	10.000	89.00	47.00	40.00	●
9.520	10.000	89.00	47.00	40.00	●
9.600	10.000	89.00	47.00	40.00	●
9.700	10.000	89.00	47.00	40.00	●
9.800	10.000	89.00	47.00	40.00	●
9.900	10.000	89.00	47.00	40.00	●
9.920	10.000	89.00	47.00	40.00	●
10.000	10.000	89.00	47.00	40.00	●
10.100	12.000	102.00	55.00	45.00	●
10.200	12.000	102.00	55.00	45.00	●
10.300	12.000	102.00	55.00	45.00	●
10.320	12.000	102.00	55.00	45.00	●
10.400	12.000	102.00	55.00	45.00	●
10.500	12.000	102.00	55.00	45.00	●
10.600	12.000	102.00	55.00	45.00	●
10.700	12.000	102.00	55.00	45.00	●
10.800	12.000	102.00	55.00	45.00	●
10.900	12.000	102.00	55.00	45.00	●
11.000	12.000	102.00	55.00	45.00	●
11.100	12.000	102.00	55.00	45.00	●
11.110	12.000	102.00	55.00	45.00	●
11.200	12.000	102.00	55.00	45.00	●
11.300	12.000	102.00	55.00	45.00	●
11.400	12.000	102.00	55.00	45.00	●
11.500	12.000	102.00	55.00	45.00	●
11.600	12.000	102.00	55.00	45.00	●
11.700	12.000	102.00	55.00	45.00	●
11.800	12.000	102.00	55.00	45.00	●
11.900	12.000	102.00	55.00	45.00	●

Y TiAlSiN-coated

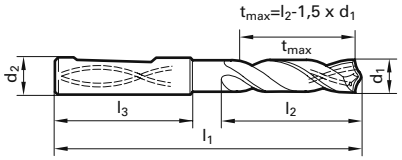
TS 100 H - TS-Drills without oil feed



d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	89422 Solid carbide 121 HA TS 100 H Ⓨ Availability
11.910	12.000	102.00	55.00	45.00	●
12.000	12.000	102.00	55.00	45.00	●
12.200	14.000	107.00	60.00	45.00	●
12.500	14.000	107.00	60.00	45.00	●
12.700	14.000	107.00	60.00	45.00	●
12.800	14.000	107.00	60.00	45.00	●
13.000	14.000	107.00	60.00	45.00	●
13.300	14.000	107.00	60.00	45.00	●
13.500	14.000	107.00	60.00	45.00	●
13.700	14.000	107.00	60.00	45.00	●
14.000	14.000	107.00	60.00	45.00	●
14.200	16.000	115.00	65.00	48.00	●
14.290	16.000	115.00	65.00	48.00	●
14.300	16.000	115.00	65.00	48.00	●
14.500	16.000	115.00	65.00	48.00	●
14.700	16.000	115.00	65.00	48.00	●
15.000	16.000	115.00	65.00	48.00	●
15.200	16.000	115.00	65.00	48.00	●
15.300	16.000	115.00	65.00	48.00	●
15.500	16.000	115.00	65.00	48.00	●
15.700	16.000	115.00	65.00	48.00	●
16.000	16.000	115.00	65.00	48.00	●
16.300	18.000	123.00	73.00	48.00	●
16.500	18.000	123.00	73.00	48.00	●
16.900	18.000	123.00	73.00	48.00	●
17.000	18.000	123.00	73.00	48.00	●
17.300	18.000	123.00	73.00	48.00	●
17.500	18.000	123.00	73.00	48.00	●
18.000	18.000	123.00	73.00	48.00	●
18.500	20.000	131.00	79.00	50.00	●
18.900	20.000	131.00	79.00	50.00	●
19.000	20.000	131.00	79.00	50.00	●
19.050	20.000	131.00	79.00	50.00	●
19.300	20.000	131.00	79.00	50.00	●
19.500	20.000	131.00	79.00	50.00	●
20.000	20.000	131.00	79.00	50.00	●

Ⓨ TiAlSiN-coated

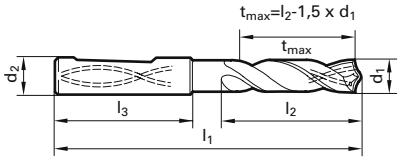
TS 100 H - TS-Drills with oil feed



					89423	89424
					Solid carbide	
					121 HA TS 100 H Ⓨ	121 HE TS 100 H Ⓨ
d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability	
3.000	6.000	62.00	20.00	36.00	●	●
3.100	6.000	62.00	20.00	36.00	●	●
3.170	6.000	62.00	20.00	36.00	●	●
3.200	6.000	62.00	20.00	36.00	●	●
3.250	6.000	62.00	20.00	36.00	●	●
3.300	6.000	62.00	20.00	36.00	●	●
3.400	6.000	62.00	20.00	36.00	●	●
3.500	6.000	62.00	20.00	36.00	●	●
3.570	6.000	62.00	20.00	36.00	●	●
3.600	6.000	62.00	20.00	36.00	●	●
3.700	6.000	62.00	20.00	36.00	●	●
3.800	6.000	66.00	24.00	36.00	●	●
3.900	6.000	66.00	24.00	36.00	●	●
3.970	6.000	66.00	24.00	36.00	●	●
4.000	6.000	66.00	24.00	36.00	●	●
4.100	6.000	66.00	24.00	36.00	●	●
4.200	6.000	66.00	24.00	36.00	●	●
4.300	6.000	66.00	24.00	36.00	●	●
4.370	6.000	66.00	24.00	36.00	●	●
4.400	6.000	66.00	24.00	36.00	●	●
4.500	6.000	66.00	24.00	36.00	●	●
4.600	6.000	66.00	24.00	36.00	●	●
4.650	6.000	66.00	24.00	36.00	●	●
4.700	6.000	66.00	24.00	36.00	●	●
4.760	6.000	66.00	28.00	36.00	●	●
4.800	6.000	66.00	28.00	36.00	●	●
4.900	6.000	66.00	28.00	36.00	●	●
5.000	6.000	66.00	28.00	36.00	●	●
5.100	6.000	66.00	28.00	36.00	●	●
5.160	6.000	66.00	28.00	36.00	●	●
5.200	6.000	66.00	28.00	36.00	●	●
5.300	6.000	66.00	28.00	36.00	●	●
5.400	6.000	66.00	28.00	36.00	●	●
5.500	6.000	66.00	28.00	36.00	●	●
5.550	6.000	66.00	28.00	36.00	●	●
5.560	6.000	66.00	28.00	36.00	●	●
5.600	6.000	66.00	28.00	36.00	●	●
5.700	6.000	66.00	28.00	36.00	●	●
5.800	6.000	66.00	28.00	36.00	●	●
5.900	6.000	66.00	28.00	36.00	●	●
5.950	6.000	66.00	28.00	36.00	●	●
6.000	6.000	66.00	28.00	36.00	●	●
6.100	8.000	79.00	34.00	36.00	●	●
6.200	8.000	79.00	34.00	36.00	●	●
6.300	8.000	79.00	34.00	36.00	●	●
6.350	8.000	79.00	34.00	36.00	●	●
6.400	8.000	79.00	34.00	36.00	●	●
6.500	8.000	79.00	34.00	36.00	●	●
6.600	8.000	79.00	34.00	36.00	●	●
6.700	8.000	79.00	34.00	36.00	●	●
6.750	8.000	79.00	34.00	36.00	●	●
6.800	8.000	79.00	34.00	36.00	●	●
6.900	8.000	79.00	34.00	36.00	●	●
7.000	8.000	79.00	34.00	36.00	●	●
7.100	8.000	79.00	41.00	36.00	●	●
7.140	8.000	79.00	41.00	36.00	●	●
7.200	8.000	79.00	41.00	36.00	●	●

Ⓨ TiAlSiN-coated

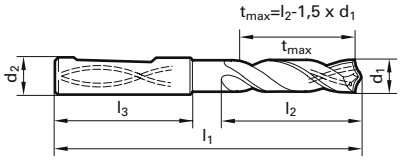
TS 100 H - TS-Drills with oil feed



					89423	89424
					Solid carbide	
					121 HA TS 100 H Ⓨ	121 HE TS 100 H Ⓨ
d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability	
7.300	8.000	79.00	41.00	36.00	●	●
7.400	8.000	79.00	41.00	36.00	●	●
7.500	8.000	79.00	41.00	36.00	●	●
7.540	8.000	79.00	41.00	36.00	●	●
7.600	8.000	79.00	41.00	36.00	●	●
7.700	8.000	79.00	41.00	36.00	●	●
7.800	8.000	79.00	41.00	36.00	●	●
7.900	8.000	79.00	41.00	36.00	●	●
7.940	8.000	79.00	41.00	36.00	●	●
8.000	8.000	79.00	41.00	36.00	●	●
8.100	10.000	89.00	47.00	40.00	●	●
8.200	10.000	89.00	47.00	40.00	●	●
8.300	10.000	89.00	47.00	40.00	●	●
8.330	10.000	89.00	47.00	40.00	●	●
8.400	10.000	89.00	47.00	40.00	●	●
8.500	10.000	89.00	47.00	40.00	●	●
8.600	10.000	89.00	47.00	40.00	●	●
8.700	10.000	89.00	47.00	40.00	●	●
8.730	10.000	89.00	47.00	40.00	●	●
8.800	10.000	89.00	47.00	40.00	●	●
8.900	10.000	89.00	47.00	40.00	●	●
9.000	10.000	89.00	47.00	40.00	●	●
9.100	10.000	89.00	47.00	40.00	●	●
9.130	10.000	89.00	47.00	40.00	●	●
9.200	10.000	89.00	47.00	40.00	●	●
9.250	10.000	89.00	47.00	40.00	●	●
9.300	10.000	89.00	47.00	40.00	●	●
9.400	10.000	89.00	47.00	40.00	●	●
9.500	10.000	89.00	47.00	40.00	●	●
9.520	10.000	89.00	47.00	40.00	●	●
9.600	10.000	89.00	47.00	40.00	●	●
9.700	10.000	89.00	47.00	40.00	●	●
9.800	10.000	89.00	47.00	40.00	●	●
9.900	10.000	89.00	47.00	40.00	●	●
9.920	10.000	89.00	47.00	40.00	●	●
10.000	10.000	89.00	47.00	40.00	●	●
10.100	12.000	102.00	55.00	45.00	●	●
10.200	12.000	102.00	55.00	45.00	●	●
10.300	12.000	102.00	55.00	45.00	●	●
10.320	12.000	102.00	55.00	45.00	●	●
10.400	12.000	102.00	55.00	45.00	●	●
10.500	12.000	102.00	55.00	45.00	●	●
10.600	12.000	102.00	55.00	45.00	●	●
10.700	12.000	102.00	55.00	45.00	●	●
10.800	12.000	102.00	55.00	45.00	●	●
10.900	12.000	102.00	55.00	45.00	●	●
11.000	12.000	102.00	55.00	45.00	●	●
11.100	12.000	102.00	55.00	45.00	●	●
11.110	12.000	102.00	55.00	45.00	●	●
11.200	12.000	102.00	55.00	45.00	●	●
11.300	12.000	102.00	55.00	45.00	●	●
11.400	12.000	102.00	55.00	45.00	●	●
11.500	12.000	102.00	55.00	45.00	●	●
11.600	12.000	102.00	55.00	45.00	●	●
11.700	12.000	102.00	55.00	45.00	●	●
11.800	12.000	102.00	55.00	45.00	●	●
11.900	12.000	102.00	55.00	45.00	●	●

Ⓨ TiAlSiN-coated

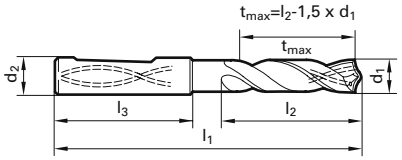
TS 100 H - TS-Drills with oil feed



d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	89423 Solid carbide 121 HA TS 100 H (Y) Availability	89424 Solid carbide 121 HE TS 100 H (Y) Availability
11.910	12.000	102.00	55.00	45.00	●	●
12.000	12.000	102.00	55.00	45.00	●	●
12.200	14.000	107.00	60.00	45.00	●	●
12.500	14.000	107.00	60.00	45.00	●	●
12.700	14.000	107.00	60.00	45.00	●	●
12.800	14.000	107.00	60.00	45.00	●	●
13.000	14.000	107.00	60.00	45.00	●	●
13.300	14.000	107.00	60.00	45.00	●	●
13.500	14.000	107.00	60.00	45.00	●	●
13.700	14.000	107.00	60.00	45.00	●	●
14.000	14.000	107.00	60.00	45.00	●	●
14.200	16.000	115.00	65.00	48.00	●	●
14.290	16.000	115.00	65.00	48.00	●	●
14.300	16.000	115.00	65.00	48.00	●	●
14.500	16.000	115.00	65.00	48.00	●	●
14.700	16.000	115.00	65.00	48.00	●	●
15.000	16.000	115.00	65.00	48.00	●	●
15.200	16.000	115.00	65.00	48.00	●	●
15.300	16.000	115.00	65.00	48.00	●	●
15.500	16.000	115.00	65.00	48.00	●	●
15.700	16.000	115.00	65.00	48.00	●	●
16.000	16.000	115.00	65.00	48.00	●	●
16.300	18.000	123.00	73.00	48.00	●	●
16.500	18.000	123.00	73.00	48.00	●	●
16.900	18.000	123.00	73.00	48.00	●	●
17.000	18.000	123.00	73.00	48.00	●	●
17.300	18.000	123.00	73.00	48.00	●	●
17.500	18.000	123.00	73.00	48.00	●	●
18.000	18.000	123.00	73.00	48.00	●	●
18.500	20.000	131.00	79.00	50.00	●	●
18.900	20.000	131.00	79.00	50.00	●	●
19.000	20.000	131.00	79.00	50.00	●	●
19.050	20.000	131.00	79.00	50.00	●	●
19.300	20.000	131.00	79.00	50.00	●	●
19.500	20.000	131.00	79.00	50.00	●	●
20.000	20.000	131.00	79.00	50.00	●	●

(Y) TiAlSiN-coated

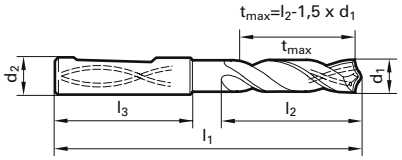
TS 100 H - TS-Drills with oil feed



d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	89425 Solid carbide 121 HA TS 100 H (Y) Availability	89426 Solid carbide 121 HE TS 100 H (Y) Availability
3.000	6.000	66.00	28.00	36.00	●	●
3.100	6.000	66.00	28.00	36.00	●	●
3.170	6.000	66.00	28.00	36.00	●	●
3.200	6.000	66.00	28.00	36.00	●	●
3.250	6.000	66.00	28.00	36.00	●	●
3.300	6.000	66.00	28.00	36.00	●	●
3.400	6.000	66.00	28.00	36.00	●	●
3.500	6.000	66.00	28.00	36.00	●	●
3.570	6.000	66.00	28.00	36.00	●	●
3.600	6.000	66.00	28.00	36.00	●	●
3.700	6.000	66.00	28.00	36.00	●	●
3.800	6.000	74.00	36.00	36.00	●	●
3.900	6.000	74.00	36.00	36.00	●	●
3.970	6.000	74.00	36.00	36.00	●	●
4.000	6.000	74.00	36.00	36.00	●	●
4.100	6.000	74.00	36.00	36.00	●	●
4.200	6.000	74.00	36.00	36.00	●	●
4.300	6.000	74.00	36.00	36.00	●	●
4.370	6.000	74.00	36.00	36.00	●	●
4.400	6.000	74.00	36.00	36.00	●	●
4.500	6.000	74.00	36.00	36.00	●	●
4.600	6.000	74.00	36.00	36.00	●	●
4.650	6.000	74.00	36.00	36.00	●	●
4.700	6.000	74.00	36.00	36.00	●	●
4.760	6.000	82.00	44.00	36.00	●	●
4.800	6.000	82.00	44.00	36.00	●	●
4.900	6.000	82.00	44.00	36.00	●	●
5.000	6.000	82.00	44.00	36.00	●	●
5.100	6.000	82.00	44.00	36.00	●	●
5.160	6.000	82.00	44.00	36.00	●	●
5.200	6.000	82.00	44.00	36.00	●	●
5.300	6.000	82.00	44.00	36.00	●	●
5.400	6.000	82.00	44.00	36.00	●	●
5.500	6.000	82.00	44.00	36.00	●	●
5.550	6.000	82.00	44.00	36.00	●	●
5.560	6.000	82.00	44.00	36.00	●	●
5.600	6.000	82.00	44.00	36.00	●	●
5.700	6.000	82.00	44.00	36.00	●	●
5.800	6.000	82.00	44.00	36.00	●	●
5.900	6.000	82.00	44.00	36.00	●	●
5.950	6.000	82.00	44.00	36.00	●	●
6.000	6.000	82.00	44.00	36.00	●	●
6.100	8.000	91.00	53.00	36.00	●	●
6.200	8.000	91.00	53.00	36.00	●	●
6.300	8.000	91.00	53.00	36.00	●	●
6.350	8.000	91.00	53.00	36.00	●	●
6.400	8.000	91.00	53.00	36.00	●	●
6.500	8.000	91.00	53.00	36.00	●	●
6.600	8.000	91.00	53.00	36.00	●	●
6.700	8.000	91.00	53.00	36.00	●	●
6.750	8.000	91.00	53.00	36.00	●	●
6.800	8.000	91.00	53.00	36.00	●	●
6.900	8.000	91.00	53.00	36.00	●	●
7.000	8.000	91.00	53.00	36.00	●	●
7.100	8.000	91.00	53.00	36.00	●	●
7.140	8.000	91.00	53.00	36.00	●	●
7.200	8.000	91.00	53.00	36.00	●	●

(Y) TiAlSiN-coated

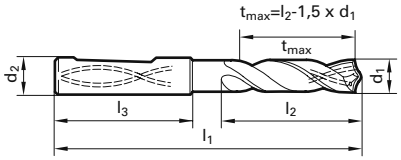
TS 100 H - TS-Drills with oil feed



					89425	89426
					Solid carbide	
					121 HA TS 100 H Ⓨ	121 HE TS 100 H Ⓨ
d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability	
7.300	8.000	91.00	53.00	36.00	●	●
7.400	8.000	91.00	53.00	36.00	●	●
7.500	8.000	91.00	53.00	36.00	●	●
7.540	8.000	91.00	53.00	36.00	●	●
7.600	8.000	91.00	53.00	36.00	●	●
7.700	8.000	91.00	53.00	36.00	●	●
7.800	8.000	91.00	53.00	36.00	●	●
7.900	8.000	91.00	53.00	36.00	●	●
7.940	8.000	91.00	53.00	36.00	●	●
8.000	8.000	91.00	53.00	36.00	●	●
8.100	10.000	103.00	61.00	40.00	●	●
8.200	10.000	103.00	61.00	40.00	●	●
8.300	10.000	103.00	61.00	40.00	●	●
8.330	10.000	103.00	61.00	40.00	●	●
8.400	10.000	103.00	61.00	40.00	●	●
8.500	10.000	103.00	61.00	40.00	●	●
8.600	10.000	103.00	61.00	40.00	●	●
8.700	10.000	103.00	61.00	40.00	●	●
8.730	10.000	103.00	61.00	40.00	●	●
8.800	10.000	103.00	61.00	40.00	●	●
8.900	10.000	103.00	61.00	40.00	●	●
9.000	10.000	103.00	61.00	40.00	●	●
9.100	10.000	103.00	61.00	40.00	●	●
9.130	10.000	103.00	61.00	40.00	●	●
9.200	10.000	103.00	61.00	40.00	●	●
9.250	10.000	103.00	61.00	40.00	●	●
9.300	10.000	103.00	61.00	40.00	●	●
9.400	10.000	103.00	61.00	40.00	●	●
9.500	10.000	103.00	61.00	40.00	●	●
9.520	10.000	103.00	61.00	40.00	●	●
9.600	10.000	103.00	61.00	40.00	●	●
9.700	10.000	103.00	61.00	40.00	●	●
9.800	10.000	103.00	61.00	40.00	●	●
9.900	10.000	103.00	61.00	40.00	●	●
9.920	10.000	103.00	61.00	40.00	●	●
10.000	10.000	103.00	61.00	40.00	●	●
10.100	12.000	118.00	71.00	45.00	●	●
10.200	12.000	118.00	71.00	45.00	●	●
10.300	12.000	118.00	71.00	45.00	●	●
10.320	12.000	118.00	71.00	45.00	●	●
10.400	12.000	118.00	71.00	45.00	●	●
10.500	12.000	118.00	71.00	45.00	●	●
10.600	12.000	118.00	71.00	45.00	●	●
10.700	12.000	118.00	71.00	45.00	●	●
10.800	12.000	118.00	71.00	45.00	●	●
10.900	12.000	118.00	71.00	45.00	●	●
11.000	12.000	118.00	71.00	45.00	●	●
11.100	12.000	118.00	71.00	45.00	●	●
11.110	12.000	118.00	71.00	45.00	●	●
11.200	12.000	118.00	71.00	45.00	●	●
11.300	12.000	118.00	71.00	45.00	●	●
11.400	12.000	118.00	71.00	45.00	●	●
11.500	12.000	118.00	71.00	45.00	●	●
11.600	12.000	118.00	71.00	45.00	●	●
11.700	12.000	118.00	71.00	45.00	●	●
11.800	12.000	118.00	71.00	45.00	●	●
11.900	12.000	118.00	71.00	45.00	●	●

Ⓨ TiAlSiN-coated

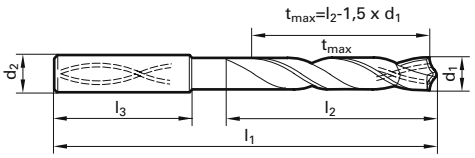
TS 100 H - TS-Drills with oil feed



d1	d2	l1	l2	l3	89425	89426
					Solid carbide	
					121 HA TS 100 H Ⓨ	121 HE TS 100 H Ⓨ
mm	mm	mm	mm	mm	Availability	
11.910	12.000	118.00	71.00	45.00	●	●
12.000	12.000	118.00	71.00	45.00	●	●
12.200	14.000	124.00	77.00	45.00	●	●
12.500	14.000	124.00	77.00	45.00	●	●
12.700	14.000	124.00	77.00	45.00	●	●
12.800	14.000	124.00	77.00	45.00	●	●
13.000	14.000	124.00	77.00	45.00	●	●
13.300	14.000	124.00	77.00	45.00	●	●
13.500	14.000	124.00	77.00	45.00	●	●
13.700	14.000	124.00	77.00	45.00	●	●
14.000	14.000	124.00	77.00	45.00	●	●
14.200	16.000	133.00	83.00	48.00	●	●
14.290	16.000	133.00	83.00	48.00	●	●
14.300	16.000	133.00	83.00	48.00	●	●
14.500	16.000	133.00	83.00	48.00	●	●
14.700	16.000	133.00	83.00	48.00	●	●
15.000	16.000	133.00	83.00	48.00	●	●
15.200	16.000	133.00	83.00	48.00	●	●
15.300	16.000	133.00	83.00	48.00	●	●
15.500	16.000	133.00	83.00	48.00	●	●
15.700	16.000	133.00	83.00	48.00	●	●
16.000	16.000	133.00	83.00	48.00	●	●
16.300	18.000	143.00	93.00	48.00	●	●
16.500	18.000	143.00	93.00	48.00	●	●
16.900	18.000	143.00	93.00	48.00	●	●
17.000	18.000	143.00	93.00	48.00	●	●
17.300	18.000	143.00	93.00	48.00	●	●
17.500	18.000	143.00	93.00	48.00	●	●
18.000	18.000	143.00	93.00	48.00	●	●
18.500	20.000	153.00	101.00	50.00	●	●
18.900	20.000	153.00	101.00	50.00	●	●
19.000	20.000	153.00	101.00	50.00	●	●
19.050	20.000	153.00	101.00	50.00	●	●
19.300	20.000	153.00	101.00	50.00	●	●
19.500	20.000	153.00	101.00	50.00	●	●
20.000	20.000	153.00	101.00	50.00	●	●

Ⓨ TiAlSiN-coated

TS 100 H - TS-Drills with oil feed



d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	89427 Solid carbide 121 HA TS 100 H Ⓨ Availability
3,000	6,000	70,00	30,00	36,00	●
3,250	6,000	70,00	30,00	36,00	●
3,300	6,000	70,00	30,00	36,00	●
3,400	6,000	75,00	35,50	36,00	●
3,500	6,000	75,00	35,50	36,00	●
3,700	6,000	75,00	35,50	36,00	●
4,000	6,000	75,00	37,50	36,00	●
4,200	6,000	75,00	37,50	36,00	●
4,300	6,000	85,00	45,00	36,00	●
4,500	6,000	85,00	45,00	36,00	●
4,650	6,000	85,00	45,00	36,00	●
5,000	6,000	90,00	50,00	36,00	●
5,100	6,000	90,00	50,00	36,00	●
5,200	6,000	90,00	50,00	36,00	●
5,500	6,000	97,00	57,00	36,00	●
5,550	6,000	97,00	57,00	36,00	●
6,000	6,000	97,00	57,00	36,00	●
6,500	8,000	106,00	66,00	36,00	●
6,750	8,000	106,00	66,00	36,00	●
6,800	8,000	106,00	66,00	36,00	●
6,900	8,000	116,00	76,00	36,00	●
7,000	8,000	116,00	76,00	36,00	●
7,400	8,000	116,00	76,00	36,00	●
7,500	8,000	116,00	76,00	36,00	●
7,800	8,000	116,00	76,00	36,00	●
8,000	8,000	116,00	76,00	36,00	●
8,500	10,000	131,00	87,00	40,00	●
8,600	10,000	131,00	87,00	40,00	●
8,800	10,000	131,00	87,00	40,00	●
9,000	10,000	131,00	87,00	40,00	●
9,250	10,000	139,00	95,00	40,00	●
9,400	10,000	139,00	95,00	40,00	●
9,500	10,000	139,00	95,00	40,00	●
10,000	10,000	139,00	95,00	40,00	●
10,200	12,000	155,00	106,00	45,00	●
10,400	12,000	155,00	106,00	45,00	●
10,500	12,000	155,00	106,00	45,00	●
10,800	12,000	155,00	106,00	45,00	●
11,000	12,000	155,00	106,00	45,00	●
11,300	12,000	163,00	114,00	45,00	●
11,400	12,000	163,00	114,00	45,00	●
11,500	12,000	163,00	114,00	45,00	●
12,000	12,000	163,00	114,00	45,00	●
12,500	14,000	182,00	133,00	45,00	●
13,000	14,000	182,00	133,00	45,00	●
13,100	14,000	182,00	133,00	45,00	●
13,500	14,000	182,00	133,00	45,00	●
14,000	14,000	182,00	133,00	45,00	●
14,500	16,000	204,00	152,00	48,00	●
15,000	16,000	204,00	152,00	48,00	●
15,100	16,000	204,00	152,00	48,00	●
15,500	16,000	204,00	152,00	48,00	●
16,000	16,000	204,00	152,00	48,00	●

Ⓨ TiAlSiN-coated

HARTNER

Application recommendations for TS 100 H

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

Order-no.	
Standard/DIN	
Tool material	
Carbide grade	
Type	
Surface finish	
Cooling	

Drill Ø mm	Feed column no.								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	f (mm/rev.)								
0.500	0.004	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.019
1.000	0.006	0.008	0.012	0.014	0.016	0.018	0.020	0.023	0.025
2.000	0.020	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125
2.500	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3.150	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.160
4.000	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
5.000	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6.300	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8.000	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10.000	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12.500	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16.000	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630
20.000	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.630
25.000	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800
31.500	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000
40.000	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250
50.000	0.250	0.310	0.400	0.500	0.630	0.800	1.000	1.250	1.250
63.000	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600
80.000	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600	2.000

Cooling:
- ☒ without coolant ducts
- ■ with coolant ducts

Coolant:
- ○ Air
- ● Neat oil
- ● Soluble oil

Material group	Material examples, new description (old description in brackets) Figures in bold = material no. to DIN EN	Tensile strength MPa (N/mm²)	Hardness	Coolant
Common structural steels	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		○
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		○
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		○
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		○
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		○
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		○
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		○
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		○
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		○
Unalloyed case hardened steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		○
Alloyed case hardened steels	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●
Nitriding steels	**1.8504** 34CrAl6	≤1000		○
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		○
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●
austenitic	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●
martensitic	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●
Hardened steels	–		≤48 HRC	●
			≤66 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	○ ○
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	○ ○
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	○
malleable cast iron	**0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	○
Chilled cast iron	–		≤350 HB	○
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		○
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		○
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		○
≤ 24 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		○
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		○
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		○
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		○
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		○ ●
	2.0790 CuNi18Zn19Pb	≤850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●

Ⓨ TiAlSiN-coated

HARTNER

Application recommendations for TS 100 H

≤3xD

89423	89424
DIN 6537 K	DIN 6537 K
Solid carbide	Solid carbide
K/P	K/P
TS 100 H	TS 100 H
Y	Y
■	■

v_c m/min	Feed column no.	
145	7	7
120	6	6
170	8	8
145	8	8
130	8	8
125	7	7
120	7	7
120	7	7
105	7	7
145	8	8
120	7	7
85	5	5
110	7	7
105	5	5
80	6	6
65	5	5
60	4	4
60	3	3
55	3	3
35	2	2
35	4	4
45	4	4
40	3	3

≤3xD

89422
DIN 6537 K
Solid carbide
K/P
TS 100 H
Y
☒

v_c m/min	Feed column no.
130	7
110	6
145	8
110	7
120	7
110	7
105	7
105	7
100	6
130	8
120	7
85	5
100	6
90	5
65	6
55	5
55	4
45	3
45	3
25	2
25	4
40	3
35	3

≤5xD

89425	89426
DIN 6537 L	DIN 6537 L
Solid carbide	Solid carbide
K/P	K/P
TS 100 H	TS 100 H
Y	Y
■	■

v_c m/min	Feed column no.	
145	7	7
120	6	6
170	8	8
145	8	8
130	8	8
125	7	7
120	7	7
120	7	7
105	7	7
145	8	8
120	7	7
85	5	5
110	7	7
105	5	5
80	6	6
65	5	5
60	4	4
60	3	3
55	3	3
35	2	2
35	4	4
45	4	4
40	3	3

≤7xD

89427
Hartner std.
Solid carbide
K/P
TS 100 H
Y
■

v_c m/min	Feed column no.
145	6
120	5
170	7
145	7
130	7
125	6
120	6
120	6
105	6
145	7
120	6
85	4
110	6
105	4
80	5
65	4
60	3
60	2
55	2
35	1
35	3
45	3
40	3

HARTNER

TS 100 R - The specialist for cast materials

New materials require new tooling solutions. As an innovative tool manufacturer, Hartner has always followed this concept and is reacting to the increasing application of CGI (cast iron with compacted graphite iron) and ADI (austempered ductile iron) in the automotive industry with the new TS Drill type TS 100 R.

High tensile strength is exceptionally demanding
CGI and ADI offer high tensile strengths, i.e. making it possible to increase the output of an engine whilst keeping the wall thickness of the engine block the same or to reduce the weight through thinner wall thicknesses whilst keeping the output of the engine the same. Subsequently, the automotive industry is demanding tools from tool manufacturers that can economically machine these new materials. Conventional drills have so far not achieved satisfactory results.

Hartner has therefore developed the new TS Drill type TS 100 R. Thanks to its patented radius point geometry, it offers highest performance and economic efficiency for the machining of the new materials. With its unique balance of face contour and flute profile it provides rigidity, dimensional accuracy and process reliability.

Powerful in common cast materials
The new radius point geometry offers more than machining of CGI and ADI. It is also recommended for the machining of common cast materials such as grey cast iron, spheroidal graphite and malleable cast iron.

Drilling depths
The two drilling depths 5 x D and 7 x D with internal cooling are suitable for a wide range of applications. Furthermore, the TS 100 R is available as a special tool with or without internal cooling to fit your specific application. Hartner can, for example, provide application-orientated coatings or even modify the design of a step drill. For the special tool request form please see page 49.

Our recommendation:
The TS 100 R drills are especially suited for machining under minimal quantity lubrication conditions. With MQL, we recommend a tool design with conical shank end and the application of Hartner‘s MQL screw and components. Please contact our technical service department for more information.

Selected machining results with TS 100 R drills

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

TS 100 R - The specialist for cast materials

Order no. 89420

Special drill with patented radius geometry for CGI and ADI as well as all cast materials.
Suitable for drilliing depths ≤ 5 x D.

Advantages:
Optimal performance and economical efficiency. Extremely rigid, dimensionally accurate and process reliable thanks to unique adaptation of face contour and flute geometry.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch flat for application in shrink fit/hydraulic chucks.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	F
Type	TS 100 R
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	
Tolerance	m7

Order no. 89421

Special drill with patented radius geometry for CGI and ADI as well as all cast materials.
Suitable for drilliing depths ≤ 7 x D.

Advantages:
Optimal performance and economical efficiency. Extremely rigid, dimensionally accurate and process reliable thanks to unique adaptation of face contour and flute geometry.

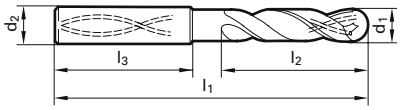
Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. The tool is available without whistle notch flat for application in shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	F
Type	TS 100 R
Shank	HA
Cutting direction	rh
Point grinding	Relieved cone
Point angle°	
Tolerance	m7

F FIRE-coated

HARTNER

TS 100 R 5 x D

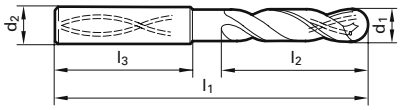


					89420
					Solid carbide/K20
					DIN 6537L
					165
					■
					F
d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability
3,00	6	66	28	36	●
3,10	6	66	28	36	●
3,17	6	66	28	36	●
3,20	6	66	28	36	●
3,25	6	66	28	36	●
3,30	6	66	28	36	●
3,40	6	66	28	36	●
3,50	6	66	28	36	●
3,57	6	66	28	36	●
3,60	6	66	28	36	●
3,70	6	66	28	36	●
3,80	6	74	36	36	●
3,90	6	74	36	36	●
3,97	6	74	36	36	●
4,00	6	74	36	36	●
4,10	6	74	36	36	●
4,20	6	74	36	36	●
4,30	6	74	36	36	●
4,37	6	74	36	36	●
4,40	6	74	36	36	●
4,50	6	74	36	36	●
4,60	6	74	36	36	●
4,65	6	74	36	36	●
4,70	6	74	36	36	●
4,76	6	82	44	36	●
4,80	6	82	44	36	●
4,90	6	82	44	36	●
5,00	6	82	44	36	●
5,10	6	82	44	36	●
5,16	6	82	44	36	●
5,20	6	82	44	36	●
5,30	6	82	44	36	●
5,40	6	82	44	36	●
5,50	6	82	44	36	●
5,55	6	82	44	36	●
5,56	6	82	44	36	●
5,60	6	82	44	36	●
5,70	6	82	44	36	●
5,80	6	82	44	36	●
5,90	6	82	44	36	●
5,95	6	82	44	36	●
6,00	6	82	44	36	●
6,10	8	91	53	36	●
6,20	8	91	53	36	●
6,30	8	91	53	36	●
6,35	8	91	53	36	●
6,40	8	91	53	36	●
6,50	8	91	53	36	●
6,60	8	91	53	36	●
6,70	8	91	53	36	●
6,75	8	91	53	36	●
6,80	8	91	53	36	●
6,90	8	91	53	36	●
7,00	8	91	53	36	●
7,10	8	91	53	36	●
7,14	8	91	53	36	●
7,20	8	91	53	36	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R 5 x D

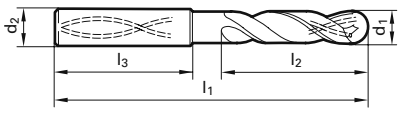


					89420
					Solid carbide/K20
					DIN 6537L
					165
					■
					F
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
7,30	8	91	53	36	●
7,40	8	91	53	36	●
7,50	8	91	53	36	●
7,54	8	91	53	36	●
7,60	8	91	53	36	●
7,70	8	91	53	36	●
7,80	8	91	53	36	●
7,90	8	91	53	36	●
7,94	8	91	53	36	●
8,00	8	91	53	36	●
8,10	10	103	61	40	●
8,20	10	103	61	40	●
8,30	10	103	61	40	●
8,33	10	103	61	40	●
8,40	10	103	61	40	●
8,50	10	103	61	40	●
8,60	10	103	61	40	●
8,70	10	103	61	40	●
8,73	10	103	61	40	●
8,80	10	103	61	40	●
8,90	10	103	61	40	●
9,00	10	103	61	40	●
9,10	10	103	61	40	●
9,13	10	103	61	40	●
9,20	10	103	61	40	●
9,25	10	103	61	40	●
9,30	10	103	61	40	●
9,40	10	103	61	40	●
9,50	10	103	61	40	●
9,52	10	103	61	40	●
9,60	10	103	61	40	●
9,70	10	103	61	40	●
9,80	10	103	61	40	●
9,90	10	103	61	40	●
9,92	10	103	61	40	●
10,00	10	103	61	40	●
10,10	12	118	71	45	●
10,20	12	118	71	45	●
10,30	12	118	71	45	●
10,32	12	118	71	45	●
10,40	12	118	71	45	●
10,50	12	118	71	45	●
10,60	12	118	71	45	●
10,70	12	118	71	45	●
10,72	12	118	71	45	●
10,80	12	118	71	45	●
10,90	12	118	71	45	●
11,00	12	118	71	45	●
11,10	12	118	71	45	●
11,11	12	118	71	45	●
11,20	12	118	71	45	●
11,30	12	118	71	45	●
11,40	12	118	71	45	●
11,50	12	118	71	45	●
11,60	12	118	71	45	●
11,70	12	118	71	45	●
11,80	12	118	71	45	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R 5 x D

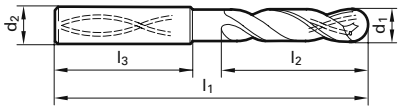


					89420
					Solid carbide/K20
					DIN 6537L
					165
					■
					F
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
11,90	12	118	71	45	●
11,91	12	118	71	45	●
12,00	12	118	71	45	●
12,10	14	124	77	45	●
12,20	14	124	77	45	●
12,30	14	124	77	45	●
12,40	14	124	77	45	●
12,50	14	124	77	45	●
12,60	14	124	77	45	●
12,70	14	124	77	45	●
12,80	14	124	77	45	●
12,90	14	124	77	45	●
13,00	14	124	77	45	●
13,10	14	124	77	45	●
13,30	14	124	77	45	●
13,40	14	124	77	45	●
13,50	14	124	77	45	●
13,70	14	124	77	45	●
13,80	14	124	77	45	●
13,90	14	124	77	45	●
14,00	14	124	77	45	●
14,10	16	133	83	48	●
14,20	16	133	83	48	●
14,29	16	133	83	48	●
14,30	16	133	83	48	●
14,40	16	133	83	48	●
14,50	16	133	83	48	●
14,60	16	133	83	48	●
14,70	16	133	83	48	●
14,90	16	133	83	48	●
15,00	16	133	83	48	●
15,10	16	133	83	48	●
15,20	16	133	83	48	●
15,30	16	133	83	48	●
15,40	16	133	83	48	●
15,50	16	133	83	48	●
15,60	16	133	83	48	●
15,70	16	133	83	48	●
15,80	16	133	83	48	●
15,87	16	133	83	48	●
15,90	16	133	83	48	●
16,00	16	133	83	48	●
16,50	18	143	93	48	●
16,67	18	143	93	48	●
17,00	18	143	93	48	●
17,50	18	143	93	48	●
18,00	18	143	93	48	●
18,50	20	153	101	50	●
19,00	20	153	101	50	●
19,50	20	153	101	50	●
20,00	20	153	101	50	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R 7 x D

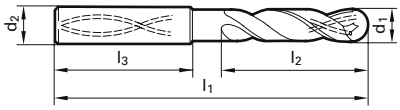


					89421
					Solid carbide/K20
					Hartner std.
					165
					■
					F
d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability
4,00	6	75	37,5	36	●
4,10	6	75	37,5	36	●
4,20	6	75	37,5	36	●
4,30	6	85	45	36	●
4,37	6	85	45	36	●
4,40	6	85	45	36	●
4,50	6	85	45	36	●
4,60	6	85	45	36	●
4,65	6	85	45	36	●
4,70	6	85	45	36	●
4,76	6	90	50	36	●
4,80	6	90	50	36	●
4,90	6	90	50	36	●
5,00	6	90	50	36	●
5,10	6	90	50	36	●
5,16	6	90	50	36	●
5,20	6	90	50	36	●
5,30	6	90	50	36	●
5,40	6	97	57	36	●
5,50	6	97	57	36	●
5,55	6	97	57	36	●
5,56	6	97	57	36	●
5,60	6	97	57	36	●
5,70	6	97	57	36	●
5,80	6	97	57	36	●
5,90	6	97	57	36	●
5,95	6	97	57	36	●
6,00	6	97	57	36	●
6,10	8	106	66	36	●
6,20	8	106	66	36	●
6,30	8	106	66	36	●
6,35	8	106	66	36	●
6,40	8	106	66	36	●
6,50	8	106	66	36	●
6,60	8	106	66	36	●
6,70	8	106	66	36	●
6,75	8	106	66	36	●
6,80	8	106	66	36	●
6,90	8	116	76	36	●
7,00	8	116	76	36	●
7,10	8	116	76	36	●
7,14	8	116	76	36	●
7,20	8	116	76	36	●
7,30	8	116	76	36	●
7,40	8	116	76	36	●
7,50	8	116	76	36	●
7,54	8	116	76	36	●
7,60	8	116	76	36	●
7,70	8	116	76	36	●
7,80	8	116	76	36	●
7,90	8	116	76	36	●
7,94	8	116	76	36	●
8,00	8	116	76	36	●
8,10	10	131	87	40	●
8,20	10	131	87	40	●
8,30	10	131	87	40	●
8,33	10	131	87	40	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R 7 x D

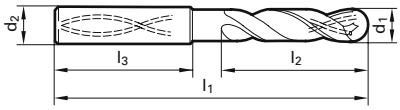


					89421
					Solid carbide/K20
					Hartner std.
					165
					■
					F
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
8,40	10	131	87	40	●
8,50	10	131	87	40	●
8,60	10	131	87	40	●
8,70	10	131	87	40	●
8,73	10	131	87	40	●
8,80	10	131	87	40	●
8,90	10	131	87	40	●
9,00	10	131	87	40	●
9,10	10	139	95	40	●
9,13	10	139	95	40	●
9,20	10	139	95	40	●
9,25	10	139	95	40	●
9,30	10	139	95	40	●
9,40	10	139	95	40	●
9,50	10	139	95	40	●
9,52	10	139	95	40	●
9,60	10	139	95	40	●
9,70	10	139	95	40	●
9,80	10	139	95	40	●
9,90	10	139	95	40	●
9,92	10	139	95	40	●
10,00	10	139	95	40	●
10,10	12	155	106	45	●
10,20	12	155	106	45	●
10,30	12	155	106	45	●
10,32	12	155	106	45	●
10,40	12	155	106	45	●
10,50	12	155	106	45	●
10,60	12	155	106	45	●
10,70	12	155	106	45	●
10,72	12	155	106	45	●
10,80	12	155	106	45	●
10,90	12	155	106	45	●
11,00	12	155	106	45	●
11,10	12	163	114	45	●
11,11	12	163	114	45	●
11,20	12	163	114	45	●
11,30	12	163	114	45	●
11,40	12	163	114	45	●
11,50	12	163	114	45	●
11,60	12	163	114	45	●
11,70	12	163	114	45	●
11,80	12	163	114	45	●
11,90	12	163	114	45	●
11,91	12	163	114	45	●
12,00	12	163	114	45	●
12,10	14	182	133	45	●
12,20	14	182	133	45	●
12,30	14	182	133	45	●
12,40	14	182	133	45	●
12,50	14	182	133	45	●
12,60	14	182	133	45	●
12,70	14	182	133	45	●
12,80	14	182	133	45	●
12,90	14	182	133	45	●
13,00	14	182	133	45	●
13,10	14	182	133	45	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R 7 x D



					89421
					Solid carbide/K20
					Hartner std.
					165
					■
					F
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
13,30	14	182	133	45	●
13,40	14	182	133	45	●
13,50	14	182	133	45	●
13,70	14	182	133	45	●
13,80	14	182	133	45	●
13,90	14	182	133	45	●
14,00	14	182	133	45	●
14,10	16	204	152	48	●
14,20	16	204	152	48	●
14,29	16	204	152	48	●
14,30	16	204	152	48	●
14,40	16	204	152	48	●
14,50	16	204	152	48	●
14,60	16	204	152	48	●
14,70	16	204	152	48	●
14,90	16	204	152	48	●
15,00	16	204	152	48	●
15,10	16	204	152	48	●
15,20	16	204	152	48	●
15,30	16	204	152	48	●
15,40	16	204	152	48	●
15,50	16	204	152	48	●
15,60	16	204	152	48	●
15,70	16	204	152	48	●
15,80	16	204	152	48	●
15,87	16	204	152	48	●
15,90	16	204	152	48	●
16,00	16	204	152	48	●
16,50	18	223	171	48	●
16,67	18	223	171	48	●
17,00	18	223	171	48	●
17,50	18	223	171	48	●
18,00	18	223	171	48	●
18,50	20	244	190	50	●
19,00	20	244	190	50	●
19,50	20	244	190	50	●
20,00	20	244	190	50	●

F FIRE-coated ■ with internal cooling

HARTNER

TS 100 R - Recommendations

General hints:
Powerful machines, no play in spindle bearings, alignment accurate tool holders. Max. concentricity error of clamped tools 0.02 mm, high coolant pressures.
We recommend the application of hydraulic chucks or shrink fit chucks.

Coolant hints:
We recommend lubrication by soluble oil or neat oil.
Under special conditions cooling just by air is possible. But instead of air cooling we would always prefer minimal quantity lubrication, that the tools are especially suited for. With MQL we recommend the conical shank end and the Hartner MQL components. Please contact our technical service department for more information.

Article no.	89420	89421
Standard/DIN	6537L	Hartner
Tool material	Solid carbide	
Carbide grade	K/P	K/P
Surface finish	F	F
Cooling	axial	axial
Drilling depth	~ 5 x D	~ 7 x D

Drill Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
2,50	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
3,15	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
4,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
5,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
6,30	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
8,00	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
10,00	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
12,50	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
16,00	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
20,00	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
25,00	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800

Tool material	Material examples *Figures in bold = material no. to DIN EN*	Tens. strength MPa (N/mm²)	Hard-ness	v_c m/min	Feed column no.	
Common structural steels	**1.0035** S185, **1.0486** StE P275N, **1.0345** P235GH, **1.0425** P265GH	≤ 500				
	1.0050 E295, **1.0070** E360, **1.8937** P500NH	> 500-850				
Free-cutting steels	**1.0718** 11SMnPb30, **1.0736** 115Mn37	≤850				
	1.0727 46 S20, **1.0728** 60 S20, **1.0757** 46SPb20	850-1000				
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E	≤700				
	1.0503 C45, **1.1191** C45E	700-850				
	1.0601 C60, **1.1221** C60E	850-1000				
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	850-1000				
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	1000-1200				
Unall. case hardened steels	**1.0301** C10, **1.1121** C10E	≤750				
Alloyed case hardened steels	**1.7043** 38Cr4	850-1000				
	1.5752 14NiCr14, **1.7131** 16MnCr5, **1.7264** 20CrMo5	1000-1200				
Nitriding steels	**1.8504** 34CrAl6	850-1000				
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	1000-1200				
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850				
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	850-1000				
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** 61CrV4	≥650-1000				
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4		≤330 HB			
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18 9	≤850				
austenitic	**1.4301** X5CrNi18 10, **1.4541** X6CrNiTi18 10, **1.4571** X6CrNiMoTi 17 12 2	≤850				
martensitic	**1.4057** X17CrNi16-1, **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18 2	≤850				
Hardened steels	–		≤40-60 HRC			
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200				
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	210	**9**	**8**
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		<300 HB	160	**9**	**8**
New cast materials CGI	**EN-GJV250** (GGV25), **EN-GJV350** (GGV35)			130	**9**	**7**
	EN-GJV400 (GGV40), **EN-GJV500** (GGV50), SiMo 6			100	**8**	**7**
New cast materials ADI	**EN-GJS-800-8** (ADI800), **EN-GJS-1000-5** (ADI1000)	800-1000		80	**8**	**7**
	EN-GJS-1200-2 (ADI1200), **EN-GJS-1400-1** (ADI1400)	1200-1400		60	**8**	**7**
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	160	**8**	**8**
malleable cast iron	**0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		<300 HB	130	**8**	**7**
Chilled cast iron	–		≤350 HB			
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850				
	3.7154 TiAl6Zr5, **3.7164** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	850-1200				
Al and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400				
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤450				
Al cast iron ≤ 10% Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600				
> 10% Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600				
Magnesiumalloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450				
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤400				
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600				
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600				
Bronze, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600				
	2.0250 CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	>600-850				
Bronze, long-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤850				
	2.0250 CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	850-1000				

F FIRE-coated

HARTNER

TS 100 R - The specialist for cast materials

❑ Inquiry ❑ Order by Fax to: +49 7431 125-21 547

Customer no. | New customer | Order no.

Contact person | Company | Contact

Hartner GmbH
P. O. Box 10 04 27
D-72425 Albstadt
Tel.: +497431 125-0
Fax: +497431 125-21 547
www.hartner.de

Street no. | Town/post code

Telephone | Fax

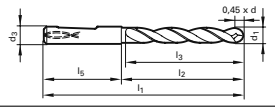
Date | Signature

WITHOUT step

TS 100 R

Carbide grade

K20



Relation of nom.-Ø d_2, shank-Ø d_3 and shank length l_5

nom.-Ø d_1 min/max	4-6	>6-8	>8-10	>10-12	>12-14	>14-16	>16-18	>18-20
shank-Ø d_3	6	8	10	12	14	16	18	20
shank length l_5	36		40	45		48		50

	Range	Complete
Nom.-Ø d_1	4.0 – 20.0 mm	
Shank-Ø d_3 to DIN 6535	see table above	
Shank design to DIN 6535	HA ■■■■, HE ■■■■	
Drilling depth l_3	max. 7 x D (run out min. 0.01-0.02)	
Flute length l_2	max. 155 mm	
Total length l_1	56 – 205 mm	
Double margins	yes / no	
Cooling	internal / external / soluble oil / min. quantity lubrication / dry	
Surface finish/coating	bright// FIRE/MolyGlide / AlTiN	
Workpiece material		
Quantity		

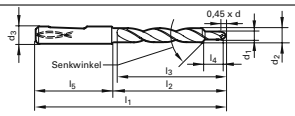
Standard tolerances: nom.-Ø = m7, shank-Ø = h6

WITH step

TS 100 R

Carbide grade

K20



Relation of nom.-Ø d_2, shank-Ø d_3 and shank length l_5

nom.-Ø d_2 min/max	4-6	>6-8	>8-10	>10-12	>12-14	>14-16	>16-18	>18-20
shank-Ø d_3	6	8	10	12	14	16	18	20
shank length l_5	36		40	45		48		50

	Range	Complete
Step-Ø d_1	4.0 – 20.0 mm	
Step-Ø d_2	4.0 – 20.0 mm	
Shank-Ø d_3 to DIN 6535	see table above	
Shank form to DIN 6535	HA ■■■■, HE ■■■■	
Step length l_4	5 – 100 mm	
Drilling depth l_3	max. 7 x D (run out min. 0.01-0.02)	
Flute length l_2	max. 155 mm	
Total length l_1	56 – 205 mm	
Step angle	60° / 90° / 120° / 180°	
Double margins	yes / no	
Cooling	internal / external / soluble oil / min. quantity lubrication / dry	
Surface finish/coating	bright// FIRE/MolyGlide / AlTiN	
Workpiece material		
Quantity		

Standard tolerances: step-Ø d_1 = m7; body-Ø d_2 = h7; shank-Ø d_3 = h6

HARTNER

TS 150 GG - The specialist for machining cast iron

Order no. 89292

Straight-fluted solid carbide drill with coolant ducts for the machining of short-chipping materials such as cast iron, grey cast iron, spheroidal graphite iron and malleable cast iron as well as aluminium alloys with high silicon content. For the production of holes with extremely high alignment accuracy (minimal deviation from straightness). Also available, on request, with our coatings.
For drilling depth ≤ 4 x D.

Advantages: Extremely good self-centering characteristics, close diameter tolerances, very good surface quality. High cutting speeds and high productivity.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. We recommend the application of shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	○
Type	TS 150 GG
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	120
Tolerance	m7

Order no. 89294

Straight-fluted solid carbide drill with coolant ducts for the machining of short-chipping materials such as cast iron, grey cast iron, spheroidal graphite iron and malleable cast iron as well as aluminium alloys with high silicon content. For the production holes with extremely high alignment accuracy (minimal deviation from straightness). Also available, on request, with our coatings.
For drilling depths up to 7 x D.

Advantages: Extremely good self-centering characteristics, close diameter tolerances, very good surface quality. High cutting speeds and high productivity.

Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. We recommend the application of shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	○
Type	TS 150 GG
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	120
Tolerance	m7

Order no. 89293

Straight-fluted drill for the drilling of short-chipping materials such as cast iron, grey cast iron, spheroidal graphite and malleable cast iron. For the production of holes with high alignment accuracy (minimal deviation from straightness).
The drills are available bright or with T-, A-, C- and F-coating, for further performance in special machining processes. Recoating is not necessary when regrinding.
For drilling depths up to 10 x D.

Advantages: Extremely good self-centering characteristics, close diameter tolerances, very good surface quality. High cutting speeds and high productivity.

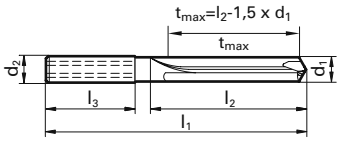
Preconditions for use:
Powerful machines. No play in spindle bearings. Alignment accurate tool holders. Max. concentricity error of clamped tools: 0.02 mm. Chatterfree, mechanical feeds. We recommend the application of shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	○
Type	TS 150 GG
Shank form	HA
Cutting direction	right-hand
Point grinding	Relieved cone
Point angle°	120
Tolerance	m7

○ bright

HARTNER

TS 150 GG - TS-Drills with oil feed 4 x D



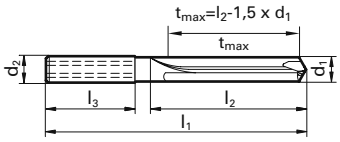
					89292
					Solid carbide
					121
					HA
					TS 150 GG
					◯
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
5.000	6.000	74.00	36.00	36.00	●
6.000	6.000	74.00	36.00	36.00	●
6.700	8.000	91.00	53.00	36.00	●
6.800	8.000	91.00	53.00	36.00	●
7.000	8.000	91.00	53.00	36.00	●
8.000	8.000	91.00	53.00	36.00	●
8.200	10.000	103.00	61.00	40.00	●
8.500	10.000	103.00	61.00	40.00	●
9.000	10.000	103.00	61.00	40.00	●
9.400	10.000	103.00	61.00	40.00	●
10.000	10.000	103.00	61.00	40.00	●
10.200	12.000	118.00	71.00	45.00	●
11.000	12.000	118.00	71.00	45.00	●
12.000	12.000	118.00	71.00	45.00	●
14.000	14.000	124.00	74.00	45.00	●
15.000	16.000	133.00	83.00	48.00	●
16.000	16.000	133.00	83.00	48.00	●
16.500	18.000	143.00	93.00	48.00	●
18.000	18.000	143.00	93.00	48.00	●
20.000	20.000	153.00	101.00	50.00	●

Intermediate sizes available

◯ bright

HARTNER

TS 150 GG - TS-Drills with oil feed 7 x D



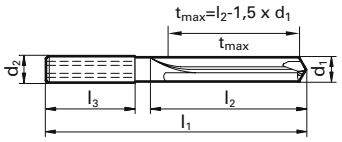
					89294
					Solid carbide
					121
					HA
					TS 150 GG
					◯
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.300	6.000	74.00	32.00	36.00	●
4.000	6.000	97.00	45.00	36.00	●
5.000	6.000	97.00	57.00	36.00	●
5.500	6.000	97.00	57.00	36.00	●
6.000	6.000	97.00	57.00	36.00	●
8.500	10.000	139.00	95.00	40.00	●
9.000	10.000	139.00	95.00	40.00	●
9.500	10.000	139.00	95.00	40.00	●
10.200	12.000	163.00	114.00	45.00	●
12.300	14.000	182.00	133.00	45.00	●
12.500	14.000	182.00	133.00	45.00	●
15.000	16.000	204.00	152.00	48.00	●
16.000	16.000	204.00	152.00	48.00	●
19.000	20.000	244.00	190.00	50.00	●

Intermediate sizes available

◯ bright

HARTNER

TS 150 GG - TS-Drills with oil feed 10 x D



					89293
					Solid carbide
					121
					HA
					TS 150 GG
					◯
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
3.000	6.000	91.00	42.00	36.00	●
3.170	6.000	91.00	42.00	36.00	●
3.250	6.000	91.00	42.00	36.00	●
3.300	6.000	91.00	42.00	36.00	●
3.500	6.000	91.00	48.00	36.00	●
3.570	6.000	91.00	48.00	36.00	●
3.800	6.000	121.00	77.00	36.00	●
3.970	6.000	121.00	77.00	36.00	●
4.000	6.000	121.00	77.00	36.00	●
4.200	6.000	121.00	77.00	36.00	●
4.400	6.000	121.00	77.00	36.00	●
4.500	6.000	121.00	77.00	36.00	●
5.000	6.000	121.00	82.00	36.00	●
5.500	6.000	121.00	82.00	36.00	●
6.000	6.000	121.00	82.00	36.00	●
6.350	8.000	146.00	106.00	36.00	●
6.500	8.000	146.00	106.00	36.00	●
6.800	8.000	146.00	106.00	36.00	●
7.000	8.000	146.00	106.00	36.00	●
7.140	8.000	146.00	106.00	36.00	●
7.500	8.000	146.00	106.00	36.00	●
7.800	8.000	146.00	106.00	36.00	●
8.000	8.000	146.00	106.00	36.00	●
8.500	10.000	175.00	130.00	40.00	●
8.730	10.000	175.00	130.00	40.00	●
9.000	10.000	175.00	130.00	40.00	●
9.500	10.000	175.00	130.00	40.00	●
9.520	10.000	175.00	130.00	40.00	●
10.000	10.000	175.00	130.00	40.00	●
10.200	12.000	209.00	159.00	45.00	●
10.500	12.000	209.00	159.00	45.00	●
10.720	12.000	209.00	159.00	45.00	●
11.000	12.000	209.00	159.00	45.00	●
11.500	12.000	209.00	159.00	45.00	●
12.000	12.000	209.00	159.00	45.00	●
12.500	14.000	233.00	183.00	45.00	●
12.700	14.000	233.00	183.00	45.00	●
13.000	14.000	233.00	183.00	45.00	●
13.500	14.000	233.00	183.00	45.00	●
14.000	14.000	233.00	183.00	45.00	●
14.500	16.000	260.00	207.00	48.00	●
15.000	16.000	260.00	207.00	48.00	●
15.500	16.000	260.00	207.00	48.00	●
16.000	16.000	260.00	207.00	48.00	●
18.000	18.000	284.00	231.00	48.00	●
20.000	20.000	308.00	255.00	50.00	●

Intermediate sizes available

◯ bright

HARTNER

Application recommendations for TS 150 GG

Order-no.
Standard/DIN
Tool material
Carbide grade
Surface finish
Type
Shank form
Cooling

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

Drill Ø mm	Feed column no. 1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
0.500	0.004	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.019
1.000	0.006	0.008	0.012	0.014	0.016	0.018	0.020	0.023	0.025
2.000	0.020	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125
2.500	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3.150	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.160
4.000	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
5.000	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6.300	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8.000	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10.000	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12.500	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16.000	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630
20.000	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.630
25.000	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800
31.500	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000
40.000	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250
50.000	0.250	0.310	0.400	0.500	0.630	0.800	1.000	1.250	1.250
63.000	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600
80.000	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600	2.000

Cooling:
☒ without coolant ducts
■ with coolant ducts

Coolant:
○ Air
● Neat oil
● Soluble oil

Material group	Material examples, new description (old description in brackets) Figures in bold = material no. to DIN EN	Tensile strength MPa (N/mm²)	Hardness	Coolant
Common structural steels	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		●
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		●
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		●
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		●
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		●
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		●
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		●
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		●
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		●
Unalloyed case hardened steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		●
Alloyed case hardened steels	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●
Nitriding steels	**1.8504** 34CrAl6	≤1000		●
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		●
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●
austenitic	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●
martensitic	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●
Hardened steels	–		≤48 HRC	●
			≤66 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	● ○
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	● ○
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	●
malleable cast iron	**0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	●
Chilled cast iron	–		≤350 HB	●
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		●
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		●
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		●
≤ 24 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		○
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		●
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		●
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		●
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		● ●
	2.0790 CuNi18Zn19Pb	≤850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●

○ bright

HARTNER

Application recommendations for TS 150 GG

≤4xD

89292
Hartner std.
Solid carbide
K
○
TS 150 GG
HA
■

v_c m/min	Feed column no.
100	6
80	6
80	6
70	6
180	7
160	7
150	7
120	6
180	6
180	6

≤7xD

89294
Hartner std.
Solid carbide
K
○
TS 150 GG
HA
■

v_c m/min	Feed column no.
120	6
100	6
90	6
80	6
40	2
410	8
410	8
380	**8**
330	**8**
280	7
110	6
80	5

≤10xD

89293
Hartner std.
Solid carbide
K
○
TS 150 GG
A
■

v_c m/min	Feed column no.
120	6
100	6
90	6
80	6
40	1
410	8
410	8
380	**8**
330	**8**
280	7
110	6
80	5

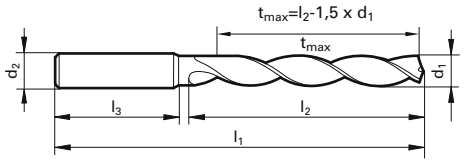
HARTNER

TS 3 G - The specialist for a precise and accurate hole form

Order no. 89247

A tool for heavy duty drilling from the solid, giving precise centering and accurate hole form. This includes applications such as oblique centering or interrupted drilling. Precision in size and surface finish correspond to those achieved with core drills. Centering or spotting is normally not required. Suitable for drilling cast iron and long-chipping aluminium alloys. For drilling depths up to 5 x D.

Standard	DIN 6537L
Tool material	Solid carbide
Surface	◯
Type	TS 3 G
Shank form	HA
Cutting direction	right-hand
Point grinding	Spiro-point
Point angle°	130
Tolerance	m7



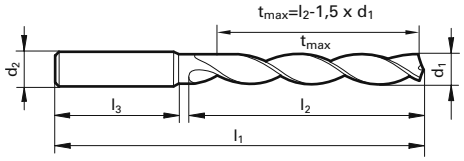
89247
Solid carbide
109
HA
TS 3 G
◯

d1 mm	d2 mm	l1 mm	l2 mm	l3 mm	Availability
3.100	6.000	66.00	28.00	36.00	●
3.200	6.000	66.00	28.00	36.00	●
3.300	6.000	66.00	28.00	36.00	●
3.500	6.000	66.00	28.00	36.00	●
3.700	6.000	66.00	28.00	36.00	●
3.800	6.000	74.00	36.00	36.00	●
4.000	6.000	74.00	36.00	36.00	●
4.100	6.000	74.00	36.00	36.00	●
4.200	6.000	74.00	36.00	36.00	●
4.500	6.000	74.00	36.00	36.00	●
4.800	6.000	82.00	44.00	36.00	●
5.000	6.000	82.00	44.00	36.00	●
5.100	6.000	82.00	44.00	36.00	●
5.200	6.000	82.00	44.00	36.00	●
5.300	6.000	82.00	44.00	36.00	●
5.500	6.000	82.00	44.00	36.00	●
5.800	6.000	82.00	44.00	36.00	●
6.000	6.000	82.00	44.00	36.00	●
6.100	8.000	91.00	53.00	36.00	●
6.200	8.000	91.00	53.00	36.00	●
6.400	8.000	91.00	53.00	36.00	●
6.500	8.000	91.00	53.00	36.00	●
6.700	8.000	91.00	53.00	36.00	●
6.800	8.000	91.00	53.00	36.00	●
7.000	8.000	91.00	53.00	36.00	●
7.100	8.000	91.00	53.00	36.00	●
7.400	8.000	91.00	53.00	36.00	●
7.500	8.000	91.00	53.00	36.00	●
7.800	8.000	91.00	53.00	36.00	●
8.000	8.000	91.00	53.00	36.00	●
8.100	10.000	103.00	61.00	40.00	●
8.200	10.000	103.00	61.00	40.00	●
8.400	10.000	103.00	61.00	40.00	●

Intermediate sizes available

◯ bright

TS 3 G - TS-Drills 3-fluted



					89247
					Solid carbide
					109
					HA
					TS 3 G
					○
d1	d2	l1	l2	l3	Availability
mm	mm	mm	mm	mm	
8.500	10.000	103.00	61.00	40.00	●
8.600	10.000	103.00	61.00	40.00	●
8.700	10.000	103.00	61.00	40.00	●
8.800	10.000	103.00	61.00	40.00	●
9.000	10.000	103.00	61.00	40.00	●
9.100	10.000	103.00	61.00	40.00	●
9.500	10.000	103.00	61.00	40.00	●
9.800	10.000	103.00	61.00	40.00	●
10.000	10.000	103.00	61.00	40.00	●
10.100	12.000	118.00	71.00	45.00	●
10.200	12.000	118.00	71.00	45.00	●
10.300	12.000	118.00	71.00	45.00	●
10.500	12.000	118.00	71.00	45.00	●
11.000	12.000	118.00	71.00	45.00	●
11.200	12.000	118.00	71.00	45.00	●
11.500	12.000	118.00	71.00	45.00	●
11.800	12.000	118.00	71.00	45.00	●
12.000	12.000	118.00	71.00	45.00	●
12.100	14.000	124.00	77.00	45.00	●
12.500	14.000	124.00	77.00	45.00	●
13.000	14.000	124.00	77.00	45.00	●
13.500	14.000	124.00	77.00	45.00	●
14.000	14.000	124.00	77.00	45.00	●
14.500	16.000	133.00	83.00	48.00	●
15.000	16.000	133.00	83.00	48.00	●
15.500	16.000	133.00	83.00	48.00	●
16.000	16.000	133.00	83.00	48.00	●
16.500	18.000	143.00	93.00	48.00	●
17.000	18.000	143.00	93.00	48.00	●
17.500	18.000	143.00	93.00	48.00	●
18.000	18.000	143.00	93.00	48.00	●
18.500	20.000	153.00	101.00	50.00	●
19.000	20.000	153.00	101.00	50.00	●
19.500	20.000	153.00	101.00	50.00	●
20.000	20.000	153.00	101.00	50.00	●

Intermediate sizes available

○ bright

HARTNER

TS 3 G - Application recommendations

≤5xD

Order-no. R	89247
Standard/DIN	6537L
Tool material	Solid carbide
Carbide grade	K
Surface finish	○
Type	TS 3 G
Shank type	HA

Tools with bold feed column no. are preferred choice.

Drill Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
2,50	0,025	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160
3,15	0,032	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,160
4,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,200
5,00	0,040	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250
6,30	0,050	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315
8,00	0,063	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,315
10,00	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,400
12,50	0,080	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500
16,00	0,100	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630
20,00	0,125	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,630
25,00	0,160	0,200	0,250	0,315	0,400	0,500	0,630	0,800	0,800

Material group	Material examples Figures in bold = material no. to DIN EN 10 027	Tens.str. N/mm²	Hard-ness	v_c m/min	Feed column no.
Common structural steels	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH **1.0050** E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤500 ≤1000			
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36) **1.0727** 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤850 ≤1000			
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30) **1.0503** C45, **1.1191** C45E (Ck45) **1.0601** C60, **1.1221** C60E (Ck60)	≤700 ≤850 ≤1000			
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4 **1.5710** 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1000 ≤1400			
Unalloyed case hard. steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850			
Alloyed case hardened steels	**1.7276** 10CrMo11, **1.5125** 11MnSi6 **1.5752** 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1000 ≤1400			
Nitriding steels	**1.8504** 34CrAl6 **1.8519** 31CrMoV9, **1.8550** 34CrAlNi7	≤1000 ≤1400			
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9 **1.2080** X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤850 ≤1400			
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400			
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB		
Stainless steels, sulphured austenitic martensitic	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9 **1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 **1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤900 ≤1100 ≤1500			
Hardened steels	–		≤48 HRC ≤66 HRC		
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000			
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20) **0.6025** EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤240 HB ≤350 HB	*100* *80*	6 6
Spheroidal graphite iron and malleable cast iron	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35) **0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤240 HB ≤350 HB	*80* *70*	6 6
Chilled cast iron	–		≤350 HB		
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2 **3.7154** TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤850 ≤1400			
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		*180*	7
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		*160*	7
Al cast alloys ≤ 10 % Si ≤ 24 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9 **3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		*150* *120*	7 6
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		*180*	6
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500			
Brass, short-chipping long-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2 **2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600 ≤600		*180*	6
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn **2.0790** CuNi18Zn19Pb	≤600 ≤850			
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10 **2.0980** CuAl11Ni, **2.1247** CuBe2	≤850 ≤1000			
Duroplastics Thermoplastics	Epoxidharz, Resopal, Pertinax, Moltopren Plexiglas, Hostalen, Novodur, Makralon	≤150 ≤100			

○ bright

Solid carbide micro-precision drills - Outstanding performance for a lot of materials

Small but mighty - with and without internal cooling

Solid carbide micro-precision drills without internal cooling for drilling depths up to 4xD and 7xD are available in the diameter range from 0.8 to 3.0 mm.

Holes up to 8xD and 15xD are the domain of solid carbide micro-precision drills with internal cooling. Thanks to the optimised tool geometry, pecking is not required for holes up to 15xD with Hartner's solid carbide micro-precision drills.

The tool design makes the solid carbide micro-precision drill 4xD without internal cooling optimally suitable as a pilot drill for the 15xD micro-precision drill with internal cooling.

NEW
now with IC for 8xD and 15xD

Superior in every sense

Solid carbide micro-precision drills have proven their exceptional performance capabilities in various volume applications and tool life tests. The tables below document a few application examples with convincing results.

Machining examples of solid carbide micro-precision drills 8xD and 15xD with IC

Hartner no.	86408	86408	86412	86412
Diameter	1.4 mm	2.5 mm	2.5 mm	2.1 mm
Coating	AlTiN	AlTiN	AlTiN	AlTiN
Material group	cast iron	alloyed case hardened steel	alloyed heat-treatable steel	stainless steel
Material description	GG25	16MnCr5	42CrMo4	X6CrNiTi18 10
Drill. depth [mm]	8xD	8xD	15xD	15xD
Hole type	blind hole	blind hole	blind hole	blind hole
Cooling	IC 80 bar	IC 80 bar	IC 80 bar	IC 80 bar
Coolant	soluble oil	soluble oil	soluble oil	soluble oil
Machine type	machining centre	machining centre	machining centre	machining centre
v_c [mm/min]	80	120	100	60
f [mm/rev.]	0.1	0.14	0.1	0.03
Tool life [m]	150	110	60	60

Internal cooling increases tool life considerably!

A comparison between a conventional micro-precision drill w/o internal cooling for holes up to 7xD and a 8xD drill with internal cooling 86408 demonstrates the advantages of internal cooling: Tool life increases considerably.

Hartner no.	Competitor without internal cooling	86408 with internal cooling
Diameter	2.6 mm	2.6 mm
Coating	TiAlN	AlTiN
Material group	stainless steel	stainless steel
Material description	105CrMo17	105CrMo17
Drill. depth [mm]	7xD	8xD
Hole type	blind hole	blind hole
Cooling	external	internal 100 bar
Coolant	neat oil	neat oil
Machine type	machining centre	machining centre
v_c [mm/min]	53	53
f [mm/rev.]	0.06	0.06
Tool life [m]	100 workpieces	500 workpieces, end of tool life not reached!

Solid carbide micro-precision drills

Order no. 86400

Solid carbide special drill with AlTiN-coating and reinforced shank without internal cooling for drilling small holes up to 4 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special flute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	facet point
Point angle	140
Tolerance	m7

Order no. 86401

Solid carbide special drill with AlTiN-coating and reinforced shank without internal cooling for drilling small holes up to 7 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special flute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	facet point
Point angle	140
Tolerance	m7

Order no. 86408

Solid carbide special drill with AlTiN-coating and reinforced shank with internal cooling for drilling small holes up to 8 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special flute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

Hints:
Please apply 86400 for centering (approx. 2/3 x D drilling depth), s. Page 67.
When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters.

Standard	Hartner std.
Tool material	Solid carbide
Surface	A
Type	N
Cutting direction	right-hand
Point grinding	facet point
Point angle	135
Tolerance	h7

Order no. 86412

Solid carbide special drill with AlTiN-coated tip and reinforced shank with internal cooling for drilling small holes up to 15 x D boring depth particularly for steel. Also applicable for machining cast iron.
The special flute geometry enables optimal chip break and chip removal also at higher cutting speeds and feeds. The two-facet point grinding on every cutting edge and the special web thinning ensure a good self-centering.

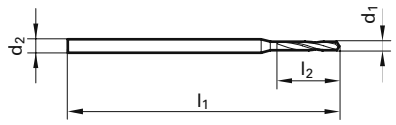
Hints:
Please apply 86400 as pilot drill (approx. 1-2 x D drilling depth), s. Page 67.
When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters.

Norm	Hartner std.
Standard	Solid carbide
Tool material	A
Surface	N
Type	right-hand
Cutting direction	facet point
Point grinding	135
Tolerance	h7

A AlTiN-coated A TiAlN-coated

HARTNER

Solid carbide micro-precision drills ~ 4 x D



				86400
				Solid carbide
				Hartner std.
				☒
				164
				A
d1	d2	l1	l2	Availability
mm	mm	mm	mm	
0.500	3.000	47.00	3.00	●
0.550	3.000	47.00	3.30	●
0.600	3.000	47.00	3.60	●
0.650	3.000	47.00	3.90	●
0.700	3.000	47.00	4.20	●
0.750	3.000	47.00	4.50	●
0.800	3.000	47.00	4.80	●
0.850	3.000	47.00	5.10	●
0.900	3.000	47.00	5.40	●
0.950	3.000	47.00	5.70	●
1.000	3.000	47.00	6.00	●
1.050	3.000	47.00	6.30	●
1.100	3.000	47.00	6.60	●
1.150	3.000	47.00	6.90	●
1.200	3.000	47.00	7.20	●
1.250	3.000	47.00	7.50	●
1.300	3.000	47.00	7.80	●
1.350	3.000	47.00	8.10	●
1.400	3.000	47.00	8.40	●
1.450	3.000	47.00	8.70	●
1.500	3.000	47.00	9.00	●
1.550	3.000	47.00	9.30	●
1.590	3.000	47.00	9.60	●
1.600	3.000	47.00	9.60	●
1.650	3.000	47.00	9.90	●
1.700	3.000	47.00	10.20	●
1.750	3.000	47.00	10.50	●
1.800	3.000	52.00	10.80	●
1.850	3.000	52.00	11.10	●
1.900	3.000	52.00	11.40	●
1.950	3.000	52.00	11.70	●
1.980	4.000	59.00	12.00	●
2.000	4.000	59.00	12.00	●
2.050	4.000	59.00	12.30	●
2.100	4.000	59.00	12.60	●
2.150	4.000	59.00	12.90	●
2.200	4.000	59.00	13.20	●
2.250	4.000	59.00	13.50	●
2.300	4.000	59.00	13.80	●
2.350	4.000	59.00	14.10	●
2.380	4.000	59.00	14.40	●
2.400	4.000	59.00	14.40	●
2.450	4.000	59.00	14.70	●
2.500	4.000	59.00	15.00	●
2.550	4.000	59.00	15.30	●
2.600	4.000	59.00	15.60	●
2.650	4.000	59.00	15.90	●
2.700	4.000	59.00	16.20	●
2.750	4.000	59.00	16.50	●
2.780	4.000	59.00	16.80	●
2.800	4.000	59.00	16.80	●
2.850	4.000	59.00	17.10	●
2.900	4.000	59.00	17.40	●
2.950	4.000	59.00	17.70	●
3.000	4.000	59.00	18.00	●

A AlTiN-coated ☒ External cooling

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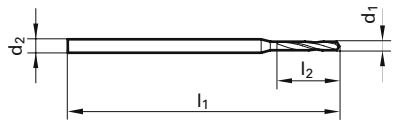
Solid carbide micro-precision drills ~ 7 x D



				86401
				Solid carbide
				Hartner std.
				☒
				164
				A
d1	d2	l1	l2	Availability
mm	mm	mm	mm	
0.500	3.000	47.00	4.00	●
0.550	3.000	47.00	4.40	●
0.600	3.000	47.00	4.80	●
0.650	3.000	47.00	5.20	●
0.700	3.000	47.00	5.60	●
0.750	3.000	47.00	6.00	●
0.800	3.000	47.00	6.40	●
0.850	3.000	47.00	6.80	●
0.900	3.000	47.00	7.20	●
0.950	3.000	47.00	7.60	●
1.000	3.000	47.00	8.00	●
1.050	3.000	47.00	8.40	●
1.100	3.000	47.00	8.80	●
1.150	3.000	47.00	9.20	●
1.200	3.000	52.00	10.80	●
1.250	3.000	52.00	11.30	●
1.300	3.000	52.00	11.70	●
1.350	3.000	52.00	12.20	●
1.400	3.000	52.00	12.60	●
1.450	3.000	52.00	13.10	●
1.500	3.000	52.00	13.50	●
1.550	3.000	52.00	14.00	●
1.590	3.000	52.00	14.40	●
1.600	3.000	52.00	14.40	●
1.650	3.000	52.00	14.90	●
1.700	3.000	52.00	15.30	●
1.750	3.000	52.00	15.80	●
1.800	3.000	52.00	16.20	●
1.850	3.000	52.00	16.70	●
1.900	3.000	52.00	17.10	●
1.950	3.000	52.00	17.60	●
1.980	4.000	63.00	18.00	●
2.000	4.000	63.00	18.00	●
2.050	4.000	63.00	18.50	●
2.100	4.000	63.00	18.90	●
2.150	4.000	63.00	19.40	●
2.200	4.000	63.00	19.80	●
2.250	4.000	63.00	20.30	●
2.300	4.000	63.00	20.70	●
2.350	4.000	63.00	21.20	●
2.380	4.000	63.00	21.60	●
2.400	4.000	63.00	21.60	●
2.450	4.000	63.00	22.10	●
2.500	4.000	63.00	22.50	●
2.550	4.000	63.00	23.00	●
2.600	4.000	67.00	23.40	●
2.650	4.000	67.00	23.90	●
2.700	4.000	67.00	24.30	●
2.750	4.000	67.00	24.80	●
2.780	4.000	67.00	25.20	●
2.800	4.000	67.00	25.20	●
2.850	4.000	67.00	25.70	●
2.900	4.000	67.00	26.10	●
2.950	4.000	67.00	26.60	●
3.000	4.000	67.00	27.00	●

A AlTiN-coated ☒ External cooling

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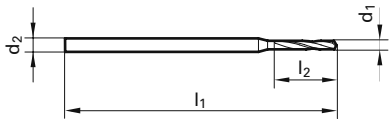
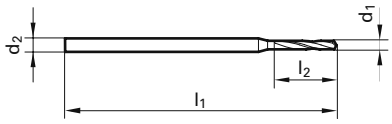
Solid carbide micro-precision drills ~ 8 x D



				86408
				Solid carbide
				Hartner std.
				■
				164
				Ⓐ
d1	d2	l1	l2	Availability
mm	mm	mm	mm	
1.400	4.000	52.00	15.00	●
1.500	4.000	52.00	17.00	●
1.600	4.000	52.00	18.00	●
1.700	4.000	56.00	19.00	●
1.800	4.000	56.00	20.00	●
1.900	4.000	56.00	21.00	●
2.000	4.000	56.00	22.00	●
2.100	4.000	62.00	23.00	●
2.200	4.000	62.00	24.00	●
2.300	4.000	62.00	25.00	●
2.400	4.000	62.00	26.00	●
2.500	4.000	62.00	28.00	●
2.600	4.000	66.00	29.00	●
2.700	4.000	66.00	30.00	●
2.800	4.000	66.00	31.00	●
2.900	4.000	66.00	32.00	●
3.000	4.000	66.00	33.00	●

Ⓐ TiAlN-coated ■ with internal cooling

Solid carbide micro-precision drills ~ 15 x D



				86412
				Solid carbide
				Hartner std.
				■
				164
				Ⓐ
d1	d2	l1	l2	Availability
mm	mm	mm	mm	
1.400	4.000	62.00	25.00	●
1.500	4.000	62.00	27.00	●
1.600	4.000	62.00	29.00	●
1.700	4.000	70.00	31.00	●
1.800	4.000	70.00	32.00	●
1.900	4.000	70.00	34.00	●
2.000	4.000	70.00	36.00	●
2.100	4.000	78.00	38.00	●
2.200	4.000	78.00	40.00	●
2.300	4.000	78.00	42.00	●
2.400	4.000	78.00	44.00	●
2.500	4.000	78.00	45.00	●
2.600	4.000	87.00	47.00	●
2.700	4.000	87.00	48.00	●
2.800	4.000	87.00	50.00	●
2.900	4.000	87.00	52.00	●
3.000	4.000	87.00	54.00	●

Ⓐ TiAlN-coated ■ with internal cooling

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Special tools questionnaire

❑ Inquiry ❑ Order by Fax to: +49 7431 25-21 547

Customer no. | New customer | Order no.

Contact person | Company | Contact

Hartner GmbH
P. O. Box 10 04 27
D-72425 Albstadt
Tel.: +497431 125-0
Fax: +497431 125-21 547
www.hartner.de

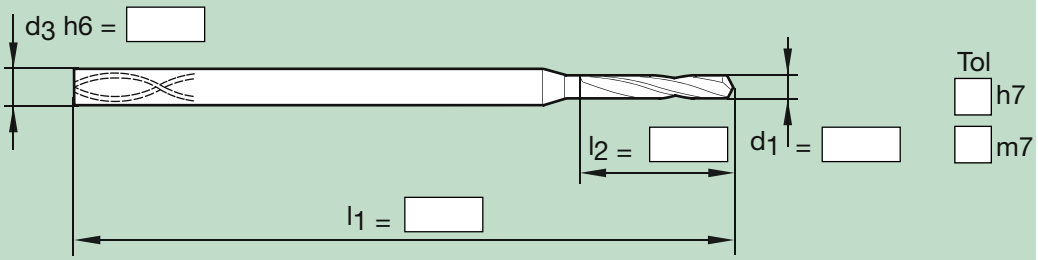
Street no. | Town/post code

Telephone | Fax

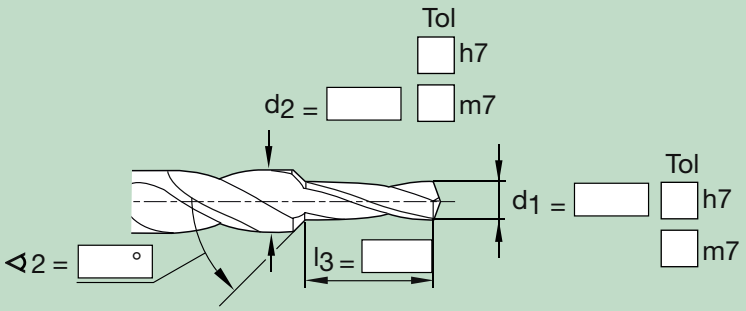
Date | Signature

Quantity

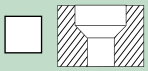
Dimensions



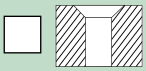
Step



Machining



Step hole



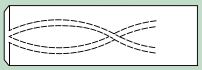
Drilling and countersinking

Shank form

HA 

HE 

Internal cooling

Yes 

No 

Coating

bright SuperA

HARTNER

Solid carbide micro-precision drills Recommendations

General hints:
Powerful machines, no play in spindle bearings, alignment accurate tool holders. Max. concentricity error of clamped tools 0.02 mm, high coolant pressures.
We recommend the application of hydraulic chucks or shrink fit chucks.

External cooling hints:
We recommend lubrication by soluble oil or neat oil.

Order-no. R
Standard/DIN
Tool material
Carbide grade
Surface finish
Typ
Coolant

All drilling tools from 8xD must be guided during spot drilling. They must never operate at full speed without support in the machine shop

Drill Ø mm	Feed column no.												
	56	57	58	59	60	61	62	63	64	65	66	67	68
	f (mm/rev.)												
0.80	0.008	0.016	0.024	0.032	0.04	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09
1.00	0.012	0.022	0.032	0.042	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12
1.50	0.021	0.036	0.051	0.066	0.09	0.10	0.12	0.13	0.15	0.15	0.16	0.17	0.18
2.00	0.032	0.052	0.072	0.092	0.12	0.14	0.16	0.18	0.20	0.21	0.22	0.23	0.24
2.50	0.045	0.070	0.095	0.120	0.15	0.17	0.20	0.22	0.25	0.26	0.27	0.28	0.30
3.00	0.060	0.090	0.120	0.150	0.18	0.21	0.24	0.27	0.30	0.31	0.33	0.34	0.36

Material group	Material examples Figures in bold = material no. to DIN EN 10 027	Tens.str. N/mm²	Hardness	Coolant
Common structural steels	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		○
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		○
Free-cutting steels	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		○
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		○
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		○
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		○
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		○
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		○
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		○
Unalloyed case hard. steels	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		○
Alloyed case hardened steels	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●
Nitriding steels	**1.8504** 34CrAl6	≤1000		○
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		○
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●
austenitic	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●
martensitic	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●
Hardened steels	–		≤48 HRC	●
			≤66 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
Cast iron	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	○ ○
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	○ ○
Spheroidal graphite iron and	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	○
malleable cast iron	**0.7070** EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	○
Chilled cast iron	–		≤350 HB	○
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●
Aluminium and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		○
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		○
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		○
≤ 24 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○
Magnesium alloys	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		○
Copper, low-alloyed	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		○
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		○
long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		○
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		○ ●
	2.0790 CuNi18Zn19Pb	≤850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●
Duroplastics	Epoxy resin, Resopal, Pertinax, Moltopren	≤150		○
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	≤100		○ ○

A AlTiN-coated A TiAlN-coated

Solid carbide micro-precision drills Recommendations

≤4xD ≤7xD

86400	86401
Hartner std.	Hartner std.
Solid carb.	Solid carb.
K/P	K/P
A	A
N	N

v_c m/min	Feed column no.	
100	64	62
100	64	62
100	64	62
90	63	61
90	64	62
90	64	62
90	63	61
90	63	61
70	62	60
100	63	61
85	63	61
70	62	60
70	62	60
60	62	60
50	62	60
60	62	60
130	68	66
130	68	66
130	68	66
120	67	65

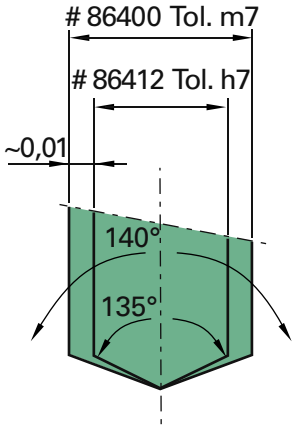
≤8xD ≤15xD

86408	86412
Hartner std.	Hartner std.
Solid carb.	Solid carb.
K/P	K/P
A	A
N	N
axial	axial

v_c m/min	Feed column no.	
105	58	58
100	58	58
105	59	59
90	59	59
95	58	58
95	58	58
90	58	58
90	58	58
70	58	58
100	57	57
85	58	58
70	58	58
70	57	57
60	57	57
50	58	58
50	58	58
50	57	57
50	57	57
70	57	57
60	56	56
70	57	57
25	56	56
150	60	60
140	60	60
140	60	60
130	60	60
35	56	56
35	56	56
70	68	68
70	68	68
135	59	59
135	59	59

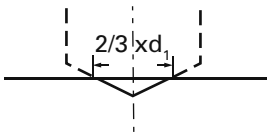
Pilot drilling

For the application of solid carbide micro-precision drills 15xD we recommend a pilot hole 1xD up to 2xD depth.
For this pilot hole, the solid carbide micro-precision drill 4xD is optimally suitable. Its point angle and its diameter tolerance are perfectly adapted.



Centering

In order to achieve full performance with solid carbide micro-precision drills from 8xD drilling depth, we recommend centering.
The solid carbide micro-precision drill up to 4xD, Hartner no. 86400, can be applied for this purpose. The centering diameter should be approximately 2/3xD.



Filter quality

When applying solid carbide micro-precision drills, we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters.

HARTNER

Solid carbide de-burring fork TS 100 EG

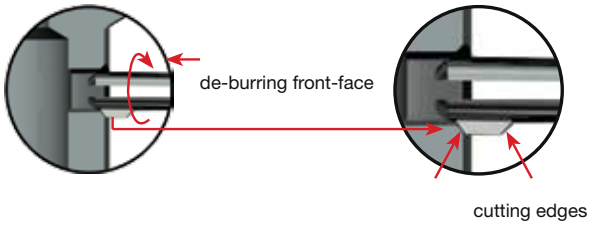
Order no. 84100

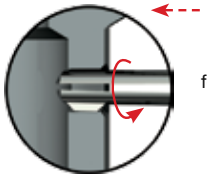
De-burring fork for universal application on machine tools, milling and turning machines as well as robots. The solid carbide de-burring fork TS 100 EG de-burrs in one machine setting so that expensive or time-consuming manual reworking is unnecessary. A 0.25 mm diameter bridge enables application in holes with respectively large tolerances.

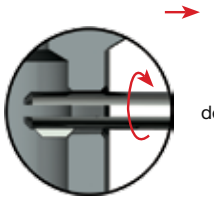
Universal application:
The ex-stock de-burring fork machines workpieces with one cross-hole as well as workpieces with multi-interrupted cut and produces high quality de-burred faces and ends of the hole.

Standard	Hartner std.
Tool material	Solid carbide
Surface	◯
Type	TS 100 EG
Shank form	DZ
Cutting direction	right-hand
Point grinding	

Operation

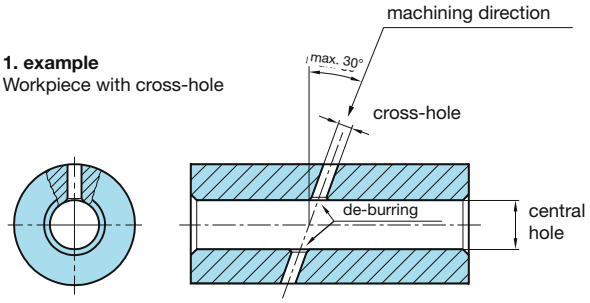






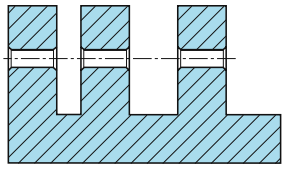
Application examples

1. example
Workpiece with cross-hole



Please note when machining workpieces with cross-holes:
– the diameter of the cross-hole must be maximal 35% of the central hole
– the diameter of the cross-hole must be 40% larger than the cutting length l_6

2. example
Workpiece with multi-interrupted cut



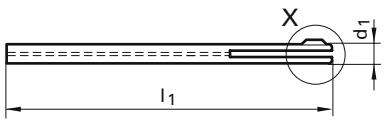
∅ range (mm)	v_c m/min	fu (mm)
< ∅ 4	8 - 10	0.1 - 0.2
∅ 4 - < ∅ 6	10 - 14	0.1 - 0.2
6 - ∅ 8	14 - 20	0.1 - 0.2

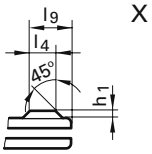
Important:
Please note that the cutting parameters are recommendations. They can be adapted to higher and lower cutting parameters.

◯ bright

HARTNER

Solid carbide de-burring fork TS 100 EG



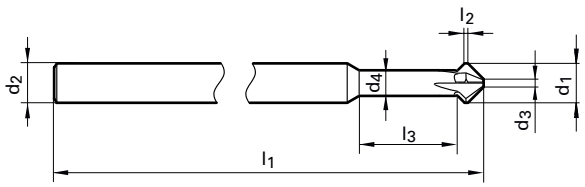


nom. Ø	d1	for Ø range	l1	l4	l9	h1	84100 Solid carbide 120 DZ TS 100 EG ◯
mm	mm	mm	mm	mm	mm	mm	Availability
2.000	1.900	1.91 - 2.15	80.00	1.00	2.05	0.35	●
2.250	2.100	2.16 - 2.40	80.00	1.50	2.60	0.40	●
2.500	2.400	2.41 - 2.70	80.00	1.50	2.90	0.40	●
2.750	2.600	2.71 - 2.90	90.00	1.50	2.95	0.45	●
3.000	2.900	2.91 - 3.25	90.00	2.00	3.65	0.45	●
3.500	3.200	3.26 - 3.60	90.00	2.00	3.80	0.60	●
4.000	3.600	3.61 - 4.25	90.00	2.00	4.10	0.70	●
4.500	4.200	4.26 - 4.75	90.00	2.50	4.60	0.70	●
5.000	4.700	4.76 - 5.30	100.00	2.50	4.85	0.75	●
6.000	5.600	5.81 - 6.20	110.00	3.00	5.80	0.80	●
6.500	6.000	6.21 - 6.70	110.00	3.00	5.90	0.90	●
7.000	6.500	6.71 - 7.10	110.00	3.00	5.85	0.85	●
8.000	7.300	7.61 - 8.05	110.00	3.50	7.00	1.00	●

Order no. 80495

Front/back deburrer for the automatic internal and external deburring of holes and contours. With shank to DIN 6535 for the clamping in shrink fit/hydraulic chucks.

Standard	Hartner std.
Tool material	Solid carbide
Surface	a
Type	TS 100 VR
Shank form	HA
Cutting direction	right-hand
Point grinding	



							80495
							Solid carbide
							120
							HA
							TS 100 VR
d1	d2 h9	d3	d4	l1	l2	l3	Availability
mm	mm	mm	mm	mm	mm	mm	
3.000	4.000	0.600	2.200	75.00	0.50	9.40	**79.00**
4.000	4.000	0.800	2.900	75.00	0.50	12.40	**81.00**
5.000	5.000	1.000	3.900	75.00	0.50	15.00	**85.00**
6.000	6.000	1.200	3.900	100.00	0.50	14.30	**90.00**
8.000	6.000	1.600		100.00	0.50	59.00	**117.00**
10.000	6.000	2.000		100.00	0.50	53.00	**144.00**
12.000	6.000	2.400		100.00	0.50	46.00	**162.00**

Intermediate sizes available.

Cutting parameters front/back de-burrer TS 100 VR

Material group	Tens. strength MPa (N/mm²)	Hard-ness	v_c (m/min)	Feed col. no.
Steels	< 850		*120 - 200*	71
	850-1200		*100 - 180*	71
	> 1200		*80 - 140*	71
Hardened steels		< 54 HRC	*60 - 120*	71
		54-60 HRC	*40 - 80*	71
Stainless/acid-resistant steels	< 850		*80 - 120*	71
Nickel-based alloys	< 1300		*30 - 60*	71
Ti-alloys	< 1300		*50 - 100*	71
Cast materials		< 240 HB30	*120 - 180*	72
		> 240 HB30	*100 - 160*	72
Al wrought alloys < 3% Si			*150 - 250*	72
Al cast alloys > 3% Si			*100 - 200*	72
Magnesium alloys			*150 - 250*	72
Non-ferrous alloys	< 850		*30 - 200*	72

Feed column no. (mm/rev.)

Ø	71	72
≤ 3.00	0.060	0.080
4.00	0.100	0.125
5.00	0.100	0.125
6.30	0.125	0.160
8.00	0.160	0.200
10.00	0.200	0.250
12.50	0.200	0.250

Important:
Please note that the cutting parameters are recommendations. They can be adapted to higher and lower cutting parameters.

a AlTiN nano-coated

Fax Inquiry / Order
simply photo-copy, complete and fax…

❑ Inquiry ❑ Order ❑ Repeat order, no. of initial order

❑ TS 100 EG ❑ TS 100 VR

❑ Please recommend the optimal tool
for the application as per description.

Drawing of layout

Machining:	De-burring	❑ Entry	❑ Exit	❑ Cross-hole
	Milling	❑ Entry, angle _____°		❑ Exit, angle _____°
Workpiece:	Hole Ø: _____mm		Hole depth: _____mm	
	Cross-hole:	❑ no	❑ yes, to _____mm	
	Material/designation: _____			
Maschine type:	❑ Machining centre		❑ Turning centre	❑ others: _____
Shank:	❑ HA	❑ HE	❑ others: _____	
Coolant:	❑ internal	❑ external		
	❑ Oil	❑ Soluble oil	❑ MQL	
	Pressure: _____bar		Quantity: _____l/min	

Company: _____ Company stamp:

Telephone/fax: _____

Contact: _____ Signature: _____

Our programme:

FU 500/FN500

INOX Drills

Micro Precision Drills

TS-Drills

Highlights

Special Drills

Gun Drills

Standard Solid Carbide De-burring Tools

Multiplex

Multiplex HPC

Standard Range

TM Vending Machines

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