

_ THE TECHNOLOGY OF GAINING BENEFIT

Competence in solid carbide drilling



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Competence in solid carbide drilling

This is the strength of **Walter Titex**. Founded in 1890 in Frankfurt am Main by Ludwig Günther, the brand draws on over 120 years' experience in drilling metals.

Numerous innovations mark **Walter Titex**'s successful journey. At the start of the twentieth century, the brand succeeded in using carbide tools to reach drilling depths that had been thought impossible. Thanks to its experiences in HSS, **Walter Titex** was a global pioneer among manufacturers in this sector.

The tools made by the competence brand are highly economical in that the cost of drilling each hole is low without compromising on hole quality.

Some things do not change with time: Our promise to deliver a standard of service that matches our outstanding tools, so that our customers can draw even greater benefit from them, has not changed since 1890.



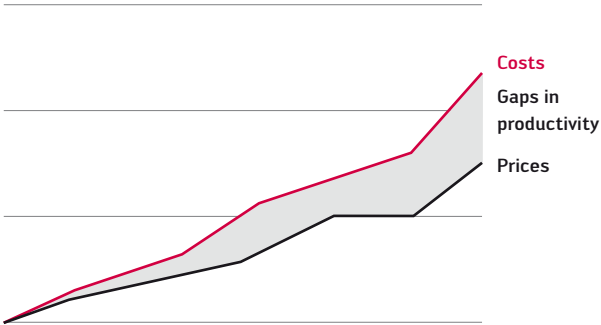
Should you require more detailed information about our products, we have provided page references to sections within **this handbook (HB)**, to the **Walter General Catalogue 2012 (GK)** and to the **Walter Supplementary Catalogue 2013/2014 (EK)**.



Productivity – Gaps in productivity – Costs pie chart

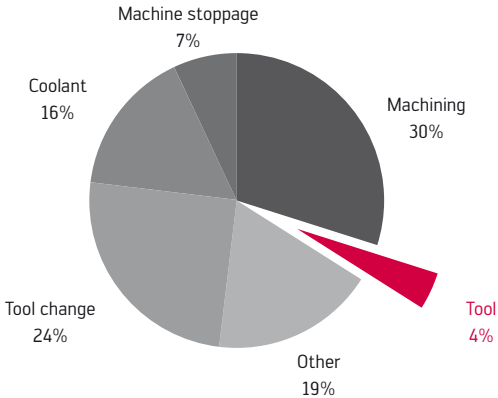
Gaps in productivity

In most sectors, the general increase in costs is higher than the increase in price of products on the market. We can help you to close these "gaps in productivity".



Costs pie chart

Tool costs account for approx. 4% of machining costs.



Productivity

Productivity is understood as the relationship between the unit of input and the rate of output. The aim is always to achieve the greatest possible output from the least possible input.

$$\longrightarrow \frac{\text{output}}{\text{input}}$$

The basic premise of "tool economics":
The price of a tool accounts for only 4% of the total manufacturing costs.
However its efficiency affects the remaining 96%.

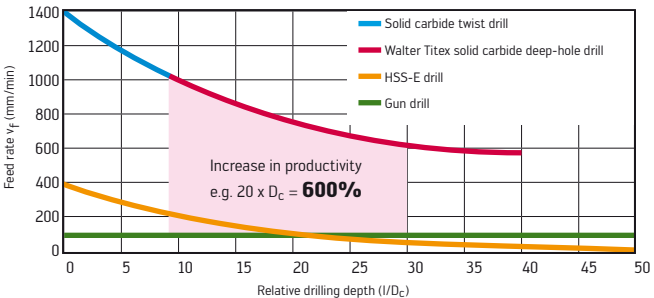
Example 1:

A 25% decrease in the price of a tool only results in a 1% saving in the total manufacturing costs. By contrast, a 30% increase in the cutting data reduces the total manufacturing costs by 10%.







$$\longrightarrow 1 : 10$$






Example 2:






Potential increase in productivity gained by using Walter Titex solid carbide deep-hole drills.



Solid carbide drills with internal cooling

Operation				
Drilling depth	3 x D _c		3 x D _c	
Designation	K3299XPL	K3899XPL	A3289DPL	A3293TTP
Type	X-treme Step 90	X-treme Step 90	X-treme Plus	X-treme Inox
Ø range	3.30 – 14.00	3.30 – 14.00	3.00 – 20.00	3.00 – 20.00
Shank	DIN 6535 HA	DIN 6535 HE	DIN 6535 HA	DIN 6535 HA
Page	EK B-75	EK B-77	GK B 70	EK B-30
				

Operation				
Drilling depth	5 x D _c			
Designation	A3382XPL	A3399XPL	A3999XPL	A3387
Type	X-treme CI	X-treme	X-treme	Alpha® Jet
Ø range	3.00 – 20.00	3.00 – 25.00	3.00 – 25.00	4.00 – 20.00
Shank	DIN 6535 HA	DIN 6535 HA	DIN 6535 HE	DIN 6535 HA
Page	GK B 81	EK B-45	EK B-62	GK B 85
				

Operation				
Drilling depth	8 x D _c		12 x D _c	
Designation	A3486TIP	A3586TIP	A6589AMP	A6588TML
Type	Alpha® 44	Alpha® 44	X-treme DM12	Alpha® 4 Plus Micro
Ø range	5.00 – 12.00	5.00 – 12.00	2.00 – 2.90	1.00 – 1.90
Shank	DIN 6535 HA	DIN 6535 HE	DIN 6535 HA	DIN 6535 HA
Page	GK B 94	GK B 96	EK B-68	GK B 126
				

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3 x D _c		5 x D _c		
A3299XPL	A3899XPL	A3389AML	A3389DPL	A3393TTP
X-treme	X-treme	X-treme M	X-treme Plus	X-treme Inox
3.00 – 20.00	3.00 – 20.00	2.00 – 2.95	3.00 – 20.00	3.00 – 20.00
DIN 6535 HA	DIN 6535 HE	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
EK B-33	EK B-54	EK B-41	GK B 86	EK B-42











5 x D _c	8 x D _c			
A3384	A6489AMP	A6488TML	A6489DPP	A3487
Alpha® Ni	X-treme DM8	Alpha® 4 Plus Micro	X-treme D8	Alpha® Jet
3.00 – 12.00	2.00 – 2.95	0.75 – 1.95	3.00 – 20.00	5.00 – 20.00
DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
GK B 84	EK B-67	GK B 121	GK B 123	GK B 95







12 x D _c		16 x D _c	
A6589DPP	A3687	A6689AMP	A6685TFP
X-treme D12	Alpha® Jet	X-treme DM16	Alpha® 4 XD16
3.00 – 20.00	5.00 – 20.00	2.00 – 2.90	3.00 – 16.00
DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
GK B 127	GK B 97	EK B-69	GK B 130










Solid carbide drills with internal cooling

Operation				
Drilling depth	20 x D _c			25 x D _c
Designation	A6789AMP	A6794TFP	A6785TFP	A6889AMP
Type	X-treme DM20	X-treme DH20	Alpha® 4 XD20	X-treme DM25
Ø range	2.00 – 2.90	3.00 – 10.00	3.00 – 16.00	2.00 – 2.90
Shank	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
Page	EK B-70	GK B 133	GK B 131	EK B-71
				







Operation		
Drilling depth	40 x D _c	50 x D _c
Designation	A7495TTP	A7595TTP
Type	X-treme D40	X-treme D50
Ø range	4.50 – 11.00	4.50 – 9.00
Shank	DIN 6535 HA	DIN 6535 HA
Page	EK B-73	HB 49, HB 68
		















25 x D _c	30 x D _c		
A6885TFP	A6989AMP	A6994TFP	A6985TFP
Alpha® 4 XD25	X-treme DM30	X-treme DH30	Alpha® 4 XD30
3.00 – 12.00	2.00 – 2.90	3.00 – 10.00	3.00 – 12.00
DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
GK B 134	EK B-72	GK B 137	GK B 136
			

					
Pilot					
K3281TFT	A6181AML	A6181TFT	A7191TFT	K5191TFT	
X-treme Pilot Step 90	X-treme Pilot 150	XD Pilot	X-treme Pilot 180	X-treme Pilot 180C	
3.00 – 16.00	2.00 – 2.95	3.00 – 16.00	3.00 – 20.00	4.00 – 7.00	
DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	
EK B-74	EK B-66	GK B 118	GK B 138	GK B 140	
					

Solid carbide drills without internal cooling

Operation				
Drilling depth	$3 \times D_c$	$3 \times D_c$		
Designation	K3879XPL	A3279XPL	A3879XPL	A3269TFL
Type	X-treme Step 90	X-treme	X-treme	Alpha® Rc
Ø range	3.30 – 14.50	3.00 – 20.00	3.00 – 20.00	3.40 – 10.40
Shank	DIN 6535 HE	DIN 6535 HA	DIN 6535 HE	DIN 6535 HA
Page	EK B-76	EK B-26	EK B-50	GK B 65
				

Operation				
Drilling depth	$5 \times D_c$			
Designation	A3378TML	A3162	A3379XPL	A3979XPL
Type	Alpha® 2 Plus Micro	ESU	X-treme	X-treme
Ø range	0.50 – 2.95	0.10 – 1.45	3.00 – 25.00	3.00 – 25.00
Shank	DIN 6535 HA	Parallel shank	DIN 6535 HA	DIN 6535 HE
Page	GK B 79	GK B 59	EK B-37	EK B-58
				

Operation				
Drilling depth	$3 \times D_c$ – Carbide-tipped		NC spot drill	
Designation	A2971	A5971	A1174	A1174C
Type	Carbide	Carbide	90°	120°
Ø range	3.00 – 16.00	8.00 – 32.00	3.00 – 20.00	3.00 – 20.00
Shank	Parallel shank	Morse taper	Parallel shank	Parallel shank
Page	GK B 58	GK B 116	GK B 53	GK B 54
				



3 x D_c

A1164TIN	A1163	A1166TIN	A1166	A1167A	A1167B
Alpha® 2	N	Maximiza	Maximiza	Maximiza	Maximiza
1.50 – 20.00	1.00 – 12.00	3.00 – 20.00	3.00 – 20.00	3.00 – 20.00	3.00 – 20.00
Parallel shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank
GK B 38	GK B 36	GK B 46	GK B 42	GK B 47	GK B 50
					














5 x D_c






8 x D_c

5 x D _c		8 x D _c		
A3367	A3967	A6478TML	A1276TFL	A1263
BSX	BSX	Alpha® 2 Plus Micro	Alpha® 22	N
3.00 – 16.00	3.00 – 16.00	0.50 – 2.95	3.00 – 12.00	0.60 – 12.00
DIN 6535 HA	DIN 6535 HE	DIN 6535 HA	Parallel shank	Parallel shank
GK B 77	GK B 110	GK B 119	GK B 57	GK B 55
				

HSS drills

Operation				
Drilling depth	~ 3 x D _c			
Designation	A1149XPL	A1149TFL	A1154TFT	A1148
Dimensions	DIN 1897	DIN 1897	DIN 1897	DIN 1897
Type	UFL®	UFL®	VA Inox	UFL®
Ø range	1.00 – 20.00	1.00 – 20.00	2.00 – 16.00	1.00 – 20.00
Shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank
Page	GK B 163	GK B 158	GK B 168	GK B 153
				

Operation					
Drilling depth	~ 8 x D _c				
Designation	A1249XPL	A1249TFL	A1254TFT	A1247	A1244
Dimensions	DIN 338	DIN 338	DIN 338	DIN 338	DIN 338
Type	UFL®	UFL®	VA Inox	Alpha® XE	VA
Ø range	1.00 – 16.00	1.00 – 20.00	3.00 – 16.00	1.00 – 16.00	0.30 – 15.00
Shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank
Page	GK B 212	GK B 208	GK B 216	GK B 204	GK B 199
					

Operation				
Drilling depth	~ 12 x D _c			
Designation	A1549TFP	A1547	A1544	A1522
Dimensions	DIN 340	DIN 340	DIN 340	DIN 340
Type	UFL®	Alpha® XE	VA	UFL®
Ø range	1.00 – 12.00	1.00 – 12.70	1.00 – 12.00	1.00 – 22.225
Shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank
Page	GK B 230	GK B 227	GK B 225	GK B 221
				

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~ 3 x D _c		~ 5 x D _c		
A1111	A2258	A3143	A3153	A6292TIN
DIN 1897	Walter standard	DIN 1899	DIN 1899	Walter standard
N	UFL® left	ESU	ESU left	MegaJet
0.50 – 32.00	1.00 – 20.00	0.05 – 1.45	0.15 – 1.4	5.00 – 24.00
Parallel shank	Parallel shank	Parallel shank	Parallel shank	DIN 1835 E
GK B 141	GK B 239	GK B 243	GK B 245	GK B 269













~ 8 x D _c					
A1222	A1211TIN	A1211	A1212	A1234	A1231
DIN 338	DIN 338	DIN 338	DIN 338	DIN 338	DIN 338
UFL®	N	N	H	UFL® left	N left
1.00 – 16.00	0.50 – 16.00	0.20 – 22.00	0.40 – 16.00	1.016 – 12.70	0.20 – 20.00
Parallel shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank	Parallel shank
GK B 185	GK B 180	GK B 171	GK B 182	GK B 195	GK B 190





~ 12 x D _c	~ 16 x D _c	~ 22 x D _c	~ 30 x D _c
A1511	A1622	A1722	A1822
DIN 340	DIN 1869-I	DIN 1869-II	DIN 1869-III
N	UFL®	UFL®	UFL®
0.50 – 22.00	2.00 – 12.70	3.00 – 12.00	3.50 – 12.00
Parallel shank	Parallel shank	Parallel shank	Parallel shank
GK B 218	GK B 232	GK B 235	GK B 236

HSS drills

Operation					
Drilling depth	~ 60 x D _c	~ 85 x D _c	~ 8 x D _c		
Designation	A1922S	A1922L	A4211TIN	A4211	A4244
Dimensions	Walter standard	Walter standard	DIN 345	DIN 345	DIN 345
Type	UFL®	UFL®	N	N	VA
Ø range	6.00 – 14.00	8.00 – 12.00	5.00 – 30.00	3.00 – 100.00	10.00 – 32.00
Shank	Parallel shank	Parallel shank	Morse taper	Morse taper	Morse taper
Page	GK B 238	GK B 237	GK B 255	GK B 247	GK B 256
					

Operation		
	NC spot drill	
Designation	A1115 · A1115S · A1115L	A1114 · A1114S · A1114L
Dimensions	Walter standard	Walter standard
Type	90°	120°
Ø range	2.00 – 25.40	2.00 – 25.40
Shank	Parallel shank	Parallel shank
Page	GK B 149	GK B 146
		

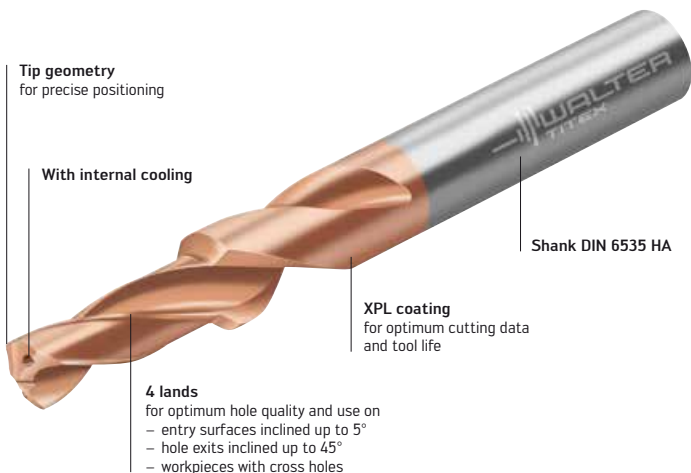
Operation		
	Twist drill set	
Dimensions	DIN 338	
Type	N; VA; UFL®	
Shank	Parallel shank	
Page	GK B 346	



$\sim 8 \times D_c$	$\sim 12 \times D_c$		$\sim 16 \times D_c$		$\sim 22 \times D_c$
A4247	A4422	A4411	A4622	A4611	A4722
DIN 345	DIN 341	DIN 341	DIN 1870-I	DIN 1870-I	DIN 1870-II
Alpha® XE	UFL®	N	UFL®	N	UFL®
10.00 – 40.00	10.00 – 31.00	5.00 – 50.00	12.00 – 30.00	8.00 – 50.00	8.00 – 40.00
Morse taper	Morse taper	Morse taper	Morse taper	Morse taper	Morse taper
GK B 258	GK B 263	GK B 260	GK B 267	GK B 265	GK B 268

Multi-diameter step drill					Taper pin drill	
K6221	K6222	K6223	K2929	K4929		
DIN 8374	DIN 8378	DIN 8376	DIN 1898 A	DIN 1898 B		
90°	90°	180°				
3.20 – 8.40	2.50 – 10.20	4.50 – 11.00	1.00 – 12.00	5.00 – 25.00		
Parallel shank	Parallel shank	Parallel shank	Parallel shank	Morse taper		
GK B 273	GK B 274	GK B 275	GK B 271	GK B 272		

Walter Titex X-treme Step 90



Walter Titex X-treme Step 90

Type: K3299XPL, HA shank, 3 x D_c

The tool

- Solid carbide high-performance chamfer drill with and without internal cooling
- XPL coating
- Diameter range 3.3 to 14.5 mm
 - Core hole diameter: M4–M16 x 1.5 mm
- Step length in accordance with DIN 8378
- Shank in accordance with DIN 6535 HA and HE

The application

- For thread/core hole diameters
- For ISO material groups P, M, K, N, S, H
- Can be used with emulsion and oil
- Can be used for inclined exits and cross holes
- Can be used for inclined and convex surfaces
- For use in general mechanical engineering, mould and die making, and the automotive and energy industries



Watch product video:

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Benefits for you

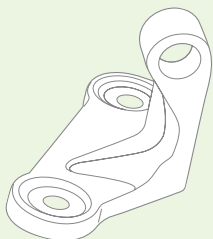
- 50% higher productivity
- Can be universally used for all material groups as well as for cross holes and inclined exits
- Improved hole quality thanks to the 4 lands



Walter Titex X-treme Step 90

Types: K3899XPL, HE shank, 3 x D_C
 K3299XPL, HA shank, 3 x D_C
 K3879XPL, HE shank, 3 x D_C

Module hinge



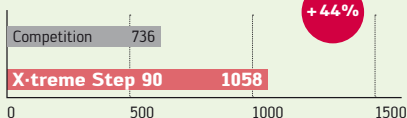
Workpiece material: St52

Tool: **X-treme Step 90**
 K3299XPL-M8
 Diameter 6.8 mm

Cutting data

	Competition	X-treme Step 90
v_c	98 m/min	98 m/min
n	4600 rpm	4600 rpm
f	0.16 mm/rev	0.23 mm/rev
vf	736 mm/min	1058 mm/min

Feed rate (mm/min)



Walter Titex X-treme – without internal cooling



Walter Titex X-treme

Types: A3279XPL, HA shank, 3 x D_C
A3879XPL, HE shank, 3 x D_C

The tool

- Solid carbide high-performance drill with internal cooling
- XPL coating
- 140° point angle
- Dimensions to
 - DIN 6537 K → 3 x D_C
 - DIN 6537 L → 5 x D_C
- Diameter range 3 to 25 mm
- Shank in accordance with DIN 6535 HA and HE

The application

- For all ISO material groups P, M, K, N, S, H
- Can be used with emulsion and oil
- Can be used for inclined exits and cross holes
- Can be used for inclined and convex surfaces
- For use in general mechanical engineering, mould and die making, and the automotive and energy industries

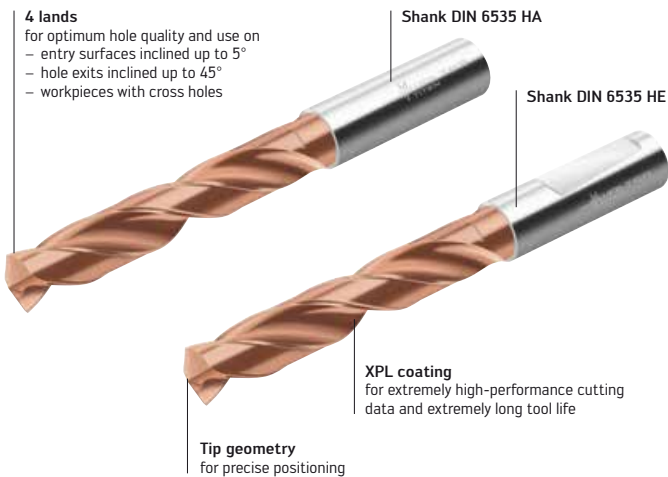


Watch product video:

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<http://goo.gl/dzSSy>

Benefits for you

- 50% higher productivity
- Can be universally used for all material groups as well as for cross holes and inclined exits
- Improved hole quality thanks to the 4 lands



Walter Titex X-treme

Types: A3379XPL, HA shank, 5 x D_C
A3979XPL, HE shank, 5 x D_C

Magnetic core
for controllers



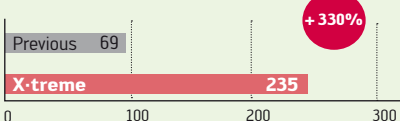
Workpiece material: C15

Tool: **X-treme**
A3279XPL-12.5
Diameter 12.5 mm

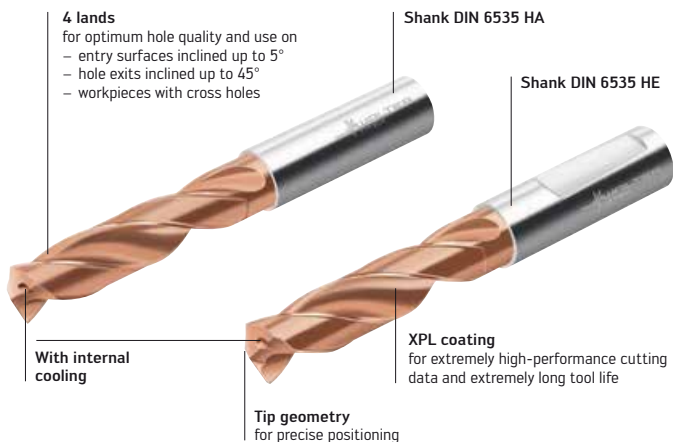
Cutting data

	Previous	X-treme
vc	122 m/min	122 m/min
n	3107 rpm	3107 rpm
f	0.23 mm/rev	0.23 mm/rev
vf	715 mm/min	715 mm/min

Tool life (m)



Walter Titex X-treme – with internal cooling



Walter Titex X-treme

Types: A3299XPL, HA shank, 3 x D_C
A3899XPL, HE shank, 3 x D_C

The tool

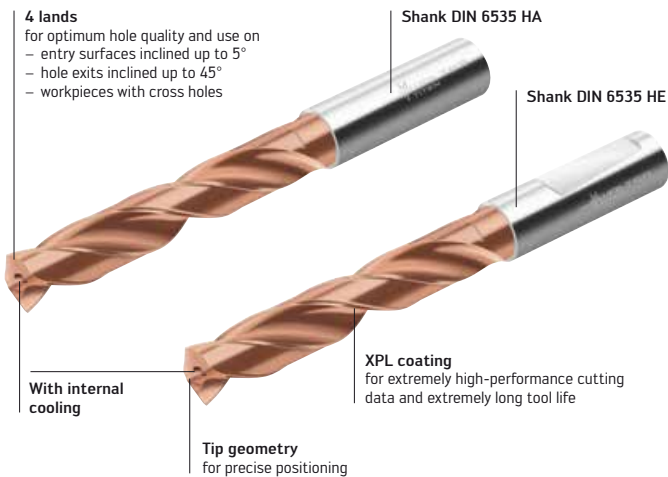
- Solid carbide high-performance drill with internal cooling
- XPL coating
- 140° point angle
- Dimensions to
 - DIN 6537 K → 3 x D_C
 - DIN 6537 L → 5 x D_C
- Diameter range 3 to 25 mm
- Shank in accordance with DIN 6535 HA and HE

The application

- For all ISO material groups P, M, K, N, S, H
- Can be used with emulsion and oil
- Can be used for inclined exits and cross holes
- Can be used for inclined and convex surfaces
- For use in general mechanical engineering, mould and die making, and the automotive and energy industries

Benefits for you

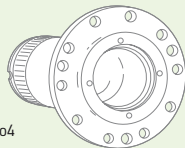
- 50% higher productivity
- Can be universally used for all material groups as well as for cross holes and inclined exits
- Improved hole quality thanks to the 4 lands



Walter Tixet X-treme

Types: A3399XPL, HA shank, 5 x D_C
A3999XPL, HE shank, 5 x D_C

Transmission shaft:
Flange drilling

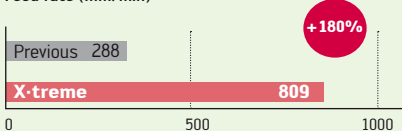


Workpiece material: 42CrMo4
Tool: **X-treme**
A3399XPL-6.8
Diameter 6.8 mm

Cutting data

	Previous	X-treme
v _C	56 m/min	91 m/min
n	2621 rpm	4260 rpm
f	0.11 mm/rev	0.19 mm/rev
v _f	288 mm/min	809 mm/min

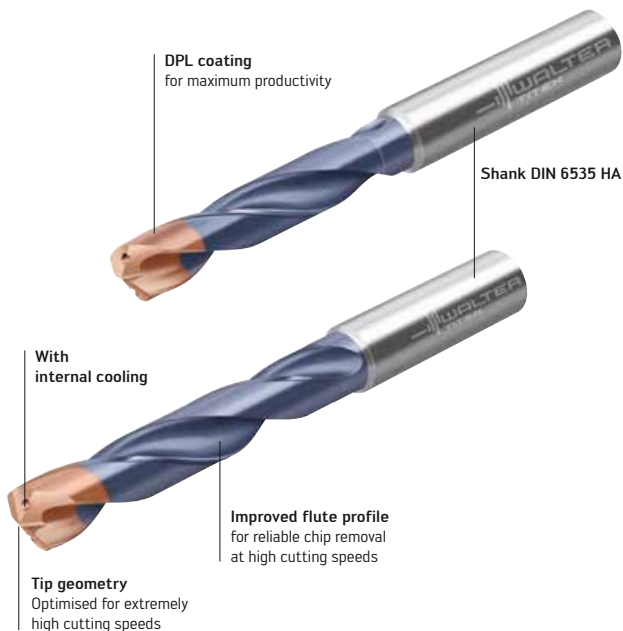
Feed rate (mm/min)



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Walter Titex X-treme Plus



Walter Titex X-treme Plus

Types: A3289DPL, HA shank, 3 x D_C
A3389DPL, HA shank, 5 x D_C

The tool

- Solid carbide high performance drill with internal coolant supply
- New type of multifunctional double coating (DPL: "Double Performance Line")
- 140° point angle
- Dimensions in accordance with
 - DIN 6537 K → 3 x D_C
 - DIN 6537 L → 5 x D_C
- Diameter range 3 to 20 mm
- Shank according to DIN 6535 HA

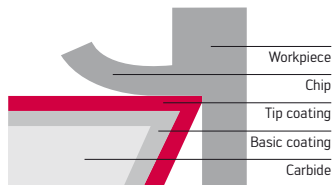
The application

- For all ISO material groups P, M, K, S, H (N)
- Can be used with emulsion, oil and minimum quantity lubrication
- For use in general mechanical engineering, in mould and die making, and the automotive and energy industries

Benefits for you

- Maximum productivity: At least double that achievable using conventional tools (greater productivity, lower production costs)
- Alternatively: Double the tool life with conventional cutting data (e.g. fewer tool changes)
- Excellent surface finish
- High process reliability
- Varied application possibilities with regard to materials and application (e.g. MQL)
- Ensures spare machine capacity

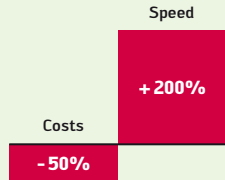
With this tool, Walter Titex is setting new standards in drilling with solid carbide tools. The drill incorporates a wealth of innovations – including the new multifunctional double coating (DPL) that has outstanding properties. With Walter Titex X-treme Plus you can increase productivity in the series production of steel components.



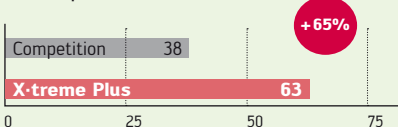
Example

Workpiece material: 42CrMo4
 Tool: **X-treme Plus**
 A3389DPL-8.5
 Diameter 8.5 mm

	Competition	X-treme Plus
vf	390 mm/min	1460 mm/min
Tool life	38 parts	63 parts

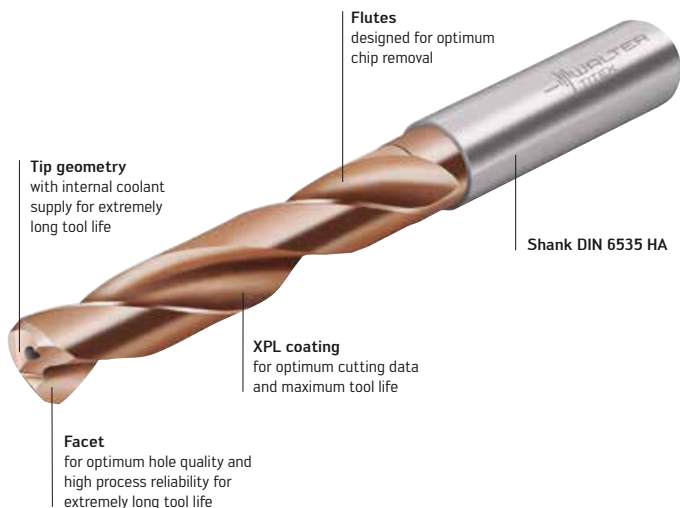


Tool life (parts)



Cost savings and increases in productivity with the X-treme Plus

Walter Titex X-treme CI



Walter Titex X-treme CI

Type: A3382XPL, HA shank, 5 x D_C

The tool

- Solid carbide high-performance drill with internal cooling
- XPL coating
- 140° point angle
- Dimensions according to
 - DIN 6537 L → 5 x D_C
- Diameter range 3 to 20 mm
- Shank according to DIN 6535 HA

The application

- For ISO material group K
- Can be used with emulsion, oil, minimum quantity lubrication and dry machining
- For use in general mechanical engineering, in mould and die making, and in the automotive and energy industries

Benefits for you

- Increase in productivity thanks to 50% higher workpiece values in comparison with conventional solid carbide drills
- Optimum hole quality for blind holes and through holes thanks to special facet → no chipping at the hole exit
- High process reliability thanks to very even wear behaviour when machining cast iron materials

Bearing cap: Drilling of flange holes

Workpiece material: GJS-400

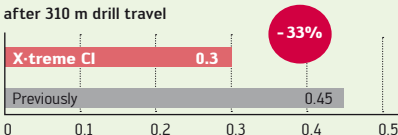
Tool: **X-treme CI**
A3382XPL-18.5
Diameter 18.5 mm

Drilling depth: 60 mm

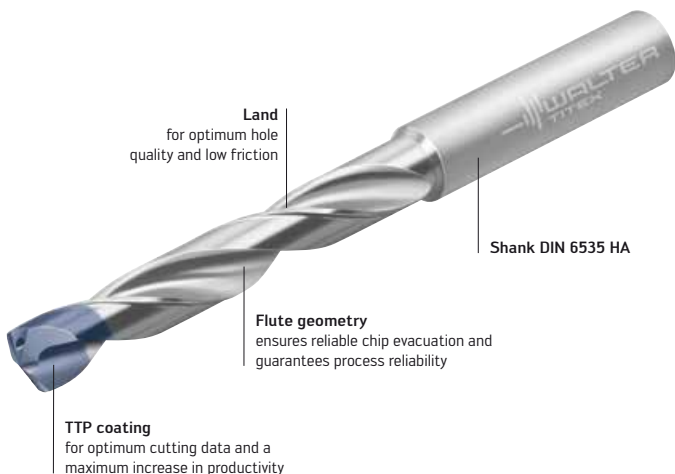
Cutting data

	X-treme CI
v_c	120 m/min
n	2065 rpm
f	0.5 mm
vf	1032 mm/min

Flank face wear after 310 m drill travel



Walter Titex X-treme Inox



Walter Titex X-treme Inox

Type: A3393TTP, HA shank, 5 x D_C

The tool

- Solid carbide high-performance drill
- TTP coating
- Dimensions to
 - DIN 6537 K → 3 x D_C
 - DIN 6537 L → 5 x D_C
- Diameter range 3 to 20 mm
- Shank according to DIN 6535 HA

The application

- For ISO material group M
- Can be used with emulsion and oil
- For use in general mechanical engineering and in the automotive, aerospace, medical, food and valve industries

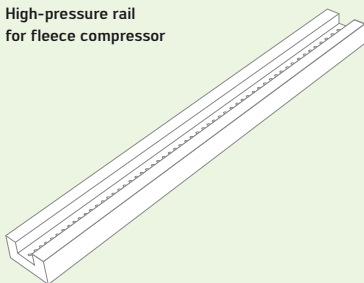
Benefits for you

- Reduced cutting forces due to new type of geometry
- Significant increase in productivity over universal drilling tools
- Low burr formation on entry and exit
- Excellent surface quality on component
- Stable main cutting edges guarantee maximum process reliability



Tip geometry
for reduced cutting forces,
low burr formation and
stable cutting edges

**High-pressure rail
for fleece compressor**

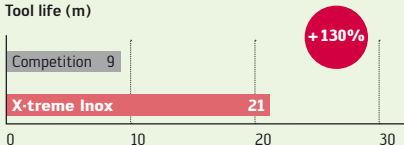


Workpiece material: 1.4542
Tool: **X-treme Inox**
A3393TTP-14.2
Diameter 14.2 mm

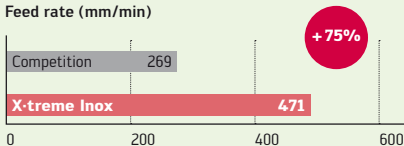
Cutting data

	Competition	X-treme Inox
v_c	60 m/min	70 m/min
n	1345 rpm	1570 rpm
f	0.2 mm/rev	0.3 mm/rev
vf	269 mm/min	471 mm/min

Tool life (m)



Feed rate (mm/min)



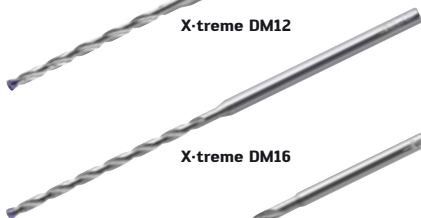
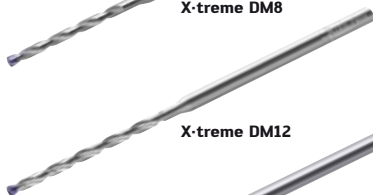
Watch product video:
Scan this QR code
or go directly to
<http://goo.gl/96NSH>

Walter Titex X-treme M, DM8..30



Watch product video:

Scan this QR code
or go directly to
<http://goo.gl/FmrPC>



The tool

- Solid carbide high-performance drill with internal cooling
- AML coating (AlTiN)
- AMP coating (AlTiN tip coating)
- Available in the following sizes:
 - 2 x D_C X-treme Pilot 150
 - 5 x D_C X-treme M
 - 8 x D_C X-treme DM8
 - 12 x D_C X-treme DM12
 - 16 x D_C X-treme DM16
 - 20 x D_C X-treme DM20
 - 25 x D_C X-treme DM25
 - 30 x D_C X-treme DM30
- Diameter range 2 to 2.95 mm
- Shank according to DIN 6535 HA

The application

- ISO material groups P, M, K, N, S, H, O
- Drilling with emulsion and oil
- For use in general mechanical engineering, mould and die making, and the automotive and energy industries

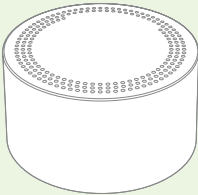
Benefits for you

- Measurable increases in productivity due to machining values which are up to 50% higher than conventional solid carbide micro-drills
- New types of point and flute geometry ensure high process reliability
- Polished flutes ensure reliable chip evacuation

Demo component

Workpiece material:
1.4571

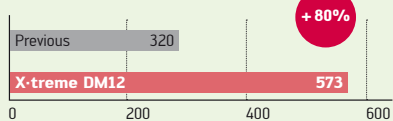
Tool:
X-treme DM12
A6589AMP-2
Diameter 2 mm



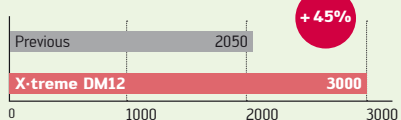
Cutting data

	Previous	X-treme DM12
v _c	50 m/min	60 m/min
n	7960 rpm	9550 rpm
f	0.04 mm/rev	0.06 mm/rev
v _f	320 mm/min	573 mm/min

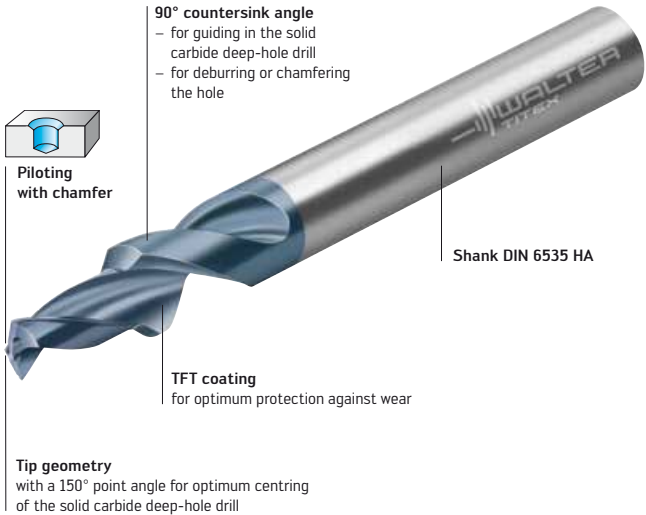
Feed rate (mm/min)



Number of holes



Walter Titex X-treme Pilot Step 90



Walter Titex X-treme Pilot Step 90

Type: K3281TFT, HA shank, 2 x D_C

The tool

- Solid carbide high-performance chamfering pilot drill with internal cooling
- TFT coating
- 150° point angle
- 90° countersink angle
- Dimensions according to Walter standard
- Drilling depth
 - 2 x D_C
- Diameter range 3 to 16 mm
- Shank according to DIN 6535 HA

The application

- For the ISO material groups P, M, K, N, S, H
- Step pilot drill for solid carbide deep-hole drills from the Alpha® and X-treme drill families for drilling depths of approx. 12 x D_C
- Can be used with emulsion and oil
- For use in general mechanical engineering, in the hydraulic industry, in mould and die making, and in the automotive and energy industries

Other Walter Titex pilot drills



Cylindrical
piloting



Type: A6181TFT



Cylindrical
piloting



Type: A6181AML



Cylindrical
piloting



Type: A7191TFL



Conical
piloting



Type: K5191TFT

Benefits for you

- Higher process reliability and tool life in deep-hole drilling
- Significantly reduced hole run-off
- No tolerance overlaps with solid carbide deep-hole drills
- High positioning accuracy as a result of a short chisel edge width

Walter Titex XD70 Technology

Coating
TTP tip coating

Polished flute
for reliable chip evacuation

4 lands for optimum hole quality and use on:

- inclined hole exits
- workpieces with cross holes

The tool

- Solid carbide high-performance drill with internal cooling
- TTP tip coating
- Dimensions:
 - Up to $50 \times D_C$ as a standard tool
 - $60-70 \times D_C$ as a special tool
- Diameter range 4.5 to 12 mm
- Shank according to DIN 6535 HA

The application

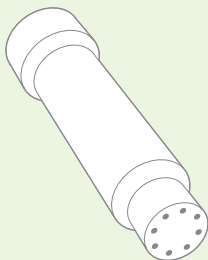
- For the ISO material groups P, K, N (M, S)
- Can be used with emulsion and oil
- For use in general mechanical engineering, mould and die making, and the automotive and energy industries

Piston rod

Workpiece material:
St 52-3

Tool:
Diameter 7 mm

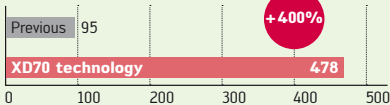
Drilling depth:
 $450 \text{ mm} - 65 \times D_C$



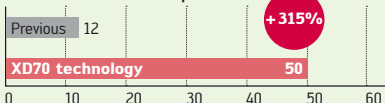
Cutting data

	Previous Gun drill	XD70 technology
v_c	70 m/min	70 m/min
n	3185 rpm	3185 rpm
f	0.03 mm/rev	0.15 mm/rev
v_f	95 mm/min	478 mm/min
Tool life	12 components	50 components

Feed rate



Tool life: Number of components





70 x D_C as special tool

Standard range



X-treme D50 – 50 x D_C



X-treme D40 – 40 x D_C



Alpha[®]4 XD30 – 30 x D_C



Alpha[®]4 XD25 – 25 x D_C



Alpha[®]4 XD20 – 20 x D_C



Alpha[®]4 XD16 – 16 x D_C

Benefits for you

- Up to 10-times higher productivity than gun drills
- Drilling without pecking
- Maximum process reliability at deep drilling depths
- Suitable for use with low coolant pressures from 20 bar
- Can be used with various material groups
- such as ISO P, K, N (M, S)
- Can be used for cross holes and inclined exits



Watch product video:
Scan this QR code or go directly
to <http://goo.gl/yQB64>



Watch product animation:
Scan this QR code or go directly
to <http://goo.gl/ZBIMm>

Walter Select for carbide and HSS drilling tools

Step by step to the right tool

STEP 1

Define the **material** to be machined, see GK page H 8 onwards.

Note the **machining group** that corresponds to your material e.g.: K5.

Identification letters	Machining group	Groups of the materials to be machined	
P	P1–P15	Steel	All types of steel and cast steel, with the exception of steel with an austenitic structure
M	M1–M3	Stainless steel	Stainless austenitic steel, austenitic-ferritic steel and cast steel
K	K1–K7	Cast iron	Grey cast iron, cast iron with spheroidal graphite, malleable cast iron, cast iron with vermicular graphite
N	N1–N10	NF metals	Aluminium and other non-ferrous metals, non-ferrous materials
S	S1–S10	Super alloys and titanium alloys	Heat-resistant special alloys based on iron, nickel and cobalt, titanium and titanium alloys
H	H1–H4	Hard materials	Hardened steel, hardened cast iron materials, chilled cast iron
O	O1–O6	Other	Plastics, glass- and carbon-fibre reinforced plastics, graphite

STEP 2

Select the **machining conditions**:

Machine stability, clamping system and workpiece		
very good	good	moderate
		

STEP 3

Select the **cutting material** (HSS, carbide) and the type of cooling:

Tools made from **carbide with internal cooling**: from page GK B 16

Tools made from **carbide without internal cooling**: from page GK B 22

Tools made from **HSS**: from page GK B 26

Page information refers to:

HB = this handbook · GK = Walter General Catalogue 2012 · EK = Walter Supplementary Catalogue 2013/2014

STEP 4

Choose your tool:

- In accordance with the drilling depth or **DIN** (e.g. 3 x D_C or DIN 338)
- In accordance with **machining conditions** (see step 2: 😊 😐 😞)
- For the relevant machining group (see step 1: P1–15; M1–M3; . . . O1–O6)

Machine stability, clamping system and workpiece		Main application		Drilling depth					
				3 x D _C					
WALTER SELECT		very good		good		moderate		Additional application	
		😊		😐		😞		☹️	
Grouping of main material groups and identification letters				Designation		A329DFL	A329DFL		
Workpiece material				Type		X Xtreme Plus	Alpha [®] 4		
Non-alloyed and low alloy steel				Dimensions		DIN 6517 K	DIN 6517 K		
High-alloy steel and high-alloy tool steel				Dia. range (mm)		3.00 – 20.00	3.00 – 20.00		
Stainless steel				Cutting tool material		K39F	K39F		
M Stainless steel				Coating		DNL	FTL		
				Flute		0 70	0 66/0 102		

STEP 5

Choose your **cutting data** from the table. See GK page B 352 or HB page 36 onwards:



- **Cutting speed:** v_C; VCRR (v_C rate chart for micro)
- **Feed:** VRR (feed rate chart)

Cutting data for wet machining		Dry machining is possible, cutting data must be selected from TEC		Drilling depth					
				3 x D _C					
WALTER SELECT		very good		good		moderate		Additional application	
		😊		😐		😞		☹️	
Grouping of main material groups and identification letters				Designation		A329DFL	A329DFL		
Workpiece material				Type		X Xtreme Plus	Alpha [®] 4		
Non-alloyed and low alloy steel				Dimensions		DIN 6517 K	DIN 6517 K		
High-alloy steel and high-alloy tool steel				Dia. range (mm)		3.00 – 20.00	3.00 – 20.00		
Stainless steel				Cutting tool material		K39F	K39F		
M Stainless steel				Coating		DNL	FTL		
				Flute		0 70	0 66/0 102		

Go to the row of your machining group (e.g. K5) and the column of your selected drilling tool. You will find the cutting speed v_C or the VCRR and VRR there.

The v_C rate chart (VCRR) and the feed rate chart (VRR) can be found in the GK from page B 382 or in the EK from page B-122 onwards.

Solid carbide cutting data with internal cooling (part 1/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth					
		Designation					
Material group	E = Emulsion O = Oil M = MQL L = Dry		v_c = Cutting speed VCRR = v _c rate chart HB page 54 VRR = feed rate chart HB page 55		Type		
					Dimensions		
					Ø range (mm)		
					Cutting material		
Structure of main material groups and code letters		Coating					
Workpiece material		Page					
		Brinell hardness HB	Tensile strength R _m N/mm ²	Machining group ¹			
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1		
		C > 0.25... ≤ 0.55% Annealed	190	639	P2		
		C > 0.25... ≤ 0.55% Tempered	210	708	P3		
		C > 0.55% Annealed	190	639	P4		
		C > 0.55% Tempered	300	1013	P5		
		Free cutting steel (short-chipping) Annealed	220	745	P6		
	Low-alloyed steel	Annealed	175	591	P7		
		Tempered	300	1013	P8		
		Tempered	380	1282	P9		
		Tempered	430	1477	P10		
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11		
		Hardened and tempered	300	1013	P12		
	Stainless steel	Hardened and tempered	400	1361	P13		
		Ferritic/martensitic, annealed	200	675	P14		
	Martensitic, tempered	330	1114	P15			
M	Stainless steel	Austenitic, quench hardened	200	675	M1		
		Austenitic, precipitation hardened (PH)	300	1013	M2		
		Austenitic/ferritic, duplex	230	778	M3		
K	Malleable cast iron	Ferritic	200	675	K1		
		Pearlitic	260	867	K2		
	Grey cast iron	Low tensile strength	180	602	K3		
		High tensile strength/austenitic	245	825	K4		
	Cast iron with spheroidal graphite	Ferritic	155	518	K5		
		Pearlitic	265	885	K6		
GGV (CGI)		200	675	K7			
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1		
		Hardenable, hardened	100	343	N2		
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3		
		≤ 12% Si, hardenable, hardened	90	314	N4		
	Magnesium alloys	> 12% Si, cannot be hardened	130	447	N5		
			70	250	N6		
Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7			
	Brass, bronze, red brass	90	314	N8			
	Cu-alloys, short-chipping	110	382	N9			
	High-strength, Ampco	300	1013	N10			
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1	
			Hardened	280	943	S2	
		Ni or Co base	Annealed	250	839	S3	
			Hardened	350	1177	S4	
	Titanium alloys		Cast	320	1076	S5	
		Pure titanium		200	675	S6	
		α and β alloys, hardened		375	1262	S7	
		β alloys		410	1396	S8	
Tungsten alloys			300	1013	S9		
Molybdenum alloys			300	1013	S10		
H	Hardened steel	Hardened and tempered	50 HRC	–	H1		
		Hardened and tempered	55 HRC	–	H2		
		Hardened and tempered	60 HRC	–	H3		
	Hardened cast iron	Hardened and tempered	55 HRC	–	H4		
O	Thermoplastics	Without abrasive fillers			O1		
	Thermosetting plastics	Without abrasive fillers			O2		
	Plastic, glass-fibre reinforced	GFRP			O3		
	Plastic, carbon-fibre reinforced	CFRP			O4		
	Plastic, aramid-fibre reinforced	AFRP			O5		
Graphite (technical)			80 Shore		O6		

Page information refers to:

The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

3 x D _c															
K3299XPL - K3899XPL				A3289DPL				A3293TTP				A3299XPL - A3899XPL			
X-treme Step 90				X-treme Plus				X-treme Inox				X-treme			
Walter standard				DIN 6537 K				DIN 6537 K				DIN 6537 K			
3.30 - 14.00				3.00 - 20.00				3.00 - 20.00				3.00 - 20.00			
K30F				K30F				K30F				K30F			
XPL				DPL				TTP				XPL			
EK B-75 / B-77				GK B 70				EK B-30				EK B-33 / B-54			
v _c	VRR			v _c	VRR			v _c	VRR			v _c	VRR		
140	12	EO	ML	200	16	EO	ML	160	10	EO	ML	140	12	EO	ML
140	12	EO	ML	180	12	EO	ML	120	10	EO	ML	140	12	EO	ML
130	12	EO	ML	170	12	EO	ML	110	10	EO	ML	130	12	EO	ML
140	12	EO	ML	180	12	EO	ML	120	10	EO	ML	140	12	EO	ML
105	10	EO	ML	140	12	EO	ML					105	10	EO	ML
150	12	EO	ML	200	16	EO	ML	145	12	EO	ML	150	12	EO	ML
140	12	EO	ML	180	12	EO	ML	120	10	EO	ML	140	12	EO	ML
105	10	EO	ML	140	12	EO	ML					105	10	EO	ML
80	7	OE		100	8	OE						80	7	OE	
63	5	OE		80	6	OE						63	5	OE	
71	9	EO		85	9	EO						71	9	EO	
95	9	EO		120	10	EO						95	9	EO	
63	5	OE		80	6	OE						63	5	OE	
71	9	EO		85	9	EO		95	9	EO		71	9	EO	
40	8	EO		50	9	EO		55	8	EO		40	8	EO	
40	6	EO		50	6	EO		53	6	EO		40	6	EO	
45	6	EO		63	6	EO		68	6	EO		45	6	EO	
34	5	EO		40	6	EO		53	6	EO		34	5	EO	
100	16	EO	ML	130	20	EO	ML					100	16	EO	ML
63	10	EO	ML	120	16	EO	ML					63	10	EO	ML
125	16	EO	ML	160	20	EO	ML					125	16	EO	ML
105	16	EO	ML	130	20	EO	ML					105	16	EO	ML
130	16	EO	ML	150	16	EO	ML					130	16	EO	ML
95	16	EO	ML	120	16	EO	ML					95	16	EO	ML
110	16	EO	ML	140	16	EO	ML					110	16	EO	ML
400	16	EO	M	450	16	EO	M	450	16	EO	M	400	16	EO	M
400	16	EO	M	450	16	EO	M	450	16	EO	M	400	16	EO	M
250	16	EO	M	320	16	EO	M	250	16	EO	M	250	16	EO	M
240	16	EO	M	300	16	EO	M	240	16	EO	M	240	16	EO	M
190	16	EO	M	250	16	EO	M	190	16	EO	M	190	16	EO	M
240	16		ML	300	16		ML	240	16		ML	240	16		ML
190	8	EO	M	280	12	EO	M	210	9	EO	M	190	8	EO	M
160	10	EO		240	16	EO		180	12	EO		160	10	EO	
190	16	EO	M	260	20	EO	M	190	16	EO	M	190	16	EO	M
60	5	EO		120	10	EO		60	7	EO		60	5	EO	
50	6	EO		50	6	EO		50	6	EO		50	6	EO	
30	5	OE		38	5	OE		38	5	OE		30	5	OE	
34	5	EO		42	5	EO		42	5	EO		34	5	EO	
19	4	OE		26	4	OE		26	4	OE		19	4	OE	
26	4	OE		32	4	OE		32	4	OE		26	4	OE	
56	6	OE		71	6	OE		71	6	OE		56	6	OE	
50	5	OE		63	5	OE		63	5	OE		50	5	OE	
12.5	4	OE		20	4	OE		20	4	OE		12.5	4	OE	
60	5	EO		120	10	EO		120	9	EO		60	5	EO	
60	5	EO		120	10	EO		120	9	EO		60	5	EO	
48	4	OE		53	4	OE						48	4	OE	
32	3	OE		45	4	OE						32	3	OE	
32	3	OE		45	4	OE						32	3	OE	
100	16	EO		130	16	EO		130	16	EO		100	16	EO	

Solid carbide cutting data with internal cooling (part 2/8)



Material group	 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth			
			Designation			
			Type			
			Dimensions			
	E = Emulsion O = Oil M = MQL L = Dry	v_c = Cutting speed VCRR = v_c rate chart HB page 54 VRR = feed rate chart HB page 55	\emptyset range (mm) Cutting material			
			Coating			
	Structure of main material groups and code letters		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹	
	Workpiece material					
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
	Stainless steel	Hardened and tempered	400	1361	P13	
		Ferritic/martensitic, annealed	200	675	P14	
Martensitic, tempered		330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
GGV (CGI)	Pearlitic	265	885	K6		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
		> 12% Si, cannot be hardened	130	447	N5	
	Magnesium alloys		70	250	N6	
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7	
Brass, bronze, red brass		90	314	N8		
Cu-alloys, short-chipping		110	382	N9		
High-strength, Ampco		300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
			Cast	320	1076	S5
	Titanium alloys	Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
Tungsten alloys	β alloys	410	1396	S8		
Molybdenum alloys		300	1013	S9		
H	Hardened steel		300	1013	S10	
		Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
	Hardened cast iron	Hardened and tempered	60 HRC	–	H3	
		Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
	Graphite (technical)		80 Shore		O6	

Page information refers to:

The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

5 x D _c															
A3389AML				A3389DPL				A3393TTP				A3382XPL			
X-treme M				X-treme Plus				X-treme Inox				X-treme CI			
Walter standard				DIN 6537 L				DIN 6537 L				DIN 6537 L			
2.00 – 2.95				3.00 – 20.00				3.00 – 20.00				3.00 – 20.00			
K30F				K30F				K30F				K30F			
AML				DPL				TTP				XPL			
EK B-41				GK B 86				EK B-42				GK B 81			
VCCR	VRR			v _c	VRR			v _c	VRR			v _c	VRR		
C100	12	E		190	12	EO	ML	150	10	EO	ML				
C80	12	E		170	12	EO	ML	110	10	EO	ML				
C80	12	E		160	12	EO	ML	100	10	EO	ML				
C100	12	E		170	12	EO	ML	110	10	EO	ML				
C71	12	E		130	12	EO	ML								
C100	12	E		190	16	EO	ML	135	12	EO	ML				
C80	12	E		170	12	EO	ML	110	10	EO	ML				
C71	12	E		130	12	EO	ML								
C56	9	E		95	8	OE									
C40	6	E		71	6	OE									
C63	10	E		85	9	EO									
C63	12	E		120	10	EO									
C40	6	E		71	6	OE									
C63	10	E		85	9	EO		90	9	EO					
C50	8	E		48	9	EO		50	8	EO					
C40	8	E		48	6	EO		50	6	EO					
C63	10	E		60	6	EO		65	6	EO					
C32	5	E		38	6	EO		50	6	EO					
C160	21	E		125	16	EO	ML					130	20	EO	ML
C160	21	E		120	16	EO	ML					120	16	EO	ML
C160	21	E		150	16	EO	ML					160	20	EO	ML
C160	21	E		125	16	EO	ML					130	20	EO	ML
C160	21	E		140	16	E	ML					160	20	EO	ML
C125	16	E		120	16	EO	ML					120	16	EO	ML
C140	19	E		130	16	OE	ML					140	20	EO	ML
C160	26	E		450	16	EO	M	450	16	EO	M				
C160	26	E		450	16	EO	M	450	16	EO	M				
C160	24	E		320	16	EO	M	250	16	EO	M				
C160	24	E		300	16	EO	M	240	16	EO	M				
C125	20	E		250	16	EO	M	190	16	EO	M				
				300	16		ML	240	16		ML				
C100	6	E		240	10	EO	M	210	9	EO	M				
C80	12	E		200	12	EO		180	12	EO					
C100	20	E		260	20	EO	M	190	16	EO	M				
C56	8	E		120	10	EO		60	7	EO					
C50	8	E		48	6	EO		48	6	EO					
C26	6	E		36	5	OE		36	5	OE					
C32	5	E		40	5	EO		40	5	EO					
C16	6	E		24	4	OE		24	4	OE					
C16	6	E		30	4	OE		30	4	OE					
C50	6	E		60	6	OE		60	6	OE					
C32	5	E		53	5	OE		53	5	OE					
C16	5	E		18	4	OE		18	4	OE					
C56	8	E		120	10	EO		120	9	EO					
C56	8	E		120	10	EO		120	9	EO					
C32	3	E		53	4	OE									
C32	3	E		45	4	OE									
C32	3	E		45	4	OE									
C100	22	E		130	16	EO		130	16	EO					

Solid carbide cutting data with internal cooling (part 3/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation	Type			
Material group	E = Emulsion O = Oil M = MQL L = Dry v_c = Cutting speed $VCRR = v_c$ rate chart HB page 54 VRR = feed rate chart HB page 55	Dimensions				
		Ø range (mm)				
		Cutting material				
Structure of main material groups and code letters		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
Workpiece material						
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
	Stainless steel	Hardened and tempered	400	1361	P13	
		Ferritic/martensitic, annealed	200	675	P14	
	Martensitic, tempered	330	1114	P15		
	M Stainless steel	Austenitic, quench hardened	200	675	M1	
Austenitic, precipitation hardened (PH)		300	1013	M2		
Austenitic/ferritic, duplex		230	778	M3		
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
		Pearlitic	265	885	K6	
GGV (CGI)		200	675	K7		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
	Magnesium alloys	> 12% Si, cannot be hardened	130	447	N5	
			70	250	N6	
Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7		
	Brass, bronze, red brass	90	314	N8		
	Cu-alloys, short-chipping	110	382	N9		
	High-strength, Ampco	300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
	Titanium alloys	Cast	320	1076	S5	
		Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
β alloys		410	1396	S8		
Tungsten alloys		300	1013	S9		
Molybdenum alloys		300	1013	S10		
H	Hardened steel	Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
		Hardened and tempered	60 HRC	–	H3	
	Hardened cast iron	Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
Graphite (technical)		80 Shore			O6	

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5 x D _c				8 x D _c				12 x D _c							
A3399XPL · A3999XPL				A6489AMP				A6489DPP				A6589AMP			
X-treme				X-treme DM8				X-treme D8				X-treme DM12			
DIN 6537 L				Walter standard				Walter standard				Walter standard			
3.00 – 25.00				2.00 – 2.95				3.00 – 20.00				2.00 – 2.90			
K30F				K30F				K30F				K30F			
XPL				AMP				DPP				AMP			
GK B 89 / B 112				EK B-67				GK B 123				EK B-68			
V _c	VRR			VCRR	VRR			V _c	VRR			VCRR	VRR		
120	10	EO	ML	C100	12	E		180	12	EO	ML	C80	12	E	
100	10	EO	ML	C80	12	E		160	12	EO	ML	C80	12	E	
95	10	EO	ML	C80	12	E		150	12	EO	ML	C80	12	E	
100	10	EO	ML	C80	12	E		160	12	EO	ML	C80	12	E	
71	8	EO	ML	C71	12	E		125	10	EO	ML	C59	10	E	
120	12	EO	ML	C100	12	E		180	12	EO	ML	C80	12	E	
100	10	EO	ML	C80	12	E		160	12	EO	ML	C80	12	E	
71	8	EO	ML	C71	12	E		125	10	EO	ML	C59	10	E	
48	6	OE		C53	8	E		85	7	OE		C45	7	E	
38	4	OE		C40	6	E		63	5	OE		C40	6	E	
63	8	EO		C63	10	E		80	8	EO		C63	10	E	
56	7	EO		C63	10	E		110	9	EO		C50	8	E	
38	4	OE		C40	6	E		63	5	OE		C40	6	E	
63	8	EO		C63	10	E		80	8	EO		C63	10	E	
42	7	EO		C50	8	E		45	8	EO		C50	8	E	
38	5	EO		C40	8	E		45	6	EO		C40	7	E	
42	6	EO		C50	8	E		56	6	EO		C50	7	E	
31	5	EO		C32	5	E		36	6	EO		C25	5	E	
95	16	EO	ML	C125	17	E		120	12	EO	ML	C100	13	E	
71	12	EO	ML	C125	17	E		110	12	EO	ML	C100	13	E	
120	16	EO	ML	C125	17	E		140	12	EO	ML	C100	13	E	
95	16	EO	ML	C125	17	E		120	12	EO	ML	C100	13	E	
95	16	EO	ML	C125	17	E		140	12	EO	ML	C100	13	E	
71	12	EO	ML	C100	14	E		110	12	EO	ML	C80	11	E	
85	16	EO	ML	C110	16	E		125	12	EO	ML	C100	12	E	
400	16	EO	M	C160	26	E		450	16	EO	M	C160	25	E	
400	16	EO	M	C160	26	E		450	16	EO	M	C160	25	E	
250	16	EO	M	C160	24	E		320	16	EO	M	C160	23	E	
240	16	EO	M	C160	24	E		300	16	EO	M	C160	23	E	
190	16	EO	M	C125	20	E		250	16	EO	M	C125	19	E	
240	16		ML					300	16		ML				
180	8	EO	M	C80	6	E		200	9	EO	M	C80	6	E	
150	10	EO		C80	12	E		170	12	EO		C80	11	E	
190	16	EO	M	C100	20	E		260	20	EO	M	C80	19	E	
56	7	EO		C52	8	E		110	9	EO		C50	7	E	
42	5	EO		C40	8	E		45	6	EO		C40	7	E	
24	4	OE		C24	6	E		32	5	OE		C21	6	E	
30	4	EO		C32	5	E		38	5	EO		C25	5	E	
15	3	OE		C16	6	E		21	4	OE		C16	5	E	
18	3	OE		C16	6	E		26	4	OE		C16	5	E	
48	6	OE		C50	6	E		50	5	OE		C40	6	E	
40	5	OE		C32	5	E		45	5	OE		C32	5	E	
11	3	OE		C16	5	E		16	4	OE		C16	5	E	
56	7	EO		C52	8	E		110	9	EO		C56	8	E	
56	7	EO		C52	8	E		110	9	EO		C56	8	E	
30	3	OE		C32	3	E		45	3	OE		C32	3	E	
26	3	OE		C32	3	E		38	3	OE		C32	3	E	
26	3	OE		C32	3	E		38	3	OE		C32	3	E	
				C100	22	E		130	16	EO		C100	20	E	

Solid carbide cutting data with internal cooling (part 4/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation				
Material group	E = Emulsion O = Oil M = MQL L = Dry		v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55		Type	
					Dimensions	
					Ø range (mm)	
					Cutting material	
Structure of main material groups and code letters		Coating				
		Page				
Workpiece material		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
	Stainless steel	Hardened and tempered	400	1361	P13	
		Ferritic/martensitic, annealed	200	675	P14	
Martensitic, tempered		330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
GGV (CGI)	Pearlitic	265	885	K6		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
		> 12% Si, cannot be hardened	130	447	N5	
	Magnesium alloys		70	250	N6	
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper		100	343	N7
Brass, bronze, red brass		90	314	N8		
Cu-alloys, short-chipping		110	382	N9		
High-strength, Ampco		300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
			Cast	320	1076	S5
	Titanium alloys	Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
Tungsten alloys	β alloys	410	1396	S8		
Molybdenum alloys		300	1013	S9		
H	Hardened steel		300	1013	S10	
		Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
	Hardened cast iron	Hardened and tempered	60 HRC	–	H3	
		Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
	Graphite (technical)		80 Shore		O6	

Page information refers to:

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For special applications, adjustment is recommended.

12 x D _c				16 x D _c				20 x D _c							
A6589DPP				A6689AMP				A6685TFP				A6789AMP			
X-treme D12				X-treme DM16				Alpha® 4 XD16				X-treme DM20			
Walter standard				Walter standard				Walter standard				Walter standard			
3.00 – 20.00				2.00 – 2.90				3.00 – 16.00				2.00 – 2.90			
K30F				K30F				K30F				K30F			
DPP				AMP				TFP				AMP			
GK B 127				EK B-69				GK B 130				GK B 132			
															
															
v _c	VRR			VCRR	VRR			v _c	VRR			VCRR	VRR		
170	12	EO	ML	C80	10	E		110	10	EO	ML	C80	10	E	
150	12	EO	ML	C71	10	E		95	10	EO	ML	C63	10	E	
140	12	EO	ML	C63	10	E		90	10	EO	ML	C71	10	E	
150	12	EO	ML	C71	10	E		95	10	EO	ML	C63	10	E	
120	10	EO	ML	C45	6	E		67	9	EO	ML	C50	8	E	
170	12	EO	ML	C80	10	E		110	12	EO	ML	C80	10	E	
150	12	EO	ML	C71	10	E		95	10	EO	ML	C63	10	E	
120	10	EO	ML	C45	6	E		67	9	EO	ML	C50	8	E	
80	7	OE		C45	10	E		42	7	OE		C36	5	E	
56	5	OE		C36	5	E		28	6	OE		C32	5	E	
75	8	EO		C63	9	E		60	8	EO		C50	9	E	
105	9	EO		C45	6	E		56	8	EO		C40	5	E	
56	5	OE		C45	10	E		28	6	OE		C32	5	E	
75	8	EO		C50	10	E		60	8	EO		C50	9	E	
42	8	EO		C45	4	E		40	7	EO		C40	8	E	
42	6	EO		C36	7	E		40	5	EO		C32	6	E	
56	6	EO		C45	4	E		50	5	EO		C32	4	E	
34	6	EO		C28	5	E		32	5	EO		C25	4	E	
110	12	EO	ML	C71	10	E		90	16	EO	ML	C63	8	E	
83	12	EO	ML	C63	10	E		67	12	EO	ML	C63	8	E	
130	12	EO	ML	C90	10	E		110	16	EO	ML	C80	8	E	
110	12	EO	ML	C71	11	E		90	16	EO	ML	C63	8	E	
130	12	EO	ML	C80	12	E		90	16	EO	ML	C63	8	E	
105	12	EO	ML	C63	10	E		67	12	EO	ML	C50	8	E	
120	12	EO	ML	C63	9	E		80	16	EO	ML	C63	9	E	
420	16	EO	M	C125	24	E		130	16	EO	M	C125	22	E	
420	16	EO	M	C125	24	E		130	16	EO	M	C125	22	E	
320	16	EO	M	C125	22	E		130	16	EO	M	C125	20	E	
280	16	EO	M	C125	22	E		130	16	EO	M	C125	20	E	
240	16	EO	M	C100	18	E		130	16	EO	M	C100	17	E	
280	16		ML					130	16		ML				
190	8	EO	M	C63	5	E		110	7	EO	M	C63	5	E	
160	10	EO		C80	9	E		90	9	EO		C63	10	E	
250	20	EO	M	C80	18	E		110	10	EO	M	C80	17	E	
105	9	EO		C40	5	E		56	8	EO		C45	6	E	
42	6	EO		C20	5	E		40	5	OE		C32	6	E	
30	4	OE		C28	5	E		24	4	OE		C21	5	E	
36	5	EO		C14	5	E		30	4	EO		C25	4	E	
18	3	OE		C14	5	E		13	3	OE		C14	5	E	
22	3	OE		C25	5	E		16	3	OE		C14	5	E	
45	5	OE		C40	5	E		36	5	OE		C40	5	E	
40	4	OE		C22	4	E		24	5	OE		C25	4	E	
14	3	OE		C18	3	E		9.5	3	OE		C14	4	E	
105	9	EO		C14	5	E		56	8	EO		C45	7	E	
105	9	EO		C14	5	E		56	8	EO		C45	7	E	
38	3	OE		C28	3	E		22	2	OE		C25	3	E	
32	3	OE										C25	3	E	
32	3	OE										C25	3	E	
125	16	EO		C90	20	E		90	16	EO		C100	20	E	

Solid carbide cutting data with internal cooling (part 5/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth					
		Designation					
Material group	E = Emulsion O = Oil M = MQL L = Dry		v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55		Type		
					Dimensions		
					Ø range (mm)		
					Cutting material		
Structure of main material groups and code letters		Coating					
Workpiece material		Page					
		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹			
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1		
		C > 0.25... ≤ 0.55% Annealed	190	639	P2		
		C > 0.25... ≤ 0.55% Tempered	210	708	P3		
		C > 0.55% Annealed	190	639	P4		
		C > 0.55% Tempered	300	1013	P5		
		Free cutting steel (short-chipping) Annealed	220	745	P6		
	Low-alloyed steel	Annealed	175	591	P7		
		Tempered	300	1013	P8		
		Tempered	380	1282	P9		
		Tempered	430	1477	P10		
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11		
		Hardened and tempered	300	1013	P12		
	Stainless steel	Hardened and tempered	400	1361	P13		
		Ferritic/martensitic, annealed	200	675	P14		
Martensitic, tempered		330	1114	P15			
M	Stainless steel	Austenitic, quench hardened	200	675	M1		
		Austenitic, precipitation hardened (PH)	300	1013	M2		
		Austenitic/ferritic, duplex	230	778	M3		
K	Malleable cast iron	Ferritic	200	675	K1		
		Pearlitic	260	867	K2		
	Grey cast iron	Low tensile strength	180	602	K3		
		High tensile strength/austenitic	245	825	K4		
	Cast iron with spheroidal graphite	Ferritic	155	518	K5		
GGV (CGI)	Pearlitic	265	885	K6			
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1		
		Hardenable, hardened	100	343	N2		
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3		
		≤ 12% Si, hardenable, hardened	90	314	N4		
		> 12% Si, cannot be hardened	130	447	N5		
	Magnesium alloys		70	250	N6		
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7		
Brass, bronze, red brass		90	314	N8			
Cu-alloys, short-chipping		110	382	N9			
High-strength, Ampco		300	1013	N10			
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1	
			Hardened	280	943	S2	
		Ni or Co base	Annealed	250	839	S3	
			Hardened	350	1177	S4	
			Cast	320	1076	S5	
	Titanium alloys	Pure titanium	200	675	S6		
		α and β alloys, hardened	375	1262	S7		
Tungsten alloys	β alloys	410	1396	S8			
Molybdenum alloys		300	1013	S9			
H	Hardened steel		300	1013	S10		
		Hardened and tempered	50 HRC	–	H1		
		Hardened and tempered	55 HRC	–	H2		
	Hardened cast iron	Hardened and tempered	60 HRC	–	H3		
		Hardened and tempered	55 HRC	–	H4		
O	Thermoplastics	Without abrasive fillers			O1		
	Thermosetting plastics	Without abrasive fillers			O2		
	Plastic, glass-fibre reinforced	GFRP			O3		
	Plastic, carbon-fibre reinforced	CFRP			O4		
	Plastic, aramid-fibre reinforced	AFRP			O5		
	Graphite (technical)		80 Shore		O6		

Page information refers to:

The specified cutting data are average recommended values.
For special applications, adjustment is recommended.



20 x D _c						25 x D _c					
A6794TFP			A6785TFP			A6889AMP			A6885TFP		
X-treme DH20			Alpha® 4 XD20			X-treme DM25			Alpha® 4 XD25		
Walter standard			Walter standard			Walter standard			Walter standard		
3.00 – 10.00			3.00 – 16.00			2.00 – 2.90			3.00 – 12.00		
K30F			K30F			K30F			K30F		
TFP			TFP			AMP			TFP		
GK B 133			GK B 131			GK B 135			GK B 134		
V _c	VRR		V _c	VRR		V _c	VRR		V _c	VRR	
			105	10	EO ML	C80	10	E	95	9	EO ML
			90	10	EO ML	C63	10	E	85	9	EO ML
			85	10	EO ML	C63	10	E	80	9	EO ML
			90	10	EO ML	C63	10	E	85	9	EO ML
63	8	EO ML	63	8	EO ML	C50	8	E	60	8	EO ML
			105	10	EO ML	C80	10	E	95	10	EO ML
			90	10	EO ML	C63	10	E	85	9	EO ML
63	8	EO ML	63	8	EO ML	C50	8	E	60	8	EO ML
40	7	OE ML	40	7	OE	C36	5	E	36	6	OE
25	6	OE	25	6	OE	C32	5	E	24	5	OE
56	7	EO	56	8	EO	C50	9	E	53	7	EO
53	7	EO ML	53	7	EO	C40	5	E	48	7	EO
25	6	OE	25	6	OE	C32	5	E	24	5	OE
56	7	EO	56	8	EO	C50	9	E	53	7	EO
36	6	EO	36	6	EO	C40	8	E	34	6	EO
			36	5	OE	C32	6	E	34	4	OE
48	5	EO	48	5	EO	C32	4	E	45	5	EO
			29	5	OE	C25	4	E	27	4	OE
			85	12	EO ML	C63	8	E	80	12	EO ML
			63	12	EO ML	C63	8	E	60	12	EO ML
			105	12	EO ML	C80	8	E	95	12	EO ML
			85	12	EO ML	C63	8	E	80	12	EO ML
			85	12	EO ML	C63	8	E	80	12	EO ML
63	12	EO ML	63	12	EO ML	C50	8	E	60	12	EO ML
71	12	OE ML	75	12	EO ML	C63	9	E	71	12	EO ML
			105	16	EO M	C125	22	E	80	16	EO M
			105	16	EO M	C125	22	E	80	16	EO M
			105	16	EO M	C125	20	E	80	16	EO M
			105	16	EO M	C125	20	E	80	16	EO M
			105	16	EO M	C100	17	E	80	12	EO M
			105	16	ML				80	16	ML
			105	7	EO M	C63	5	E	95	6	EO M
			85	9	EO	C63	10	E	80	8	EO
			105	10	EO M	C80	17	E	95	10	EO M
53	7	EO M	53	7	EO	C45	6	E	48	7	EO
			36	5	OE	C32	6	E	34	4	OE
16	3	OE	21	3	OE	C19	5	E	20	3	OE
			28	3	EO	C25	4	E	26	3	EO
12	3	OE	12	3	OE	C14	5	E	11	2	OE
15	3	OE	15	3	OE	C14	5	E	14	2	OE
			34	5	OE	C40	5	E	32	5	OE
			21	4	OE	C25	4	E	19	4	OE
9	3	OE	9	3	OE	C14	4	E	8,5	2	OE
53	7	EO M	53	7	EO	C45	7	E	48	7	EO
53	7	EO M	53	7	EO	C45	7	E	48	7	EO
21	2	OE	21	2	OE	C25	3	E	20	2	OE
						C25	3	E			
						C25	3	E			
			85	12	EO	C100	20	E	80	12	EO

Solid carbide cutting data with internal cooling (part 6/8)

 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation				
Material group	E = Emulsion O = Oil M = MQL L = Dry v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55		Type			
			Dimensions			
			Ø range (mm)			
			Cutting material			
Structure of main material groups and code letters		Coating				
Workpiece material		Page				
		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
		Hardened and tempered	400	1361	P13	
	Stainless steel	Ferritic/martensitic, annealed	200	675	P14	
Martensitic, tempered		330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
GGV (CGI)	Pearlitic	265	885	K6		
N	Aluminium wrought alloys	Cannot be hardened	30	-	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
		> 12% Si, cannot be hardened	130	447	N5	
	Magnesium alloys		70	250	N6	
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper		100	343	N7
Brass, bronze, red brass		90	314	N8		
Cu-alloys, short-chipping		110	382	N9		
High-strength, Ampco		300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
			Cast	320	1076	S5
	Titanium alloys	Pure titanium		200	675	S6
		α and β alloys, hardened		375	1262	S7
Tungsten alloys	β alloys		410	1396	S8	
Molybdenum alloys			300	1013	S9	
H	Hardened steel	Hardened and tempered		50 HRC	-	H1
		Hardened and tempered		55 HRC	-	H2
		Hardened and tempered		60 HRC	-	H3
	Hardened cast iron	Hardened and tempered		55 HRC	-	H4
O	Thermoplastics	Without abrasive fillers				O1
	Thermosetting plastics	Without abrasive fillers				O2
	Plastic, glass-fibre reinforced	GFRP				O3
	Plastic, carbon-fibre reinforced	CFRP				O4
	Plastic, aramid-fibre reinforced	AFRP				O5
Graphite (technical)			80 Shore		O6	













Page information refers to:

Solid carbide cutting data with internal cooling (part 7/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation	Type			
Material group	E = Emulsion O = Oil M = MQL L = Dry v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55	Dimensions	Coating			
		Structure of main material groups and code letters	Ø range (mm)	Page		
		Workpiece material	Cutting material			
		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
	Stainless steel	Hardened and tempered	400	1361	P13	
		Ferritic/martensitic, annealed	200	675	P14	
	Martensitic, tempered	330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
		Pearlitic	265	885	K6	
GGV (CGI)		200	675	K7		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
	Magnesium alloys	> 12% Si, cannot be hardened	130	447	N5	
			70	250	N6	
Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper		100	343	N7	
			90	314	N8	
	Cu-alloys, short-chipping		110	382	N9	
		High-strength, Ampco	300	1013	N10	
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
				320	1076	S5
	Titanium alloys	Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
	Tungsten alloys	β alloys	410	1396	S8	
	Molybdenum alloys		300	1013	S9	
		300	1013	S10		
H	Hardened steel	Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
		Hardened and tempered	60 HRC	–	H3	
	Hardened cast iron	Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
	Graphite (technical)		80 Shore		O6	

Page information refers to:







The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

50 x D _c			K3281TFT			Pilot drill			A6181TFT						
A7595TTP			X-treme Pilot Step 90			X-treme Pilot 150			XD Pilot						
Walter standard			Walter standard			Walter standard			Walter standard						
4.50 – 9.00			3.00 – 16.00			2.00 – 2.95			3.00 – 16.00						
K30F			K30F			K30F			K30F						
TTP			TFT			AML			TFT						
HB 68			EK B-74			GK B 117			GK B 118						
															
															
v _c	VRR			v _c	VRR			VCR	VRR			v _c	VRR		
90	10	EO		120	12	EO	ML	C100	12	E		120	12	EO	ML
90	10	EO		105	12	EO	ML	C80	12	E		105	12	EO	ML
80	10	EO		100	12	EO	ML	C80	12	E		100	12	EO	ML
90	10	EO		105	12	EO	ML	C80	12	E		105	12	EO	ML
63	10	EO		75	9	EO	ML	C67	9	E		75	9	EO	ML
80	10	EO		120	12	EO	ML	C100	12	E		120	12	EO	ML
90	10	EO		105	12	EO	ML	C80	12	E		105	12	EO	ML
71	8	EO		75	9	EO	ML	C67	9	E		75	9	EO	ML
				50	6	OE	ML	C45	6	E		50	6	OE	ML
				42	4	OE		C40	6	E		42	4	OE	
80	10	EO		67	9	EO		C63	10	E		67	9	EO	
63	10	EO		60	7	EO	ML	C50	6	E		60	7	EO	ML
				42	4	OE		C40	6	E		42	4	OE	
71	9	EO		67	9	EO		C63	10	E		67	9	EO	
56	8	EO		42	7	EO		C50	8	E		42	7	EO	
56	6	OE		42	5	EO		C40	8	E		42	5	EO	
				56	6	EO		C50	6	E		56	6	EO	
50	6	OE		34	5	EO		C25	5	E		34	5	EO	
90	12	EO		100	16	EO	ML	C80	10	E		100	16	EO	ML
71	9	EO		75	16	EO	ML	C80	10	E		75	16	EO	ML
90	11	EO		120	16	EO	ML	C100	10	E		120	16	EO	ML
90	12	EO		100	16	EO	ML	C80	10	E		100	16	EO	ML
90	11	EO		95	20	E	ML	C80	10	E		95	20	E	ML
71	9	EO		75	16	EO	ML	C63	10	E		75	16	EO	ML
71	9	EO		85	20	OE	ML	C71	10	E		85	20	OE	ML
90	13	EO		400	16	EO	M	C160	20	E		400	16	EO	M
90	13	EO		400	16	EO	M	C160	20	E		400	16	EO	M
90	13	EO		250	16	EO	M	C160	20	E		250	16	EO	M
90	13	EO		240	16	EO	M	C160	20	E		240	16	EO	M
90	13	EO		190	16	EO	M	C125	20	E		190	16	EO	M
				240	16		ML					240	16		ML
90	13	EO		210	9	EO	M	C80	6	E		210	9	EO	M
90	13	EO		180	12	EO		C80	12	E		180	12	EO	
				190	16	EO	M	C100	20	E		190	16	EO	M
				60	7	EO	M	C56	8	E		60	7	EO	M
				42	5	EO		C40	8	E		42	5	EO	
				26	4	OE		C22	6	E		26	4	OE	
				32	4	EO		C25	5	E		32	4	EO	
				16	3	OE		C20	6	E		16	3	OE	
				20	3	OE		C20	6	E		20	3	OE	
				56	6	OE		C50	6	E		56	6	OE	
32	4	OE		48	5	OE		C32	5	E		48	5	OE	
				12	3	OE		C20	5	E		12	3	OE	
				60	7	EO	M	C56	8	E		60	7	EO	M
				60	7	EO	M	C56	8	E		60	7	EO	M
				36	3	OE		C40	3	E		36	3	OE	
				31	3	OE		C40	3	E		31	3	OE	
				31	3	OE		C40	3	E		31	3	OE	
				100	16	EO		C100	20	E		100	16	EO	

Solid carbide cutting data with internal cooling (part 8/8)



 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation				
Material group	E = Emulsion O = Oil M = MQL L = Dry v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55		Type			
			Dimensions			
			Ø range (mm)			
			Cutting material			
Structure of main material groups and code letters		Coating				
Workpiece material		Page				
		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
P	Non-alloyed steel	C ≤ 0.25% Annealed	125	428	P1	
		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
	High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11	
		Hardened and tempered	300	1013	P12	
	Stainless steel	Hardened and tempered	400	1361	P13	
		Ferritic/martensitic, annealed	200	675	P14	
Martensitic, tempered		330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
GGV (CGI)	Pearlitic	265	885	K6		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
		> 12% Si, cannot be hardened	130	447	N5	
	Magnesium alloys		70	250	N6	
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7	
Brass, bronze, red brass		90	314	N8		
Cu-alloys, short-chipping		110	382	N9		
High-strength, Ampco		300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
			Cast	320	1076	S5
	Titanium alloys	Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
Tungsten alloys	β alloys	410	1396	S8		
Molybdenum alloys		300	1013	S9		
H	Hardened steel		300	1013	S10	
		Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
	Hardened cast iron	Hardened and tempered	60 HRC	–	H3	
		Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
	Graphite (technical)		80 Shore		O6	

Page information refers to:







Pilot drill							
A7191TFT				K5191TFT			
X-treme Pilot 180				X-treme Pilot 180C			
Walter standard				Walter standard			
3.00 – 10.00				4.00 – 7.00			
K30F				K30F			
TFT				TFT			
GK B 138, HB 68				GK B 140			
							
							
v _c	VRR			v _c	VRR		
120	9	EO	ML	120	9	EO	ML
105	8	EO	ML	105	8	EO	ML
100	8	EO	ML	100	8	EO	ML
105	8	EO	ML	105	8	EO	ML
75	6	EO	ML	75	6	EO	ML
120	9	EO	ML	120	9	EO	ML
105	8	EO	ML	105	8	EO	ML
75	6	EO	ML	75	6	EO	ML
50	4	OE	ML	50	4	OE	ML
42	2	OE		42	2	OE	
67	6	EO		67	6	EO	
60	5	EO	ML	60	5	EO	ML
42	2	OE		42	2	OE	
67	6	EO		67	6	EO	
42	5	EO		42	5	EO	
42	4	EO		42	4	EO	
56	4	EO		56	4	EO	
34	4	EO		34	4	EO	
100	12	EO	ML	100	12	EO	ML
75	12	EO	ML	75	12	EO	ML
120	12	EO	ML	120	12	EO	ML
100	12	EO	ML	100	12	EO	ML
100	12	EO	ML	100	12	EO	ML
75	12	EO	ML	75	12	EO	ML
90	12	EO	ML	90	12	EO	ML
400	12	EO	M	400	12	EO	M
400	12	EO	M	400	12	EO	M
250	12	EO	M	250	12	EO	M
240	12	EO	M	240	12	EO	M
190	10	EO	M	190	10	EO	M
240	12		ML	240	12		ML
210	6	EO	M	210	6	EO	M
180	8	EO		180	8	EO	
190	12	EO	M	190	12	EO	M
60	5	EO	M	60	5	EO	M
42	4	EO		42	4	EO	
26	3	OE		26	3	OE	
32	3	EO		32	3	EO	
16	2	OE		16	2	OE	
20	2	OE		20	2	OE	
56	5	OE		56	5	OE	
48	4	OE		48	4	OE	
12	2	OE		12	2	OE	
60	5	EO	M	60	5	EO	M
60	5	EO	M	60	5	EO	M
36	2	OE		36	2	OE	
31	2	OE		31	2	OE	
31	2	OE		31	2	OE	
100	12	EO		100	12	EO	

The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

Solid carbide cutting data without internal cooling

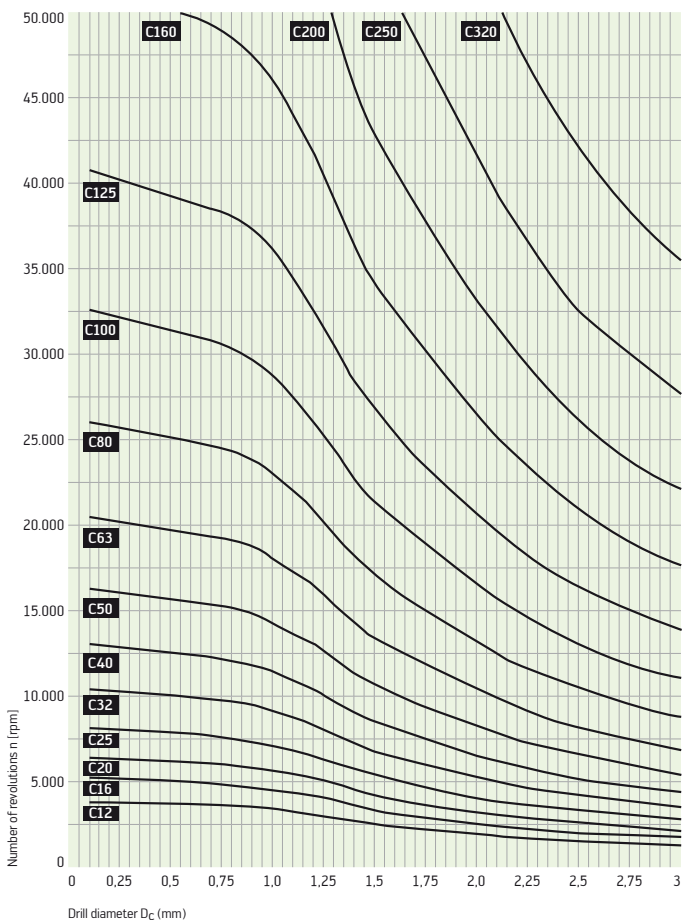
 = Cutting data for wet machining  = Dry machining is possible, cutting data must be selected from Walter GPS		Drilling depth				
		Designation				
Material group	E = Emulsion O = Oil M = MQL L = Dry v_c = Cutting speed VCRR = v_c rating chart HB page 54 VRR = feed rate chart HB page 55		Type			
			Dimensions			
			Ø range (mm)			
			Cutting material			
Structure of main material groups and code letters		Coating				
Workpiece material		Page				
		Brinell hardness HB	Tensile strength R_m N/mm ²	Machining group ¹		
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		C > 0.25... ≤ 0.55% Annealed	190	639	P2	
		C > 0.25... ≤ 0.55% Tempered	210	708	P3	
		C > 0.55% Annealed	190	639	P4	
		C > 0.55% Tempered	300	1013	P5	
		Free cutting steel (short-chipping) Annealed	220	745	P6	
	Low-alloyed steel	Annealed	175	591	P7	
		Tempered	300	1013	P8	
		Tempered	380	1282	P9	
		Tempered	430	1477	P10	
High-alloyed steel and high-alloyed tool steel	Annealed	200	675	P11		
	Hardened and tempered	300	1013	P12		
Stainless steel	Hardened and tempered	400	1361	P13		
	Ferritic/martensitic, annealed	200	675	P14		
	Martensitic, tempered	330	1114	P15		
M	Stainless steel	Austenitic, quench hardened	200	675	M1	
		Austenitic, precipitation hardened (PH)	300	1013	M2	
		Austenitic/ferritic, duplex	230	778	M3	
K	Malleable cast iron	Ferritic	200	675	K1	
		Pearlitic	260	867	K2	
	Grey cast iron	Low tensile strength	180	602	K3	
		High tensile strength/austenitic	245	825	K4	
	Cast iron with spheroidal graphite	Ferritic	155	518	K5	
GGV (CGI)	Pearlitic	265	885	K6		
N	Aluminium wrought alloys	Cannot be hardened	30	–	N1	
		Hardenable, hardened	100	343	N2	
	Cast aluminium alloys	≤ 12% Si, cannot be hardened	75	260	N3	
		≤ 12% Si, hardenable, hardened	90	314	N4	
		> 12% Si, cannot be hardened	130	447	N5	
	Magnesium alloys		70	250	N6	
	Copper and copper alloys (bronze/brass)	Non-alloyed, electrolytic copper	100	343	N7	
Brass, bronze, red brass		90	314	N8		
Cu-alloys, short-chipping		110	382	N9		
High-strength, Ampco		300	1013	N10		
S	Heat-resistant alloys	Fe-based	Annealed	200	675	S1
			Hardened	280	943	S2
		Ni or Co base	Annealed	250	839	S3
			Hardened	350	1177	S4
			Cast	320	1076	S5
	Titanium alloys	Pure titanium	200	675	S6	
		α and β alloys, hardened	375	1262	S7	
Tungsten alloys	β alloys	410	1396	S8		
Molybdenum alloys		300	1013	S9		
H	Hardened steel		300	1013	S10	
		Hardened and tempered	50 HRC	–	H1	
		Hardened and tempered	55 HRC	–	H2	
	Hardened cast iron	Hardened and tempered	60 HRC	–	H3	
		Hardened and tempered	55 HRC	–	H4	
O	Thermoplastics	Without abrasive fillers			O1	
	Thermosetting plastics	Without abrasive fillers			O2	
	Plastic, glass-fibre reinforced	GFRP			O3	
	Plastic, carbon-fibre reinforced	CFRP			O4	
	Plastic, aramid-fibre reinforced	AFRP			O5	
	Graphite (technical)		80 Shore		O6	

Page information refers to:

3 x D _c							
K3279XPL				A3279XPL · A3879XPL			
X-treme Step 90				X-treme			
Walter standard				DIN 6537 K			
3.30 – 14.50				3.00 – 20.00			
K30F				K30F			
XPL				XPL			
EK B-110				EK B-26 / B-50			
							
							
v _c	VRR			v _c	VRR		
110	12	EO	ML	110	12	EO	ML
120	12	EO	ML	120	12	EO	ML
110	12	EO	ML	110	12	EO	ML
120	12	EO	ML	120	12	EO	ML
95	10	EO	ML	95	10	EO	ML
110	12	EO	ML	110	12	EO	ML
120	12	EO	ML	120	12	EO	ML
95	10	EO	ML	95	10	EO	ML
63	7	OE		63	7	OE	
48	5	OE		48	5	OE	
63	9	EO		63	9	EO	
80	9	EO		80	9	EO	
48	5	OE		48	5	OE	
63	9	EO		63	9	EO	
40	7	EO		40	7	EO	
53	6	EO		53	6	EO	
90	16	EO	ML	90	16	EO	ML
90	16	EO	ML	90	16	EO	ML
110	16	EO	ML	110	16	EO	ML
95	16	EO	ML	95	16	EO	ML
110	16	EO	ML	110	16	EO	ML
90	16	EO	ML	90	16	EO	ML
100	16	EO	ML	100	16	EO	ML
260	10	EO		260	10	EO	
260	10	EO		260	10	EO	
240	16	EO		240	16	EO	
210	16	EO		210	16	EO	
170	12	EO		170	12	EO	
200	7	EO	M	200	7	EO	M
170	12	EO		170	12	EO	
190	16	EO	ML	190	16	EO	ML
67	5	EO		67	5	EO	
42	5	OE		42	5	OE	
36	4	OE		36	4	OE	
67	5	EO		67	5	EO	
67	5	EO		67	5	EO	
34	4	OE		34	4	OE	
26	3	OE		26	3	OE	
26	3	OE		26	3	OE	
95	16	EO		95	16	EO	

The specified cutting data are average recommended values.
For special applications, adjustment is recommended.

VCRR: RPM diagram Solid carbide micro-drills



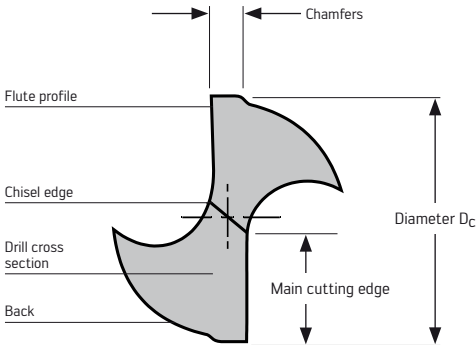
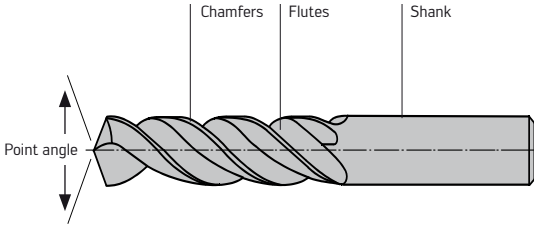
VRR: Feed rate charts for HSS and carbide drills, core drills, countersinks and centre drills

VRR	Feed rate f (mm) for \emptyset (mm)									
	0,25	0,4	0,5	0,6	0,8	1	1,2	1,5	2	2,5
1	0,001	0,001	0,002	0,002	0,003	0,003	0,004	0,005	0,007	0,008
2	0,002	0,003	0,003	0,004	0,005	0,007	0,008	0,010	0,013	0,017
3	0,003	0,004	0,005	0,006	0,008	0,010	0,012	0,015	0,020	0,025
4	0,003	0,005	0,007	0,008	0,011	0,013	0,016	0,020	0,027	0,033
5	0,004	0,007	0,008	0,010	0,013	0,017	0,020	0,025	0,033	0,042
6	0,005	0,008	0,010	0,012	0,016	0,020	0,024	0,030	0,040	0,050
7	0,006	0,009	0,012	0,014	0,019	0,023	0,028	0,035	0,047	0,058
8	0,007	0,011	0,013	0,016	0,021	0,027	0,032	0,040	0,053	0,067
9	0,008	0,012	0,015	0,018	0,024	0,030	0,036	0,045	0,060	0,075
10	0,008	0,013	0,017	0,020	0,027	0,033	0,040	0,050	0,067	0,083
12	0,010	0,016	0,020	0,024	0,032	0,040	0,048	0,060	0,080	0,10
16	0,013	0,021	0,027	0,032	0,043	0,053	0,064	0,080	0,11	0,13
20	0,017	0,027	0,033	0,040	0,053	0,067	0,080	0,10	0,13	0,17

VRR	Feed rate f (mm) for \emptyset (mm)									
	4	5	6	8	10	12	15	20	25	40
1	0,013	0,017	0,018	0,021	0,024	0,026	0,029	0,033	0,037	0,047
2	0,027	0,033	0,037	0,042	0,047	0,052	0,058	0,067	0,075	0,094
3	0,040	0,050	0,055	0,063	0,071	0,077	0,087	0,10	0,11	0,14
4	0,053	0,067	0,073	0,084	0,094	0,10	0,12	0,13	0,15	0,19
5	0,067	0,083	0,091	0,11	0,12	0,13	0,14	0,17	0,19	0,24
6	0,080	0,10	0,11	0,13	0,14	0,15	0,17	0,20	0,22	0,28
7	0,093	0,12	0,13	0,15	0,16	0,18	0,20	0,23	0,26	0,33
8	0,11	0,13	0,15	0,17	0,19	0,21	0,23	0,27	0,30	0,38
9	0,12	0,15	0,16	0,19	0,21	0,23	0,26	0,30	0,34	0,42
10	0,13	0,17	0,18	0,21	0,24	0,26	0,29	0,33	0,37	0,47
12	0,16	0,20	0,22	0,25	0,28	0,31	0,35	0,40	0,45	0,57
16	0,21	0,27	0,29	0,34	0,38	0,41	0,46	0,53	0,60	0,75
20	0,27	0,33	0,37	0,42	0,47	0,52	0,58	0,67	0,75	0,94

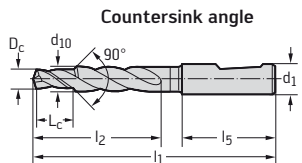
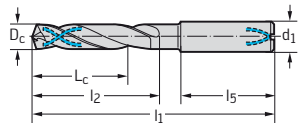


Designations



Designations in catalogue

D_C	Cutting diameter
d_1	Shank diameter
d_{10}	Step diameter
L_C	Effective length
l_1	Overall length
l_2	Flute length
l_5	Shank length



Cutting materials

HSS cutting materials

4 groups of high-speed steel are used for Walter Titex tools:

HSS	High-speed steel for general applications (twist drills, core drills, countersinks, reamers in some cases, centre drills, multi-diameter step drills)
HSS-E	High-speed steel with 5% Co to withstand higher stress, especially thermal stress (high-performance twist drills, reamers in some cases)
HSS-E Co8	High-speed steel with 8% Co for maximum thermal loading capability, in accordance with American standard designation M42 (special tools)
HSS-PM	High-speed steel manufactured using powder metallurgy with an extremely high alloy content. Advantages: High degree of purity and uniformity of the joint, outstanding wear resistance and thermal loading capability (special tools)

	Material no.	Short name	Old standard designation	AISI ASTM	AFNOR	B.S.	UNI
HSS	1.3343	S 6-5-2	DMo5	M2	–	BM2	HS 6-5-2
HSS-E	1.3243	S 6-5-2-5	EMo5 Co5	M35	6.5.2.5	–	HS 6-5-2-5
HSS-E Co8	1.3247	S 2-10-1-8	–	M42	–	BM42	HS 2-9-1-8
HSS-PM	Trade name ASP						

	Alloy table					
	C	Cr	W	Mo	V	Co
HSS	0,82	4,0	6,5	5,0	2,0	–
HSS-E	0,82	4,5	6,0	5,0	2,0	5,0
HSS-E Co8	1,08	4,0	1,5	9,5	1,2	8,25
HSS-PM	Trade name ASP					

Carbide cutting materials

Carbides mainly consist of tungsten carbide (WC) as the hard material and cobalt (Co) as the binding material. In the majority of cases, the cobalt content is between 6 and 12%. The following rule generally applies: The higher the cobalt

content, the tougher the material, but the less resistance to wear and vice-versa. Another determining factor in carbides is the grain size. The hardness increases as the grain size becomes finer.

		Co in %	Grain size	Hardness HV
K10	<ul style="list-style-type: none">– Extremely wear-resistant substrate– Use in brazed drilling and boring tools	6	normal	1650
K20F	<ul style="list-style-type: none">– Extremely wear-resistant substrate with fine grain size– Use in short-chipping materials such as cast iron workpieces	6–7	fine	1650–1800
K30F	<ul style="list-style-type: none">– Extremely fine substrate, extremely tough and wear-resistant– Universal application for a variety of materials	10	finest	1550

Surface treatments and hard material coatings for increasing performance

Surface treatments

Steam treatment of tools made from HSS

Implementation

Dry steam atmosphere, 520 to 580 °C

Effect

Adherent oxide layer consisting of Fe_3O_4 approx. 0.003 to 0.010 mm deep

Property

- Low tendency towards cold welding, increased surface hardness and therefore improved wear resistance
- Increased corrosion resistance
- Improved sliding properties due to better lubricant adhesion as a result of FeO crystals
- Reduction in grinding stress

Nitriding of tools made from HSS

Implementation

Treatment in media giving off nitrogen, 520 to 570 °C

Effect

Enrichment of surface with nitrogen and partially with carbon

Property

- Low tendency towards cold welding and build-up on the cutting edge
- Increased hardness and therefore greater wear resistance

















Hard material coatings

Surface coating has developed into a proven technological process for improving the performance of metal cutting tools. In contrast to surface treatment, the tool surface remains chemically unaltered and a thin layer is applied. With Walter Titex tools made from high-speed steel and carbide, PVD processes are used for the coating which operate at process temperatures of less than 600 °C and therefore do not change the basic tool material. Hard material layers have a higher hardness and wear resistance than the cutting material itself.







In addition, they:

- Keep the cutting material and the material to be machined apart
- Act as a thermal insulation layer

Coated tools not only have a longer service life, but they can also be used with higher cutting speeds and feed rates.

Surface treatment/ coating	Process/ coating	Property	Example tool
Uncoated	No treatment	–	
Steamed	Steam treatment	Universal treatment for HSS	
Fibre-steamed	Steam treatment	Universal treatment of lands for HSS	
TiN	TiN coating	Universal coating	
TiP	TiN tip coating	Special coating for optimum chip evacuation	
TFL	Tinal coating	High-performance coating with wide application area	
TFT	Tinal TOP coating	High-performance coating with particularly low friction	
TFP	Tinal tip coating	High-performance coating for optimum chip evacuation	
TTP	Tinal TOP tip coating	High-performance coating with particularly low friction	
TML	Tinal microcoating	Special coating for small drills with extremely low friction	
XPL	AlCrN coating	High-performance coating for maximum wear resistance	
DPL	Double coating	High-performance coating for maximum wear resistance	
DPP	Double tip coating	High-performance coating for maximum wear resistance	
AML	AlTiN microcoating	Special coating for small drills with extremely low friction	
AMP	AlTiN micro tip coating	Special coating for small drills with extremely low friction	
TMS	AlTiN thin coating	High-performance coating for solid carbide reaming tools	

Walter Titex X-treme drill family

Tool type	Remarks on field of application	Workpiece material group							Drilling depth 2 x D _c
		P	M	K	N	S	H	O	
 <p>X-treme Pilot 150</p>	<ul style="list-style-type: none"> – Pilot drill, specially designed for X-treme DM.... – 150° point angle 	••	••	••	••	••	••	••	A6181AML
 <p>X-treme M, DM8 ... DM30</p>	<ul style="list-style-type: none"> – Solid carbide micro deep-hole drill diameter 2.00–2.95 mm, 5 to 30 x D_c with internal cooling – D stands for “Deep” – M stands for “Micro” – For universal use 	••	••	••	••	••	•	••	
 <p>Alpha® 4 Plus Micro</p>	<ul style="list-style-type: none"> – Solid carbide micro-drill diameter 0.75–1.95 mm, 8 and 12 x D_c with internal cooling – For universal use 	••	••	••	••	••	•	••	
 <p>Alpha® 2 Plus Micro</p>	<ul style="list-style-type: none"> – Solid carbide micro-drill diameter 0.5–3 mm, 5 and 8 x D_c without internal cooling – For universal use 	••		••	••	••	•	••	
 <p>X-treme Step 90</p>	<ul style="list-style-type: none"> – Solid carbide chamfer drill with internal cooling – Step length in accordance with DIN 8378 – Can be used universally with high cutting data 	••	••	••	••	••	••		
 <p>X-treme Step 90</p>	<ul style="list-style-type: none"> – Solid carbide chamfer drill without internal cooling – Step length in accordance with DIN 8378 – Can be used universally with high cutting data 	••	••	••	••	••	••	••	

Drilling depth







	3 x D _c	5 x D _c	8 x D _c	12 x D _c	16 x D _c	20 x D _c	25 x D _c	30 x D _c
		A3389AML	A6489AMP	A6589AMP	A6689AMP	A6789AMP	A6889AMP	A6989AMP
			A6488TML	A6588TML				
		A3378TML	A6478TML					
	*K3299XPL K3899XPL							
	K3879XPL							

One-piece = HA shank

* Two-piece = HA shank
HE shank

Walter Titex X-treme drill family

Workpiece material group

Tool type	Remarks on field of application	Workpiece material group							Drilling depth 2 x D _c
		P	M	K	N	S	H	O	
 X-treme	<ul style="list-style-type: none"> – Solid carbide drill in accordance with DIN 6537 short/long with internal cooling – Can be used universally with high cutting data 	••	••	••	••	••	••		
 X-treme	<ul style="list-style-type: none"> – Solid carbide drill in accordance with DIN 6537 short/long without internal cooling – Can be used universally with high cutting data 	••	••	••	••	••	••	••	
 X-treme Plus	<ul style="list-style-type: none"> – Solid carbide high-performance drill in accordance with DIN 6537 short/long with internal cooling – Can be used universally with maximum cutting data 	••	••	••	••	••	••	•	
 X-treme CI	<ul style="list-style-type: none"> – Solid carbide high-performance drill in accordance with DIN 6537 long with internal cooling – Specially developed for cast iron materials – CI stands for "cast iron" 			••					
 X-treme Inox	<ul style="list-style-type: none"> – Solid carbide drill in accordance with DIN 6537 short/long with internal cooling – Specially developed for stainless steels 	••	••		•	••		•	
 Alpha® Ni	<ul style="list-style-type: none"> – Solid carbide drill in accordance with DIN 6537 long with internal cooling – Specially developed for Ni alloys 	•	•			••	•		







Drilling depth

	3 x D _c	5 x D _c	8 x D _c	12 x D _c	16 x D _c	20 x D _c	25 x D _c	30 x D _c
	*A3299XPL A3899XPL	*A3399XPL A3999XPL						
	*A3279XPL A3879XPL	*A3379XPL A3979XPL						
	A3289DPL	A3389DPL						
		A3382XPL						
	A3293TTP	A3393TTP						
		A3384						

One-piece = HA shank

* Two-piece = HA shank
HE shank

Walter Titex X-treme drill family

Tool type	Remarks on field of application	Workpiece material group							Drilling depth 2 x D _c
		P	M	K	N	S	H	O	
Alpha® Rc 	<ul style="list-style-type: none"> – Solid carbide drill in accordance with DIN 6537 short without internal cooling – Specially developed for hardened materials 				••	••	••		
Alpha® Jet 	<ul style="list-style-type: none"> – Straight flute solid carbide drill in accordance with DIN 6537 long, 8 and 12 x D_c with internal cooling – For short-chipping cast iron and aluminium materials 			••	••	•		••	
X-treme D8...D12 	<ul style="list-style-type: none"> – Solid carbide deep-hole drill, 8 x D_c and 12 x D_c with internal cooling – D stands for “deep” – Can be used universally with high cutting data 	••	••	••	••	••	••	•	
Alpha® 44 	<ul style="list-style-type: none"> – Solid carbide drill 8 x D_c with internal cooling – UFL® profile – For universal use 	••	•	•	••	••		••	
Alpha® 22 	<ul style="list-style-type: none"> – Solid carbide drill 8 x D_c without internal cooling – UFL® profile – For universal use 	••		••	••	••			
X-treme Pilot Step 90 	<ul style="list-style-type: none"> – Stepped pilot drill, specially designed for Alpha® 4 XD, X-treme D & DH and XD70 technology with internal cooling – 150° point angle – 90° countersink angle 	••	••	••	••	••	••	••	K3281TFT







Drilling depth

	3 x D _c	5 x D _c	8 x D _c	12 x D _c	16 x D _c	20 x D _c	25 x D _c	30 x D _c
A3269TFL								
		A3387	A3487	A3687				
			A6489DPP	A6589DPP				
			*A3486TIP A3586TIP					
			A1276TFL					

One-piece = HA shank

* Two-piece = HA shank
HE shank

Walter Titex X-treme drill family

Tool type	Remarks on field of application	Workpiece material group							Drilling depth 2 x D _c
		P	M	K	N	S	H	O	
XD Pilot 	<ul style="list-style-type: none"> – Pilot drill, specially designed for Alpha® 4 XD, X-treme D & DH and XD70 technology with internal cooling – 150° point angle 	••	••	••	••	••	••	••	A6181TFT
X-treme Pilot 180 	<ul style="list-style-type: none"> – Pilot drill, specially designed for Alpha® 4 XD, X-treme D & DH and XD70 technology with internal cooling – 180° point angle – Specially developed for inclined and convex surfaces 	••	••	••	••	••	••	••	A7191TFT
X-treme Pilot 180C 	<ul style="list-style-type: none"> – Pilot drill, specially designed for Alpha® 4 XD, X-treme D & DH and XD70 technology with internal cooling – Specially developed for inclined and convex surfaces – The conical design means that there is no shoulder between the pilot hole and the deep hole (important with crankshafts) – 180° point angle 	••	••	••	••	••	••	••	K5191TFT
Alpha® 4 XD16...30 	<ul style="list-style-type: none"> – Solid carbide deep-hole drill 16 to 30 x D_c with internal cooling – For universal use 	••	••	••	••	••	•	••	
X-treme DH20–DH30 	<ul style="list-style-type: none"> – Solid carbide deep-hole drill, 20 x D_c and 30 x D_c with internal cooling – D stands for “deep” – H stands for “heavy-duty materials” (steel that is difficult to cut), e.g. crankshafts 	••	••	••	•	••	•		
X-treme D40–D50 	<ul style="list-style-type: none"> – Solid carbide deep-hole drill, 40 x D_c and 50 x D_c with internal cooling – For universal use 	••	•	••	••	•			

Drilling depth

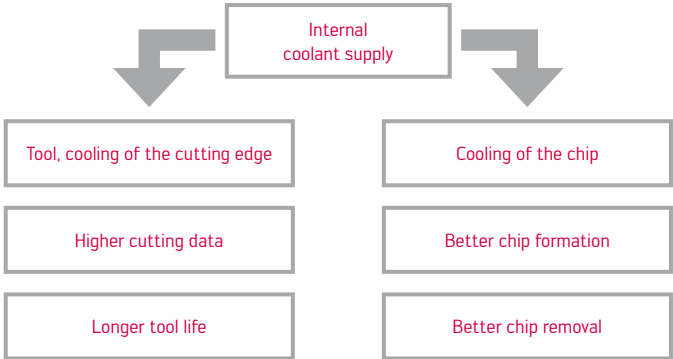
	3 x D _c	5 x D _c	8 x D _c	12 x D _c	16 x D _c	20 x D _c	25 x D _c	30 x D _c	40 x D _c	50 x D _c
					A6685TFP	A6785TFP	A6885TFP	A6985TFP		
						A6794TFP		A6994TFP		
									A7495TTP	A7595TTP

One-piece = HA shank

Internal coolant supply

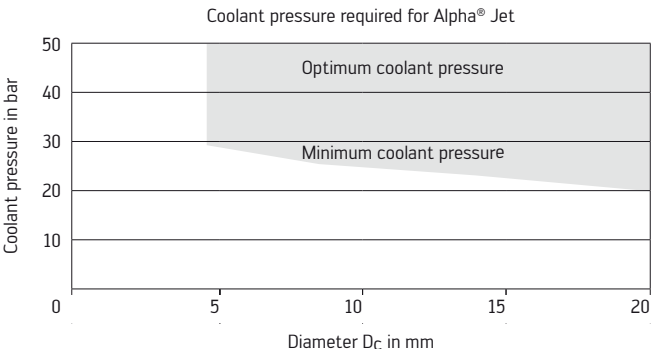
Effect of the internal coolant supply

- Standard for solid carbide high-performance tools today
- Helical flow through the tool; the helix angle matches the course of the flutes
- The internal coolant supply has an effect on the tool (cutting edge) and aids the machining process directly (chip formation)



Coolant pressure required

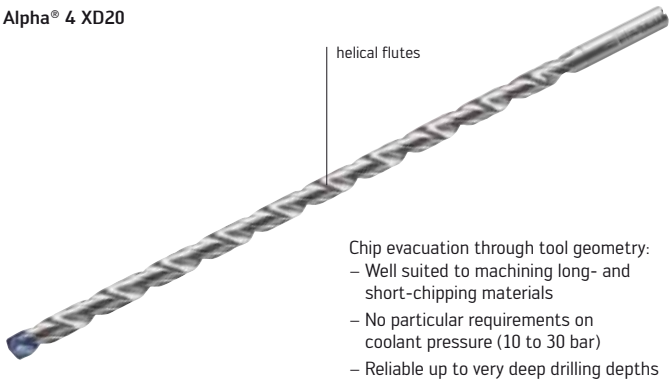
- The coolant pressure required for Walter Titex solid carbide drills with internal cooling is 10 to 30 bar.
- The only exception is the Alpha® Jet type: The straight flutes require higher pressure (see diagram).



Internal coolant supply and chip removal

Comparison of a tool with helical flutes (Alpha® 4 XD20) and a tool with straight flutes (Alpha® Jet)

Alpha® 4 XD20

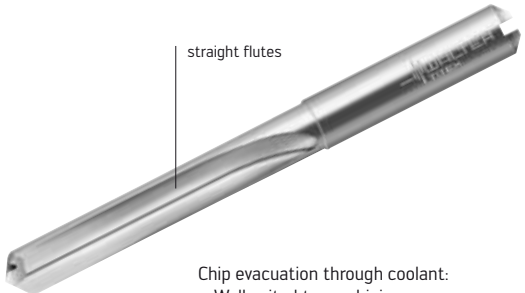


helical flutes

Chip evacuation through tool geometry:

- Well suited to machining long- and short-chipping materials
- No particular requirements on coolant pressure (10 to 30 bar)
- Reliable up to very deep drilling depths

Alpha® Jet



straight flutes

Chip evacuation through coolant:

- Well suited to machining short-chipping materials
- High coolant pressure required (see diagram on opposite page)
- Reliable up to drilling depths of approx. $20 \times D_c$

Shank shapes

Shank DIN 6535 HA



- Parallel shank without flat
- Optimum concentricity
- First choice for solid carbide tools, HSC machining, deep-hole drilling and micromachining

- Suitable adaptors:
- Hydraulic expansion chuck
 - Shrink-fit chuck



Shank DIN 6535 HE



- Parallel shank with flat
- Second choice for solid carbide tools

- Suitable adaptors:
- Whistle-notch chuck
 - Hydraulic expansion chuck with bush



Parallel shank



- Parallel shank with shank diameter the same as cutting diameter
- Most common shank design in HSS tools
- Rarely used in solid carbide tools

- Suitable adaptors:
- Collet chuck



Tapered shank DIN 228 A (Morse taper)



- Tapered shank
- Used fairly frequently in HSS tools

Clamping devices



Hydraulic expansion chuck

- Concentricity 0.003–0.005 mm
- Uniform wear and therefore longer service life
- Outstanding operational smoothness
- Especially suitable for solid carbide tools with standard shank shape HA
- Able to transfer high torques
- Outstanding process reliability
- Very good damping properties
- Optimum hole quality (surface, precision)
- Relatively dirt-resistant
- Easy to use
- Suitable for HSC machining



Shrink-fit chuck

- Concentricity 0.003–0.005 mm
- Very evenly distributed wear and therefore longer service life
- Outstanding operational smoothness
- Especially suitable for solid carbide tools with standard shank shape HA
- Suitable for HSC machining



Whistle-notch chuck













- Concentricity approx. 0.01 mm
- Especially suitable for HSS and solid carbide tools with standard shank shape HE
- Able to transfer high torques thanks to positive fit



Collet chuck

- Concentricity approx. 0.025 mm
- Especially suitable for HSS tools with parallel shank

Drilling operations

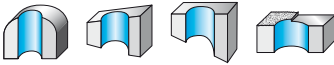
Operation	Subgroup	Description	Example
Drilling	Continuous drilling	Drilling into solid material. This is what the majority of drilling tools are designed for. Drilling tools are also often used as step drills in special applications.	
	Interrupted cut	Drilling into solid material. The drilling process is interrupted, e.g. because the tool meets a cross hole or the hole is being drilled through several components. In these cases, the stability of the tool is extremely important. It can be advantageous to have four lands.	 
	"Rough" surface finish	Drilling into solid material. The top and/or bottom of the component to be machined is rough or uneven (e.g. curved or inclined surfaces). In these cases, the stability of the tool is extremely important. It can be advantageous to have four lands. A pilot tool with a 180° point angle can be used if the hole entry is uneven.	
	Hole entry on a curved surface		
	Hole entry on an uneven or inclined surface		
Hole exit on an uneven or inclined surface			
Counter-boring	A hole has already been drilled in the component and requires further machining, or there are consecutive different-sized holes. There are special tools for this kind of machining. Standard drilling tools may potentially be used. In contrast to continuous drilling, varying chip formation must be considered. The cutting data also need to be adapted. Increased wear is to be expected on edges of the drill bit.		
Spot drilling	Drilling a hole for the purpose of centring on NC machines, e.g. for the final drilling operation.		
Centring	Drilling a hole for the purpose of centring, e.g. for the final drilling operation.		
Counter-sinking	For countersinking pre-drilled holes for countersunk-head screws and countersunk-head rivets; also for deburring.		
Reaming	For making holes with limited diameter tolerances and a fine surface quality. The process is similar to counterboring, but with significantly better hole quality. An additional operation that can be avoided by designing components to meet production requirements and by using carbide drilling tools, if necessary.		



X-treme Plus, e.g. A3389DPL



X-treme D12, e.g. A6589DPP



X-treme, e.g. A3299XPL

Application	Limits/measures
Interrupted cut	<ul style="list-style-type: none"> - Reduce the feed (approx. 0.25 to 0.5 x f) - Use a tool with four lands
Curved surface	<ul style="list-style-type: none"> - Reduce the feed (approx. 0.25 to 0.5 x f) - Use a tool with four lands - If required, pilot drill or mill the surface (180°)
Hole entry on an inclined surface	<ul style="list-style-type: none"> - Reduce the feed (approx. 0.25 to 0.5 x f) - Use a tool with four lands (inclination up to 5°) - If required, pilot drill or mill the surface (inclination greater than 5°)
Hole exit on an inclined surface	<ul style="list-style-type: none"> - Reduce the feed (approx. 0.25 to 0.5 x f) - Use a tool with four lands - Inclined surfaces up to 45° inclination possible



e.g. E111



e.g. E1174



e.g. K1114



e.g. E6819TIN



e.g. F2481TMS

Surface quality

Factors affecting the surface quality

Under the same conditions, solid carbide tools produce better-quality surfaces than HSS tools.

In addition:

- The shorter the drill, the better the surface quality.
Therefore the tool used should always be as short as possible – this also applies to the accuracy of the hole.
- The feed has a significantly greater effect on the surface quality than the cutting speed.

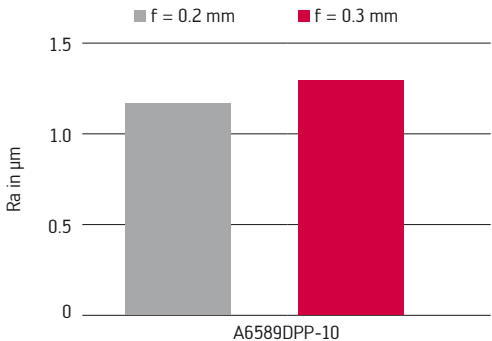
Achievable surface quality using a solid carbide drill as an example

Operating parameters (drilling without centring):

Tool:	X-treme D12 (A6589DPP)
Diameter:	10 mm
Drilling depth:	100 mm
Material:	C45
Coolant:	Emulsion 6%

$$v_c = 100 \text{ m/min}$$

$$p = 20 \text{ bar}$$



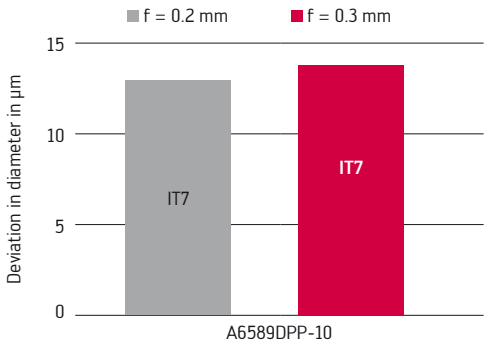
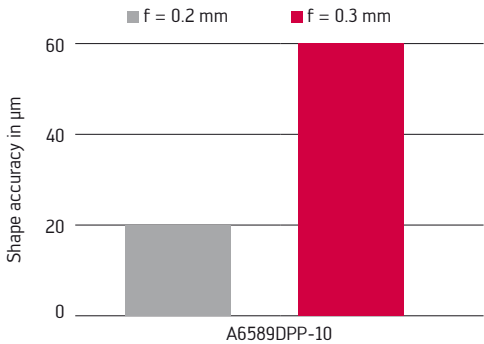
Accuracy of the drilled hole

Factors affecting the accuracy of the drilled hole

Under the same conditions, solid carbide tools create more accurate holes than HSS tools.

The factors that affect surface quality also affect the accuracy of the drilled hole (see previous page).

The measured values depicted below were obtained using the same tools and cutting data as on the previous page.



In this example, the tolerance class IT7 is achieved under optimum conditions.

Hole run-off

Hole run-off

Under the same conditions, solid carbide tools wander significantly less than HSS tools. Hole run-off increases with the length of the tool and the depth of the hole. This is the reason why the tool used should always be as short as possible.

The following table compares the deviations in position from the hole entry to the hole exit at a drilling depth of $30 \times D_C$ for different types of tools.

Diameter: 8 mm
 Drilling depth: 240 mm
 Material: C45

Hole no.	XD Technology		Gun drill		HSS drill	
	X	Y	X	Y	X	Y
1	0,02	0,04	0,00	0,03	0,05	-0,19
2	0,00	-0,02	0,02	0,08	0,45	-0,23
3	0,02	-0,05	-0,01	0,10	0,33	-0,23
4	0,04	-0,09	0,05	0,04	0,74	-0,41
5	0,08	0,05	0,00	0,09	0,74	-0,67
6	-0,05	0,09	0,07	0,05	0,60	-0,78
7	0,02	-0,06	-0,02	0,06	0,33	-0,27
8	-0,01	-0,07	0,04	0,03	-0,19	-0,25
9	-0,06	0,05	-0,03	0,14	-0,24	-0,09
Average	0,046		0,048		0,380	

H7 hole tolerance

Holes with an H7 tolerance class

Achieving an IT (International Tolerance) class of 7 (H7 is a very common tolerance for holes) with a drilling tool eliminates the need for subsequent fine machining, such as reaming, in many applications. The manufacturing tolerances of solid carbide drilling tools are inherently so small that this tolerance class could be achieved. However, the tool is only one aspect of the application that affects the accuracy of the drilled hole. The machine components and machining conditions all have an effect on the achievable accuracy of the drilled hole (see table).

	Influential factors	Example of the effect
Hole	<ul style="list-style-type: none"> – Diameter – Drilling depth 	Tolerance class IT 7 for diameters of 5 mm–12 µm, for diameters of 12 mm–18 µm
Machine	<ul style="list-style-type: none"> – Stability under dynamic load – Stability under thermal load – Level of maintenance – Controller – Measuring sensor 	The more stable the machine, the more accurate the operation. The same applies to the accuracy of the controller and the measuring sensor in the machine.
Spindle	<ul style="list-style-type: none"> – Concentricity – Stability under dynamic load – Stability under thermal load – Level of maintenance 	Extremely good concentricity is required and the condition of the spindle must be known.
Clamping devices	<ul style="list-style-type: none"> – Design type – Concentricity – Stability under dynamic load – Stability under thermal load – Level of maintenance 	Not every clamping device can be used for high-precision machining. A hydraulic expansion chuck is the first choice when drilling (also see HB “Clamping devices” section on page 73).
Tool	<ul style="list-style-type: none"> – Material (e.g. HSS or solid carbide) – Tool geometry, e.g. point grinding and the number of lands – Manufacturing tolerances – Level of wear 	Solid carbide tools achieve higher degrees of accuracy than HSS tools. The level of wear plays a very large role.
Cutting data	<ul style="list-style-type: none"> – Correct cutting speed – Correct feed – Chip removal – Coolant 	Incorrect cutting data can result in imprecise holes. The feed has a greater effect on the hole than the cutting speed.
Workpiece	<ul style="list-style-type: none"> – Material – Condition of the material, e.g. homogeneity – Cross holes – Surface quality – Inclined hole entry and/or hole exit – Stability, e.g. wall thickness – Stability under dynamic load – Stability under thermal load 	The shape and the material have a considerable effect on the accuracy of the drilled hole.
Clamping arrangement	<ul style="list-style-type: none"> – Stability under dynamic load – Stability under thermal load 	A poor clamping arrangement has a significant effect on the accuracy.

Coolant / MQL / dry

Use of coolants

Use of tools with internal and external cooling

(usually emulsion containing 5–7% oil)

The “active” area on the tool is rinsed with coolant

- The coolant is circulated and re-used

MQL – Minimum quantity lubrication (usually with an internal coolant supply)

- A small quantity of coolant is supplied directly to the cutting edge

– There is no closed circuit – the coolant is used up almost completely; the component, the chips and the tool are virtually dry after machining.

- Compressed air is normally used as a carrier medium

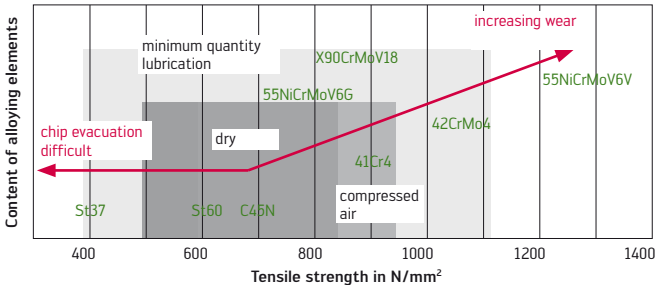
Dry machining

- No lubricant used at all; cooling with compressed air if required

For materials suitable for MQL/dry machining

- Brass alloys
- Magnesium alloys
- Cast iron materials
- Aluminium alloys (mainly cast alloys)

Dry machining of steel materials



For tools suitable for MQL/dry machining

- Most tools from the Alpha® and X-treme families are suitable
- An optimised elliptical or round shank end should be used with MQL machining (see image)

MQL shank ends



DIN 69090



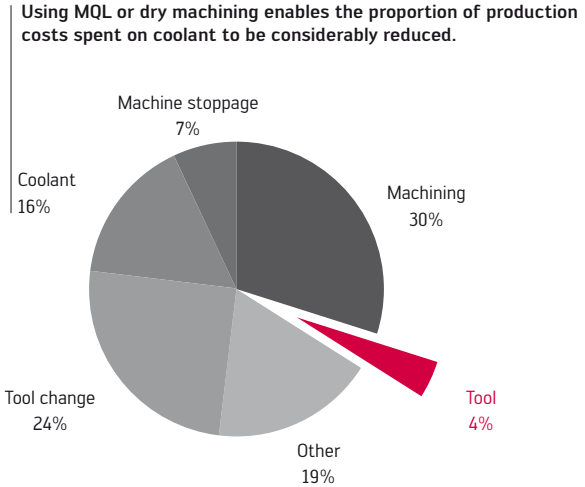
elliptical shape



round shape

Advantages of MQL/dry machining

- More environmentally friendly than conventional cooling lubricant as coolant is not used
- Less of a health hazard as operators are not exposed to biocides in cooling lubricants
- No disposal costs



Requirements for MQL/dry machining

Component

- Material (see opposite page)
- Wall thickness (due to possible deformation caused by heat)

Tool (see cutting data tables)

- Special tool with shank end optimised for MQL machining, if required

Machine

- Prevention of localised temperature increases
- Minimum quantity lubrication (single-channel or dual-channel system)
- The processing of chips must be optimised for dry machining, as a significant proportion of the heat generated by the chips must be removed
- Chips must not be washed away by the coolant

HSC/HPC machining

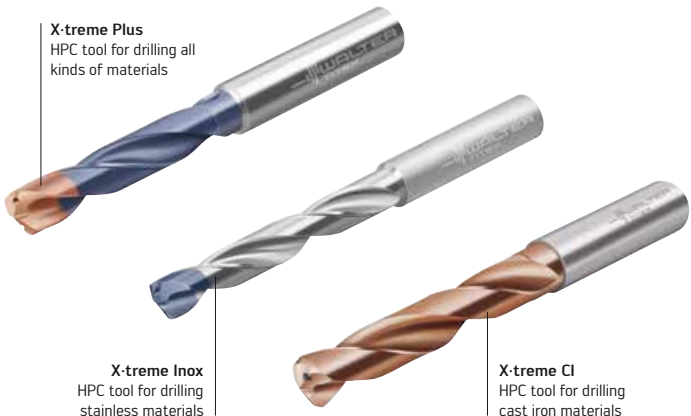
What does HSC/HPC machining stand for?

HSC stands for High-Speed Cutting, i.e. machining at high speeds. The term is most often used with milling cutters. With milling, HSC mainly involves increasing cutting speeds at small axial and radial cutting depths. Large surfaces are machined in a short space of time.

HPC stands for High-Performance Cutting, i.e. increasing the metal removal rate. High-performance drilling therefore usually involves HPC machining, as both the cutting speed and the feed are optimised and increased in order to obtain the highest possible feed rate and therefore productivity.

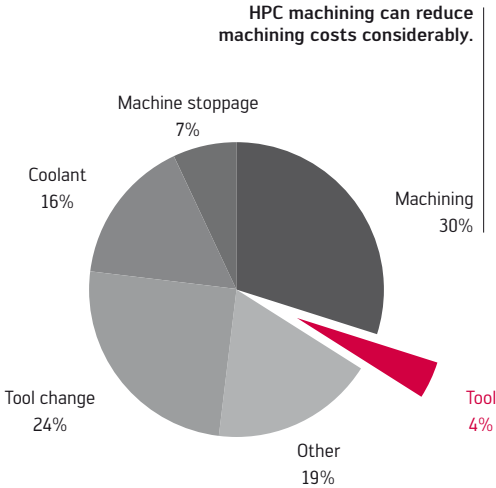
Tools suitable for HPC machining

- Solid carbide drills
 - With high-performance coatings (with a few exceptions, e.g. uncoated tools when drilling short-chipping aluminium)
 - Tools with internal cooling (drilling depths greater than approx. $2 \times D_c$)
 - Optimised geometry with a high degree of stability and the lowest-possible cutting force
- Tools from the Walter Titex X-treme family are suitable
- Extremely high cutting data are achieved with X-treme Plus (universal use), X-treme Inox (for stainless materials) and X-treme CI (for cast iron materials) at drilling depths of up to $5 \times D_c$
- For greater drilling depths, the X-treme D8 and D12 for drilling depths of $8 \times D_c$ and $12 \times D_c$ are the most suitable
- For even greater drilling depths of up to $50 \times D_c$, the Alpha® 4 XD16 to Alpha® 4 XD30 and the X-treme D40/D50 are suitable tools



Advantages of HSC/HPC machining

- Highest possible metal removal rate
- Increased productivity reduces machining costs
- Spare machine capacity
- Fast job handling



Requirements for HSC/HPC machining

Component

- Suitable material
- High degree of stability (→ low deformation under high cutting forces)

Tool (see page to the left and cutting data tables)

Machine

- High degree of stability
- Fast axes
- High drive power
- Little change in shape caused by heat transfer
- Internal cooling is required with a few exceptions

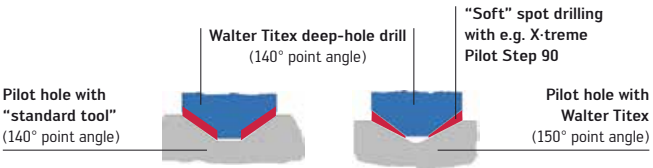


Deep-hole drilling – Pilot holes

Walter Titex solid carbide deep-hole drills

Walter Titex has been making solid carbide deep-hole drills since 2003. Drilling depths of $30 \times D_C$ were reliably achieved as early as 2005. Drilling depths of up to $70 \times D_C$ have been achieved since 2010 (see HB “Product information – Solid carbide drills – Walter Titex XD70 Technology” section on page 32).

Deep-hole drilling using Walter Titex carbide tools is always without pecking, i.e. the drilling operation is not interrupted.



The pilot hole

The pilot hole has a significant effect on:

- Process reliability
- Hole quality
- Service life of the deep-hole drill

A pilot hole should be drilled when the final drilling depth will be $16 \times D_C$ or more. Essentially, a pilot hole can be created with any solid carbide tool that has the same point angle as the deep-hole drill to be used subsequently. Its diameter must also be the same as that of the deep-hole drill.

Walter Titex pilot drills

Walter Titex deep-drilling technology encompasses not only solid carbide deep-hole drills but also special pilot drills (see HB “Product information – Solid carbide drills – Other Walter Titex pilot drills” section on page 31). Walter Titex pilot drills have the following advantages over “conventional” carbide drills:

- Higher degree of stability
- Point angle adjusted to the application
- Diameter tolerance adjusted to the application
- Special conical design

These properties offer the following benefits:

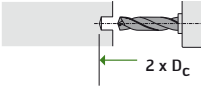

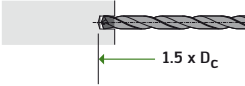

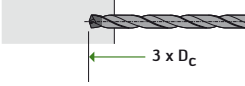



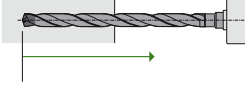

- Even greater process reliability
- Further optimised hole quality
- Significantly longer service life of the deep-hole drills thanks to protection of the peripheral cutting edges and “soft” spot drilling of the deep-hole drills (see image above)


Drilling strategy 1: XD Technology $\leq 30 \times D_C$

suitable for:

- A6685TFP	- A6985TFP
- A6785TFP	- A6794TFP
- A6885TFP	- A6994TFP

P	M	K	N	S	H	O
✓	✓	✓		✓	✓	✓

<p>1 Pilot drilling</p> 	 <p>10-30 bar on</p>	<p>2 x D_C A6181TFT A7191TFT K5191TFT K3281TFT</p>
<p>2 Feeding in</p> 	 <p>off</p>	<p>XD Technology</p> <p>$n_{max} = 100 \text{ rpm}$ $v_f = 1000 \text{ mm/min}$</p>
<p>3 Spot drilling</p> 	 <p>10-30 bar on</p>	<p>XD Technology</p> <p>$v_c = 25-50\%$ $v_f = 25-50\%$</p>
<p>4 Deep-hole drilling</p> 	 <p>10-30 bar on</p>	<p>XD Technology</p> <p>$v_c = 100\%$ $v_f = 100\%$</p>
<p>5 Retracting</p> 	 <p>off</p>	<p>XD Technology</p> <p>$n_{max} = 100 \text{ rpm}$ $v_f = 1000 \text{ mm/min}$</p>

$V_c / V_f \rightarrow$  GPS

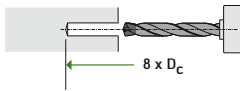
Drilling strategy 2: XD Technology $\leq 30 \times D_c$

suitable for:

- A6685TFP	- A6885TFP
- A6785TFP	- A6985TFP

P	M	K	N	S	H	O
			✓			

1 Pilot drilling



10-30 bar
on

$8 \times D_c$
A6489DPP

2 Feeding in

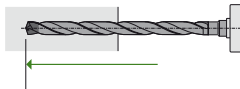


off

XD Technology

$n_{max} = 100 \text{ rpm}$
 $v_f = 1000 \text{ mm/min}$

3 Deep-hole drilling

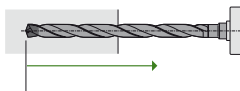


10-30 bar
on

XD Technology

$v_c = 100\%$
 $v_f = 100\%$

4 Retracting



off

XD Technology

$n_{max} = 100 \text{ rpm}$
 $v_f = 1000 \text{ mm/min}$

$V_c / V_f \rightarrow$ GPS

Drilling strategy 3: XD Technology $\leq 50 \times D_c$


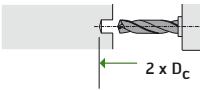

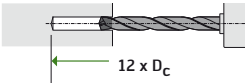

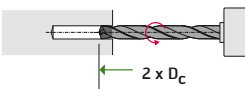

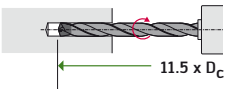

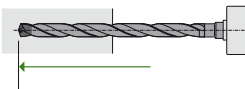

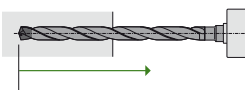
suitable for:

– A7495TTP

– A7595TTP

– Special boring tools up to $50 \times D_c$

P	M	K	N	S	H	O
✓		✓	✓			


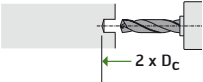

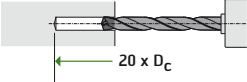

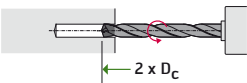

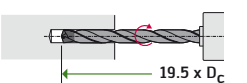

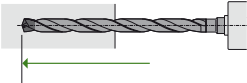

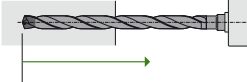
1	Pilot drilling 1		10-30 bar on	2 x D_c A6181TFT A7191TFT K3281TFT
				
2	Pilot drilling 2		10-30 bar on	12 x D_c A6589DPP
				
3	Feeding in		off	XD Technology
				
4	Feeding in		off	XD Technology
				
5	Deep-hole drilling		20-40 bar on	XD Technology
				
6	Retracting		off	XD Technology
				


Drilling strategy 4: XD Technology $\leq 50 \times D_c$

suitable for:

– Special boring tools $\geq 50 \times D_c$

P	M	K	N	S	H	O
✓		✓	✓			

1	Pilot drilling 1	 10-30 bar on	$2 \times D_c$ A6181TFT A7191TFT K3281TFT
			
2	Pilot drilling 2	 10-30 bar on	$20 \times D_c$ A6785TFP
			
3	Feeding in	 off	XD Technology
			
4	Piloting	 off	XD Technology
			
5	Deep-hole drilling	 20-40 bar on	XD Technology
			
6	Retracting	 off	XD Technology
			

$V_c / V_f \rightarrow$  GPS

Drilling strategy 5: Micro XD Technology $\leq 30 \times D_c$

suitable for:

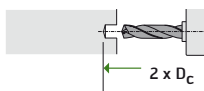
– A6489AMP – A6789AMP

– A6589AMP – A6889AMP

– A6689AMP – A6989AMP

P	M	K	N	S	H	O
✓	✓	✓	✓	✓	✓	✓

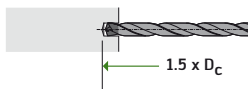
1 Pilot drilling



10-30 bar
on

$2 \times D_c$
A6181AML

2 Feeding in

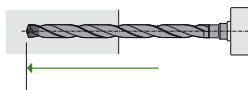


off

XD Technology

$n_{\max} = 100 \text{ rpm}$
 $v_f = 1000 \text{ mm/min}$

3 Deep-hole drilling

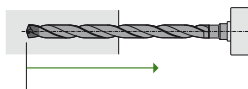


10-30 bar
on

XD Technology

$v_c = 100\%$
 $v_f = 100\%$

5 Retracting



off

XD Technology

$n_{\max} = 100 \text{ rpm}$
 $v_f = 1000 \text{ mm/min}$

$V_c / V_f \rightarrow$ GPS



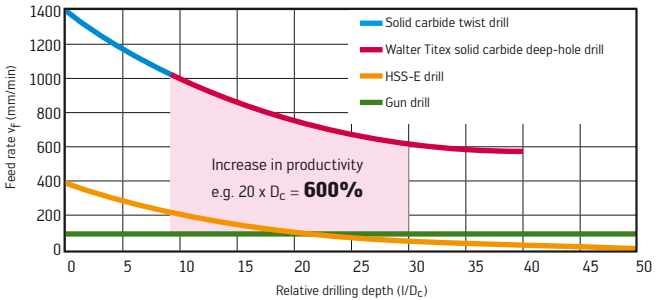
Deep-hole drilling – Solid carbide and gun drills

Comparing solid carbide deep-hole drills and gun drills

Drilling deep holes using gun drills is a common and reliable procedure.

In many applications, these tools can be replaced with solid carbide deep-hole drills. This enables the machining speed

and therefore productivity levels to be increased enormously, as in some cases higher feed rates can be achieved using helical solid carbide drills (see image).



In addition to increasing productivity, using **Walter Titex** solid carbide deep-hole drills has the following positive effects on the production of parts/components with deep holes:

- Shortened process chain
- Complete machining in one clamping arrangement
- No outsourcing required
- Shorter lead times
- High versatility
- Easy to use
- No particular requirements on cooling lubricant
- No particular requirements on the coolant pressure
- Sealing of the work room is not necessary thanks to the low level of coolant pressure required
- No investment in deep-drilling machines required
- Use on machining centres
- No need to purchase drill bushes, steady-rest bushes or sealing rings
- No problems with cross holes

Micromachining

Walter Titex solid carbide micro-drills

Walter Titex offers a comprehensive range of drilling tools for use in micromachining. The smallest solid carbide high-performance tools have a diameter of 0.5 mm without an internal coolant supply and a diameter of 0.75 mm with an internal coolant supply (see "Tools – Solid carbide – Micromachining" section). The largest micro-tool has a diameter of 2.99 mm.

The range includes internally cooled and externally cooled tools. Drilling depths of up to $30 \times D_C$ can be achieved with tools from the catalogue range. Externally cooled Alpha® 2 Plus Micro tools can even achieve drilling depths of up to $8 \times D_C$ in many materials without pecking.

The dimensions of the tools are adjusted to the particular conditions when drilling small-diameter holes in accordance with Walter Titex standards. A longer shank ensures that the tool is not obscured by the clamping device (visual check). This also allows any potential interference contours to be avoided.

Solid carbide high-performance tools for small diameters are available in both the established Alpha® range and the newer X-treme drill family (see HB "Product information – Solid carbide drills – Walter Titex X-treme M, DM8..30" section from page 28 onwards).

The following points should be taken into consideration when using solid carbide micro-drills:

- The coolant must be filtered (filter size $< 20 \mu\text{m}$, typical size $5 \mu\text{m}$)
- A coolant pressure of 20 bar is sufficient, higher pressures are possible
- There is a risk of the coolant pumps overheating due to the small volume of fluid flowing through them
- Use oil or emulsion as a coolant
- The surfaces of the workpieces should be as flat and smooth as possible, as bumps generate higher lateral forces (risk of the tool breaking or rapid wear)
- The use of hydraulic-expansion adaptors or shrink-fit adaptors is recommended
- The drilling strategy should always be followed when drilling deep holes (see page 86 onwards) and the correct X-treme Pilot 150 pilot tool used (type A6181AML).

Wear

Optimum time for regrinding



Tool stopped at the last minute

The peripheral cutting edge will soon break, which then poses a risk to the components



Condition shortly before the end of the tool's service life

Components at risk

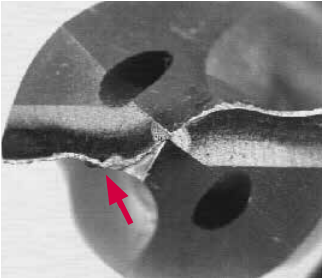


Optimum time

The tool can be reconditioned several times



Chisel edge wear



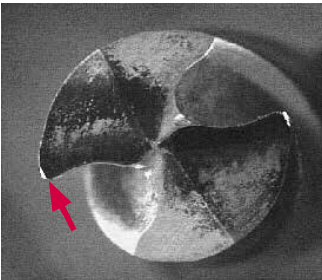
Action

- Send for reconditioning

Shortening of the tool

- Approx. 0.3 to 0.5 mm depending on wear

Wear on the peripheral cutting edge



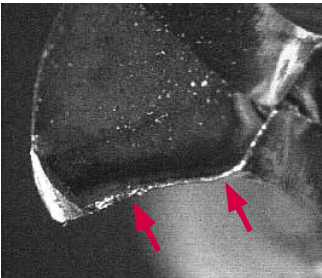
Action

- Send for reconditioning

Shortening of the tool

- Approx. 0.3 to 0.5 mm depending on wear

Severe wear on the main and peripheral cutting edges



Action

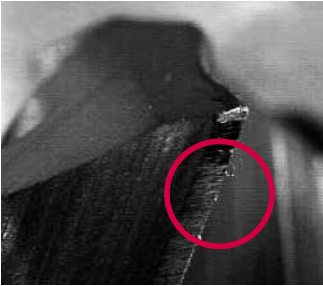
- Remove the tool from the machine sooner
- Send for reconditioning

Shortening of the tool

- Approx. 1.0 mm below the chamfer wear

Wear

Wear on the chamfers



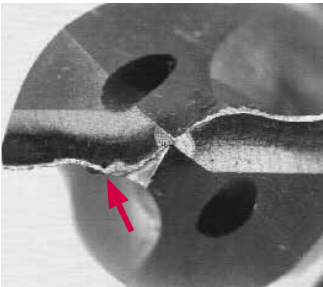
Action

- Remove the tool from the machine sooner
- The chamfer is deformed
- Send for reconditioning

Shortening of the tool

- Depends on the damage to the chamfers

Wear on the chisel edge and main cutting edge



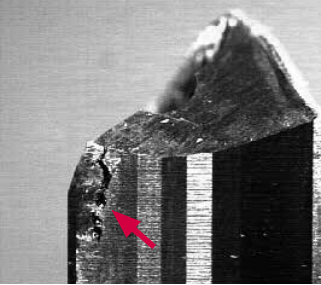
Action

- Send for reconditioning

Shortening of the tool

- 0.5 mm under the peripheral cutting edge

Extreme material deposits and chipping



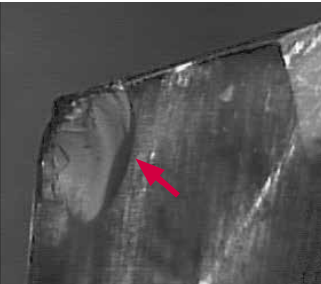
Action

- Remove deposits
- Send for reconditioning

Shortening of the tool

- Approx. 0.3 to 0.5 mm depending on wear

Chipping at the corners of the main cutting edge



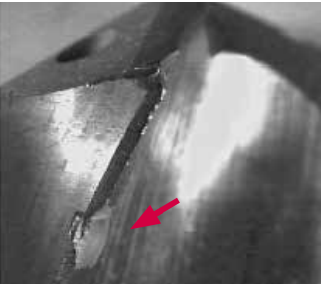
Action

- Shortening of the tool and grinding of a new point
- Send for reconditioning

Shortening of the tool

- At least 1 mm under the chipping

Cracks/chipping on the chamfer



Action

- Send for reconditioning

Shortening of the tool

- Grinding of a new point

Wear

Chipping on the peripheral cutting edges



Action

- Remove the tool from the machine sooner
- Send for reconditioning

Shortening of the tool

- 1.0 mm below the chipping

Chipping on the chamfer



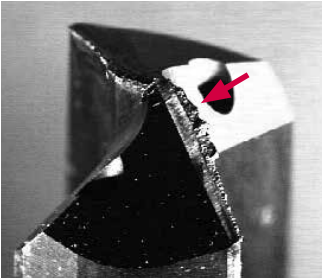
Action

- Send for reconditioning

Shortening of the tool

- Set the tip back until the damage has been removed completely

Deposits on the main cutting edge with damage



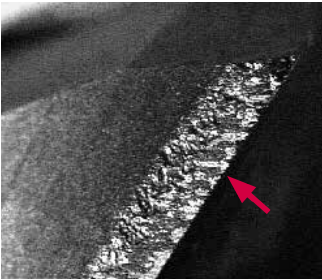
Action

- Send for reconditioning

Shortening of the tool

- Regrind the point, shorten by approx. 0.3 to 0.5 mm depending on wear

Deposits on the chamfer with damage



Action

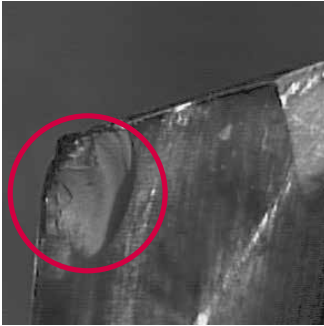
- Send for reconditioning

Shortening of the tool

- Shorten and recondition the tool

Problems – Causes – Solutions

Chipped peripheral cutting edges



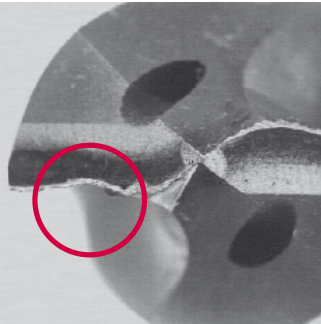
- Excessive edge wear causing the corner to chip
 - Recondition promptly
- Workpiece springs up when through-hole drilling, tool therefore catches
 - Reduce the feed rate for through-hole drilling (- 50%)
- Inclined exit during through-hole drilling results in interrupted cut
 - Reduce the feed rate for through-hole drilling (- 50%)
- Through-hole drilling of a cross hole results in interrupted cut
 - Reduce the feed rate for through-drilling of the cross hole (- 50% to - 70%)
- Centring with too small a point angle, tool therefore drilling with the edges first
 - Pre-centre with point angle > point angle of drill
- Mechanical overload of peripheral cutting edges
 - Reduce the feed
- Material has hard surface
 - Reduce the feed rate and cutting speed for drilling on entry (and, if applicable, on exit if hard on both sides) (- 50% in both cases)
- Material too hard
 - Use special tool for hard/hardened materials

Destroyed peripheral cutting edges



- Excessive edge wear
 - Recondition promptly
- Peripheral cutting edges overheated
 - Reduce the cutting speed

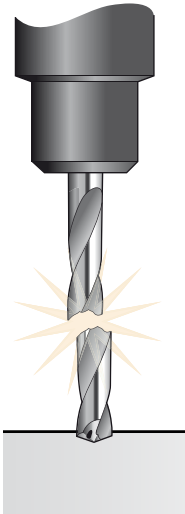
Centre region destroyed



- Excessive wear in the centre causing it to chip
 - Recondition promptly
- Mechanical overload of point
 - Reduce the feed
- Material has hard surface
 - Reduce the feed rate and cutting speed for drilling on entry (- 50%)
- Material too hard
 - Use special tool for hard/hardened materials

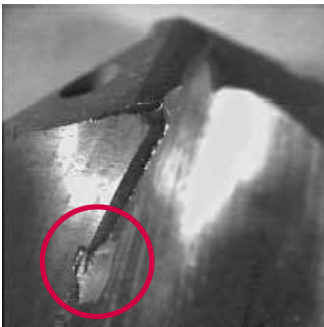
Problems – Causes – Solutions

Drill bit breakage



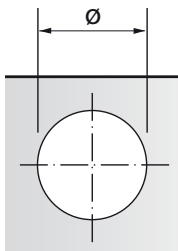
- Excessive wear causing breakage due to overloading
 - Recondition promptly
- Chip accumulation
 - Check that the flute length is at least equal to drilling depth $+1.5 \times d$
 - Use a drill bit with better chip transport properties
- Drill bit wanders on entry (e.g. because bit is too long, entry surface is not flat, entry surface is inclined)
 - Centre or pilot drill
- On lathes: Alignment error between rotary axis and drill axis
 - Use an HSS(-E) drill bit or a drill bit with a steel shank instead of a solid carbide tool
- Workpiece not clamped with adequate stability
 - Improve workpiece clamping

Chipping on cylindrical lands



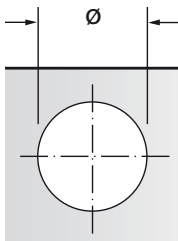
- Handling error
- Keep tools in their original packaging
- Keep tools apart/prevent contact between them

Hole too large



- Excessive centre wear or irregular wear
 - Recondition promptly
- Drill bit wanders on entry (e.g. because bit is too long, entry surface is not flat, entry surface is inclined)
 - Centre-mark
- Concentricity error of the chuck or the machine spindle
 - Use a hydraulic expansion chuck or shrink-fit chuck
 - Check and repair the machine spindle
- Workpiece not clamped with adequate stability
 - Improve workpiece clamping

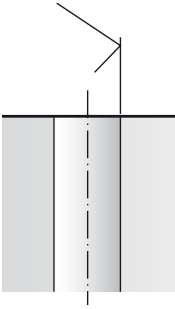
Hole too small



- Excessive wear of cylindrical lands or edges
 - Recondition promptly
- Hole not round
 - Reduce the cutting speed

Problems – Causes – Solutions

Poor surface finish



- Excessive wear of the peripheral cutting edge or cylindrical lands
 - Recondition promptly
- Chip accumulation
 - Check that the flute length is at least equal to drilling depth $+1.5 \times d$
 - Use a drill bit with better chip transport properties

Poor chip formation



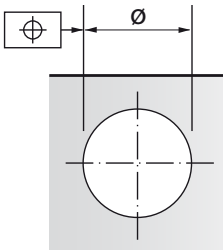
- Excessive wear of the main cutting edge affecting chip formation
 - Recondition promptly
- Chips are too thin as the feed rate is too low
 - Increase the feed
- Inadequate cooling causing the chips to overheat
 - Use internal cooling instead of external cooling
 - Increase the pressure of the internal coolant supply
 - Program interruptions in the feed motion, if necessary

Burr on the hole exit



- Excessive wear on the peripheral cutting edge
- Recondition promptly

Entry position outside tolerance



- Excessive centre wear
- Recondition promptly
- Drill bit wanders on entry (e.g. because bit is too long, entry surface is not flat, entry surface is inclined)
- Centre-mark

Drilling calculation formulae

Speed

$$n = \frac{v_c \times 1000}{D_c \times \pi} \quad [\text{min}^{-1}]$$

Cutting speed

$$v_c = \frac{D_c \times \pi \times n}{1000} \quad [\text{m/min}]$$

Feed per revolution

$$f = f_z \times z \quad [\text{mm}]$$

Feed rate

$$v_f = f \times n \quad [\text{mm/min}]$$

Metal removal rate (continuous drilling)

$$Q = \frac{v_f \times \pi \times D_c^2}{4 \times 1000} \quad [\text{cm}^3/\text{min}]$$

Power requirement

$$P_{\text{mot}} = \frac{Q \times k_c}{60000 \times \eta} \quad [\text{kW}]$$

Torque

$$M_c = \frac{D_c^2 \times k_c \times f}{8000} = \frac{P_c \times 9500}{n} \quad [\text{Nm}]$$

Feed force

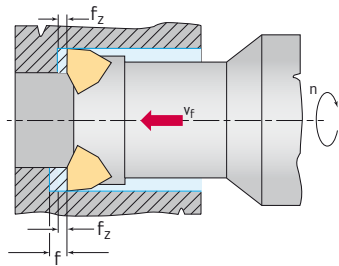
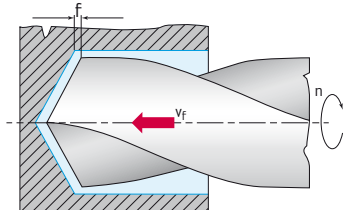
$$F_f = 0,63 \times \frac{f \times D_c \times k_c}{2} \quad [\text{N}]$$

Specific cutting force

$$k_c = \frac{k_{c1.1}}{h^{m_c}}$$

Chip thickness

$$h = f_z \times \sin \kappa \quad [\text{mm}]$$



n	Speed	rpm
D_c	Cutting diameter	mm
z	Number of teeth	
v_c	Cutting speed	m/min
v_f	Feed rate	mm/min
f_z	Feed per tooth	mm
f	Feed per revolution	mm
A	Chip cross section	mm ²
Q	Metal removal rate	cm ³ /min
P_{mot}	Power requirement	kW
M_c	Torque	Nm
F_f	Feed force	N
h	Chip thickness	mm
k_c	Specific cutting force	N/mm ²
η	Machine efficiency (0.7 – 0.95)	
κ	Approach angle	°
$k_{c1.1}^*$	Specific cutting force for 1 mm ² chip cross section with $h = 1$ mm	N/mm ²
m_c^*	Increase in the k_c curve	

* For m_c and $k_{c1.1}$ see table in GK on page H 7

Hardness comparison table

Tensile strength Rm in N/mm ²	Brinell hardness HB	Rockwell hardness HRC	Vickers hardness HV	PSI
150	50		50	22
200	60		60	29
250	80		80	37
300	90		95	43
350	100		110	50
400	120		125	58
450	130		140	66
500	150		155	73
550	165		170	79
600	175		185	85
650	190		200	92
700	200		220	98
750	215		235	105
800	230	22	250	112
850	250	25	265	120
900	270	27	280	128
950	280	29	295	135
1000	300	31	310	143
1050	310	33	325	150
1100	320	34	340	158
1150	340	36	360	164
1200	350	38	375	170
1250	370	40	390	177
1300	380	41	405	185
1350	400	43	420	192
1400	410	44	435	200
1450	430	45	450	207
1500	440	46	465	214
1550	450	48	480	221
1600	470	49	495	228
		51	530	247
		53	560	265
		55	595	283
		57	635	
		59	680	
		61	720	
		63	770	
		64	800	
		65	830	
		66	870	
		67	900	
		68	940	
		69	980	

Page information refers to:

HB = this handbook · GK = Walter General Catalogue 2012 · EK = Walter Supplementary Catalogue 2013/2014

Thread tapping core diameters

M ISO metric coarse pitch thread

Designation (DIN 13)	Female thread core diameter (mm)		Drill size (mm)
	min	6H max	
M 2	1,567	1,679	1,60
M 2,5	2,013	2,138	2,05
M 3	2,459	2,599	2,50
M 4	3,242	3,422	3,30
M 5	4,134	4,334	4,20
M 6	4,917	5,153	5,00
M 8	6,647	6,912	6,80
M 10	8,376	8,676	8,50
M 12	10,106	10,441	10,20
M 14	11,835	12,210	12,00
M 16	13,835	14,210	14,00
M 18	15,294	15,744	15,50
M 20	17,294	17,744	17,50
M 24	20,752	21,252	21,00
M 27	23,752	24,252	24,00
M 30	26,211	26,771	26,50
M 36	31,670	32,270	32,00
M 42	37,129	37,799	37,50

MF ISO metric fine pitch thread

Designation (DIN 13)	Female thread core diameter (mm)		Drill size (mm)
	min	6H max	
M 6 x 0,75	5,188	5,378	5,25
M 8 x 1	6,917	7,153	7,00
M 10 x 1	8,917	9,153	9,00
M 10 x 1,25	8,647	8,912	8,75
M 12 x 1	10,917	11,153	11,00
M 12 x 1,25	10,647	10,912	10,75
M 12 x 1,5	10,376	10,676	10,50
M 14 x 1,5	12,376	12,676	12,50
M 16 x 1,5	14,376	14,676	14,50
M 18 x 1,5	16,376	16,676	16,50
M 20 x 1,5	18,376	18,676	18,50
M 22 x 1,5	20,376	20,676	20,50

UNC Unified Coarse Thread

Designation (ASME B 1.1)	Female thread core diameter (mm)		Drill size (mm)
	min	2B max	
No. 2-56	1,694	1,872	1,85
No. 4-40	2,156	2,385	2,35
No. 6-32	2,642	2,896	2,85
No. 8-32	3,302	3,531	3,50
No. 10-24	3,683	3,962	3,90
$\frac{1}{4}$ -20	4,976	5,268	5,10
$\frac{5}{16}$ -18	6,411	6,734	6,60
$\frac{3}{8}$ -16	7,805	8,164	8,00
$\frac{1}{2}$ -13	10,584	11,013	10,80
$\frac{5}{8}$ -11	13,376	13,868	13,50
$\frac{3}{4}$ -10	16,299	16,833	16,50

UNF Unified Fine Thread

Designation (ASME B 1.1)	Female thread core diameter (mm)		Drill size (mm)
	min	2B max	
No. 4-48	2,271	2,459	2,40
No. 6-40	2,819	3,023	2,95
No. 8-36	3,404	3,607	3,50
No. 10-32	3,962	4,166	4,10
$\frac{1}{4}$ -28	5,367	5,580	5,50
$\frac{5}{16}$ -24	6,792	7,038	6,90
$\frac{3}{8}$ -24	8,379	8,626	8,50
$\frac{1}{2}$ -20	11,326	11,618	11,50
$\frac{5}{8}$ -18	14,348	14,671	14,50

G Pipe thread

Designation (DIN EN ISO 228)	Female thread core diameter (mm)		Drill size (mm)
	min	max	
G $\frac{1}{8}$	8,566	8,848	8,80
G $\frac{1}{4}$	11,445	11,890	11,80
G $\frac{3}{8}$	14,950	15,395	15,25
G $\frac{1}{2}$	18,632	19,173	19,00
G $\frac{5}{8}$	20,588	21,129	21,00
G $\frac{3}{4}$	24,118	24,659	24,50
G 1	30,292	30,932	30,75

Thread forming core diameters

M ISO metric coarse pitch thread

Designation (DIN 13)	Female thread core diameter (DIN 13-50) (mm)		Pilot drill size (mm)
	min	7H max	
M 1,6	1,221	-	1,45
M 2	1,567	1,707	1,82
M 2,5	2,013	2,173	2,30
M 3	2,459	2,639	2,80
M 3,5	2,850	3,050	3,25
M 4	3,242	3,466	3,70
M 5	4,134	4,384	4,65
M 6	4,917	5,217	5,55
M 8	6,647	6,982	7,40
M 10	8,376	8,751	9,30
M 12	10,106	10,106	11,20
M 14	11,835	12,310	13,10
M 16	13,835	14,310	15,10

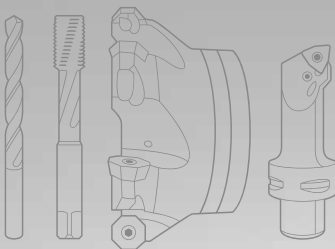
MF ISO metric fine pitch thread

Designation (DIN 13)	Female thread core diameter (DIN 13-50) (mm)		Pilot drill size (mm)
	min	7H max	
M 6 x 0,75	5,188	5,424	5,65
M 8 x 1	6,917	7,217	7,55
M 10 x 1	8,917	9,217	9,55
M 12 x 1	10,917	11,217	11,55
M 12 x 1,5	10,376	10,751	11,30
M 14 x 1,5	12,376	12,751	13,30
M 16 x 1,5	14,376	14,751	15,30

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