

SOLID CARBIDE REAMERS

Solid carbide reamers

Product overview	**C152**
Grade overview	**C153**
System code – solid carbide reamers	**C154**
Solid carbide reamers	**C155-C159**
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C

Solid carbide reamers Product overview

Products	Solid carbide reamers	Ø	Application						Type	Page
			P	M	K	N	S	H		
3112H7		4-20	✔		✔				Straight flute with inner hole	C155

✔ Very suitable ✔ Suitable

Coated cemented carbide PVD

Grade	Grade description
KRG102	PVD coated P10–P20/K10–K20 carbide substrate for steel and cast iron.

Uncoated cemented carbide

Grade	Grade description
YK10F	Uncoated N10/K10 carbide substrate for cast iron and non ferrous materials.

Solid carbide reamers

System code – solid carbide reamers

3	1	1	2	H7	– 0850
1	2	3	4	5	6

Type	
Code	Description
3	Reamer

1

Shank type	
Code	Description
1	Straight shank
2	Straight shank DIN10
5	Straight shank DIN 6535 HA
9	Morse taper shank

2

Coolant supply	
Code	Description
0	External
1	Internal

3

Flute	
Code	Description
1	Right-hand twist
2	Straight flute
3	Left-hand twist

4

Classe de tolérance	
Code	Description
H7	The tolerance class of the reamed hole is equivalent to H7 (GB/T1800-1804)

5

Diameter [mm]	
Code	Description
0850	8,5
...	

6



a Reaming

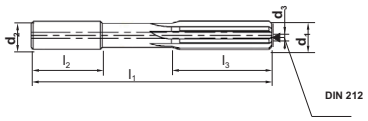
Reamer, straight flute — Steel, cast iron

3112H7



– Factory standard
– Coolant exit, axial concentric





Article	✻	Dimensions [mm]						Teeth	Grade
		d_1	d_2 (h6)	d_3 (m7)	l_1	l_2	l_3		KRG102
3112H7-0291	✻	2.91	4	0.6	70	28	20	4	○
3112H7-0295	✻	2.95	4	0.6	70	28	20	4	○
3112H7-0296	✻	2.96	4	0.6	70	28	20	4	○
3112H7-0297	✻	2.97	4	0.6	70	28	20	4	○
3112H7-0298	✻	2.98	4	0.6	70	28	20	4	○
3112H7-0299	✻	2.99	4	0.6	70	28	20	4	○
3112H7-0300	✻	3	4	0.6	70	28	20	4	●
3112H7-0301	✻	3.01	4	0.6	70	28	20	4	●
3112H7-0302	✻	3.02	4	0.6	70	28	20	4	●
3112H7-0303	✻	3.03	4	0.6	70	28	20	4	●
3112H7-0311	✻	3.11	4	0.6	70	28	20	4	○
3112H7-0318	✻	3.18	4	0.6	70	28	20	4	○
3112H7-0348	✻	3.48	4	0.6	70	28	20	4	○
3112H7-0350	✻	3.5	4	0.6	70	28	20	4	○
3112H7-0395	✻	3.95	4	0.6	70	28	20	4	○
3112H7-0396	✻	3.96	4	0.6	70	28	20	4	○
3112H7-0397	✻	3.97	4	0.6	70	28	20	4	○
3112H7-0398	✻	3.98	4	0.6	70	28	20	4	○
3112H7-0399	✻	3.99	4	0.6	70	28	20	4	○
3112H7-0400	✻	4	4	0.6	70	28	20	6	●
3112H7-0401	✻	4.01	4	1	70	28	20	4	●
3112H7-0402	✻	4.02	4	1	70	28	20	4	●
3112H7-0403	✻	4.03	4	1	70	28	20	4	●
3112H7-0404	✻	4.04	4	1	70	28	20	4	○
3112H7-0405	✻	4.05	4	1	70	28	20	4	○
3112H7-0407	✻	4.07	4	1	70	28	20	4	○
3112H7-0408	✻	4.08	4	1	70	28	20	4	●
3112H7-0414	✻	4.14	4	1	70	28	20	4	○
3112H7-0450	✻	4.5	5	1	70	28	20	4	○
3112H7-0452	✻	4.52	5	1	70	28	20	4	○
3112H7-0457	✻	4.57	5	1	70	28	20	4	○
3112H7-0495	✻	4.95	5	1	70	28	22	6	○
3112H7-0496	✻	4.96	5	1	70	28	22	6	○
3112H7-0497	✻	4.97	5	1	70	28	22	6	○
3112H7-0498	✻	4.98	5	1	70	28	22	6	○
3112H7-0499	✻	4.99	5	1	70	28	22	6	○
3112H7-0500	✻	5	5	1	70	28	22	6	●

● Ex stock ○ On demand
✻ With internal cooling

Application field

P	M	K	N	S	H
✔		✔			

✔ Very suitable
✔ Suitable

System code > C154 Machining instructions > C193 Cutting data > C160 Nonstandard order > C164

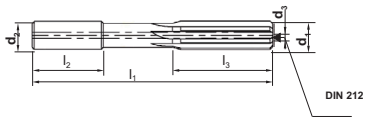
Reamer, straight flute | Steel, cast iron



3112H7

– Factory standard
– Coolant exit, axial concentric





Article	✲	Dimensions [mm]						Teeth	Grade
		d_1	d_2 (h6)	d_3 (m7)	l_1	l_2	l_3		KRG102
3112H7-0501	✲	5.01	5	1	70	28	22	6	●
3112H7-0502	✲	5.02	5	1	70	28	22	6	●
3112H7-0503	✲	5.03	5	1	70	28	22	6	●
3112H7-0504	✲	5.04	5	1	70	28	22	6	○
3112H7-0505	✲	5.05	5	1	70	28	22	6	○
3112H7-0550	✲	5.5	6	1	70	28	22	6	○
3112H7-0552	✲	5.52	6	1	70	28	22	6	○
3112H7-0553	✲	5.53	6	1	70	28	22	6	○
3112H7-0561	✲	5.61	6	1	70	28	22	6	○
3112H7-0593	✲	5.93	6	1	70	28	22	6	○
3112H7-0595	✲	5.95	6	1	100	36	22	6	●
3112H7-0596	✲	5.96	6	1	100	36	22	6	●
3112H7-0597	✲	5.97	6	1	100	36	22	6	●
3112H7-0598	✲	5.98	6	1	100	36	22	6	●
3112H7-0599	✲	5.99	6	1	100	36	22	6	●
3112H7-0600	✲	6	6	1	100	36	22	6	●
3112H7-0601	✲	6.01	6	1.3	100	36	22	6	●
3112H7-0602	✲	6.02	6	1.3	100	36	22	6	●
3112H7-0603	✲	6.03	6	1.3	100	36	22	6	●
3112H7-0635	✲	6.35	8	1.3	100	36	22	6	○
3112H7-0650	✲	6.5	8	1.3	100	36	22	6	○
3112H7-0655	✲	6.55	8	1.3	100	36	22	6	○
3112H7-0693	✲	6.93	8	1.3	100	36	22	6	○
3112H7-0695	✲	6.95	8	1.3	110	42	25	6	○
3112H7-0696	✲	6.96	8	1.3	110	42	25	6	○
3112H7-0697	✲	6.97	8	1.3	110	42	25	6	○
3112H7-0698	✲	6.98	8	1.3	110	42	25	6	○
3112H7-0699	✲	6.99	8	1.3	110	42	25	6	○
3112H7-0700	✲	7	8	1.3	110	42	25	6	●
3112H7-0701	✲	7.01	8	1.3	110	42	25	6	●
3112H7-0702	✲	7.02	8	1.3	110	42	25	6	●
3112H7-0703	✲	7.03	8	1.3	110	42	25	6	●
3112H7-0750	✲	7.5	8	1.3	110	42	25	6	○
3112H7-0770	✲	7.7	8	1.3	110	42	25	6	○
3112H7-0793	✲	7.93	8	1.3	110	42	25	6	○
3112H7-0795	✲	7.95	8	1.3	110	42	25	6	○
3112H7-0796	✲	7.96	8	1.3	110	42	25	6	○

● Ex stock ○ On demand
✲ With internal cooling

Application field

P	M	K	N	S	H
✔		✔			

✔ Very suitable
✔ Suitable

System code > C154 Machining instructions > C193 Cutting data > C160 Nonstandard order > C164

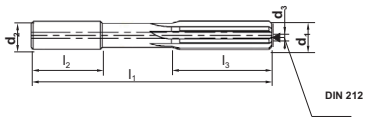
Reamer, straight flute | Steel, cast iron

3112H7



– Factory standard
– Coolant exit, axial concentric





Article	✻	Dimensions [mm]						Teeth	Grade
		d_1	d_2 (h6)	d_3 (m7)	l_1	l_2	l_3		KRG102
3112H7-0797	✻	7.97	8	1.3	110	42	25	6	○
3112H7-0798	✻	7.98	8	1.3	110	42	25	6	○
3112H7-0799	✻	7.99	8	1.3	110	42	25	6	○
3112H7-0800	✻	8	8	1.3	110	42	25	6	●
3112H7-0801	✻	8.01	8	2	110	42	25	6	●
3112H7-0802	✻	8.02	8	2	110	42	25	6	●
3112H7-0803	✻	8.03	8	2	110	42	25	6	●
3112H7-0880	✻	8.8	10	2	110	42	25	6	○
3112H7-0885	✻	8.85	10	2	110	42	25	6	○
3112H7-0900	✻	9	10	2	110	42	25	6	●
3112H7-0901	✻	9.01	10	2	110	42	25	6	●
3112H7-0902	✻	9.02	10	2	110	42	25	6	○
3112H7-0903	✻	9.03	10	2	110	42	25	6	●
3112H7-0920	✻	9.2	10	2	110	42	25	6	○
3112H7-0930	✻	9.3	10	2	110	42	25	6	○
3112H7-0993	✻	9.93	10	2	110	42	25	6	○
3112H7-0995	✻	9.95	10	2	110	38	25	6	○
3112H7-0996	✻	9.96	10	2	110	38	25	6	○
3112H7-0997	✻	9.97	10	2	110	38	25	6	○
3112H7-0998	✻	9.98	10	2	110	38	25	6	○
3112H7-0999	✻	9.99	10	2	110	38	25	6	○
3112H7-1000	✻	10	10	2	110	38	25	6	●
3112H7-1001	✻	10.01	10	2	110	38	25	6	●
3112H7-1002	✻	10.02	10	2	110	38	25	6	●
3112H7-1003	✻	10.03	10	2	110	38	25	6	●
3112H7-1024	✻	10.24	10	2	110	38	24	6	○
3112H7-1100	✻	11	12	2	110	38	28	6	●
3112H7-1101	✻	11.01	10	2	110	38	24	6	●
3112H7-1102	✻	11.02	10	2	110	38	24	6	○
3112H7-1103	✻	11.03	10	2	110	38	24	6	●
3112H7-1155	✻	11.55	12	2	110	38	28	6	○
3112H7-1195	✻	11.95	12	2	110	38	28	6	○
3112H7-1196	✻	11.96	12	2	110	38	28	6	○
3112H7-1197	✻	11.97	12	2	110	38	28	6	○
3112H7-1198	✻	11.98	12	2	110	38	28	6	○
3112H7-1199	✻	11.99	12	2	110	38	28	6	○
3112H7-1200	✻	12	12	2	110	38	28	6	●

● Ex stock ○ On demand
✻ With internal cooling

Application field

P	M	K	N	S	H
✔		✔			

✔ Very suitable
✔ Suitable

System code > C154 Machining instructions > C193 Cutting data > C160 Nonstandard order > C164

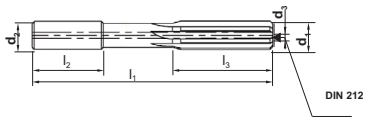
Reamer, straight flute | Steel, cast iron

3112H7



– Factory standard
– Coolant exit, axial concentric





Article	✲	Dimensions [mm]						Teeth	Grade
		d_1	d_2 (h6)	d_3 (m7)	l_1	l_2	l_3		KRG102
3112H7-1201	✲	12.01	12	2	110	38	28	6	●
3112H7-1202	✲	12.02	12	2	110	38	28	6	●
3112H7-1203	✲	12.03	12	2	110	38	28	6	●
3112H7-1300	✲	13	14	2	110	38	28	6	●
3112H7-1301	✲	13.01	14	2	110	38	28	6	●
3112H7-1302	✲	13.02	14	2	110	38	28	6	●
3112H7-1303	✲	13.03	14	2	110	38	28	6	●
3112H7-1394	✲	13.94	14	2	110	38	28	6	○
3112H7-1400	✲	14	14	2	110	38	32	6	●
3112H7-1401	✲	14.01	14	2	110	38	28	6	●
3112H7-1402	✲	14.02	14	2	110	38	28	6	●
3112H7-1403	✲	14.03	14	2	110	38	28	6	●
3112H7-1500	✲	15	16	2	110	38	32	6	●
3112H7-1501	✲	15.01	16	2	110	38	28	6	●
3112H7-1502	✲	15.02	16	2	110	38	28	6	○
3112H7-1503	✲	15.03	16	2	110	38	28	6	●
3112H7-1565	✲	15.65	16	2	110	38	28	6	○
3112H7-1593	✲	15.93	16	2	110	38	28	6	○
3112H7-1595	✲	15.95	16	2	150	52	32	6	○
3112H7-1596	✲	15.96	16	2	150	52	32	6	○
3112H7-1597	✲	15.97	16	2	150	52	32	6	○
3112H7-1598	✲	15.98	16	2	150	52	32	6	○
3112H7-1599	✲	15.99	16	2	150	52	32	6	○
3112H7-1600	✲	16	16	2	150	52	32	6	●
3112H7-1601	✲	16.01	16	3	150	52	32	6	●
3112H7-1602	✲	16.02	16	3	150	52	32	6	○
3112H7-1603	✲	16.03	16	3	150	52	32	6	●
3112H7-1800	✲	18	18	3	150	52	36	6	●
3112H7-2000	✲	20	20	3	150	50	36	6	●

● Ex stock ○ On demand
✲ With internal cooling

Application field

P	M	K	N	S	H
✔		✔			

✔ Very suitable
✔ Suitable

System code > C154 Machining instructions > C193 Cutting data > C160 Nonstandard order > C164

Notes

Guide for recommended cutting data – Solid carbide reamers

Solid carbide reamers

Material group		Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]							
						3101H7		3102H7		3112H7		3103H7	
						YK10F		YK10F		KRG102		YK10F	
						Coolant							
						external	f-group	external	f-group	internal	f-group	external	f-group
P	Unalloyed steel	ca. 0,15 % C	annealed	125	1					85	5		
		ca. 0,45 % C	annealed	190	2					75	5		
		ca. 0,45 % C	tempered	250	3					70	5		
		ca. 0,75 % C	annealed	270	4					60	5		
		ca. 0,75 % C	tempered	300	5					55	5		
	Low-alloyed steel		annealed	180	6					75	5		
			tempered	275	7					60	5		
			tempered	300	8					55	5		
			tempered	350	9					55	5		
	High-alloyed steel and high-alloyed tool steel		annealed	200	10					70	5		
			hardened and tempered	325	11					55	5		
M	Stainless steel	ferritic/martensitic	annealed	200	12								
		martensitic	tempered	240	13								
		austenitic	quench hardened	180	14								
		austenitic-ferritic		230	15								
K	Grey cast iron	perlitic/ferritic		180	16	23	5	23	5	75	5	23	5
		perlitic (martensitic)		260	17	19	5	19	5	60	5	19	5
	Cast iron with spheroidal graphite	ferritic		160	18	19	5	19	5	60	5	19	5
		perlitic		250	19	17	5	17	5	50	5	17	5
	Malleable cast iron	ferritic		130	20	23	5	23	5	75	5	23	5
		perlitic		230	21	14	5	14	5	55	5	14	5
N	Aluminium wrought alloys	cannot be hardened		60	22	45	6	45	6			45	6
		hardenable	hardened	100	23	40	6	40	6			40	6
	Cast aluminium alloys	≤ 12% Si, cannot be hardened		75	24	37	6	37	6			37	6
		≤ 12% Si, hardenable	hardened	90	25	35	6	35	6			35	6
		> 12% Si, cannot be hardened		130	26	32	6	32	6			32	6
	Copper and copper alloys (bronze/brass)	machining steel, PB> 1%		110	27	37	6	37	6			37	6
		CuZn, CuSnZn		90	28	34	6	34	6			34	6
		CuSn, Pb-free copper, electrolytic copper		100	29	37	6	37	6			37	6
S	Heat-resistant alloys	Fe-based alloys	annealed	200	30								
			hardened	280	31								
		Ni or Co bass	annealed	250	32								
			hardened	350	33								
			cast	320	34								
	Titanium alloys	pure titanium		R_m 400	35								
		α and β alloys	hardened	R_m 1050	36								
H	Hardened steel		hardened and tempered	55 HRC	37								
			hardened and tempered	60 HRC	38								
	Hard cast iron		cast	400	39								
	Hardened cast iron		hardened and tempered	55 HRC	40								
X	Non-metallic materials	Thermoplasts			41								
		Thermosetting plastics			42								
		Plastic, glass-fibre reinforced GFRP			43								
		Plastic, carbon fibre reinforced CFRP			44								
		Graphite			45								
		Wood			46								

Note: The given cutting values are guide values, which were determined under ideal conditions.
The values have to be adapted in individual cases.
With hole depths of 5xD adjust the cutting data accordingly to the application.
f-group = feed rate recommendations on page C140.
For examples of material for cutting tool groups view page D22.

Recommend feed rate

Solid carbide reamers

f-group	Feed rate [mm]																			
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø13	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20
1	0,01	0,02	0,03	0,04	0,04	0,05	0,05	0,06	0,06	0,06	0,07	0,07	0,08	0,08	0,09	0,09	0,09	0,09	0,10	0,10
2	0,01	0,02	0,03	0,04	0,05	0,06	0,06	0,06	0,07	0,07	0,08	0,09	0,09	0,09	0,10	0,10	0,10	0,11	0,11	0,11
3	0,01	0,02	0,04	0,05	0,06	0,06	0,07	0,07	0,08	0,09	0,09	0,10	0,10	0,11	0,11	0,12	0,12	0,12	0,13	0,13
4	0,02	0,03	0,04	0,06	0,06	0,07	0,08	0,09	0,09	0,10	0,11	0,11	0,12	0,12	0,13	0,13	0,14	0,14	0,15	0,15
5	0,02	0,03	0,05	0,06	0,07	0,09	0,09	0,10	0,11	0,11	0,12	0,13	0,14	0,14	0,15	0,15	0,16	0,16	0,17	0,17
6	0,02	0,04	0,06	0,07	0,09	0,10	0,11	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,17	0,18	0,18	0,19	0,19	0,20
7	0,02	0,04	0,06	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,18	0,19	0,20	0,20	0,21	0,22	0,22	0,23
8	0,03	0,05	0,07	0,10	0,11	0,13	0,14	0,15	0,16	0,17	0,18	0,20	0,21	0,22	0,23	0,23	0,24	0,25	0,26	0,26
9	0,03	0,06	0,08	0,11	0,13	0,15	0,16	0,17	0,18	0,20	0,21	0,23	0,24	0,25	0,26	0,27	0,28	0,29	0,29	0,30
10	0,04	0,07	0,10	0,13	0,15	0,17	0,19	0,20	0,21	0,23	0,24	0,26	0,27	0,29	0,30	0,31	0,32	0,33	0,34	0,35
11	0,04	0,07	0,11	0,15	0,17	0,20	0,21	0,23	0,24	0,26	0,28	0,30	0,32	0,33	0,35	0,36	0,37	0,38	0,39	0,40
12	0,05	0,09	0,13	0,17	0,20	0,23	0,25	0,26	0,28	0,30	0,32	0,35	0,36	0,38	0,40	0,41	0,42	0,44	0,45	0,46
13	0,05	0,10	0,15	0,20	0,23	0,26	0,28	0,30	0,32	0,35	0,37	0,40	0,42	0,44	0,46	0,47	0,49	0,50	0,52	0,53
14	0,06	0,11	0,17	0,23	0,26	0,30	0,33	0,35	0,37	0,40	0,43	0,46	0,48	0,50	0,53	0,54	0,56	0,58	0,59	0,61
15	0,07	0,13	0,20	0,26	0,30	0,35	0,37	0,40	0,43	0,46	0,49	0,53	0,55	0,58	0,61	0,62	0,64	0,66	0,68	0,70

Note: The given cutting values are guide values, which were determined under ideal conditions.
The values have to be adapted in individual cases.

1. Select the appropriate product series.
2. Determine the immersion.
3. Select the used material and read the cutting speed.
4. Determine the feed rate group and have a look at the appropriate feed rate recommendations.
5. Select the diameter of tool and determine the immersion.

Solid carbide reamers

Material group		Composition / structure / heat treatment		Brinell hardness HB	Machining group	Starting values for cutting speed v_c [m/min]								
						3101H7		3102H7		3112H7		3103H7		
						YK10F		YK10F		KRG102		YK10F		
						Coolant								
						Ext.	f-group	Ext.	f-group	Int.	f-group	Ext.	f-group	
P	Unalloyed steel	approx. 0,15 % C	annealed	125	1					85	5			
		approx. 0,45 % C	annealed	190	2					75	5			
		approx. 0,45 % C	tempered	250	3					70	5			
		approx. 0,75 % C	annealed	270	4					60	5			
		approx. 0,75 % C	tempered	300	5					55	5			
	Low-alloyed steel		annealed	180	6					75	5			
			tempered	275	7					60	5			
			tempered	300	8					55	5			
			tempered	350	9					55	5			
	High-alloyed steel and high-alloyed tool steel		annealed	200	10					70	5			
			hardened and tempered	325	11					55	5			
M	Stainless steel	ferritic/martensitic	annealed	200	12									
		martensitic	tempered	240	13									
		austenitic	quench hardened	180	14									
		austenitic-ferritic		230	15									
K	Grey cast iron	perlitic/ferritic		180	16	23	5	23	5	75	5	23	5	
		perlitic (martensitic)		260	17	19	5	19	5	60	5	19	5	
	Cast iron with spheroidal graphite	ferritic		160	18	19	5	19	5	60	5	19	5	
		perlitic		250	19	17	5	17	5	50	5	17	5	
	Malleable cast iron	ferritic		130	20	23	5	23	5	75	5	23	5	
		perlitic		230	21	14	5	14	5	55	5	14	5	
N	Aluminium wrought alloys	cannot be hardened		60	22	45	6	45	6			45	6	
		hardenable	hardened	100	23	40	6	40	6			40	6	
	Cast aluminium alloys	≤ 12 % Si, cannot be hardened		75	24	37	6	37	6			37	6	
		≤ 12 % Si, hardenable	hardened	90	25	35	6	35	6			35	6	
		> 12 % Si, cannot be hardened		130	26	32	6	32	6			32	6	
	Copper and copper alloys (bronze/brass)	machining steel, PB> 1%		110	27	37	6	37	6			37	6	
		CuZn, CuSnZn		90	28	34	6	34	6			34	6	
		CuSn, Pb-free copper, electrolytic copper		100	29	37	6	37	6			37	6	
S	Heat-resistant alloys	Fe-based alloys	annealed	200	30									
			hardened	280	31									
		Ni or Co bass	annealed	250	32									
			hardened	350	33									
			cast	320	34									
	Titanium alloys	pure titanium		R_m 400	35									
		α and β alloys	hardened	R_m 1050	36									
H	Hardened steel		hardened and tempered	55 HRC	37									
			hardened and tempered	60 HRC	38									
	Hard cast iron		cast	400	39									
	Hardened cast iron		hardened and tempered	55 HRC	40									
X	Non-metallic materials	Thermoplasts			41									
		Thermosetting plastics			42									
		Plastic, glass-fibre reinforced GFRP			43									
		Plastic, carbon fibre reinforced CFRP			44									
		Graphite			45									
		Wood			46									

Note: The given cutting values are guide values, which were determined under ideal conditions.
The values have to be adapted in individual cases.
With hole depths of 5xD adjust the cutting data accordingly to the application.
f-group = feed rate recommendations on page C163.
For examples of material for cutting tool groups view page D11.

Recommended feed rate

Solid carbide reamers

f-group	Feed rate [mm]																			
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø13	Ø14	Ø15	Ø16	Ø17	Ø18	Ø19	Ø20
1	0,01	0,02	0,03	0,04	0,04	0,05	0,05	0,06	0,06	0,06	0,07	0,07	0,08	0,08	0,09	0,09	0,09	0,09	0,10	0,10
2	0,01	0,02	0,03	0,04	0,05	0,06	0,06	0,06	0,07	0,07	0,08	0,09	0,09	0,09	0,10	0,10	0,10	0,11	0,11	0,11
3	0,01	0,02	0,04	0,05	0,06	0,06	0,07	0,07	0,08	0,09	0,09	0,10	0,10	0,11	0,11	0,12	0,12	0,12	0,13	0,13
4	0,02	0,03	0,04	0,06	0,06	0,07	0,08	0,09	0,09	0,10	0,11	0,11	0,12	0,12	0,13	0,13	0,14	0,14	0,15	0,15
5	0,02	0,03	0,05	0,06	0,07	0,09	0,09	0,10	0,11	0,11	0,12	0,13	0,14	0,14	0,15	0,15	0,16	0,16	0,17	0,17
6	0,02	0,04	0,06	0,07	0,09	0,10	0,11	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,17	0,18	0,18	0,19	0,19	0,20
7	0,02	0,04	0,06	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,18	0,19	0,20	0,20	0,21	0,22	0,22	0,23
8	0,03	0,05	0,07	0,10	0,11	0,13	0,14	0,15	0,16	0,17	0,18	0,20	0,21	0,22	0,23	0,23	0,24	0,25	0,26	0,26
9	0,03	0,06	0,08	0,11	0,13	0,15	0,16	0,17	0,18	0,20	0,21	0,23	0,24	0,25	0,26	0,27	0,28	0,29	0,29	0,30
10	0,04	0,07	0,10	0,13	0,15	0,17	0,19	0,20	0,21	0,23	0,24	0,26	0,27	0,29	0,30	0,31	0,32	0,33	0,34	0,35
11	0,04	0,07	0,11	0,15	0,17	0,20	0,21	0,23	0,24	0,26	0,28	0,30	0,32	0,33	0,35	0,36	0,37	0,38	0,39	0,40
12	0,05	0,09	0,13	0,17	0,20	0,23	0,25	0,26	0,28	0,30	0,32	0,35	0,36	0,38	0,40	0,41	0,42	0,44	0,45	0,46
13	0,05	0,10	0,15	0,20	0,23	0,26	0,28	0,30	0,32	0,35	0,37	0,40	0,42	0,44	0,46	0,47	0,49	0,50	0,52	0,53
14	0,06	0,11	0,17	0,23	0,26	0,30	0,33	0,35	0,37	0,40	0,43	0,46	0,48	0,50	0,53	0,54	0,56	0,58	0,59	0,61
15	0,07	0,13	0,20	0,26	0,30	0,35	0,37	0,40	0,43	0,46	0,49	0,53	0,55	0,58	0,61	0,62	0,64	0,66	0,68	0,70

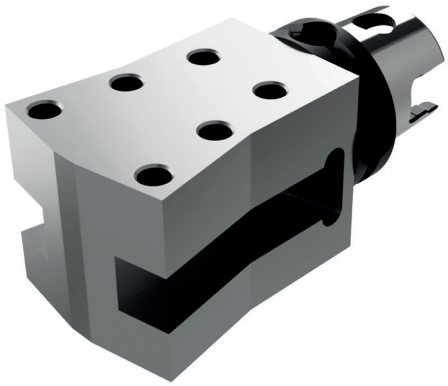
Note: The given cutting values are guide values, which were determined under ideal conditions.
The values have to be adapted in individual cases.

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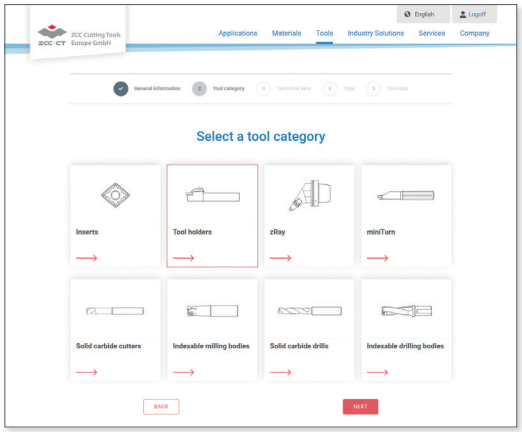
Example: Special tool holder



Example: Special solid carbide step drill

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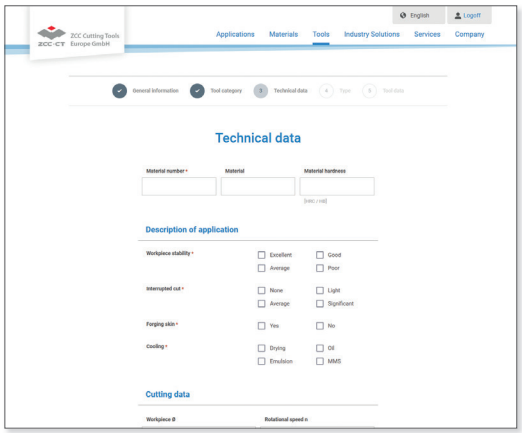
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Define the relevant tool parameters

Defining the tool parameters

You are now guided step by step through the process. You can also securely upload your drawings, diagrams and 3D models (where available).

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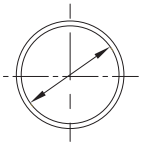
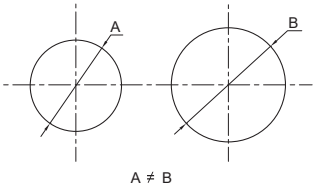
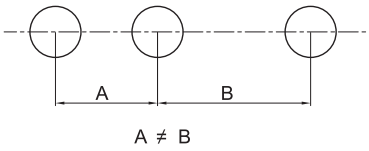
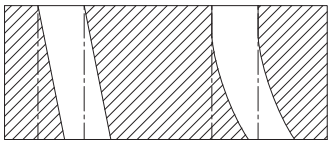
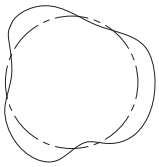
Now go directly to the new **special tool form** on our website and get started.

Technical information

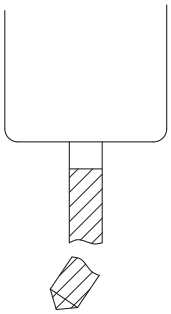
Trouble shooting – drilling	**C194-C198**
Technical information – drilling	**C199-C205**
Special tools – drilling	**C206**

C

Trouble shooting – solid carbide drills

Error	Reason	Countermeasure
Oversized holes 	– Insufficient clamping of workpiece and/or tool – Large radial run out – Point relief is off centre	– Use precision clamping – Reduce spindle play – Check and adjust clamped drill
	– Asymmetric point angle – Large radial run out – Point relief is off centre	– Regrind drill – Check quality of regrinding
Irregular hole size 	– Asymmetric point angle – Large radial run out – Point relief is off centre – High wear	– Use precision clamping – Reduce spindle play – Check and adjust clamped drill
	– Insufficient clamping of work piece and/or tool – Large radial run out – Point relief is off centre – High wear	– Use precision clamping – Reduce spindle play – Check and adjust clamped drill
	– Feed rate too high	– Reduce feed rate
	– Insufficient coolant	– Increase amount of coolant or change coolant supply
Low position accuracy 	– Insufficient clamping and spindle positio-ning – Large radial run out of spindle	– Improve positioning of machine – Use precision clamping – Calibrate spindle – Check and adjust clamped drill
	– The feed direction is not vertical to the workpiece surface	– Adjust feed rate vertically to workpiece surface
	– Tool isn't aligned with centre of spindle (lathe machines	– Centre the tool
Bad drill run out 	– High tool wear	– Regrind drill
	– Poor drill accuracy	– Improve positioning of drill
	– Asymmetric point angle – Large radial run out – Point relief is off centre	– Regrind drill – Check quality of regrinding
	– Insufficient tool stability	– Improve stability of tool
	– Uneven workpiece surface – Tool isn't aligned with centre of spindle (lathe machines)	– Before boring align the workpiece horizontally to the drill or pre-machine the workpiece
Inaccurate hole (roundness) 	– Asymmetric point angle – Large radial run out – Point relief is off centre – High wear	– Regrind drill – Check quality of regrinding
	– Insufficient clamping of work piece and/or tool – Large radial run out of spindle	– Use precision clamping – Calibrate spindle – Check and adjust clamped drill
	– Clearance angle too large	– Regrind the drill
	– Insufficient tool stability	– Improve tool stability

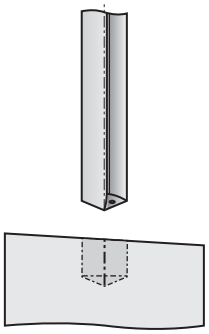
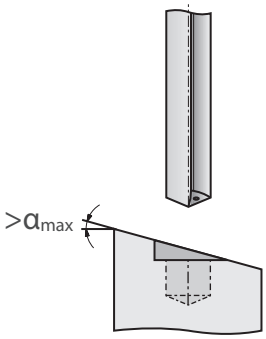
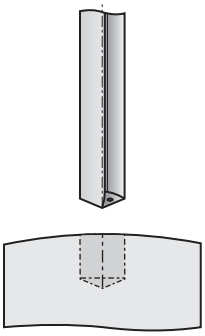
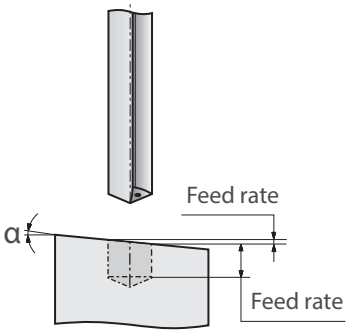
Trouble shooting – solid carbide drills

Error	Reason	Countermeasure
Bad surface quality	– Bad drill regrinding	– Improve regrinding
	– Insufficient amount of coolant or coolant method	– Change coolant supply – Increase amount of coolant
	– Insufficient clamping – Large radial run out of spindle	– Use precision clamping – Calibrate spindle
	– Feed rate too high	– Reduce feed rate
	– High wear of cutting edge – High welding	– Regrind drill – Use a coated drill
	– Bad chip removal	– Chose a suitable drill (with an accordingly flute, helical angle etc.) – Adjust cutting speed (reduce feed rate, etc.)
Bad cylindricity 	– No symmetrical point angle – Large radial run out (drilling) – Centre insert is off centre – Large cutting edge wear – Feed rate too low	– Regrind drill – Check regrind – Increase feed rate
Breakage of drill 	– Insufficient clamping of tool and/or workpiece	– Improve stability of tool and clamping of workpiece
	– Clearance angle too small	– Use a drill with bigger clearance angle or regrind
	– Feed rate too high	– Reduce feed rate
	– Excessive wear	– Regrind drill
	– Chip jamming	– Chose a suitable drill (considering flute geometry, helical angle, etc.) – Adjust cutting speed – Reduce feed rate
	– Drilling in uneven surfaces	– Increase rigidity of drill and clamping of machine and workpiece – Use drill with sharp centre insert – Pre-drill a centre hole – Create a straight surface (e.g. with solid carbide milling cutter) – Use a guide bush or bush plate
Chipping on the drill 	– Hard surface or blow holes	– Check material and chose suitable grade – Change cutting conditions (cutting speed, feed rate or machining method)
	– Feed rate too high	– Reduce feed rate
	– Insufficient coolant	– Improve/increase coolant supply
Chipping on the cutting edge 	– Poor clamping – Large radial run out	– Use a more precise clamping device – Adjust the spindle
	– Cutting speed and feed rate too high	– Reduce cutting speed and feed rate
	– Clearance angle too large	– Use a drill with smaller clearance angle or regrind

Trouble shooting – solid carbide drills

Error	Reason	Countermeasure
Excessive wear 	– Overdue regrinding	– Regrind in time
	– Drill tip not in centre position	– Adjust drill with centre of spindle
	– Cutting speed too high	– Reduce cutting speed
	– Cutting angle not suitable	– Chose right cutting angle
	– Material not suitable	– Chose suitable material
	– Insufficient cooling	– Use suitable cooling
Wear and chipping on point relief	– Feed rate too high	– Reduce feed rate
	– Cutting angle not suitable	– Chose right cutting angle
	– Material not suitable	– Chose suitable material
	– Clearance angle too small	– Regrind drill
Breakage on margin	– Guide bush too large	– Change guide bush
Built up edge on margin	– High wear and heat	– Regrind drill
	– Insufficient cooling	– Change cooling method
	– Incorrect coolant	– Change coolant
	– Workpiece material is too soft	– Use drill with smaller clearance angle
High vibrations	– Clearance angle too large	– Regrind drill
	– Drill stability too low	– Improve stability
Swarf clogs the drill	– Long chips – Chip removal not fluent	– Optimise cutting data – Change drill or adjust machine
One-side wear	– Drill tip not centred	– Adjust drill with centre of spindle
	– Poor clamping	– Improve drill clamping – Check concentricity

Trouble shooting – PC series

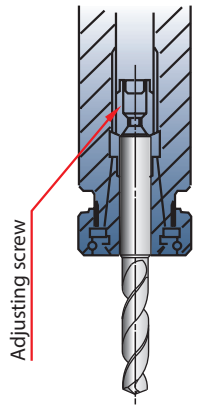
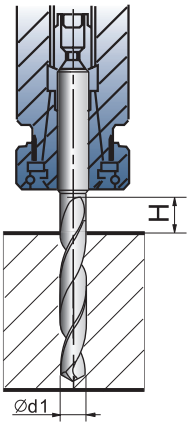
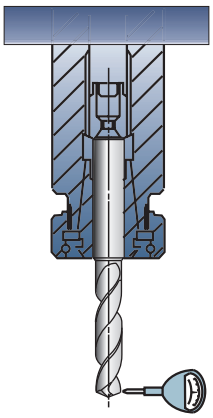
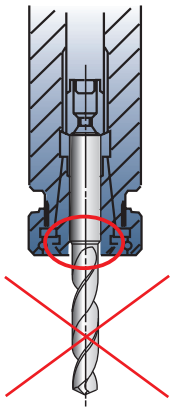
Machining	Recommendation
Sloped surface 	– Inclined surfaces should be pre-machined (chamfering). 
Inclined surface 	– Reduce feed rate accordingly.  Inclination angle / Max. feed rate 1° / 80% 2° / 50% 3° / 30%

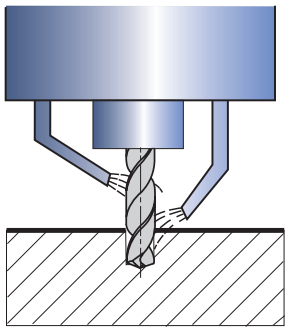
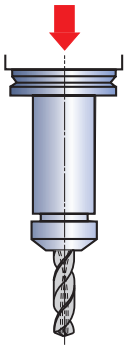
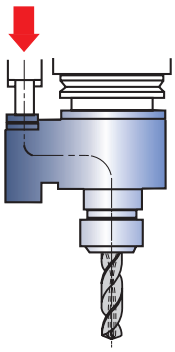
Trouble shooting – solid carbide reamers

Problem	Solution
Oversized hole	– Reduce the diameter of the reamer. – Check concentricity of the reamer and hole. – Check the radial run-out of the reamer. – Check the shank of the reamer for scratches. – Select a suitable coolant. – Adjust the cutting parameters.
Hole too small	– Increase the diameter of the reamer. – Reduce the cutting speed. – Reduce allowance. – Regrind or replace the reamer. – Ensure sufficient cooling.
Poor hole roundness and straightness	– Guarantee concentricity of the reamer chamfer. – Reduce overhang. – Check radial run-out after the reamer is clamped. – Adjust concentricity of the reamer and hole. – Check and ensure drill geometry.
Poor surface quality	– Reduce the cutting speed. – Ensure correct reaming allowance. – Check the cutting chamfer length of the reamer for wear and built-up edge. – Ensure stability of the machine, tool holder and reamer. – Chose the reamer according to the application. – Check the hole allowance.
Poor bore quality	– Pull out the reamer in cutting direction. – Reduce the cutting speed. – Use reamers with more teeth. – Check for concentricity and radial run-out. – Improve coolant supply. – Chose the optimal coolant lubrication.
Reamer breakage and thermal damage	– The guide chamfer is insufficient. Check the drill and drilling axis. – Adjust machining allowance. – Ensure sufficient coolant supply. – Adjust the cutting speed and feed rate. – Improve the stability of the machine, the tool holder and the cutting tool. – Change or regrind the cutting tool if the cutter wear is too high.
Damage on reamer shank	– Check clamping sleeve and tool holder for damage.
Short tool life	– Check coolant supply. – Change from straight fluted to helical fluted reamers. – Check all factors affecting machining precision.
Scratched hole surface	– Check the cutting edge for built-up edges and if necessary correct the cutting data. – Improve clamping of the work piece.
Trumpet-shaped entry hole	– Improve clamping of the work piece. – Check radial run-out of the clamped reamer. – The centre of the reamer may not be aligned with the centre of the hole. Adjust concentricity.

Solid carbide drills

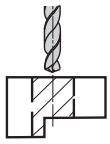
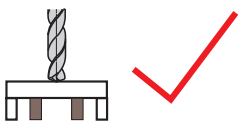
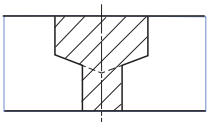
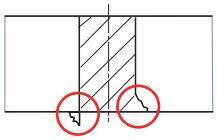
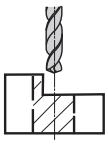
Operation notes

Correct drill clamping	Max. drilling length	Radial run-out	Wrong drill clamping
			
Use precision collets	H = 1,5 x d1	Radial run-out <0.02 mm	Don't clamp on the drill flutes.

External coolant method	Internal coolant method	
		
The coolant liquid should shoot to the end and the centre of the drill as shown in the figure.	Coolant pressure is about 0.5–1 mpa (coolant pressure is 2–3 mpa when the diameter is less than 5 mm), coolant volume: 1.5–4 L/min	

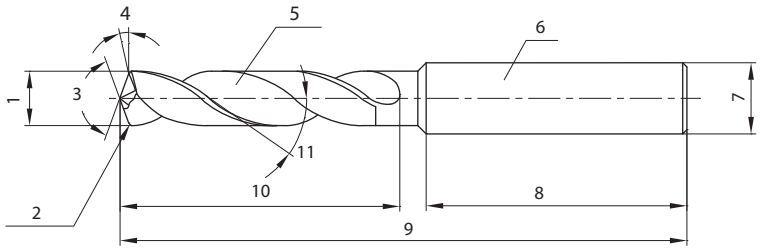
Handling of coolants:

1. Small chip particles and dust can cause jamming in the oil hole. A fine mesh filter should be used.
2. Dirt and dust particles will adhere to the oil hole and lead to unsmooth coolant flow. Regularly change the coolant. Please ensure proper coolant supply.

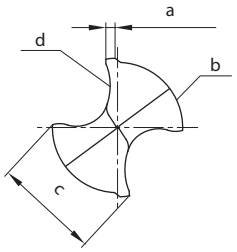
Interrupted cutting	Thin work pieces	Stepped holes	Burrs and work piece chippings on exit
 Reduce the feed rate when drilling interrupted cut.	  If bending occurs, add a supporter.	 – First drill the larger hole, then the smaller hole. – We can offer multiple step and chamfer drills on request.	 – Reduce the feed rate approx. by half when the drill exits. – Use a drill with a different point angle.
 Machine a countersink with an end mill prior to drilling.			

Solid carbide drills

Terminology

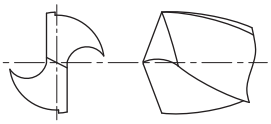
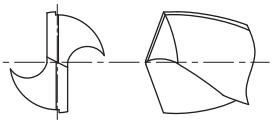
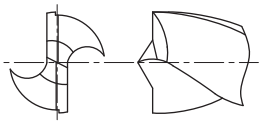


1. Drilling diameter
2. Chamfer
3. Point angle
4. Clearance angle
5. Chip pocket
6. Shank
7. Shank diameter
8. Shank length
9. Overall length
10. Flute length
11. Helical angle



a. Margin width
b. Body clearance
c. Land width
d. Primary cutting edge

Cutting edge type

Shape	 (Conical)	 (Dual flats)	 (Centring tip)
Features	– The flank face is conical and the clearance angel increases toward the centre of drill. – Wide applications, commonly used both for soft and hard materials.	– The flank face is dual flats, to facilitate cutting and initial entering. – Often used for small diameter drills.	– This shape has two-stage point angles for perfect centring capabilities and reduces burrs. – It is the first choice for drilling thin plate.

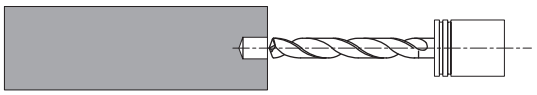
Solid carbide drills

Drill specification and cutting parameters

Chip pocket	The chip pocket ensures that the chips are removed out of the hole during processing.
Helical angle	The helical angle describes the pitch of the flute. It's specified according to the to be machined material. hardened materials — small ⟵ helical angle ⟶ large — tough materials
Cutting edge length or spiral length	The cutting edge length needs to be specified according to the drilling depth, guide bushing length and the whole regrinding length. The larger the helical angle, the lower the stability. Since it greatly influences the tool life, it should be as small as possible. The recommended min. spiral length is the drilling depth plus 1.5 times of the hole diameter.
Point angle	Generally the point angle is 140°, for special applications it should be set differently. tough materials, easy to machine — small ⟵ point angle ⟶ large — hardened materials and high-performance drilling
Core diameter	The core diameter is an important factor and influences the stability and the chip flow. low axial cutting force, low stability, for easy to machine materials — small ⟵ core diameter ⟶ large — high axial cutting force, high stability, for hardened materials or cross holes
Chamfer width	The chamfer width influences the guidance and friction of the drill during machining. low friction and bad drill guidance — small ⟵ chamfer width ⟶ large — high friction and good drill guidance
Back taper	The drill diameter is slightly reduced from cutting edge to shank to reduce friction during machining.
Body clearance	The area behind the chamfer width. The body clearance is necessary to reduce friction during machining.

Deep hole drilling

1 Preparation of the pilot hole with 1534SP03C*



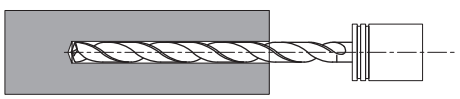
– Point angle of pilot drill must be bigger than SL drill.
– Diameter of pilot drill must be 0.01–0.04 mm bigger than SL drill.
– The pilot hole should be 1–3×D.

2 Entering the pilot hole with SL drill



– Entering the pilot hole with low cutting speed. (VC: 20–30 m/min)
– Stop 1–3 mm before end of pilot hole. (Vf = 0)
– Increase cutting speed up to recommended parameter and then start drilling at feed rate.

3 Manufacturing the deep hole



– Drilling with suitable cutting speed and feed rate.
In case of cross holes feed rate should be reduced to 0.05 mm/rev..

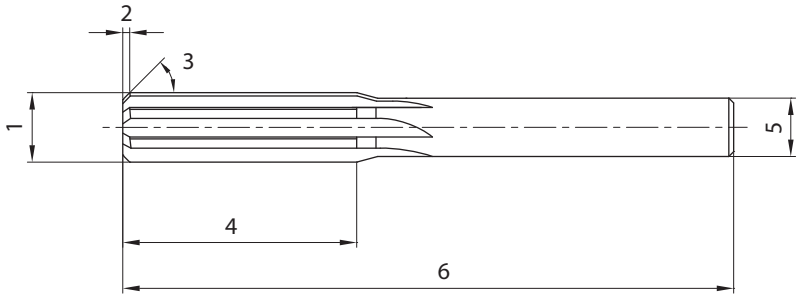
4 Pulling out the drill



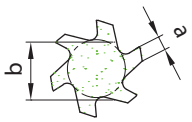
– After reaching the required depth reduce the cutting speed (VC: 20–30 m/min) and pull out the drill at high feed rate. (Vf: 2000 mm/min)

Solid carbide reamers

Terminology

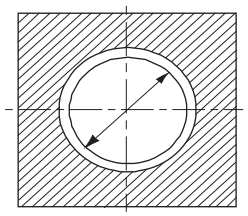


1.Nominal diameter
2.Chamfer length
3.Entry angle
4.Cutting edge length
5.Shank diameter
6.Total length

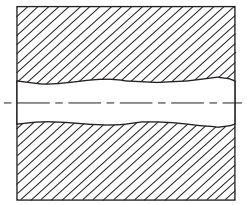


a.Cutting edge thickness
b.Core diameter

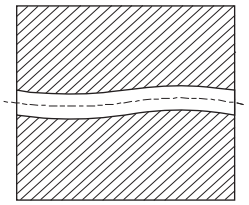
Reaming is semi-finishing and finishing of a previously formed hole within a narrow tolerance for higher surface quality, perfect roundness, cylindricity, etc.. To achieve a precisely reamed hole, the right choice of reamer and reamer diameter is important. In addition to that, the bore tolerance, the material and the machining conditions need to be taken into account. Furthermore the bore quality is strongly influenced by the radial run-out of the cutting tool.



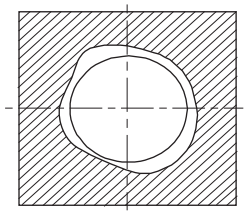
Diameter tolerance/Allowance



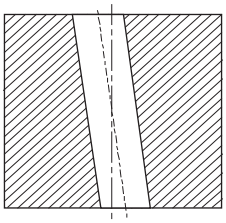
Cylindricity



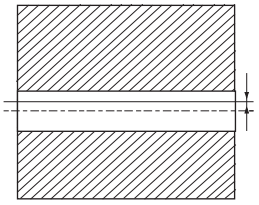
Straightness



Roundness



Vertical deviation



Off centre

Solid carbide thread formers

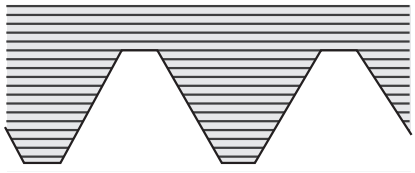
What is thread forming?

The material fibres aren't severed but compressed at the base of the thread. This is why no material is lost unlike when thread cutting.

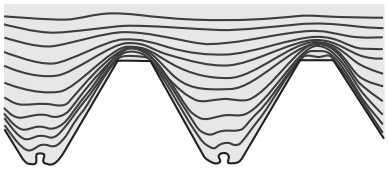
Advantages of thread forming:
- The thread is formed much more precisely.
- The thread is more resilient.
- The threads have a very smooth surface.
- Higher rotation speeds and feed rates possible than in thread cutting.
- Longer tool life increases the productivity.

Disadvantages of thread forming:
- Higher requirements on the hole tolerance.
- Can't be used as hand tool.
- Greater heat build-up than in thread drilling.
- Limited material choice.
- Often the use of a release agent is necessary.

Thread formers should be used in materials with good cold formability. Next to steel, stainless steel and aluminium alloys, these include light metals and light metal alloys with a yield strength of 1200 N/mm^2. Basically, all long-chipping materials are suitable.



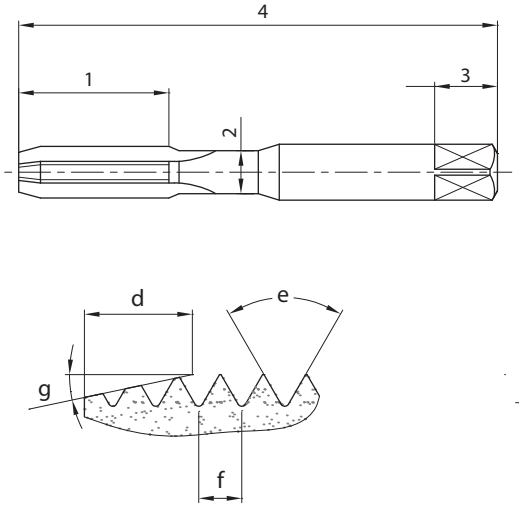
Fibre orientation after thread cutting



Fibre orientation after thread forming

Solid carbide taps

Terminology



Chamfer and thread profile

1.Thread length
2.Neck diameter
3.Square head length
4.Total length

a.Core diameter
b.Cutting edge thickness
c.Chip pocket

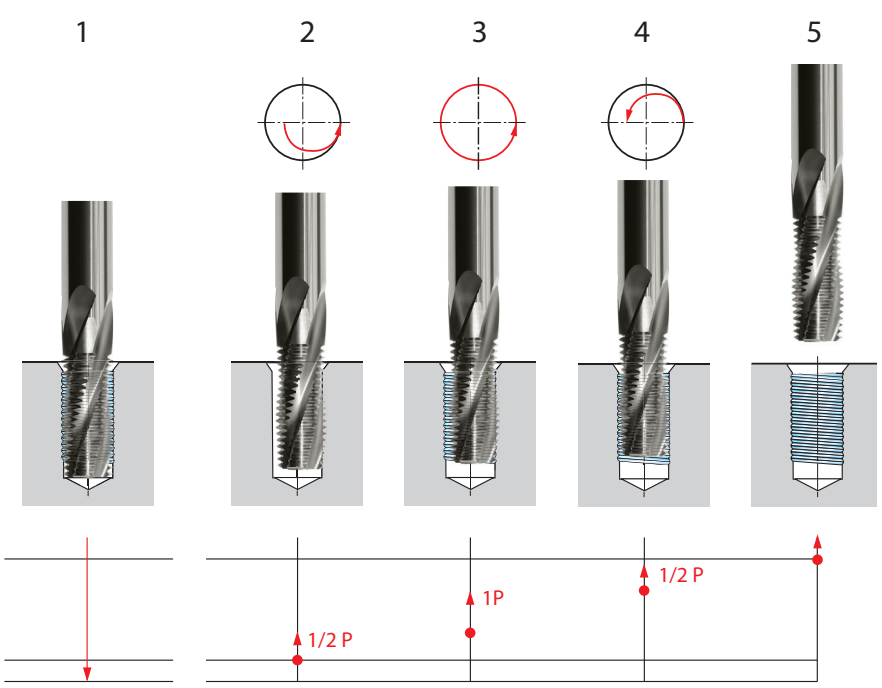
d.Chamfer length
e.Thread profile angle
f.Pitch
g.Chamfer angle

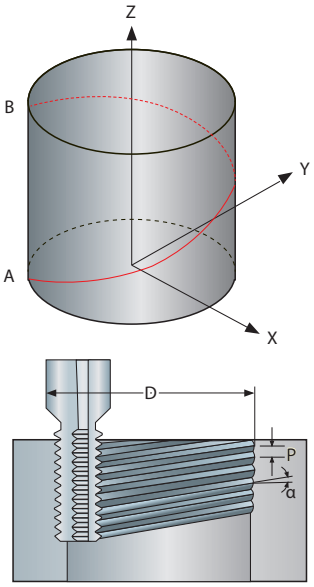
Chip space and application

Chip space type	Features	Application
 Helical flute tap	– Helical flute – No chips inside the hole – Good entering performance – Simple centring	– For long-chipping materials – Suitable for blind holes – Usage in holes with groove
 Straight flute tap	– Straight flute – Stable cutting edge – Easy regrinding	– For hard machining – For short-chipping materials – For through holes and blind holes – For wear material

Solid carbide thread milling cutters

Solid carbide thread milling cutters with cylindrical shank – example

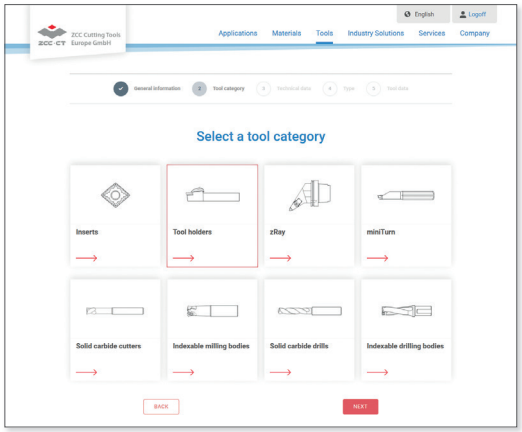




α Helix angle
D Diameter
p Pitch

Go directly to the special tool tailored for your drilling applications

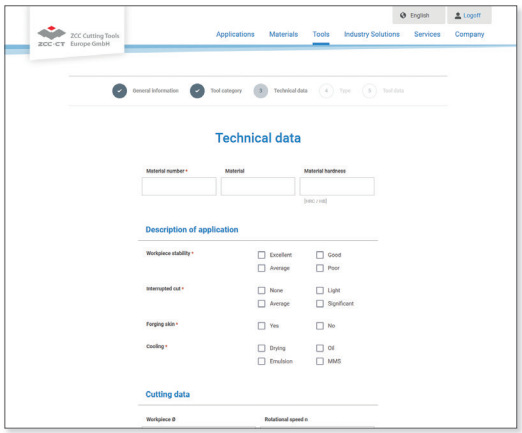
Are there drilling applications at your company where having custom tools tailored to your unique needs would deliver real benefits both in terms of logistics and at a technical and commercial level? ZCC Cutting Tools Europe is there to advise and assist you during the planning, development and ordering process. Use our new online tool to request a special tool and get your personal quotation in just a few short steps (https://www.zccct-europe.com/en/tools/special-tools).



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Selecting the tool category

Scan the QR code on this page to go directly to the launch page of our online tool where you can request the special tool you need. You can begin by selecting the tool category you need. It's that easy.



Define the relevant tool parameters.

Defining the tool parameters

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