Catalogue

Version2018

Drilling

ZCC Cutting Tools Europe GmbH

your Partner \ your Value

WELCOME TO ZCC CUTTING TOOLS EUROPE

ZCC-CT, one of the World's leading carbide tooling manufacturers, welcomes you to its products. We are able to offer you a wide product range of high performance cutting tools at economic prices and a good supply service to support the production and productivity at your manufacturing facilities. You will find the main tool types in the various sections of the catalogue, Turning is in section A, Milling in section B and Drilling in section C of the catalogue.

We are looking forward to working with you and developing good cooperation together. Our team at ZCC Cutting Tools Europe is ready to support you in all of your requirements.

Member of Minmetals Group

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MC 734/MC

Indexable drills

C

Indexable drills Product overview

Indexable insert drill





ZD03	ZTD02	ZTD03	ZTD04	ZTD05	
16-58	13-50	13-50	13-50	17-50	Diameter
C16	C8	C10	C12	C14	Page

Drilling

PM P M K


For machining of steel, stainless steel and cast iron.

EM P M S


For machining of steel, stainless steel and heat-resistant alloys.

PG P K


For machining of steel and cast iron.

D P M K


For machining of steel, stainless steel and cast iron.

53 P M K N


For machining of steel, stainless steel, cast iron and non-ferrous metals.

Indexable drills Grade overview

Coated cemented carbide CVD

Grade	ISO	Micro structure	Grade description
YB6338	P20 – P40 K20 – K40		CVD coated P20–P40/K20–K40 carbide substrate for operation with higher cutting speed and feed rate in steel and cast iron.
YBD252	K20 – K35		CVD coated K20–K35 carbide substrate. Optimized for medium to roughing operation of cast iron and Steel. Good wear resistance and toughness at higher cutting speed.

Coated cemented carbide PVD

Grade	ISO	Micro structure	Grade description
YBG202	P10 – P30 M10 – M25		PVD coated M10–M25/P10–P30 carbide substrate for finishing to medium application of stainless steel and steel (milling). Good wear resistance in a wide application field.
YBG205	P10 – P30 M20 – M40 S15 – S25		PVD multilayer coated P10–P30/M20–M40/S15–S25 carbide substrate for finishing to medium application of stainless steel, super alloy and steel (milling). Good wear resistance and thermal stability in a wide application field.
YBG212	P25 – P35 M25 – M35		PVD coated M25–M40/P25–P35 carbide substrate for steel and stainless steel. Especially for inner insert at drilling operation.

Uncoated carbide

Grade	ISO	Micro structure	Grade description
YD201	K10 – K30 N10 – N30		Uncoated N10–N30/K10–K30 carbide substrate for medium application in aluminum and other material.

Application fields of grades – Indexable drills

	ISO	HC[1] (CVD)	HC[1] (PVD)	HT	HW	PCBN & PCD
P	P01					
	P10	YBD252, YB6338	YBG202, YBG205, YBG212			
	P20					
	P30					
	P40					
M	M01					
	M10		YBG202, YBG205, YBG212			
	M20					
	M30					
	M40					
K	K01					
	K10	YBD252, YB6338	YBG202, YBG205, YBG212			
	K20					
	K30					
	K40					
N	N01					
	N10				YD201	
	N20					
	N30					
S	S01					
	S10		YBG202, YBG205, YBG212			
	S20					
	S30					
H	H01					
	H10					
	H20					
	H30					

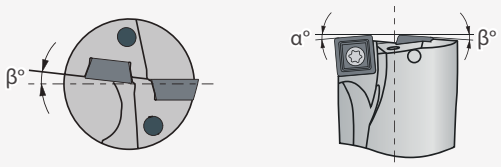
P	Steel	N	Non-ferrous alloys
M	Stainless steel	S	Heat-resistant alloys
K	Cast iron	H	Hardened materials

HC[1] Coated cemented carbide
HT Uncoated cermet
HW Uncoated cemented carbide

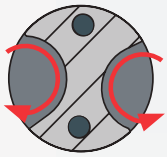
ZTD series

Indexable drills ZTD02 / 03 / 04 / 05

- For machining of steel, stainless steel, cast iron and heat-resistant alloys.
- Drilling bodies with PVD coated surfaces.
- Big chip pocket for better chip removal.
- Optional adapter for inner cooling in conventional machines.
- Diameter range 13.0–50.0 mm



Precise insert seat and stable insert clamping



Big chip pocket

Adapter for inner cooling

Insert grades

YB6338	YBG205	YBG212
CVD	*PVD*	*PVD*
P15 – P35	*P10 – P30*	*M10 – M25*
	M20 – M30	
	S15 – S35	

Chip breakers

-PM

- Steel and cast iron

-EM

- Stainless steel and heat-resistant alloys

ZD – 03 300 – XP – 32 W C 05 – 02

1	2	3	4	5	6	7	8	9

Type

Code	Description
ZD	Indexable drill (WCMX*)
ZTD	Indexable drill (SPGT*)

1

L/D relation

Code	Description
02	2 x D
03	3 x D
04	4 x D
05	5 x D

2

Diameter [mm]

Code	Description
130	13
...	

3

Shank type

Code	Description
XP	Weldon shank

4

Coupling size [mm]

5

Insert shape

W 

S 

6

Clearance angle

Code	Description
C	7°
P	11°

7

Cutting edge length [mm]

Code	Insert shape W	Insert shape S
03	3.8	
04	4.3	
05	5.4	5
06	6.5	6
08	8.7	7.94
09		9.8
11		11.5
12		12.7
14		14.3

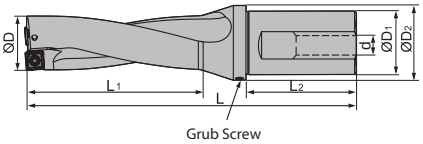
8

No. of teeth

9

Indexable drills series

ZTD02



Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD02-130-XP20-SP05-02	✻	●	13	20	25	31	50	98	M13×1	0.165	SPGT0502**	ZTD-XP20-Thin
ZTD02-140-XP20-SP05-02	✻	●	14	20	25	33	50	100	M13×1	0.171	SPGT0502**	ZTD-XP20-Thin
ZTD02-150-XP20-SP05-02	✻	●	15	20	25	35	50	102	M13×1	0.176	SPGT0502**	ZTD-XP20-Thin
ZTD02-160-XP20-SP05-02	✻	●	16	20	25	37	50	104	M13×1	0.184	SPGT0502**	ZTD-XP20-Thin
ZTD02-170-XP25-SP06-02	✻	●	17	25	32	39	56	117	M16×1,5	0.325	SPGT0602**	ZTD-XP20-Thin
ZTD02-180-XP25-SP06-02	✻	●	18	25	32	41	56	119	M16×1,5	0.332	SPGT0602**	ZTD-XP25-Thin
ZTD02-190-XP25-SP06-02	✻	●	19	25	32	43	56	121	M16×1,5	0.342	SPGT0602**	ZTD-XP25-Thin
ZTD02-200-XP25-SP06-02	✻	●	20	25	32	45	56	123	M16×1,5	0.353	SPGT0602**	ZTD-XP25-Thin
ZTD02-210-XP25-SP06-02	✻	●	21	25	32	47	56	125	M16×1,5	0.35	SPGT0602**	ZTD-XP25-Thin
ZTD02-220-XP25-SP07-02	✻	●	22	25	32	49	56	127	M16×1,5	0.367	SPGT07T3**	ZTD-XP25-Thin
ZTD02-230-XP25-SP07-02	✻	●	23	25	32	51	56	129	M16×1,5	0.38	SPGT07T3**	ZTD-XP25-Thin
ZTD02-240-XP25-SP07-02	✻	●	24	25	32	53	56	131	M16×1,5	0.443	SPGT07T3**	ZTD-XP25-Thin
ZTD02-250-XP25-SP07-02	✻	●	25	25	32	55	56	133	M16×1,5	0.41	SPGT07T3**	ZTD-XP25-Thin
ZTD02-260-XP25-SP07-02	✻	●	26	25	32	57	56	135	M16×1,5	0.454	SPGT07T3**	ZTD-XP25-Thin
ZTD02-270-XP25-SP07-02	✻	●	27	25	32	59	56	137	M16×1,5	0.445	SPGT07T3**	ZTD-XP25-Thin
ZTD02-280-XP32-SP09-02	✻	●	28	32	37	61	60	146	M22×2	0.661	SPGT0904**	ZTD-XP32-Thin
ZTD02-290-XP32-SP09-02	✻	●	29	32	37	63	60	148	M22×2	0.682	SPGT0904**	ZTD-XP32-Thin
ZTD02-300-XP32-SP09-02	✻	●	30	32	37	65	60	150	M22×2	0.702	SPGT0904**	ZTD-XP32-Thin
ZTD02-310-XP32-SP09-02	✻	●	31	32	37	67	60	152	M22×2	0.759	SPGT0904**	ZTD-XP32-Thin
ZTD02-320-XP32-SP09-02	✻	●	32	32	37	69	60	154	M22×2	0.742	SPGT0904**	ZTD-XP32-Thin
ZTD02-330-XP32-SP09-02	✻	●	33	32	37	71	60	156	M22×2	0.774	SPGT0904**	ZTD-XP32-Thin
ZTD02-340-XP40-SP11-02	✻	●	34	40	47	73	70	173	(BSPT)RC1/4	1.2	SPGT1104**	
ZTD02-350-XP40-SP11-02	✻	●	35	40	47	75	70	175	(BSPT)RC1/4	1.23	SPGT1104**	
ZTD02-360-XP40-SP11-02	✻	●	36	40	47	77	70	177	(BSPT)RC1/4	1.26	SPGT1104**	
ZTD02-370-XP40-SP11-02	✻	●	37	40	47	79	70	179	(BSPT)RC1/4	1.29	SPGT1104**	
ZTD02-380-XP40-SP11-02	✻	●	38	40	47	81	70	181	(BSPT)RC1/4	1.33	SPGT1104**	
ZTD02-390-XP40-SP11-02	✻	●	39	40	47	83	70	183	(BSPT)RC1/4	1.39	SPGT1104**	
ZTD02-400-XP40-SP11-02	✻	●	40	40	47	85	70	185	(BSPT)RC1/4	1.43	SPGT1104**	
ZTD02-410-XP40-SP11-02	✻	●	41	40	47	87	70	187	(BSPT)RC1/4	1.44	SPGT1104**	
ZTD02-420-XP40-SP14-02	✻	●	42	40	52	89	70	199	(BSPT)RC1/4	1.62	SPGT1405**	
ZTD02-430-XP40-SP14-02	✻	●	43	40	52	91	70	201	(BSPT)RC1/4	1.67	SPGT1405**	
ZTD02-440-XP40-SP14-02	✻	●	44	40	52	93	70	203	(BSPT)RC1/4	1.71	SPGT1405**	
ZTD02-450-XP40-SP14-02	✻	●	45	40	52	95	70	205	(BSPT)RC1/4	1.76	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD02-460-XP40-SP14-02	✻	●	46	40	52	97	70	207	(BSPT)RC1/4	1.81	SPGT1405**	
ZTD02-470-XP40-SP14-02	✻	●	47	40	52	99	70	209	(BSPT)RC1/4	1.87	SPGT1405**	
ZTD02-480-XP40-SP14-02	✻	●	48	40	52	101	70	211	(BSPT)RC1/4	1.92	SPGT1405**	
ZTD02-490-XP40-SP14-02	✻	●	49	40	52	103	70	213	(BSPT)RC1/4	1.98	SPGT1405**	
ZTD02-500-XP40-SP14-02	✻	●	50	40	52	105	70	215	(BSPT)RC1/4	2.05	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

Spare parts

	Insert	SPGT0502**	SPGT0602**	SPGT07T3**	SPGT0904**	SPGT1104**	SPGT1405**
	Grub screw					M6x6	M8x8
	Screw	I60M2x4,3	I60M2,2x5,5	I6OM3*10	I60M3,5x8	I60M4x10	I60M5x13
	Wrench	WT06IP	WT07IP	WT07IP	WT15IP	WT15IP	WT20IP

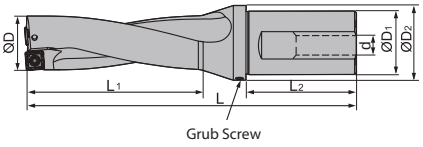
Insert

C19

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Indexable drills series

ZTD03



Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD03-130-XP20-SP05-02	✻	●	13	20	25	44	50	111	M13×1	0.179	SPGT0502**	ZTD-XP20-Thin
ZTD03-140-XP20-SP05-02	✻	●	14	20	25	47	50	114	M13×1	0.186	SPGT0502**	ZTD-XP20-Thin
ZTD03-150-XP20-SP05-02	✻	●	15	20	25	50	50	117	M13×1	0.195	SPGT0502**	ZTD-XP20-Thin
ZTD03-160-XP20-SP05-02	✻	●	16	20	25	53	50	120	M13×1	0.214	SPGT0502**	ZTD-XP20-Thin
ZTD03-170-XP25-SP06-02	✻	●	17	25	32	56	56	134	M16×1,5	0.32	SPGT0602**	ZTD-XP25-Thin
ZTD03-180-XP25-SP06-02	✻	●	18	25	32	59	56	137	M16×1,5	0.331	SPGT0602**	ZTD-XP25-Thin
ZTD03-190-XP25-SP06-02	✻	●	19	25	32	62	56	140	M16×1,5	0.342	SPGT0602**	ZTD-XP25-Thin
ZTD03-200-XP25-SP06-02	✻	●	20	25	32	65	56	143	M16×1,5	0.356	SPGT0602**	ZTD-XP25-Thin
ZTD03-210-XP25-SP06-02	✻	●	21	25	32	68	56	146	M16×1,5	0.391	SPGT0602**	ZTD-XP25-Thin
ZTD03-220-XP25-SP07-02	✻	●	22	25	32	71	56	149	M16×1,5	0.391	SPGT07T3**	ZTD-XP25-Thin
ZTD03-230-XP25-SP07-02	✻	●	23	25	32	74	56	152	M16×1,5	0.442	SPGT07T3**	ZTD-XP25-Thin
ZTD03-240-XP25-SP07-02	✻	●	24	25	32	77	56	155	M16×1,5	0.485	SPGT07T3**	ZTD-XP25-Thin
ZTD03-250-XP25-SP07-02	✻	●	25	25	32	80	56	158	M16×1,5	0.492	SPGT07T3**	ZTD-XP25-Thin
ZTD03-260-XP25-SP07-02	✻	●	26	25	32	83	56	161	M16×1,5	0.497	SPGT07T3**	ZTD-XP25-Thin
ZTD03-270-XP25-SP07-02	✻	●	27	25	32	86	56	164	M16×1,5	0.521	SPGT07T3**	ZTD-XP25-Thin
ZTD03-280-XP32-SP09-02	✻	●	28	32	37	89	60	174	M22×2	0.75	SPGT0904**	ZTD-XP32-Thin
ZTD03-290-XP32-SP09-02	✻	●	29	32	37	92	60	177	M22×2	0.777	SPGT0904**	ZTD-XP32-Thin
ZTD03-300-XP32-SP09-02	✻	●	30	32	37	95	60	180	M22×2	0.81	SPGT0904**	ZTD-XP32-Thin
ZTD03-310-XP32-SP09-02	✻	●	31	32	37	98	60	183	M22×2	0.831	SPGT0904**	ZTD-XP32-Thin
ZTD03-320-XP32-SP09-02	✻	●	32	32	37	101	60	186	M22×2	0.867	SPGT0904**	ZTD-XP32-Thin
ZTD03-330-XP32-SP09-02	✻	●	33	32	37	104	60	189	M22×2	0.928	SPGT0904**	ZTD-XP32-Thin
ZTD03-340-XP40-SP11-02	✻	●	34	40	47	107	70	207	(BSPT)RC1/4	1.33	SPGT1104**	
ZTD03-350-XP40-SP11-02	✻	●	35	40	47	110	70	210	(BSPT)RC1/4	1.371	SPGT1104**	
ZTD03-360-XP40-SP11-02	✻	●	36	40	47	113	70	213	(BSPT)RC1/4	1.414	SPGT1104**	
ZTD03-370-XP40-SP11-02	✻	●	37	40	47	116	70	216	(BSPT)RC1/4	1.448	SPGT1104**	
ZTD03-380-XP40-SP11-02	✻	●	38	40	47	119	70	219	(BSPT)RC1/4	1.498	SPGT1104**	
ZTD03-390-XP40-SP11-02	✻	●	39	40	47	122	70	222	(BSPT)RC1/4	1.554	SPGT1104**	
ZTD03-400-XP40-SP11-02	✻	●	40	40	47	125	70	225	(BSPT)RC1/4	1.667	SPGT1104**	
ZTD03-410-XP40-SP11-02	✻	●	41	40	47	128	70	228	(BSPT)RC1/4	1.653	SPGT1104**	
ZTD03-420-XP40-SP14-02	✻	●	42	40	52	131	70	241	(BSPT)RC1/4	1.903	SPGT1405**	
ZTD03-430-XP40-SP14-02	✻	●	43	40	52	134	70	244	(BSPT)RC1/4	1.951	SPGT1405**	
ZTD03-440-XP40-SP14-02	✻	●	44	40	52	137	70	247	(BSPT)RC1/4	2.039	SPGT1405**	
ZTD03-450-XP40-SP14-02	✻	●	45	40	52	140	70	250	(BSPT)RC1/4	2.12	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD03-460-XP40-SP14-02	✻	●	46	40	52	143	70	253	(BSPT)RC1/4	2.186	SPGT1405**	
ZTD03-470-XP40-SP14-02	✻	●	47	40	52	146	70	256	(BSPT)RC1/4	2.264	SPGT1405**	
ZTD03-480-XP40-SP14-02	✻	●	48	40	52	149	70	259	(BSPT)RC1/4	2.341	SPGT1405**	
ZTD03-490-XP40-SP14-02	✻	●	49	40	52	152	70	262	(BSPT)RC1/4	2.43	SPGT1405**	
ZTD03-500-XP40-SP14-02	✻	●	50	40	52	155	70	265	(BSPT)RC1/4	2.52	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

Spare parts

	Insert	SPGT0502**	SPGT0602**	SPGT07T3**	SPGT0904**	SPGT1104**	SPGT1405**
	Grub screw					M6x6	M8x8
	Screw	I60M2x4,3	I60M2,2x5,5	I6OM3*10	I60M3,5x8	I60M4x10	I60M5x13
	Wrench	WT06IP	WT07IP	WT07IP	WT15IP	WT15IP	WT20IP

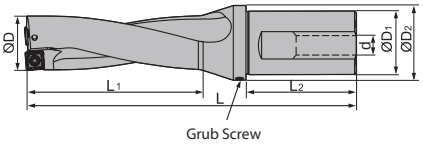
Insert

C19

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Indexable drills series

ZTD04



Article	✲	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD04-130-XP20-SP05-02	✲	●	13	20	25	57	50	124	M13×1	0.185	SPGT0502**	ZTD-XP20-Thin
ZTD04-140-XP20-SP05-02	✲	○	14	20	25	61	50	128	M13×1	0.195	SPGT0502**	ZTD-XP20-Thin
ZTD04-150-XP20-SP05-02	✲	○	15	20	25	65	50	132	M13×1	0.205	SPGT0502**	ZTD-XP20-Thin
ZTD04-160-XP20-SP05-02	✲	●	16	20	25	69	50	136	M13×1	0.216	SPGT0502**	ZTD-XP20-Thin
ZTD04-170-XP25-SP06-02	✲	●	17	25	32	73	56	151	M16×1,5	0.333	SPGT0602**	ZTD-XP25-Thin
ZTD04-180-XP25-SP06-02	✲	●	18	25	32	77	56	155	M16×1,5	0.347	SPGT0602**	ZTD-XP25-Thin
ZTD04-190-XP25-SP06-02	✲	●	19	25	32	81	56	159	M16×1,5	0.362	SPGT0602**	ZTD-XP25-Thin
ZTD04-200-XP25-SP06-02	✲	●	20	25	32	85	56	163	M16×1,5	0.381	SPGT0602**	ZTD-XP25-Thin
ZTD04-210-XP25-SP06-02	✲	●	21	25	32	89	56	167	M16×1,5	0.4	SPGT0602**	ZTD-XP25-Thin
ZTD04-220-XP25-SP07-02	✲	●	22	25	32	93	56	171	M16×1,5	0.391	SPGT07T3**	ZTD-XP25-Thin
ZTD04-230-XP25-SP07-02	✲	●	23	25	32	97	56	175	M16×1,5	0.484	SPGT07T3**	ZTD-XP25-Thin
ZTD04-240-XP25-SP07-02	✲	●	24	25	32	101	56	179	M16×1,5	0.513	SPGT07T3**	ZTD-XP25-Thin
ZTD04-250-XP25-SP07-02	✲	●	25	25	32	105	56	183	M16×1,5	0.494	SPGT07T3**	ZTD-XP25-Thin
ZTD04-260-XP25-SP07-02	✲	●	26	25	32	109	56	187	M16×1,5	0.535	SPGT07T3**	ZTD-XP25-Thin
ZTD04-270-XP25-SP07-02	✲	●	27	25	32	113	56	191	M16×1,5	0.582	SPGT07T3**	ZTD-XP25-Thin
ZTD04-280-XP32-SP09-02	✲	●	28	32	37	117	60	202	M22×2	0.6527	SPGT0904**	ZTD-XP32-Thin
ZTD04-290-XP32-SP09-02	✲	●	29	32	37	121	60	206	M22×2	0.846	SPGT0904**	ZTD-XP32-Thin
ZTD04-300-XP32-SP09-02	✲	●	30	32	37	125	60	210	M22×2	0.893	SPGT0904**	ZTD-XP32-Thin
ZTD04-310-XP32-SP09-02	✲	●	31	32	37	129	60	214	M22×2	0.914	SPGT0904**	ZTD-XP32-Thin
ZTD04-320-XP32-SP09-02	✲	●	32	32	37	133	60	218	M22×2	0.966	SPGT0904**	ZTD-XP32-Thin
ZTD04-330-XP32-SP09-02	✲	●	33	32	37	137	60	222	M22×2	1.016	SPGT0904**	ZTD-XP32-Thin
ZTD04-340-XP40-SP11-02	✲	●	34	40	47	141	70	241	(BSPT)RC1/4	1.46	SPGT1104**	
ZTD04-350-XP40-SP11-02	✲	●	35	40	47	145	70	245	(BSPT)RC1/4	1.52	SPGT1104**	
ZTD04-360-XP40-SP11-02	✲	●	36	40	47	149	70	249	(BSPT)RC1/4	1.579	SPGT1104**	
ZTD04-370-XP40-SP11-02	✲	●	37	40	47	153	70	253	(BSPT)RC1/4	1.592	SPGT1104**	
ZTD04-380-XP40-SP11-02	✲	●	38	40	47	157	70	257	(BSPT)RC1/4	1.801	SPGT1104**	
ZTD04-390-XP40-SP11-02	✲	●	39	40	47	161	70	261	(BSPT)RC1/4	1.801	SPGT1104**	
ZTD04-400-XP40-SP11-02	✲	●	40	40	47	165	70	265	(BSPT)RC1/4	1.874	SPGT1104**	
ZTD04-410-XP40-SP11-02	✲	●	41	40	47	169	70	269	(BSPT)RC1/4	1.861	SPGT1104**	
ZTD04-420-XP40-SP14-02	✲	●	42	40	52	173	70	283	(BSPT)RC1/4	2.168	SPGT1405**	
ZTD04-430-XP40-SP14-02	✲	●	43	40	52	177	70	287	(BSPT)RC1/4	2.17	SPGT1405**	
ZTD04-440-XP40-SP14-02	✲	●	44	40	52	181	70	291	(BSPT)RC1/4	2.31	SPGT1405**	
ZTD04-450-XP40-SP14-02	✲	●	45	40	52	185	70	295	(BSPT)RC1/4	2.421	SPGT1405**	

● Ex stock ○ On demand

✲ Internal cooling

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD04-460-XP40-SP14-02	✻	●	46	40	52	189	70	299	(BSPT)RC1/4	2.507	SPGT1405**	
ZTD04-470-XP40-SP14-02	✻	●	47	40	52	193	70	303	(BSPT)RC1/4	2.612	SPGT1405**	
ZTD04-480-XP40-SP14-02	✻	●	48	40	52	197	70	307	(BSPT)RC1/4	2.66	SPGT1405**	
ZTD04-490-XP40-SP14-02	✻	●	49	40	52	201	70	311	(BSPT)RC1/4	2.836	SPGT1405**	
ZTD04-500-XP40-SP14-02	✻	●	50	40	52	205	70	315	(BSPT)RC1/4	2.954	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

Spare parts

	Insert	SPGT0502**	SPGT0602**	SPGT07T3**	SPGT0904**	SPGT1104**	SPGT1405**
	Grub screw					M6x6	M8x8
	Screw	I60M2x4,3	I60M2,2x5,5	I6OM3*10	I60M3,5x8	I60M4x10	I60M5x13
	Wrench	WT06IP	WT07IP	WT07IP	WT15IP	WT15IP	WT20IP

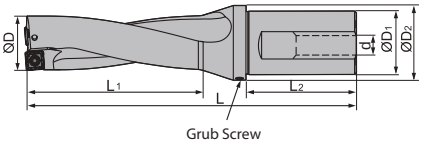
Insert

C19

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Indexable drills series

ZTD05



Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD05-170-XP25-SP06-02	✻	●	17	25	32	90	56	168	M13×1	0.374	SPGT0602**	ZTD-XP25-Thin
ZTD05-180-XP25-SP06-02	✻	●	18	25	32	95	56	173	M13×1	0.394	SPGT0602**	ZTD-XP25-Thin
ZTD05-190-XP25-SP06-02	✻	●	19	25	32	100	56	178	M13×1	0.415	SPGT0602**	ZTD-XP25-Thin
ZTD05-200-XP25-SP06-02	✻	●	20	25	32	105	56	183	M13×1	0.44	SPGT0602**	ZTD-XP25-Thin
ZTD05-210-XP25-SP06-02	✻	●	21	25	32	110	56	188	M16×1,5	0.466	SPGT0602**	ZTD-XP25-Thin
ZTD05-220-XP25-SP07-02	✻	●	22	25	32	115	56	193	M16×1,5	0.476	SPGT07T3**	ZTD-XP25-Thin
ZTD05-230-XP25-SP07-02	✻	○	23	25	32	120	56	198	M16×1,5	0.507	SPGT07T3**	ZTD-XP25-Thin
ZTD05-240-XP25-SP07-02	✻	●	24	25	32	125	56	203	M16×1,5	0.542	SPGT07T3**	ZTD-XP25-Thin
ZTD05-250-XP25-SP07-02	✻	●	25	25	32	130	56	208	M16×1,5	0.561	SPGT07T3**	ZTD-XP25-Thin
ZTD05-260-XP25-SP07-02	✻	●	26	25	32	135	56	213	M16×1,5	0.613	SPGT07T3**	ZTD-XP25-Thin
ZTD05-270-XP25-SP07-02	✻	●	27	25	32	140	56	218	M16×1,5	0.665	SPGT07T3**	ZTD-XP25-Thin
ZTD05-280-XP32-SP09-02	✻	●	28	32	37	145	60	230	M16×1,5	0.891	SPGT0904**	ZTD-XP32-Thin
ZTD05-290-XP32-SP09-02	✻	●	29	32	37	150	60	235	M16×1,5	0.965	SPGT0904**	ZTD-XP32-Thin
ZTD05-300-XP32-SP09-02	✻	●	30	32	37	155	60	240	M16×1,5	0.959	SPGT0904**	ZTD-XP32-Thin
ZTD05-310-XP32-SP09-02	✻	●	31	32	37	160	60	245	M16×1,5	1.042	SPGT0904**	ZTD-XP32-Thin
ZTD05-320-XP32-SP09-02	✻	●	32	32	37	165	60	250	M22×2	1.11	SPGT0904**	ZTD-XP32-Thin
ZTD05-330-XP32-SP09-02	✻	●	33	32	37	170	60	255	M22×2	1.117	SPGT0904**	ZTD-XP32-Thin
ZTD05-340-XP40-SP11-02	✻	●	34	40	47	175	70	275	M22×2	1.57	SPGT1104**	
ZTD05-350-XP40-SP11-02	✻	●	35	40	47	180	70	280	M22×2	1.65	SPGT1104**	
ZTD05-360-XP40-SP11-02	✻	●	36	40	47	185	70	285	M22×2	1.712	SPGT1104**	
ZTD05-370-XP40-SP11-02	✻	●	37	40	47	190	70	290	M22×2	1.802	SPGT1104**	
ZTD05-380-XP40-SP11-02	✻	●	38	40	47	195	70	295	(BSPT)RC1/4	1.873	SPGT1104**	
ZTD05-390-XP40-SP11-02	✻	●	39	40	47	200	70	300	(BSPT)RC1/4	1.962	SPGT1104**	
ZTD05-400-XP40-SP11-02	✻	●	40	40	47	205	70	305	(BSPT)RC1/4	2.068	SPGT1104**	
ZTD05-410-XP40-SP11-02	✻	●	41	40	47	210	70	310	(BSPT)RC1/4	2.167	SPGT1104**	
ZTD05-420-XP40-SP14-02	✻	●	42	40	52	215	70	325	(BSPT)RC1/4	2.39	SPGT1405**	
ZTD05-430-XP40-SP14-02	✻	●	43	40	52	220	70	330	(BSPT)RC1/4	2.502	SPGT1405**	
ZTD05-440-XP40-SP14-02	✻	●	44	40	52	225	70	335	(BSPT)RC1/4	2.612	SPGT1405**	
ZTD05-450-XP40-SP14-02	✻	●	45	40	52	230	70	340	(BSPT)RC1/4	2.733	SPGT1405**	
ZTD05-460-XP40-SP14-02	✻	●	46	40	52	235	70	345	(BSPT)RC1/4	2.854	SPGT1405**	
ZTD05-470-XP40-SP14-02	✻	●	47	40	52	240	70	350	(BSPT)RC1/4	2.894	SPGT1405**	
ZTD05-480-XP40-SP14-02	✻	●	48	40	52	245	70	355	(BSPT)RC1/4	3.109	SPGT1405**	
ZTD05-490-XP40-SP14-02	✻	●	49	40	52	250	70	360	(BSPT)RC1/4	3.271	SPGT1405**	

● Ex stock ○ On demand

✻ Internal cooling

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Article	✻	Stock	Dimensions [mm]							kg	Inserts	Adapter
			ØD	ØD1	ØD2	L1	L2	L	d			
ZTD05-500-XP40-SP14-02	✻	●	50	40	52	255	70	365	(BSPT)RC1/4	3.425	SPGT1405**	

● Ex stock ○ On demand
✻ Internal cooling

Spare parts

	Insert	SPGT0602**	SPGT07T3**	SPGT0904**	SPGT1104**	SPGT1405**
	Grub screw				M6x6	M8x8
	Screw	I60M2,2x5,5	I60M2x4,3	I60M3,5x8	I60M4x10	I60M5x13
	Wrench	WT07IP	WT06IP	WT15IP	WT15IP	WT20IP

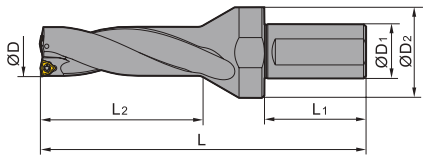
Insert

C19

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Indexable drills series

ZD03



Article	✻	Stock	Dimensions [mm]						kg	Inserts
			ØD	ØD1	ØD2	L1	L2	L		
ZD03-160-XP25-WC03-02	✻	●	16	25	32	56	52	129	0.33	WCMX0302**
ZD03-170-XP25-WC03-02	✻	●	17	25	32	56	55	133	0.33	WCMX0302**
ZD03-180-XP25-WC03-02	✻	●	18	25	32	56	58	137	0.35	WCMX0302**
ZD03-190-XP25-WC03-02	✻	●	19	25	32	56	61	140	0.36	WCMX0302**
ZD03-200-XP25-WC03-02	✻	●	20	25	32	56	64	143	0.37	WCMX0302**
ZD03-210-XP25-WC04-02	✻	●	21	25	45	56	67	153	0.51	WCMX0402**
ZD03-220-XP25-WC04-02	✻	●	22	25	45	56	70	156	0.54	WCMX0402**
ZD03-230-XP25-WC04-02	✻	●	23	25	45	56	73	159	0.55	WCMX0402**
ZD03-240-XP25-WC04-02	✻	●	24	25	45	56	76	162	0.57	WCMX0402**
ZD03-250-XP25-WC04-02	✻	●	25	25	45	56	79	165	0.6	WCMX0402**
ZD03-260-XP32-WC05-02	✻	●	26	32	55	60	83	176	0.93	WCMX0503**
ZD03-270-XP32-WC05-02	✻	●	27	32	55	60	86	180	0.97	WCMX0503**
ZD03-280-XP32-WC05-02	✻	●	28	32	55	60	89	184	1.01	WCMX0503**
ZD03-290-XP32-WC05-02	✻	●	29	32	55	60	92	188	1.05	WCMX0503**
ZD03-300-XP32-WC05-02	✻	●	30	32	55	60	95	192	1.08	WCMX0503**
ZD03-310-XP40-WC06-02	✻	●	31	40	60	70	98	203	1.44	WCMX06T3**
ZD03-320-XP40-WC06-02	✻	●	32	40	60	70	101	206	1.48	WCMX06T3**
ZD03-330-XP40-WC06-02	✻	●	33	40	60	70	104	209	1.52	WCMX06T3**
ZD03-340-XP40-WC06-02	✻	●	34	40	60	70	107	212	1.55	WCMX06T3**
ZD03-350-XP40-WC06-02	✻	●	35	40	60	70	110	215	1.61	WCMX06T3**
ZD03-360-XP40-WC06-02	✻	●	36	40	60	70	113	218	1.66	WCMX06T3**
ZD03-370-XP40-WC06-02	✻	●	37	40	60	70	116	221	1.71	WCMX06T3**
ZD03-380-XP40-WC06-02	✻	●	38	40	60	70	119	225	1.76	WCMX06T3**
ZD03-390-XP40-WC06-02	✻	●	39	40	60	70	122	228	1.82	WCMX06T3**
ZD03-400-XP40-WC06-02	✻	●	40	40	60	70	125	231	1.93	WCMX06T3**
ZD03-410-XP40-WC06-02	✻	●	41	40	60	70	128	234	1.94	WCMX06T3**
ZD03-420-XP40-WC08-02	✻	●	42	40	60	70	131	239	2.18	WCMX0804**
ZD03-430-XP40-WC08-02	✻	●	43	40	60	70	134	242	2.245	WCMX0804**
ZD03-440-XP40-WC08-02	✻	●	44	40	60	70	137	245	2.34	WCMX0804**
ZD03-450-XP40-WC08-02	✻	●	45	40	60	70	140	248	2.34	WCMX0804**
ZD03-460-XP40-WC08-02	✻	●	46	40	60	70	143	251	2.49	WCMX0804**
ZD03-470-XP40-WC08-02	✻	●	47	40	60	70	146	253	2.88	WCMX0804**
ZD03-480-XP40-WC08-02	✻	●	48	40	70	70	149	255	2.55	WCMX0804**

● Ex stock ○ On demand

✻ Internal cooling

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Article	✻	Stock	Dimensions [mm]							Inserts
			ØD	ØD1	ØD2	L1	L2	L	kg	
ZD03-490-XP40-WC08-02	✻	○	49	40	70	70	152	257	2.619	WCMX0804**
ZD03-500-XP40-WC08-02	✻	●	50	40	70	70	155	259	2.62	WCMX0804**
ZD03-510-XP40-WC08-02	✻	○	51	40	70	70	158	261	2.62	WCMX0804**
ZD03-520-XP40-WC08-02	✻	○	52	40	70	70	161	263	2.808	WCMX0804**
ZD03-530-XP40-WC08-02	✻	○	53	40	70	70	164	265	2.906	WCMX0804**
ZD03-540-XP40-WC08-02	✻	●	54	40	70	70	167	267	2.983	WCMX0804**
ZD03-550-XP40-WC08-02	✻	○	55	40	70	70	170	269	3.126	WCMX0804**
ZD03-560-XP40-WC08-02	✻	○	56	40	70	70	173	271	3.157	WCMX0804**
ZD03-570-XP40-WC08-02	✻	○	57	40	70	70	176	273	3.275	WCMX0804**
ZD03-580-XP40-WC08-02	✻	●	58	40	70	70	179	275	3.501	WCMX0804**

● Ex stock ○ On demand

✻ Internal cooling

Spare parts

	Insert	WCMX0302**	WCMX0402**	WCMX0503**	WCMX06T3**	WCMX0804**
	Screw	I60M2.5x6.5	I60M2.5x6.5T	I60M3x7	I60M3x7	I60M3.5x10.4
	Wrench	WT06IP	WT07IP	WT15IP	WT15IP	WT20IP

Insert

Medium Cut

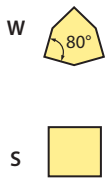
C20

System code C7 Grade selection C5 Technical info C165 Cutting data C22

Indexable drills ISO code – inserts

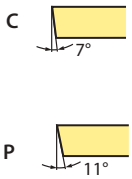
W	C	M	X	08	04	12	R	–	PG
1	2	3	4	5	6	7	8		9

Insert shape



1

Clearance angle



2

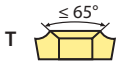
Tolerance class

Code	I.C [mm]	m [mm]	S [mm]
G	±0,025	±0,025	±0,130
M	±0,05–0,13	±0,08–0,18	±0,130

3

Fastening features (metric)

Insert shape



X Special

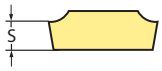
4

Cutting edge length l [mm]

I.C [mm]	Insert shape	
		
	S	W
3.8		03
4.3		04
5.4		05
6.35	06	
6.5		06
8.0		08
8.7	08	
9.252	09	
12.7	12	

5

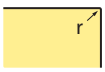
Insert thickness S [mm]



Code	S	Code	S
00	0.79	05	5.56
T0	0.99	T5	5.95
01	1.59	06	6.35
T1	1.98	T6	6.75
02	2.38	07	7.94
T2	2.58	09	9.52
03	3.18	T9	9.72
T3	3.97	11	11.11
04	4.76	12	12.70
T4	4.96		

6

Nose radius r [mm]



Code	r
04	0.4
08	0.8
12	1.2

7

Rotation direction

Code	Description
R	Right
L	Left

8

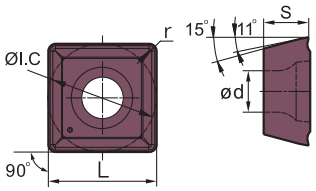
Chip breaker overview
(on page C3)

9

SPGT	L	I.C	S	d
05 02	5	5	2.38	2.2
06 02	6	6	2.38	2.6
07 T3	7.94	7.94	3.97	2.8
09 04	9.8	9.8	4.76	4.2
11 04	11.5	11.5	4.76	4.4
14 05	14.3	14.3	5.2	5.75

Ideal machining conditions
Normal machining conditions
Unfavorable machining conditions

Drilling inserts

SP** drilling insert				HC[1] (CVD)						HC[1] (PVD)						HW			
			P																
			M																
			K																
			N																
			S																
			H																
ISO		r		YB6338	YBD252					YBG202	YBG205	YBG212				YD201			
PM 	**SPGT050204-PM**	0.4		●							●	●							
	SPGT060204-PM	0.4		●							●	●							
	SPGT07T308-PM	0.8		●							●	●							
	SPGT090408-PM	0.8		●							●	●							
	SPGT110408-PM	0.8		●							●	●							
	SPGT140512-PM	1.2		●							●	●							
EM 	**SPGT050204-EM**	0.4									●	●							
	SPGT060204-EM	0.4									●	●							
	SPGT07T308-EM	0.8									●	●							
	SPGT090408-EM	0.8									●	●							
	SPGT110408-EM	0.8									●	●							
	SPGT140512-EM	1.2									●	●							

● Ex Stock ○ On demand

HC[1] Coated carbide
HW Uncoated carbide

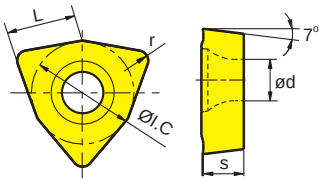
Tool holder

ZTD02	ZTD03	ZTD04	ZTD05
			
C10	C12	C14	C16

WCMX	L	I.C	S	d
03 02	3.8	5.56	2.38	2.8
04 02	4.3	6.35	2.38	3.1
05 03	5.4	7.94	3.18	3.2
06 T3	6.5	9.525	3.97	3.7
08 04	8.7	12.7	4.76	4.3

Ideal machining conditions
Normal machining conditions
Unfavorable machining conditions

Drilling inserts



WC** drilling insert			HC¹ (CVD)		HC¹ (PVD)			HW
		P	❁	❁	❁	❁	❁	
		M	❁		❁	❁	❁	
		K	❁					❁
		N						❁
		S			❁	❁		
		H						
	ISO	r	YB6338	YBD252	YBG202	YBG205	YBG212	YD201
-53	**WCMX030208R-53**	0.8		●	●			
	WCMX040208R-53	0.8		●	●			
	WCMX050308R-53	0.8		●	●			
	WCMX06T308R-53	0.8		●	●			○
	WCMX080412R-53	1.2		●	●			●
-D	**WCMX030208R-D**	0.8		○				
	WCMX040208R-D	0.8		○				
	WCMX050308R-D	0.8		○				
	WCMX06T308R-D	0.8		○				
	WCMX080412R-D	1.2		●				
PG	**WCMX030208R-PG**	0.8			●			
	WCMX040208R-PG	0.8			●			
	WCMX050308R-PG	0.8		○	●	○		
	WCMX06T308R-PG	0.8			●			
	WCMX080412R-PG	1.2		○	●			

● Ex Stock ○ On demand

HC¹ Coated carbide
HW Uncoated carbide

Tool holder
ZD03

C16

Notes

Indexable drills

	Material group	Composition / structure / heat treatment		HB	Machining group	ZTD* SPGT05/06		ZTD* SPGT07/09		
						v_c [m/min]	f [mm]	v_c [m/min]	f [mm]	
P	Unalloyed steel	ca. 0,15 % C	annealed	125	1	200-300	0,05-0,08	200-300	0,06-0,11	
		ca. 0,45 % C	annealed	190	2	200-300	0,05-0,08	200-300	0,06-0,11	
		ca. 0,45 % C	tempered	250	3	200-300	0,05-0,08	200-300	0,06-0,11	
		ca. 0,75 % C	annealed	270	4	200-300	0,05-0,08	200-300	0,06-0,11	
		ca. 0,75 % C	tempered	300	5	200-300	0,05-0,08	200-300	0,06-0,11	
	Low-alloyed steel		annealed	180	6	140-220	0,05-0,08	140-220	0,07-0,12	
			tempered	275	7	140-220	0,05-0,08	140-220	0,07-0,12	
			tempered	300	8	140-220	0,05-0,08	140-220	0,07-0,12	
			tempered	350	9	140-220	0,05-0,08	140-220	0,07-0,12	
	High-alloyed steel and high-alloyed tool steel		annealed	200	10	120-180	0,05-0,08	120-180	0,07-0,12	
			hardened and tempered	325	11	120-180	0,05-0,08	120-180	0,07-0,12	
M	Stainless steel	ferritic/martensitic	annealed	200	12	110-230	0,05-0,08	110-230	0,06-0,11	
		martensitic	tempered	240	13	110-230	0,05-0,08	110-230	0,06-0,11	
		austenitic	quench hardened	180	14	110-230	0,05-0,08	110-230	0,06-0,11	
		austenitic-ferritic		230	15	110-230	0,05-0,08	110-230	0,06-0,11	
K	Grey cast iron	perlitic/ferritic		180	16	170-240	0,05-0,08	170-240	0,08-0,14	
		perlitic (martensitic)		260	17	170-240	0,05-0,08	170-240	0,08-0,14	
	Cast iron with spheroidal graphite	ferritic		160	18	130-200	0,05-0,08	130-200	0,08-0,14	
		perlitic		250	19	130-200	0,05-0,08	130-200	0,08-0,14	
	Malleable cast iron	ferritic		130	20	120-220	0,05-0,08	120-220	0,08-0,14	
		perlitic		230	21	120-220	0,05-0,08	120-220	0,08-0,14	
N	Aluminium wrought alloys	cannot be hardened		60	22					
		hardenable	hardened	100	23					
	Cast aluminium alloys	≤ 12 % Si, cannot be hardened		75	24					
		≤ 12 % Si, hardenable	hardened	90	25					
		> 12 % Si, cannot be hardened		130	26					
	Copper and copper alloys (bronze/brass)	machining steel, PB> 1%		110	27					
		CuZn, CuSnZn		90	28					
		CuSn, Pb-free copper, electrolytic copper		100	29					
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.
For examples of material for cutting tool groups view page D22.

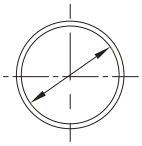
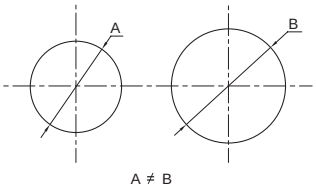
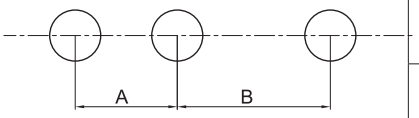
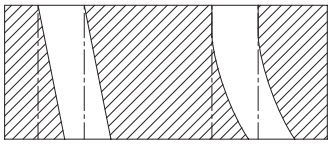
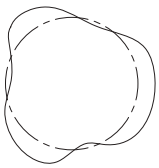
	ZTD*		ZD03		ZD03		
	SPGT11/14		WCMX03-05		WCMX06-08		
	v_c [m/min]	f [mm]	v_c [m/min]	f [mm]	v_c [m/min]	f [mm]	
	200-300	0,08-0,14	200-300	0,05-0,08	200-300	0,06-0,11	
	200-300	0,08-0,14	200-300	0,05-0,08	200-300	0,06-0,11	
	200-300	0,08-0,14	200-300	0,05-0,08	200-300	0,06-0,11	
	200-300	0,08-0,14	200-300	0,05-0,08	200-300	0,06-0,11	
	200-300	0,08-0,14	200-300	0,05-0,08	200-300	0,06-0,11	
	140-220	0,09-0,16	140-220	0,05-0,08	140-220	0,07-0,12	
	140-220	0,09-0,16	140-220	0,05-0,08	140-220	0,07-0,12	
	140-220	0,09-0,16	140-220	0,05-0,08	140-220	0,07-0,12	
	140-220	0,09-0,16	140-220	0,05-0,08	140-220	0,07-0,12	
	120-180	0,09-0,16	120-180	0,05-0,08	120-180	0,07-0,12	
	120-180	0,09-0,16	120-180	0,05-0,08	120-180	0,07-0,12	
	110-230	0,08-0,14	110-230	0,05-0,08	110-230	0,06-0,11	
	110-230	0,08-0,14	110-230	0,05-0,08	110-230	0,06-0,11	
	110-230	0,08-0,14	110-230	0,05-0,08	110-230	0,06-0,11	
	110-230	0,08-0,14	110-230	0,05-0,08	110-230	0,06-0,11	
	170-240	0,12-0,21	170-240	0,05-0,08	170-240	0,08-0,14	
	170-240	0,12-0,21	170-240	0,05-0,08	170-240	0,08-0,14	
	130-200	0,12-0,21	130-200	0,05-0,08	130-200	0,08-0,14	
	130-200	0,12-0,21	130-200	0,05-0,08	130-200	0,08-0,14	
	120-220	0,12-0,21	120-220	0,05-0,08	120-220	0,08-0,14	
	120-220	0,12-0,21	120-220	0,05-0,08	120-220	0,08-0,14	

Notes

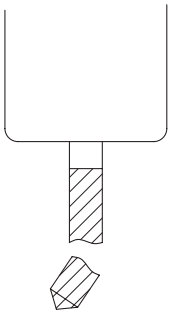
Technical information

C

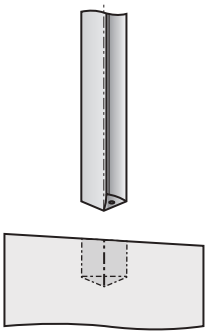
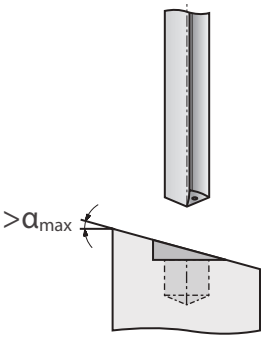
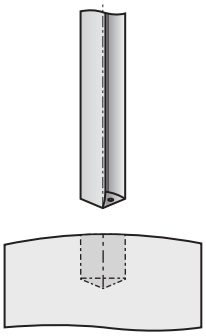
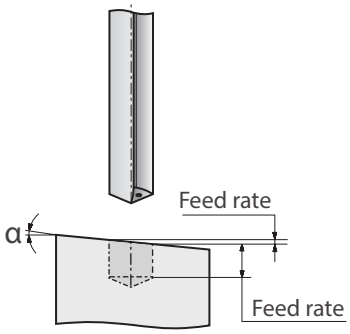
Trouble shooting – solid carbide drills

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  A ≠ B	– Insufficient clamping and spindle positioning – 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
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.)

Trouble shooting – solid carbide drills

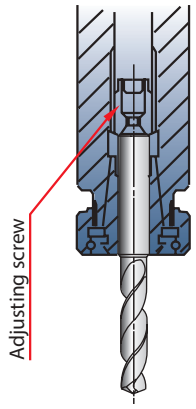
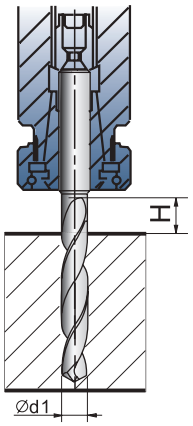
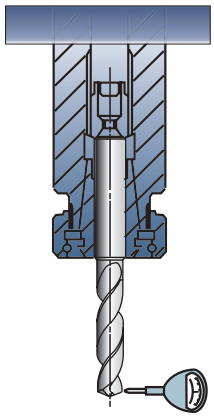
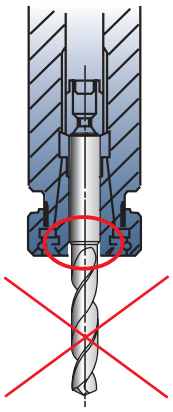
Problem	Reason	Countermeasure
Bad cylindricity 	– No symmetrical point angle – Large radial run out (drilling) – Centre insert is off centre – Large cutting edge wear – Feed rate too low	– Regrind drill – Check regrind – Increase feed rate
Breakage of drill 	– Insufficient clamping of tool and/or workpiece	– 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
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
	– Wrong 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

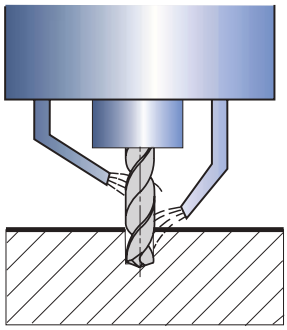
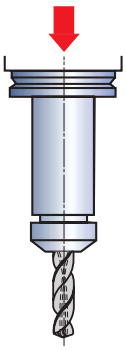
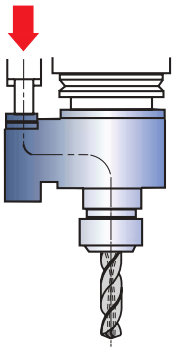
Trouble shooting – PC series

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 %

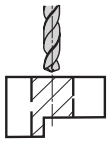
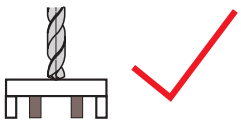
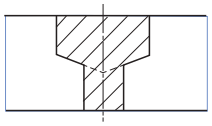
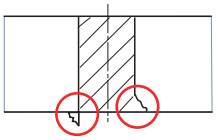
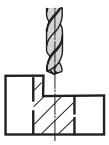
Operation notes

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	

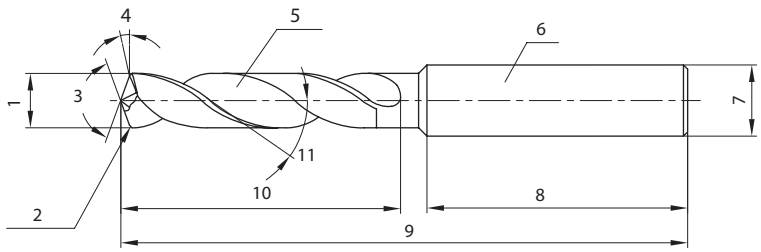
Handling of coolants:

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.

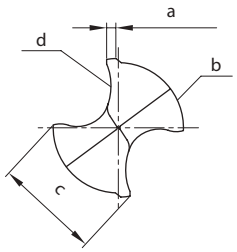
Interrupted cutting	Thin work pieces	Stepped holes	Burrs and work piece chippings on exit
 Reduce the feed rate when drilling interrupted cut.	  If bending occurs, add a supporter.	 – First drill the larger hole, then the smaller hole. – We can offer multiple step and chamfer drills on request.	 – Reduce 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

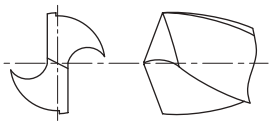
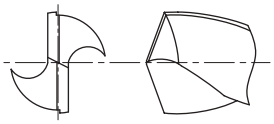
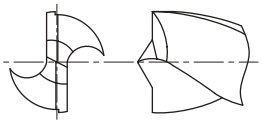


1. Drilling diameter
2. Chamfer
3. Point angle
4. Clearance angle
5. Chip pocket
6. Shank
7. Shank diameter
8. Shank length
9. Overall length
10. Flute length
11. Helical angle



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.

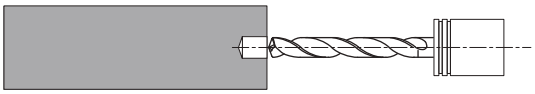
Solid carbide drills

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*

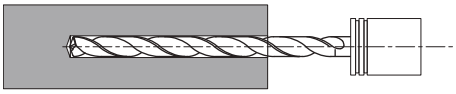


– Point angle of pilot drill must be bigger than SL drill.
– Diameter of pilot drill must be 0.01–0.04 mm bigger than SL drill.
– The pilot hole should be 1–3×D.

2 Entering the pilot hole with SL drill

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

3 Manufacturing the deep hole



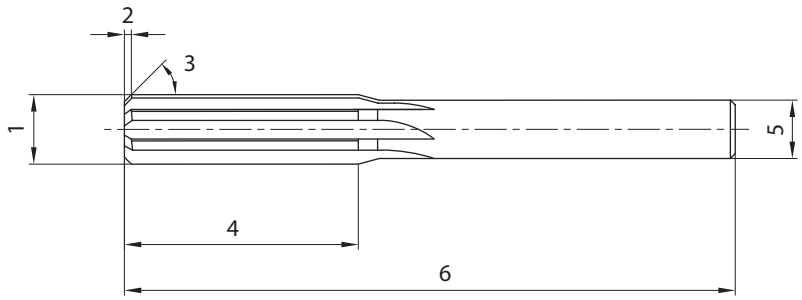
– Drilling with suitable cutting speed and feed rate.
– In case of cross holes feed rate should be reduced to 0.05 mm/rev..

4 Pulling out the drill

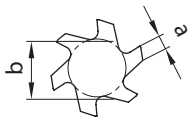
– After reaching the required depth reduce the cutting speed (V_C: 20–30 m/min) and pull out the drill at high feed rate. (V_f: 2000 mm/min)

Solid carbide reamers

Terminology

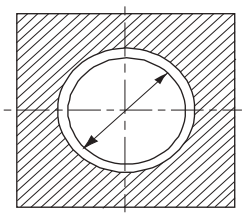


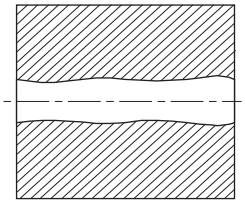
1. Nominal diameter
2. Chamfer length
3. Entry angle
4. Cutting edge length
5. Shank diameter
6. Total length

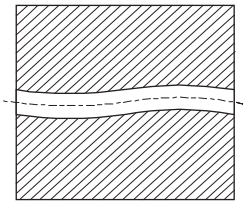


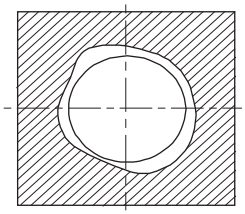
a. Cutting edge thickness
b. Core diameter

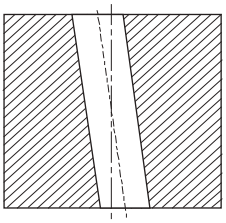
Reaming is semi-finishing and finishing of a previously formed hole within a narrow tolerance for higher surface quality, perfect roundness, cylindricity, etc.. To achieve a precisely reamed hole, the right choice of reamer and reamer diameter is important. In addition to that, the bore tolerance, the 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.

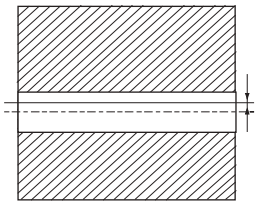

Diameter tolerance/Allowance


Cylindricity


Straightness


Roundness


Vertical deviation


Off centre

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 workpiece.
Trumpet-shaped entry hole	– Improve clamping of the workpiece. – 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 thread formers

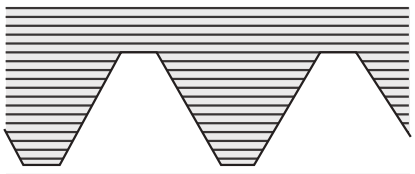
What is thread forming?

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.

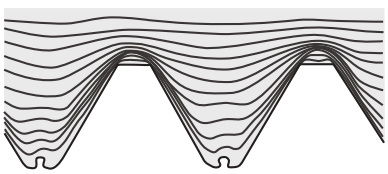
Advantages of thread forming:
- The thread is formed much more precisely.
- The thread is more resilient.
- The threads have a very smooth surface.
- Higher rotation speeds and feed rates possible than in thread cutting.
- Longer tool life increases the productivity.

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.



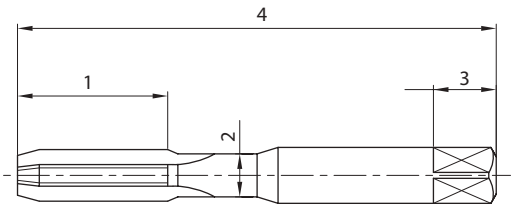
Fibre orientation after thread cutting



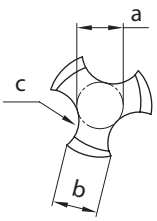
Fibre orientation after thread forming

Solid carbide taps

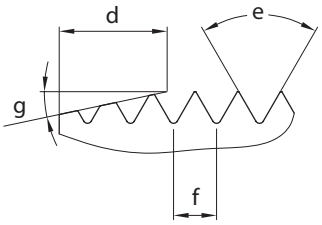
Terminology



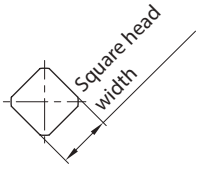
1. Thread length
2. Neck diameter
3. Square head length
4. Total length



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



Chamfer and thread profile



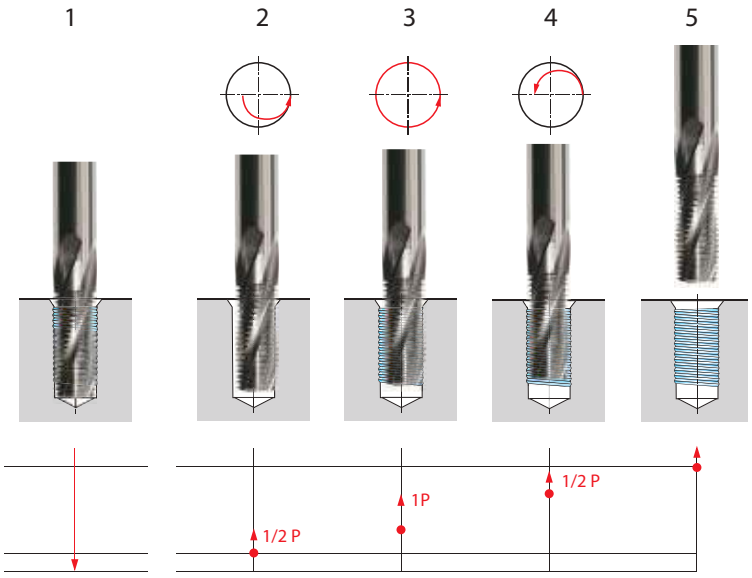
d. Chamfer length
e. Thread profile angle
f. Pitch
g. Chamfer angle

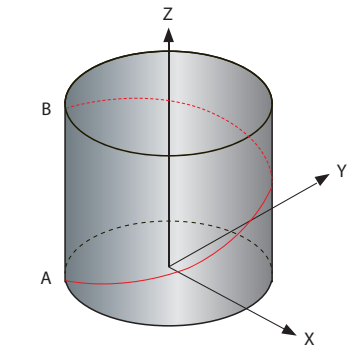
Chip space and application

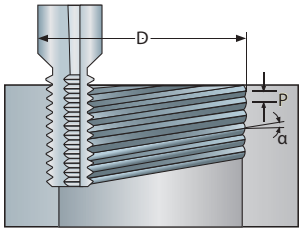
Chip space type	Features	Application
 Helical flute tap	– Helical flute – No chips inside the hole – Good entering performance – Simple centring	– For long-chipping materials – Suitable for blind holes – Usage in holes with groove
 Straight flute tap	– Straight flute – Stable cutting edge – Easy regrinding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

Technical information

D

Comparison table materials

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
P	Alloy steel											
	15	1015	1.0401	C15	080M15	-	1350	CC12	C15C16	F.111	-	
	20	1020	1.0402	C22	050A20	2C	1450	CC20	C20C21	F.112	-	20
	35	1035	1.0501	C35	060A35	-	1550	CC35	C35	F.113	-	35
	45	1045	1.0503	C45	080M40	-	1650	CC45	C45	F.114	-	45
	55	1055	1.0535	C55	070M55	-	1655	-	C55	-	-	55
	60	1060	1.0601	C60	080A62	43D	-	CC55	C60	-	-	60
	Y15	1213	1.7015	9SMn28	230M07	-	1912	S250	CF9SMn28	11SMn28	SUM22	15Ch
	-	12L13	1.0718	9SMnPb28	-	-	1914	S250Pb	CF9MnPb28	11SMnPb28	SUM22L	-
	-	-	1.0722	10SPb20	-	-	-	10PbF2	CF10Pb20	10SPb20	-	-
	-	1140	1.0726	35S20	212M36	8M	1957	35MF4	-	F210G	-	-
	Y13	1215	1.0736	9SMn36	240M07	1B	-	S300	CF9SMn36	12SMn35	-	-
	-	12L14	1.0737	9SMnPb36	-	-	1926	S300Pb	CF9SMnPb36	12SMnP35	-	-
	55Si2Mn	9255	1.0904	55Si9	250A53	45	2085	55S7	55Si8	56Si7	-	-
	-	9262	1.0961	60SiCr7	-	-	-	60SC7	60SiCr8	60SiCr8	-	-
	15	1015	1.1141	Ck15	080M15	32C	1370	XC12	C16	C15K	S15C	15
	40Mn	1039	1.1157	40Mn4	150M36	15	-	35M5	-	-	-	40G
	25	1025	1.1158	Ck25	-	-	-	-	-	-	S25C	25
	35Mn2	1335	1.1167	36Mn5	-	-	2120	40Mn5	-	36Mn5	SMn438(H)	35G2,35GL
	30Mn	1330	1.1170	28Mn6	150M28	14A	-	20M5	C28Mn	-	SCMn1	30G
	35Mn	1035	1.1183	Cf35	060A35	-	1572	XS38TS	C36	-	S35C	-
	Ck45	1045	1.1191	45	080M46	-	1672	XC42	C45	C45K	S45C	-
	55	1055	1.1203	Ck55	070M55	-	-	XC45	C50	C55K	S55C	55
	50	1050	1.1213	Cf53	060A52	-	1674	XC48TS	C53	-	S50C	-
	60Mn	1060	1.1221	Ck60	080A62	43D	1678	XC60	C60	-	S58C	60,60G
	-	1095	1.1274	Ck101	060A96	-	1870	-	-	-	SUP4	-
	-	-	1.3401	X120Mn12	Z120M12	-	-	X120M12	XG120Mn12	X120Mn12	SCMnH/1	110G13L
	Gr15;45Gr	52100	1.3505	100Cr6	534A99	31	2258	100C6	100Cr6	F.131	SUJ2	SchCh 15
	-	ASTM A204Gr.A	1.5415	15Mo3	1501-240	-	2912	15D3	16Mo3KW	16Mo3	-	-
	-	4520	1.5426	16Mo5	1503-245-420	-	-	-	16Mo5	16Mo5	-	-
	-	ASTM A350LF5	1.5622	14Ni6	-	-	-	16N6	14Ni6	15Ni6	-	-
	-	ASTM A353	1.5662	X8Ni9	1501-509;510	-	-	-	X10Ni9	XBNi09	-	-

Comparison table materials

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
P	**Alloy steel**											
	-	2515	1.5680	12Ni19	-	-	-	Z18N5	-	-	-	-
	-	3135	1.5710	36NiCr6	640A35	111A	-	35NC6	-	-	SNC236	-
	-	3415	1.5732	14NiCr10	-	-	-	14NC11	16NiCr11	15NiCr11	SNC415(H)	-
	-	3415 3310	1.5752	14NiCr14	655M13 655A12	36A	-	12NC15	-	-	SNC815(H)	-
	-	9840	1.6511	36CrNiMo4	816M40	110	-	40NCD3	38CrNiMo4(KB)	35CrNiMo4	-	40 ChN2MA
	-	8620	1.6523	21NiCrMo2	850M20	362	2503	20NCD2	20NiCrMo2	20NiCrMo2	SNCCM220(H)	-
	-	8740	1.6546	40NiCrMo2	311-Type7	-	-	-	40NiCrMo2(KB)	40NiCrMo2	SNC240	38ChGNM
	40CrNiMoA	4340	1.6582	34CrNiMo6	817M40	24	2541	35NCD6	35CrNiMo6(KB)	-	-	38Ch2N2MA
	-	-	1.6587	17CrNiMo6	820A16	-	-	18NCD6	-	14CrNiMo13	-	-
	15Cr	5015	1.7015	15Cr3	523M15	-	-	12C3	-	-	SCr415(H)	15Ch
	35Cr	5132	1.7033	34Cr4	530A32	18B	-	32C4	34Cr4(KB)	35Cr4	SCr430(H)	35Ch
	40Cr	5140	1.7035	41Cr4	530M40	18	-	42C4	41Cr4	42Cr4	SCr440(H)	40Ch
	40Cr	5140	1.7045	42Cr4	-	-	2245	-	-	42Cr4	SCr440	40Ch
	18CrMn	5115	1.7131	16MnCr15	(527M20)	-	2511	16MC5	16MnCr15	16MnCr15	-	18ChG
	20CrMn	5155	1.7176	55Cr3	527A60	48	-	55C3	-	-	SUP9(A)	50ChGA
	30CrMn	4130	1.7218	25CrMo4	1717CDS110	-	2225	25CD4	25CrMo4(KB)	55Cr3	SCM420; SCM430	30ChM
	35CrMo	4137;4135	1.7220	34CrMo4	708A37	19B	2234	35CD4	35CrMo4	34CrMo4	SCM432; SCRRM3	AS38ChGM
	40CrMoA	4140;4142	1.7223	41CrMo4	708M40	19A	2244	42CD4TS	41CrMo4	41CrMo4	SCM440	40 ChFA
	42CrMo 42CrMnMo	4140	1.7225	42CrMo4	708M40	19A	2244	42CD4	42CrMo4	42CrMo4	SCM440(H)	-
	-	-	1.7262	15CrMo5	-	-	2216	12CD4	-	12CrMo4	SCM415(H)	-
	-	ASTM A182 F11;F12	1.7335	13CrMo44	1501- 620Gr.27	-	-	15CD3.5; 15CD4.5	14CrMo44	14CrMo45	-	12ChM , 15ChM
	-	-	1.7361	32CrMo12	722M24	40B	2240	30CD12	32CrMo12	F.124.A	-	-
	-	ASTM A182 F.22	1.7380	10CrMo910	1501- 622Gr.31;45	-	2218	12CD9;10	12CrMo9,10	TU.H	-	-
	-	-	1.7715	14MoV63	1503-660-440	-	-	-	-	13MoCrV6	-	-
	50CrVA	6150	1.8159	50CrV4	735A50	47	2230	50CV4	50CrV4	51CrV4	SUP10	50ChGFA
	-	-	1.8509	41CrAlMo7	905M39	41B	2940	40CAD6,12	41CrAlMo7	41CrAlMo7	-	38ChMJuA
	-	-	1.8523	39CrMoV139	897M39	40C	-	-	36CrMoV12	-	-	-

Comparison table materials

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
P	Alloy steel											
	T10	W.110	1.1545	C105W1	-	-	1880	Y1105	C98KU C100KU	F.515 F.516	-	U10A
	T12A	W.112	1.1663	C125W	-	-	-	Y2120	C120KU	(C120)	SK2	U13
	CrV;9SiCr	L3	1.2067	100Cr6	BL3	-	-	Y100C6	-	100Cr6	-	-
	Cr12	D3	1.2080	X210Cr12	BD3	-	-	Z200Cr12	X210Cr13KU X250Cr12KU	X210Cr12	SKD1	Ch12
	4Cr5MoVSi	H13	1.2344	X40CrMoV5 1	BH13	-	2242	Z40CDV5	X35CrMoV05KU X40CrMoV51KU	X40CrMoV5	SKD61	4Ch5MF1S
	Cr6WV	A2	1.2363	X100CrMoV5 1	BA2	-	2260	Z100CDV5	X100CrMoV51KU	X100CrMoV5	SKD12	-
	CrWMo	-	1.2419	105WCr6	-	-	2140	105WC13	10WCr6 107WCr5KU	105WCr5	SKS31 SKS2 SKS3	ChWG
	Cr12W	-	1.2436	X210CrW12	-	-	2312	-	X215CrW12 1KU	X210CrW12	SKD2	-
	5CrNiMo	S1	1.2542	45WCrV7	BS1	-	2710	-	45WCrV8KU	45WCrSi8	-	-
	3Cr2W8V	H21	1.2581	X30WCrV9 3 X30WCrV93KU	BH21	-	-	Z30WCV9	X28W09KU X30WCrV9 3KU	X30WCrV9	SKD5	3Ch2W8F
	Cr12MoV	-	1.2601	X165CrMoV 12	-	-	2310	-	X165CrMoW12KU	X160CrMoV12	SKD11	-
	5CrNiMo	L6	1.2713	55NiCrMoV6	-	-	-	55NCDV7	-	F.250.S	SKT4	5ChNM
	V	W210	1.2833	100V1	BW2	-	-	Y1105V	-	-	SKS43	-
	W6Mo5Cr4V2Co5	-	1.3243	S6-5-2-5	-	-	2723	Z85WDKCV	HS6-5-2-5	HS6-5-2-5	SKH55	R6M5K5
	W18Cr4VCo5	T4	1.3255	S18-1-2-5	BT4	-	-	Z80WKCV 10-05-04-01	X78WCo1805KU	HS18-1-1-5	SKH3	-
	W6Mo5Cr4V2	M2	1.3343	S6-5-2	BM2	-	2722	Z85WDCV 06-05-04-02	X82WMo0605KU	HS6-5-2	SKH9	R6M5
	-	M7	1.3348	S2-9-2	-	-Z-	2782	Z100WCWV 09-02-04-02	HS2-9-2	HS2-9-2	-	-
	W18Cr4V	T1	1.3355	S18-0-1	BT1	-	-	Z80WCV 18-04-01	X75W18KU	HS18-0-1	SKH2	-
	W6Mo5Cr4V3	M3	-	S6-5-3	-	-	-	-	-	-	SKH52	-
	-	M42	-	-	BM42	-	-	-	-	-	SKH59	-

Comparison table materials

ISO	Country and standard						Main application
	China	USA	Germany	Japan	Daido Steel Co., Ltd (Japan)	Russia	
	GB	AISI/SAE	DIN	JIS	DAIDO	GOST	
P	**Plastic die steel**						
	-	P20 mod.		-	PX5N		For mass production of large mirror dies. Automobile tail light, front fender of car, video camera, household electrical appliances etc
	-	-		-	NAK55		High precision mirror die. Video camera, music disc, Cosmetic Containers, transparent covers, transparent films etc
	-	-		-	NAK80		High precision mirror die. Video camera, music disc, Cosmetic Containers, transparent covers, transparent films etc
	3Cr13	420 mod.		SUS420J2 mod.	S-STAR		For ultra-mirror corrosion resistant precise dies. Accessories of camera, CD, lens, watch case.
	Cold-working die steel						
	-	02	-	SKS93	YK30		Stamping die, gauge calipers, paper cutter, auxiliary tools
	9CrWMn	01 mod.	-	SKS3 mod.	GOA		Blanking die, gauge calipers, drawing die, taps, Perforated punch.
	Cr12MoV	D2	X165CrMoV12	SKD11	DC11		Blanking die, cold forming die, cold drawing die, forming roller, punch
	-	D2 mod.	-	SKD11 mod.	DC53		Blanking die, cold forming die, cold drawing die, forming roll, punch
	Hot-working die steel						
	4Cr5MoSiV1	H13	X40CrMoV51	SKD61	DHA1		Aluminum-compression die, connecting parts of compression die, hot stamping die, hot extrusion die, thermal shear cutting blade
	-	-	-	-	DH21		Long life Aluminum compression die
	-	-	-	-	DH31-S		Compression die
	-	-	-	-	DH2F		Compression die, plastic die

Comparison table materials

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
M	**Stainless steel**											
	0Cr13; 1Cr12	403	1.4000	X6Cr13	403S17	-	2301	Z6C13	X6Cr13	F.3110	SUS403	08Ch13
	-	-	1.4001	X7Cr14	-	-	-	-	-	F.8401	-	-
	1Cr13	410	1.4006	X10Cr13	410S21	56A	2302	Z10C14	X12Cr13	F.3401	SUS410	12Ch13
	1Cr17	430	1.4016	X6Cr17	430S15	60	220	Z8C17	X8Cr17	F.3113	SUS430	12Ch17
	2Cr13	410	1.4021	X20Cr13	S62	56B; 56C	-	Z20C13	X20C13	F.3401	SUS410	20Ch13
	-	-	1.4027	G-X20Cr14	420C29	56B	-	Z20C13M	-	-	SCS2	20Ch13L
	4Cr13	-	1.4034	X46Cr13	420S45	56D	2304	Z40CM Z38C13M	X40Cr14	F.3405	SUS420J2	40Ch13
	1Cr17Ni2	431	1.4057	X20CrNi172	431S29	57	2321	Z15CNi6.02	X16CNi16	F.3427	SUS431	20Ch17N2
	Y1Cr17	430F	1.4104	X12CrMoS17	-	-	2383	Z10CF17	X10CrS17	F.3117	SUS430F	-
	1Cr17Mo	434	1.4113	X6CrMo171	434S17	-	2325	Z8CD17.01	X8CrMo17	-	SUS434	-
	-	-	1.4313	X5CrNi134	425C11	-	-	Z4CND13.4M	-	-	SCS5	-
	-	-	1.4408	G-X6CrNiMo1810	316C16	-	-	-	-	F.8414	SCS14	07Ch18N10G2S2M2L
	4Cr9Si2	HW3	1.4718	X45CrSi93	401S45	52	-	Z45CS9	X45CrSi8	F.322	SUH1	40Ch9S2
	0Cr13Al	405	1.4724	X10CrAl13	403S17	-	-	Z10C13	X10CrAl12	F.311	SUS405	10Ch13SJu
	Cr17	430	1.4742	X10CrAl18	430S15	60	-	Z10CAS18	X8Cr17	F.3113	SUS430	15Ch18SJu
	8Cr20Si2Ni	HNV6	1.4757	X80CrNiSi20	443S65	59	-	Z80CSN20.02	X80CrSiNi20	F.320V	SUH4	-
	2Cr25N	446	1.4762	X10CrAl24	-	-	2322	Z10CAS24	X16Cr26	-	SUH446	-
	Austenitic stainless steel											
	0Cr18Ni9	304	1.4301	X5CrNi1810	304S15	58E	2332	Z6CN18.09	X5CrNi1810	F.3551; F.3541; F.3504	SUS304	08Ch18N10
	1Cr18Ni9MoZr	303	1.4305	X10CrNiS189	303S21	58M	2346	Z10CNF18.09	X10CrNiS18.09	F.3508	SUS303	-
	0Cr19Ni10	304L	1.4306	X2CrNi1911	304S12	-	2352	Z2CN18.10	X2CrNi18.11	F.3503	SCS19	03Ch18N11
	-	-	1.4308	G-X6CrNi189	304C15	-	-	Z6CN18.10M	-	-	SCS13	07Ch18N9L
	Cr17Ni7	301	1.4310	X12CrNi177	-	-	2331	Z12CN17.07	X12CrNi1707	F.3517	SUS301	-
	-	304LN	1.4311	X2CrNiN1810	304S62	-	2371	Z2CN18.10	-	-	SUS304LN	-
	0Cr19Ni9	304	1.4350	X5CrNi189	304S31	58E	-	Z6CN18.09	X5CrNi1810	-	SUS304	-
	0Cr17Ni11Mo2	316	1.4401	X5CrNiMo1712	316S16	Z6CND17.11	2347	1.4401	X5CrNiMo1712	F.3543	SUS316	-
	00Cr17Ni13Mo2	316LN	1.4429	X2CrNiMoN17133	-	-	2375	Z2CND17.13	-	-	SUS316LN	-
	0Cr27Ni12Mo3	316L	1.4435	X2CrNiMo18143	316S12	-	2353	Z2CDN17.13	X2CrNiMo1713	-	SCS16,	03Ch17N14M2
	00Cr19Ni13Mo3	317L	1.4438	X2CrNiMo17133	317S12	-	2367	Z2CND19.15	X2CrNiMo18.16	-	SUS317L	-
	-	329L	1.4460	X8CrNiMo275	-	-	2324	-	-	-	SUS329L; SCH11; SCS11	-
	1Cr18Ni9Ti	321	1.4541	X6CrNiTi1810	2337	321S12	58B	Z6CNT18.10	X6CrNiTi1811	F.3553	SUS321	12Ch18N10T
	1Cr18Ni11Nb	347	1.4550	X6CrNiNb1810	347S17	58F	2338	Z6CNNb18.1	X6CrNiTi1811	F.3552	SUS347	08Ch18N12B
	Cr18Ni12Mo2Ti	316Ti	1.4571	X6CrNiMoTi17122	320S17	58J	2350	Z6NDT17.12	X6CrNiMoTi17	F.3535	-	10Ch17N13M2T

Comparison table materials

ISO	Country and standard										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
M	**Austenitic stainless steel**											
	-	-	1.4581	G-X5CrNiMoNb1810	318C7	-	-	Z4CNDNb1812M	XG8CrNiMo18	-	SCS22	-
	Cr17Ni12Mo3Nb	318	1.4583	X10CrNiMoNb1812	-	-	-	Z6CNDNb1713B	X6CrNiMoTiNb17	-	-	-
	1Cr23Ni13	309	1.4828	X15CrNiSi2012	309S24	-	-	Z15CNS20.1	-	-	SUH309	20Ch20N14S2
	0Cr25Ni20	310S	1.4845	X12CrNi2521	310S24	-	2361	Z12CN2520	X6CrNi2520	F.331	SUH310	20Ch23N18
	Cr15Ni36W3Ti	330	1.4864	X12NiCrSi3616	-	-	-	Z12CNS35.1	-	-	SUH330	-
	-	-	1.4865	G-X40NiCrSi3818	330C11	-	-	-	XG50NiCr3919	-	SCH15	-
	5Cr2Mn9Ni4N	EV8	1.4871	X53CrMnNiN219	349S54; 321S12	- 58B	-	Z52CMN21.0	X53CrMnNiN219	-	SUH35	55Ch20G9AN4
	1Cr18Ni9Ti	321	1.4878	X12CrNiTi189	321S320	58C	-	Z6CNT18.12	X6CrNiTi1811	F.3523	SU321	09Ch18N10T

ISO	Country and standard									
	China	USA	Germany	Great Britain	Sweden	France	Italy	Spain	Japan	Russia
K	**Nodular cast iron**									
	QT400-18	60-40-18	GGG40	400/17	0717-02	FGS370-17	GS370-17	FGE38-17	FCD400	VC 42-12
	QT450-10	65-45-12	--	420/12	--	FGS400-12	GS400-12	FGE42-12	FCD450	-
	QT500-7	70-50-05	GGG50	500/7	0727-02	FGS500-7	GS500-7	FGE50-7	FCD500	VC 50-2
	QT600-3	80-60-03	GGG60	600/7	0732-03	FGS600-2	GS600-2	FGE60-2	FCD600	VC 60-2
	QT700-2	100-70-03	GGG70	700/2	0737-01	FGS700-2	GS700-2	FGE70-2	FCD700	VC 70-2
	QT800-2	120-90-02	GGG80	800/2	0864-03	FGS800-2	GS800-2	FGE80-2	FCD800	VC 80-2
	QT900-2	--	--	900/2	--	--	--	--	--	-
	Grey cast iron									
	--	NO.60	GG40	--	0140	FGL400	--	--		Sc 40
	HT350	NO.50	GG35	350	0135	FGL350	G35	FG35	FC350	Sc 35
	HT300	NO.45	GG30	300	0130	FGL300	G30	FG30	FC300	Sc 30
	HT250	NO.35	GG25	250	0125	FGL250	G25	FG25	FC250	Sc 25
	HT200	NO.30	GG20	200	0120	FGL200	G20	FG20	FC200	Sc 20
	HT150	NO.20	GG15	150	0115	FGL150	G15	FG15	FC150	Sc 15
	HT100	--	--	100	0110	--	G10	--	FC100	-

ISO	Country and standard										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
H	**Hardened materials**											
	-	440A	1.4108	X100CrMo03	-	-	2258 08	-	-	-	C4BS	-
	-	610	1.4111	X100CrMoV15	-	-	2534 05	-	-		AC4A	-
	-	0-2	-	X65CrMo14	-	-	2541 06	-	-		AC4A	-

Comparison table materials

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
N	**Aluminium-based alloys**											
	-	SC64D	3.2373	G-AlSi9MgWA			4251	A-S7G			C4BS	-
	-	DG-AlSi12		G-ALMG5	LM5		4252	A-SU12			AC4A	
	-	356.1			LM25		4244				A5052	
	-	A413.0		GD-AlSi12			4247				A6061	
	-	A380.1		GD-AlSi8Cu3	LM24		4250				A7075	
	-	A413.1		G-AlSi12(Cu)	LM20		4260				ADC12	
	-	A413.2		G-AlSi12	LM6		4261					
	-	A360.2		G-AlSi10Mg(Cu)	LM9		4253					

ISO	Country and standard											
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan	Russia
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS	GOST
S	**Nickel based alloys**											
	-	5391	LW2 4670	S-NiCr13A16MoNb	mar-46	-	-	NC12AD	-	-		
	-	AMS 5397	LW2 4674	NiCo15Cr10MoAlTi	-	-	-	-	-	-		
	-	5660	LW2.4662	NiFe35Cr14MoTi	-	-	-	ZSNCDT42	-	-		
	-	5383	LW2.4668	NiCr19Fe19NbMo	HR8	-	-	NC19eNB	-	-		
	-	-	2.4631	NiCr20TiAk	Hr401.601	-	-	NC20TA	-	-		-
	-	AMS 5399	2.4973	NiCr19Co11MoTi	-	-	-	NC19KDT	-	-		-
	-	AMS 5544	LW2.4668	NiCr19Fe19NbMo	-	-	-	NC20K14	-	-		
	-	5390A	2.4603	-	-	-	-	NC22FeD	-	-		-
	-	5666	2.4856	NiCr22Mo9Nb	-	-	-	NC22FeDNB	-	-		-
	-	-	2.4630	NiCr20Ti	HR5.2034	-	-	NC20T	-	-		-
	-	4676	2.4375	NiCu30AL3Ti	3072-76	-	-	-	-	-		-
	Cobalt based alloys											
	-	5537C AMS		CoCr20W15Ni	-	-	-	KC20WN	-	-		
	-	5772	LW2.4964	CoCr20W14Ni				KC22WN				
	Titanium alloys											
	-	UNS R54520	3.7115.1	TiAl5Sn2.5	TA14/17	-	-	T-A5E	-	-		
	-							UNS R56400				
	-	-	3.7165.1	TiAl6V4	TA10-13/ TA28		-	UNS R56401	T-A6V	-	-	
	-			TiAl5V5Mo5Cr3								
	-	-	3.7185	TiAl4Mo4Sn4Si0.5	-	-	-	-	-	-		

Comparison table hardness and tensile strength

Hardness				Tensile strength N/mm²
Rockwell Hardness		Vickers Hardness	Brinell Hardness	
HRC	HRA	HV	HB	
70.0	86.6	1037	—	—
69.5	86.3	1017	—	—
69.0	86.1	997	—	—
68.5	85.8	978	—	—
68.0	85.5	959	—	—
67.5	85.2	941	—	—
67.0	85.0	923	—	—
66.5	84.7	906	—	—
66.0	84.4	889	—	—
65.5	84.1	872	—	—
65.0	83.9	856	—	—
64.5	83.6	840	—	—
64.0	83.3	825	—	—
63.5	83.1	810	—	—
63.0	82.8	795	—	—
62.5	82.5	780	—	—
62.0	82.2	766	—	—
61.5	82.0	752	—	—
61.0	81.7	739	—	—
60.5	81.4	726	—	—
60.0	81.2	713	—	2555
59.5	80.9	700	—	2500
59.0	80.6	688	—	2450
58.5	80.3	676	—	2395
58.0	80.1	664	—	2345
57.5	79.8	653	—	2295
57.0	79.5	642	—	2250
56.5	79.3	631	—	2205
56.0	79.0	620	—	2160
55.5	78.7	609	—	2115
55.0	78.5	599	—	2075
54.5	78.2	589	—	2035
54.0	77.9	579	—	1995
53.5	77.7	570	—	1955
53.0	77.4	561	—	1920
52.5	77.1	551	—	1885
52.0	76.9	543	—	1850
51.5	76.6	534	—	1815

Hardness				Tensile strength N/mm²
Rockwell Hardness		Vickers Hardness	Brinell Hardness	
HRC	HRA	HV	HB	
51.0	76.3	525	501	1780
50.5	76.1	517	494	1750
50.0	75.8	509	488	1720
49.5	75.5	501	481	1690
49.0	75.3	493	474	1660
48.5	75.0	485	468	1630
48.0	74.7	478	461	1605
47.5	74.5	470	455	1575
47.0	74.2	463	449	1550
46.5	73.9	456	442	1525
46.0	73.7	449	436	1500
45.5	73.4	443	430	1475
45.0	73.2	436	424	1450
44.5	72.9	429	418	1430
44.0	72.6	423	413	1405
43.5	72.4	417	407	1385
43.0	72.1	411	401	1360
42.5	71.8	405	396	1340
42.0	71.6	399	391	1320
41.5	71.3	393	385	1300
41.0	71.1	388	380	1280
40.0	70.8	382	375	1260
40.0	70.5	377	370	1245
39.5	70.3	372	365	1225
39.0	70.0	367	360	1210
38.5	—	362	355	1190
38.0	—	357	350	1175
37.5	—	352	345	1160
37.0	—	347	341	1140
36.5	—	342	336	1125
36.0	—	338	332	1110
35.5	—	333	327	1095
35.0	—	329	323	1080
34.5	—	324	318	1065
34.0	—	320	314	1050
33.5	—	316	310	1035
33.0	—	312	306	1020
32.5	—	308	302	1010

Comparison table hardness and tensile strength

Hardness				Tensile strength N/mm²	Hardness				Tensile strength N/mm²
Rockwell Hardness		Vickers Hardness	Brinell Hardness		Rockwell Hardness		Vickers Hardness	Brinell Hardness	
HRC	HRA	HV	HB		HRC	HRA	HV	HB	
32.0	—	304	298	995	24.0	—	249	245	820
31.5	—	300	294	980	23.5	—	246	242	810
31.0	—	296	291	970	23.0	—	243	240	800
30.5	—	292	287	960	22.5	—	240	237	790
30.0	—	289	283	950	22.0	—	237	234	785
29.5	—	285	280	935	21.5	—	234	232	775
29.0	—	281	276	920	21.0	—	231	229	765
28.5	—	278	273	910	20.5	—	229	227	760
28.0	—	274	269	900	20.0	—	226	225	750
27.5	—	271	266	890	19.5	—	223	222	745
27.0	—	268	263	880	19.0	—	221	220	735
26.5	—	264	260	870	18.5	—	218	218	730
26.0	—	261	257	860	18.0	—	216	216	725
25.5	—	258	254	850	17.5	—	214	214	715
25.0	—	255	251	835	17.0	—	211	211	710
24.5	—	252	248	830					

Note: The conversion values for steel in the table are commonly applicable for the steels with carbon from low to high.

Conversion table chip breakers – turning

Comparison table for turning inserts chip breaker

ISO	Application	ZCC-CT		Sandvik		Seco		Kennametal		ISCAR		Walter		Mitsubishi		Sumitomo		Tungaloy		Kyocera		Korloy		Ingersoll Tague Tec	
		Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos
P	Steel																								
	Wiper-finishing	WG		WF WL	WF WK	W-MF2	W-F1	FW MW	FW MW	WF		NF	PF	SW	FW	NLU-W	NLU-W	ASW		WP		VW LW		WS	
	Finishing	DF EF	SF HF	PF QF	PF UF 23	FF1 MF1	FF1 F1	FF FN	11 UF LF	SF	PF SM	NF3 NS6	PF4 PF5	FH FS	FJ FV	NSE NSU NLU NFA NFL	NLU NFP NFK	TF TS 17	PF 01	DP GP VF	CF	VG VF VL	VF	FG FC VF	FA SA FG
	Semi-finishing	DM EM	HM	PM QM	PM UM	MF2	F2	FN	MF	NF TF SM	14 16 17 19	NS6	PS5	SH SA	SW SV MV	NSX	NSU NSC NSK	TS TM AS	PS	HQ CQ CJ	CK DP GP VF XP	VQ VC VB	HMP	WT ML	WT
	Medium machining to light roughing	DM PM	HR	PM QM	PR UR	M3 MF3	F2	MN	MF	GN PP NR	17 19	NM4 NM6	PM5	MV MZ MA	MV MW	NGE NGU NUX	NMU NSF	TM DM	PM	GS CS HS PS	HQ XQ GK G	VM	C25	PC MC MT MG MF	PC MT PMR
	Wiper-medium			WR WM	WM	W-M3 W-R4 W-R7	W-F2	MW RW	MW	WG		NM	PM	MW		NGU-W				WQ					
	Roughing	DR		PR QR 31		M5 MR5 MR7		RP UN RN		TNM GN	19	NM9		GH MAT MT		NMU NMX	NMU	TH TR TU		PT GT HT	G St-form	HR		RT	
	Single side roughing	HDR 31HPR DR LR		HR QR		R8 RR9 -56 -57 -UX		RH RM RP		NM		NR6 NR8		HA HZ HH HV HX		NMP NHG NHP NHU NHW				HX		GH VH VT		HT HD HY HZ RX RH	CMX
M	Stainless steel																								
	Wiper-finishing	WG		WF WL WMX	WF WK	W-MF2		FW MW	FW MW	WF			PF	SW	FW	NLU-W	NLU-W								
	Finishing	EF DF	EF HF	MF	MF UF	FF1 F2 MF1	F1	FF FP	11 UF LF	NF VL	PF SM	NF4	PF4 PF5	FS	FJ FV	NSU NLU	NSU NLU	SS	SS	GU		VF	EA SF	FG	
	Semi-finishing	EF EM	EF EM HF HM	MF MM	MF MM UM	MF3	F2	FP	MF	PP TF	14 16 17 19	NM4	PS5	SH MS	SW SV MV	NEX NUP	NSU	SS SM	PS	MS	CK DP GP VF XP	VP2	HMP		
	Medium machining to light roughing	EM DM	EM HM	MM	MM UM	R6 56	F2	MP	HP	PP TF	17 19	NM4 NR4	PM5	MS ES MH	MV MW	NGU	NMU	SA S	PM	MS	HQ XQ GK G	HS VP3	C25	EM SU MT	MT PMR WT
	Wiper medium			WR WM	WM	W-M3		MW RW	MW	WG			PM	MW		NGU -W									
	Roughing	ER DR	HR	MR QR PR	MR	R7 R8		MP -P		HTW NR	19	NR4		GH HZ		NMU NMX NHG						VM		ET	CMX
	Single side roughing	ER DR HDR LR		HR QR		-56		RP		NM						NMP NHG NHP NHU NHW	NMP NHG NHP NHU NHW								

Conversion table chip breakers – turning

Comparison table for turning inserts chip breaker

ISO	Application	ZCC-CT		Sandvik		Seco		Kennametal		ISCAR		Walter		Mitsubishi		Sumitomo		Tungaloy		Kyocera		Korloy		Ingersoll Tague Tec	
		Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos
K Cast iron	Wiper-Finishing	WG		WF WM	WF	W-MF2	W-F1	FW MW	FW MW	WF						NLU-W	NLU-W								
	Finishing	DF	HF	KF	KF	F1	F1	FF FN	11 UF LF	NF SM	14 19		PS5			NSU	NLU			C		VM			
	Semi-finishing	PM	HM	KF KM	KF KM	M3	F2	FN	MF	GN	14 19	NM5	PS5	GH		NUX NGU	NSU	CM		C Stand. form		B25	HMP		
	Medium machining to light roughing	DR	HM HR	KM QM	KM	M3	F2	UN	HP	GN NR		NM6	PM5			NUZ NGU NMU	NMU	CM		GC ZS		VK GR	C25	MT MG	MT PMR WT
	Wiper medium					W-M3 W-R4 W-R7		MW	MW	WG		NM	PM			NGU-W									
	Roughing	DR *NMA	HR	KR QR	KR UR	M5				NR		NR6		GH		NMU				ZS		MA		RT	CMX
N Non-ferrous metals	Finishing		LC		AL				LF	NF			PM2												
	Semi-finishing		LC		AL		AL	GP		NF PP	AS						NAG			AH	AH	HA	AK		FL SA
	Medium machining to light roughing		LH		AL		AL	GG-FS MS	HP	NMS													AR		
S Heat-resistant alloys	Finishing	NF EF	NF	NGP	MF	MF1		FS	GT-HP	SF PF	PF SM		PF4	FJ		NSU	NSU					VP1			
	Semi-finishing	NF NM EM	NF	23	MM	MF1 M1		FS MS	GT-MF	SF PF	PF SM		PF5	MJ		NEX NUP	NSU NSK					VP2	AK		
	Medium machining to light roughing	NM EM		MF	MM UM	M1		MS	MT-LF	PP TF			PS5	MS		NMU	NSK					VP3	HMP	SU	
	Roughing	ER		SR		MR3 MR4		RP		TF HTW NR				GJ								VM			

Conversion table grades – turning

Coated cemented carbide CVD

ISO		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	Widia
P	Steel	YBC052	GC4205 GC4305	KCP05 KC9105	AC805P	UE6005 UE6105	T9005 T9105	CA5505	WPP01 WPP05	IC8150 IC9150 IC428	TP0500 TP0501			
P	Steel	YB6315 YBC152 YBC252	GC4315 GC4215	KCP10 KC9110	AC810P AC700G	UC6110 MY5015	T9015 T9115	CA510 CA5515 CA510	WPP10 WPP10S	IC8150 IC8250 IC9150 IC9250 IC9015	TP1500 TP1501	NC3010	TT8115 TT8125	WP15CT
P	Steel	YBC252 YBC251	GC4325 GC4225 GC4025	KCP25 KC9125	AC820P AC8020P AC900G AC2000	UE6020 MC6025	T9025 T9125	CA5525 CA525 CR9025	WPP20 WPP20S	IC8150 IC8250 IC9250 IC9025	TP2501 TP2500 TP200	NC3220 NC3120	TT8125 TT3500	WP25CT
P	Steel	YBC352 YBC351	GC4335 GC4235 GC4035	KCP30 KC8050	AC830P AC3000	UE6035 UE6400	T903 T9135	CA530 CA5535 CA535	WPP30 WPP30S	IC8250 IC8350 IC9350	TP3500	NC3030 NC5330 NC500H	TT5100 TT8135	WP35CT
M	Stainless steel	YBM151 YBM153	GC2015 GC1515	KCM15	AC610M	MC7015	T9115			IC8250 IC9250 IC6015			TT9215	WM15CT
M	Stainless steel	YBM253 YBM251	GC2015 GC2025	KCM25 KC9225	AC610M AC630M	US7020 MC7015 MC7025	T6020 T6120 T9125	CA6515	WAM20	IC8250 IC9350 IC9025 IC6025	TM 2000 TP200 TP2500	NC9025	TT5100 TT9225	WM25CT
M	Stainless steel	YBM351 YBM253	GC2025 GC2035	KCM25 KCM35 KC9225	AC630M AC6030M AC830P AC3000	US735 US7025	T6030 T6130	CA6525	WAM30	IC8350 IC9350 IC9025	TP3500 TM4000		TT5100 TT7100 TT9235	WM35CT
M	Stainless steel	YBM351	GC2035	KCM35 KC9240 KC9245	AC630M AC6030M AC830P AC3000	US735	T6030 T6130	CA6525		IC6025 IC9350	TP40		TT5100 TT7100 TT9235	
K	Cast iron	YBD052	GC3005 GC3205	KCK05	AC405K AC410K	UC5005 UC5105	T5105	CA4505		IC5005 IC9007		NC6205	TT1300 TT7005	WK05CT
K	Cast iron	YB7315 YBD102 YBD152 YBD152C	GC3215	KCK15 KC9315	AC410K AC415K AC420K AC700G	MC5015 UC5115 MY5015	T5105 T5115	CA4010 CA4515 CA4115	WAK10 WAK10S	IC9015 IC9007 IC8150 IC5010 IC428 IC4028 IC9150	TK1001 TK1000	NC6210	TT1300 TT7310 T7015	
K	Cast iron	YB7315 YBD152 YBD152C	GC3225	KCK20 KC9320	AC420K AC900G	MC5015 UC5115 UE6110 MY5015	T5125 T9125	CA4125	WAK20 WKK20S	IC5010 IC428 IC4028 C9150	TK2000 TK2001	NC5330		WK20CT

Conversion table grades – turning

Coated cemented carbide PVD

ISO		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	Widia
P	P01-05		GC1105					PR1005						
P	P10-15	YBG101 YBG102 YBG105	GC1515 GC1115 GC1025	KC5010 KC5510 KC7215 KC7315	AC510U	VP10MF VP15TF	AH710	PR930 PR1005 PR930 PR115	WSM10 WXN10	IC520N IC507 IC570 IC807 IC907 IC908				
P	P20-25	YB9320 YBG205 YBG202	GC1515 GC1125 GC1025	KC5025 KC5525 KU25T	AC520U	VP20RT VP20MF	AH725 AH120	PR930 PR1025 PR1225	WSM20 WMP20S WSM21	IC228 IC250 IC308 IC828 IC350 IC354 IC507 IC807 IC808 IC907 IC908 IC928 IC1008 IC1028 IC3028	CP200 CP250 TP2000 TS2500		TT8020 TT9020	
P	P30-35	YBG302	GC1125 GC2035	KC7335	AC530U		SH730 J740 GH130 AH740	PR660	WSM30	IC228 IC250 IC328 IC330 IC354 IC528 IC1008 IC1028 IC3028	CP500	PC5300		
M	M10	YBG101 YBG102 YBG105	GC1105 GC1115 GC1025 GC1125 GC1515	KCU10 KC5010 KC5510 KC6005 KC6015	EH10Z AC510U AC530U	VP10MF	AH710	PR915 PR1005	WSM10	IC330 IC354 IC507 IC520 IC570 IC807 IC1028 IC3028	CP500 TS2000	PC8110	TT5080	WS10PT
M	M20	YB9320 YBG205 YBG202	GC1025 GC1125	KC501 KCU25	AC520U AC530U	VP10RT VP15TF VP20RT VP20MF	AH120 AH725 SH730 AH710 AH630 GH330	PR1025 PR1125 PR1225	WSM10 WMP20S WSM20 WSM21	IC228 IC250 IC354 IC808 IC908 IC1008 IC1028 IC3028	TS2000 TS2500 CP200 CP250		TT8020 TT9020 TT9080	WS25PT
M	M30	YBG302	GC2035	KC5025 KCU25		VP10RT VP15TF VP20RT VP20MF MP7035	AH12 AH725 SH730 AH710 AH630 GH330 J740	PR1025 PR1125	WSM20 WSM21 WSM30	IC228 IC250 IC328 IC330 IC1008 IC1028 IC3028	CP500 TS2500	PC5300 PC9030		
S	S05		S05F			MP9005	AH905			IC507 IC907				
S	S10	YBG102 YBG105 YBG202 YBG205	GC1105 GC1115	KC5010 KCU10 KC5510 KCS10	AC510U EH510Z	MP9015 VP10RT	AH905 SH730 AH110 AH120		WSM10	IC507 IC807 IC808 IC806 IC907	CP200 CP250 TS2000 TS2500	PC8110	TT5080	WS10PT
S	S20	YB9320 YBG205 YBG202	GC1025 GC1125 GC1515	KC5010 KCU10 KC5025 KCU25 KC5525	AC520U EH520Z	MP9015 MT9015 VP20RT	AH120 AH725	PR1125	WSM20 WSM21 WSM30	IC507 IC807 IC907	CP250 TS2500 CP500	PC5300	TT5080 TT8020 TT9080	WS25PT
S	S30	YBG302			AC520U	VP15TF	AH725	PR1125	WSM30	IC3028 IC808 IC830		PC5400	TT8020	
N	N10	YBG101 YBG102 YBG105	GC1515	KC5410					WXN10	IC520				

Conversion table grades – turning

Cermet

ISO		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	Widia
P	Steel		CT5005		T110A T1000A	AP25N VP25N	NS520 AT520 GT520 GT720	TN30 TN6010 PV30 PV7010		IC20N IC520N		CN1000 CC105	CT3000 PV3010	
P10-15		**YNG151 YNG151C**	CT5015 CT530	KT315 KT125	T1200A T2000Z T1500A T1500Z	NX2525 AP25N VP25N	NS520 NS730 GT730 NS9530 GT9530	TN60 TN6010 PV60 PV6010		IC20N IC520N IC530N	CM TP1020 TP1030 CMP	CN1000 CT10 CN2000 CC115	CT3000 PV3010	TTI15
P20-25		**YNT251**	GC1525	KT325 KT1120 KT5020	T1200A T2000Z T1500A T1500Z	NX2525 NX3035 AP25N VP25N MP3025	N5530 NS730 GT730 NS9530 GT9530	TN60 TN6020 PV60 PV7020 PV7025		IC20N IC30N IC75T IC520N IC530N	CM TP1020 TP1030 CMP	CN20 CN2000 CC115		TTI15
P30-35					T3000Z	MP3025 VP45N		PV7025 PV90		IC75T				
M	Stainless steel													
M10		**YNG151 YNG151C**	GC1525	KT125	T110A T1000A T1500Z T2000Z	NX2525 AP25N VP25N	NS520 AT530 GT530 GT720	TN60 TN6020 PV60 PV7020			CM TP1020 TP1030 CMP		CT3000 PV3010	TTI15
M20		**YNT251**	CT5015 CT530	HT2	T110A T1000A T1500Z T2000Z	NX2525 AP25N VP25N	NS530 GT730 NS730	TN90 TN6020 PV90 PV7020 PV7025					CT3000 PV3010	TTI15
M30					T3000Z									
M40														
K	Cast iron													
K01-05					T110A T1000A T2000Z T1500Z	NX2525 AP25N	NS520 GT730 NS730	TN30 TN6010 PV30 PV7005 PV7010				CN1000	CT3000 PV3010	
K10-15		**YNG151 YNG151C**	CT5015	KT325 KT125	T1200A T1500A T2000Z T1500Z	NX2525 AP25N	NS520 GT730 NS730	TN60 TN6020 PV60 PV7020 PV7025				CN1000	CT3000 PV3010	
K20-25		**YNT251**	CT5015		T3000Z	NX2525 AP25N								

Conversion table grades – turning

Uncoated carbide

ISO		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	Widia
N	Non-ferrous metals	N01	YD101 YD201	H10 H13A	KF1	H1		KS05F				883 890			
		N10	YD101 YD201	H10 H13A	K313 K68 KF1 THM-F	H1	HTi10	KS15F	KW10	WK01 WK10	IC20	890 KX HX	H01	K10	THM
		N20	YD101 YD201	H10 H13A	K313 K68 KF1 THM-F			KS15F	KW15		IC20	KX HX			

Conversion table grades – milling

CVD milling grades

Material / Class		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec
P	P05		K20W GC4220			F7010							
	P10		K20W GC3040 GC4220 GC4230		ACP100	F7010				IC4100 IC5100	MP1500	NC5330 NCM325	IN6505 IN6520
	P20	**YBC301 YBC302 YBC251 YBC253**	GC3040 GC4230		CS3000	FH7020	T3130		WKP25 WKP25S	IC4050 IC4100 IC5100 IC5400	MP1500 MP2500 MS2500 T25M	NC5330 NCM325	IN6505 IN6520 IN7035
	P30	**YBC301 YBC302 YBM253 YBM351**	GC2040 GC4240	KC930M KC935M	CS3000	F7030	T3130		WKP35 WKP35S WTP35	IC4050 IC5400	MK3000 T25M T350M	NCM325	IN7035 IN6530
	P40	**YBC401 YBM351**	GC2040 GC4240								T350M		IN6530
M	M10		GC4230			F7010					MP1500	NCM325 NC5330	IN6520
	M20	**YBM251 YBM253**	GC4230			F7020	T3130			IC4050	MP1500 MP2500 MS2500 T25M	NCM325 NCM335	IN7035 IN6520 IN6505
	M30	**YBM351**	GC2040 GC4240	KC930M KC935M		F7030	T3130		WTP35		MP2500 MS2500 T25M T350M	NCM335	IN6530 IN7035 IN6505
	M40		GC2040 GC4240								T350M		IN6530
K	K05	**YBD152**		KCK15		F7010 MC5020				DT7150 IC4100			
	K10	**YBD152 YBD252**	K20W	KCK15	ACK200	F7010 MC5020	T1115		WAK15	DT7150 IC4100 IC4010	MP1500 MK1500	NC5330	IN6520
	K20	**YBD252**	K20W		ACK200		T1115		WKP25 WKP25S	DT7150 IC4100	MP1500 MP2500 MS2500 T25M MK1500	NC5330	IN6530 IN6515 IN6520
	K30			KC930M KC935M					WKP35 WKP35S	IC4050	MK3000 MP2500 MS2500		IN6530 IN6515

Conversion table grades – milling

CVD milling grades

Material / Class		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec
S05	S										MK3000		
S10	Heat-resistant alloys												
S20											MP2500 MS2500 T25M		IN7035 IN6520
S30			GC2040						WTP35		MM4500 T350M		
N05	N												
N10	Non-ferrous metals												
N20											MP2500 25M		
H05	H												
H10	Hardened materials		K20W										
H20			K20W GC3040										

Conversion table grades – milling

PVD milling grades

Material / Class		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec
P Steel	P05				ACZ120	VP05HT	GH130			IC903			
	P10	**YBG102**	GC1010 GC1025 GC1020	KC522M KC525M KC610M KC643M KC715M	ACZ210M ACZ220W	VP10H	AH120 GH130	PR730 PR1225 PR1525	WHX15 WHH15 WXM15	IC903 IC950 IC1008	F15M		IN2004 IN2006
	P20	**YBG202** **YBG252**	GC1020 GC1025 GC1010 GC2030	KC522M KC525M KC643M KC715M KC725M	ACP200 ACZ330 ACX70 ACW30 AC350 ACZ50M	VP15TF VP20M VP20RT	AH725 AH120 AH130 AH330 AH725 AH730 GH330	PR630 PR830 PR730 PR1225 PR1230 PR1525	WXM15	IC810 IC380 IC830 IC900 IC908 IC910 IC950 IC1008	F25M MP3000	PC3500 PC3600	IN2006 IN1030 IN2004 IN2005 IN2015 IN2030 IN2505 IN2540
	P30	**YBG302**	GC1030 GC2030	KC530M KC725M KC735M	ACP200 ACP300 ACZ50M ACZ330 ACZ350 ACX70 ACW30 AC350	VP30RT	AH740 AH130 AH140	PR630 PR660 PR830 PR1230	WXM35	IC300 IC328 IC830 IC900 IC928 IC350 IC808 IC908	F30M MP3000	PC3500 PC3600 PC5300 PC3545 PC9570T	IN1030 IN2005 IN2015 IN2030 IN2035 IN2040 IN2505 IN2530 IN4035
	P40		GC1030	KC735M	ACP300 ACZ350		AH140 AH750		WXP45 WSP45 WSP46	IC300 IC328 IC928	F40M	PC5300 PC3545	IN2035 IN2040
M Stainless steel	M10		GC1020	KC522M KC610M KC643M KC715M	ACZ220W ACZ350 EH20Z		AH330 GH110 GH130	PR730 PR1225 PR660 PR1525		PR730 PR660 PR1225 PR1525	F15M	PC8110	IN2505
	M20	**YBG202** **YBG205** **YBG252** **YB9320**	GC1020 GC1025 GC1030 GC203	KC522M KC525M KC610M KC715M KC725M	ACP200 ACZ250M ACZ220M ACZ350 EH20Z AC350	VP15TF VP20RT	AH725 AH730 GH110	PR730 PR1025 PR660 PR1225 PR1525	WXM15	PR730 PR660 PR1025 PR1225 PR1525	F25M MP3000	PC5300 PC8110 PC9530	IN2005 IN2015 IN2505
	M30	**YBG302**	GC1040 GC203	KC525M KC530M KC725M KC735M	ACP300 ACZ250M ACX80 AC350	VP30RT	AH740 AH120 AH130 GH330 GH340				F30M MP3000	PC9530 PC3545 PC9570T	IN1030 IN2015 IN2030 IN2035 IN2530 IN4035
	M40		GC1040	KC530M KC735M	ACP300 ACX80		AH140 AH750 GH330 GH340		WSM35 WSM36 WXM35		F40M	PC3545	IN1030 IN2030 IN2035 IN2530 IN4035
K Cast iron	K05		GC1010	KC510M	ACZ210M ACZ120 ACZ310		AH330	PR905 PR1210 PR1510			MH1000	PC8110	IN2510
	K10	**YBG102** **YBG152**	GC1010	KC510M KC520M KC620M KC643M	EH20Z ACZ310		AH120 AH330 AH725	PR905 PR1210 PR1510	WXH15 WHH15 WXM15	IC810 IC950 IC1008	F15M MK2000	PC6510	IN2004 IN2010 IN2510
	K20		GC1020	KC520M KC620M KC725M	ACK300 EH20Z ACX80 ACW30	VP15TF	GH130		WKK25	IC328 IC830 IC950 IC350 IC808 IC908 IC1008	F25M MK2000 MO3000	PC6510 PC5300	IN1030 IN2004 IN2010 IN2015 IN2030 IN2505
	K30		GC1020	KC620M KC725M	ACK300 ACZ250M					IC328 IC830 IC900 IC908 IC350 IC808 IC908	F30M F40M MP3000	PC5300 PC9570T	IN2005 IN2015 IN2030 IN2505

Conversion table grades – milling

PVD milling grades

Material / Class		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec
S	S05	YBG102									MH1000 F15M	PC8110	
Heat-resistant alloys	S10	YBG102 YBG202 YBG205		KC525M KC643M	ACZ20W	VP15TF		PR905 PR1210 PR1510		IC808	NH1000 F15M F25M	PC5300	
	S20	YBG202 YBG205	S30T GC1025 GC1030 GC2030	KC525M KC643M	ACZ20W			PR905 PR1210 PR1510		IC908 IC380 IC900 IC903 IC908 IC928 IC830 IC808	F25M F30M	PC5300 PC3545	IN2005 IN2505
	S30		GC2030	KC725M KC735M	ACZ50M				WSM35 WSM36 WSP45 WSP46 WXM35 WXP45	IC328 IC928 IC830	F40M	PC3545	IN1030 IN2030 IN2035 IN2530 IN4035
N	N05			KC510M							MH1000 F15M		
Non-ferrous metals	N10	YBG202	GC1025 GC1030	KC510M KC620M KC522M	EH20Z				WXN15		MH1000 F15M		
	N20		GC1025 GC1030	KC620M KC522M KC525M KC651M							F25M F30M F40M MP3000		
H	H05					VP05HT				IC903	MH1000 F15M	PC210F	IN2004 IN2006
Hadened materiels	H10	YBG102	GC1010	KC643M		VP10MF			WXH15 WHH15	IC900 IC808	MK2000 F30M MP3000	PC210F	IN2004 IN2005 IN2006
	H20	YBG202	GC1010 GC1025 GC1030			VP15TF				IC810 IC908	F30M F40M MK2000 MP3000		

Conversion table grades – milling

Uncoated milling grades

ISO		ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Walter	Kyocera	Iscar	SECO	Korloy	Ingersoll Tague Tec
N01	N		H10	K115M K110M				WK10		IC20N		H01	IN04S
N10	Non-ferrous metals	YD101		K313	EH520	HTi10		WKM	GW25	IC08	H15	G10	IN10K IN05S
N20		YD201	H13A H10F	KMF	EH520	TF15		KMG40		IC28	H25		IN15K

Examples of materials for machining groups

Material No.	Material	Machining group
1.0722	10SPb20	1
1.0715	9SMn28	1
1.0736	9SMn36	1
1.0718	9SMnPb28	1
1.0737	9SMnPb36	1
1.0401	C15	1
1.0402	C22	1
1.1141	Ck15	1
1.1170	28Mn6	2
1.0726	35S20	2 / 3
1.1167	36Mn5	2 / 3
1.1157	40Mn4	2 / 3
1.0501	C35	2 / 3
1.0503	C45	2 / 3
1.1191	Ck45	2 / 3
1.1183	Cf35	2 /3
1.1213	Cf53	2 /3
1.1545	C 105 W1	4 / 5
1.1663	C 125 W	4 / 5
1.0535	C55	4 / 5
1.0601	C60	4 / 5
1.1274	Ck101	4 / 5
1.1203	Ck55	4 / 5
1.1221	Ck60	4 / 5
1.5710	36NiCr6	5 / 9
1.5120	38MnSi 4	5 / 9
1.1545	C 105 W2	4 / 5
1.1663	C 125 W	4 / 5
1.0535	C65	4 / 5
1.0601	C70	4 / 5
1.1274	Ck101	4 / 5
1.1203	Ck55	4 / 5
1.1221	Ck60	4 / 5
1.5710	36NiCr7	5 / 9
1.5120	38MnSi 5	5 / 9
1.1545	C 105 W3	4 / 5
1.1663	C 125 W	4 / 5
1.0535	C75	4 / 5
1.0601	C80	4 / 5
1.1274	Ck101	4 / 5
1.1203	Ck55	4 / 5
1.1221	Ck60	4 / 5
1.5710	36NiCr8	5 / 9
1.5120	38MnSi 6	5 / 9
1.1545	C 105 W4	4 / 5
1.1663	C 125 W	4 / 5
1.0535	C85	4 / 5
1.0601	C90	4 / 5
1.1274	Ck101	4 / 5

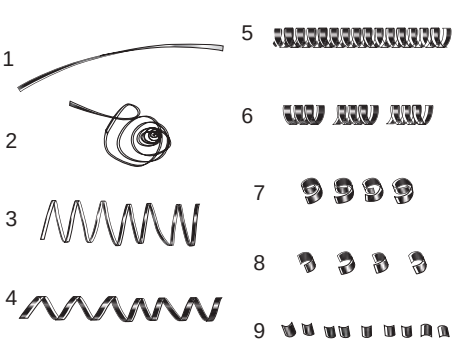
Material No.	Material	Machining group
1.1203	Ck55	4 / 5
1.1221	Ck60	4 / 5
1.5710	36NiCr9	5 / 9
1.5120	38MnSi 7	5 / 9
1.1545	C 105 W5	4 / 5
1.1663	C 125 W	4 / 5
1.0535	C95	4 / 5
1.0601	C100	4 / 5
1.1274	Ck101	4 / 5
1.1203	Ck55	4 / 5
1.1221	Ck60	4 / 5
1.5710	36NiCr10	5 / 9
1.5120	38MnSi 8	5 / 9
1.5680	12Ni19	10 / 11
1.3255	S 18-1-2-5	10 / 11
1.3348	S 2-9-2	10 / 11
1.3343	S 6-5-2	10 / 11
1.3243	S 6-5-2-5	10 / 11
1.2363	X 100 CrMoV 5-1	10 / 11
1.2601	X165CrMoV12	10 / 11
1.2080	X210 Cr 12	10 / 11
1.2581	X30WCrV 9-3	10 / 11
1.2344	X40CrMoV 5-1	10 / 11
1.4718	X45CrSi9-3	10 / 11
1.3355	S 18-0-1	10 /11
1.4027	G-X20Cr14	12 / 13
1.4006	X12 Cr 13	12 / 13
1.4104	X12CrMoS 17	12 / 13
1.4057	X19CrNi 17-2	12 / 13
1.4034	X46Cr 13	12 / 13
1.4871	X53 CrMnNiN 21-9	12 / 13
1.4113	X6CrMo 17	12 / 13
1.4000	X6CR 13	12 / 13
1.4001	X7Cr14	12 / 13
1.4016	X6Cr17	12 / 13
1.4581	G-X5CrNiMoNb 18	14
1.4308	G-X6CrNi 18-9	14
1.4408	G-X6CrNiMo 18-10	14
1.4583	X6CrNiMoNb 18-12	14
1.4571	X6CrNiMoTi 17-12-2	14
1.4550	X6CrNiNb 18-10	14
1.4541	X14CrNiTi 18-10	14
1.4845	X12CrNi 25-21	14
1.4310	X10CrNi 18-8	14
1.4305	X10CrNiS 18-10	14
1.4878	X12CrNiTi 18-9	14
1.4317	X2CrNi 18-8	14
1.4436	X3CrNiMo 17-13-3	14
1.4440	X2CrNiMo 18-16	14

Material No.	Material	Machining group
1.4429	X2CrNiMoN 17-13-3	14
1.4311	X2CrNiN 18 10	14
1.4301	X5CrNi 18-10	14
1.4401	X5CrNiMo 17-12-2	14
0.6010	GG10	16
0.6015	GG15	16
0.6020	GG20	16
0.6025	GG25	16 / 17
0.6030	GG30	17
0.6035	GG35	17
0.6040	GG40	17
1.4829	X12NiCrSi 22-12	17
1.4828	X15CrNiSi20-12	17
0.7033	GGG35.3	18
0.7040	GGG40	18
0.7043	GGG40.3	18
0.8135	GTS-35	18
0.7050	GGG50	19
0.7060	GGG60	19
0.7070	GGG70	19
0.7660	GGGNiCr 20-2	19
0.7652	GGGNiMn 13-7	19
0.8155	GTS-55	21
0.8165	GTS-65	21
0.8170	GTS-70	21
0.8145	GTS-45	21
3.0205	Al99	22
3.3315	AlMg 1	22
3.1325	AlCuMg 1	23
3.2315	AlMgSi 1	23
3.2581	G-AlSi12	24
3.2163	G-AlSi9Cu3	24
3.2381	G-AlSi10Mg	25
2.0375	CuZn36Pb 3	27
2.1096	G-CuSn5ZnPb	27
2.0590	G-CuZn40Fe	27
2.0240	CuZn15	28
2.0060	E-Cu 57	29
1.4865	G-X40NiCrSi 38-18	30
1.4864	X12NiCrSi 36-16	30
2.4631	NiCr20TiAl	32
2.4856	NiCr22Mo9Nb	32
2.4375	NiCu30Al	33
2.4955	NiFe25Cr20NbTi	33
2.4764	CoCr20W15Ni	34
1.3401	G-X120Mn12	34
3.7165	TiAl6V4	36

Test protocol

Date: **ZCC Cutting Tools Europe GmbH**

General	End User		Distributor	
Company				
Contact person				
Machine				
Type				
Producer				
Power [kW]				
Tooling system				
Work piece				
Material				
Hardness/Tensile strength [N/mm²]				
Heat treatment/Surface				
Interrupt cutting				
Cutting tools				
Producer (holder)				
Toolholder (name)				
Teeth Z				
Producer/Supplier				
Insert type/Tool number				
Grade				
Solid carbide tools number				
Cooling				
Cutting Data				
RPM n [U/min]				
Cutting speed Vc [m/min]				
Feed rate f [mm/rpm]				
Feed rate Vf [mm/min]				
Depth of cut a_p [mm]				
Width of cut a_e [mm]				
Machining length [mm]				
Cutting time T [min]				
Results				
Machined pieces/Edges				
Surface quality				
Flankwear VB				
Criteria				
Notch wear				
Crater wear				
Plastic deformation				
Built-up edge				
Insert breakage				
Cutting edge breakage				
Chip forms				



Conclusion:

Fax: +49-(0)211-989240-111
E-mail: technik@zccct-europe.com

Signature:

Torque for screw

Thread	M1,6	M1,8	M2	M2,2	M2,5	M3	M3,5	M4	M4,5	M5	M6	M7	M8	M10	M12
Torque [Nm]	0,2	0,3	0,4	0,7	0,8	1,5	2,3	3,4	5,0	6,7	11,4	19,2	27,0	55,8	85

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ROLLOMATIC


ZCC-CT


400 COMBI


ZCC-CT


Detroit (USA)
Düsseldorf (Germany / Europe)
Zhuzhou (China)


QUALITY MANAGEMENT SYSTEM
CERTIFICATE
CHINA QUALITY CERTIFICATION CENTRE


ENVIRONMENTAL MANAGEMENT
SYSTEM CERTIFICATE
CHINA QUALITY CERTIFICATION CENTRE


bsi.
Certificate of Registration
QUALITY MANAGEMENT SYSTEM - ISO 9001:2008
This is to certify that:
ZCC Cutting Tools Europe
GmbH
Haltorfer Straße 12
Düsseldorf
40472
Germany
Holds Certificate No:
FS 651501
and operates a Quality Management System which complies with the requirements of ISO 9001:2008 for the following scope:
Distribution and Logistics for Metal Cutting Tools
For and on behalf of BSI:
Peter U. E. Leveringhaus,
Managing Director BSI Group Deutschland GmbH
Original Registration Date: 17/06/2010
Latest Revision Date: 11/06/2016
Effective Date: 17/06/2016
Expiry Date: 14/09/2018
Page: 1 of 1

The Company

Zhuzhou Cemented Carbide Cutting Tools Co., Ltd. (ZCC-CT) is located in Zhuzhou, Hunan province, China and is the largest supplier of carbide tools into the Chinese market. The ZCC-CT cutting tool company is part of the "Zhuzhou cemented carbide Group" who manufacture carbide materials and powders. Both of these companies are part of the "Minmetals Corporation" who mine and produce raw tungsten carbide materials.

Since its foundation in 1953 ZCC-CT has developed rapidly by progressively using highly advanced modern production technology as well as having a highly qualified and committed workforce. With over 2,000 employees the company is now the largest producer of carbide cutting tools in China and one of the leading carbide manufacturers worldwide.

Using this advanced production technology, ZCC-CT products are manufactured to the highest quality standards to maintain a constant quality and high performance. The wide range of products contains indexable carbide inserts (coated and uncoated), inserts of Cermets, CBN, PCD and ceramics, solid carbide cutting tools as well as tool holders and milling bodies. The products are produced to various international standards such as ISO DIN, ANSI, JIS and BSI. Furthermore customised and special carbide product are also offered.

Research and development plays a major and significant role at ZCC-CT. The production facilities use the most sophisticated and advanced equipment available and this is supplied by the leading machine and equipment manufacturers in Germany and Switzerland. A highly qualified and skilled team of engineers in the R&D departments are constantly developing new and improved cutting tools. There is a constant desire to continually enhance the quality, to fulfill the ever increasing market requirements for new and initiative products and to achieve the best possible result for the customers.

The production and administration facilities in China are certified to ISO 9001:2000 and they maintain strict environmental management to ISO 14001:2004 standards.

Since 2003 ZCC Cutting Tools has operated a sales organisation in Europe. This sales and warehousing subsidiary of ZCC-CT is based in Düsseldorf (Germany) and has been progressively build up and expanded by Mr. Quanliang Zhao the European Managing Director.

Sales to all European countries, as well as Russia and Turkey, are controlled and managed from this European central warehouse in Düsseldorf, with the majority of the products being dispatched on the same day of ordering. The business operates under the quality management system for "Distribution and Logistics of Metal Cutting Tools" and is certified with DIN EN ISO 9001:2008.

ZCC Cutting Tools Europe has a constantly growing number of employees covering sales, marketing, warehouse and distribution, technical support, IT, HR and accounting. Our external sales team and our partners from around Europe are there to support you on-site in your production facilities or distribution operations. Our internal, highly qualified, technical application engineering staff are always available to give the customer technical advice and support via telephone, by email or in person. The internal sales team takes care of your enquiries and orders and together with dedicated warehouse staff they ensure that products are dispatched to you as quickly as possible.

The complete team at ZCC Cutting Tools Europe are there to support you and be your competent and efficient partner in the global Cutting Tool Industry.

Sales center in Europe

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