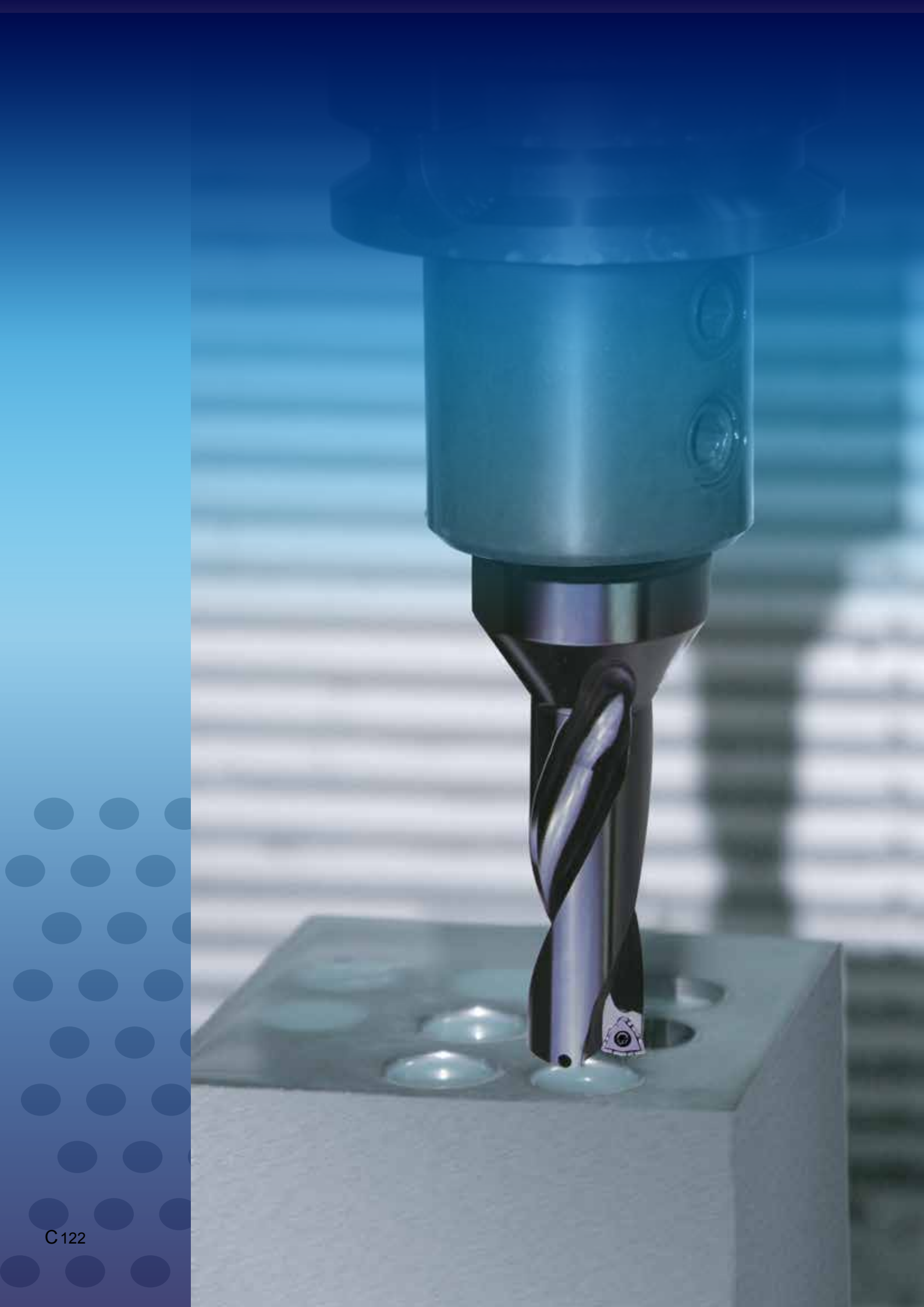


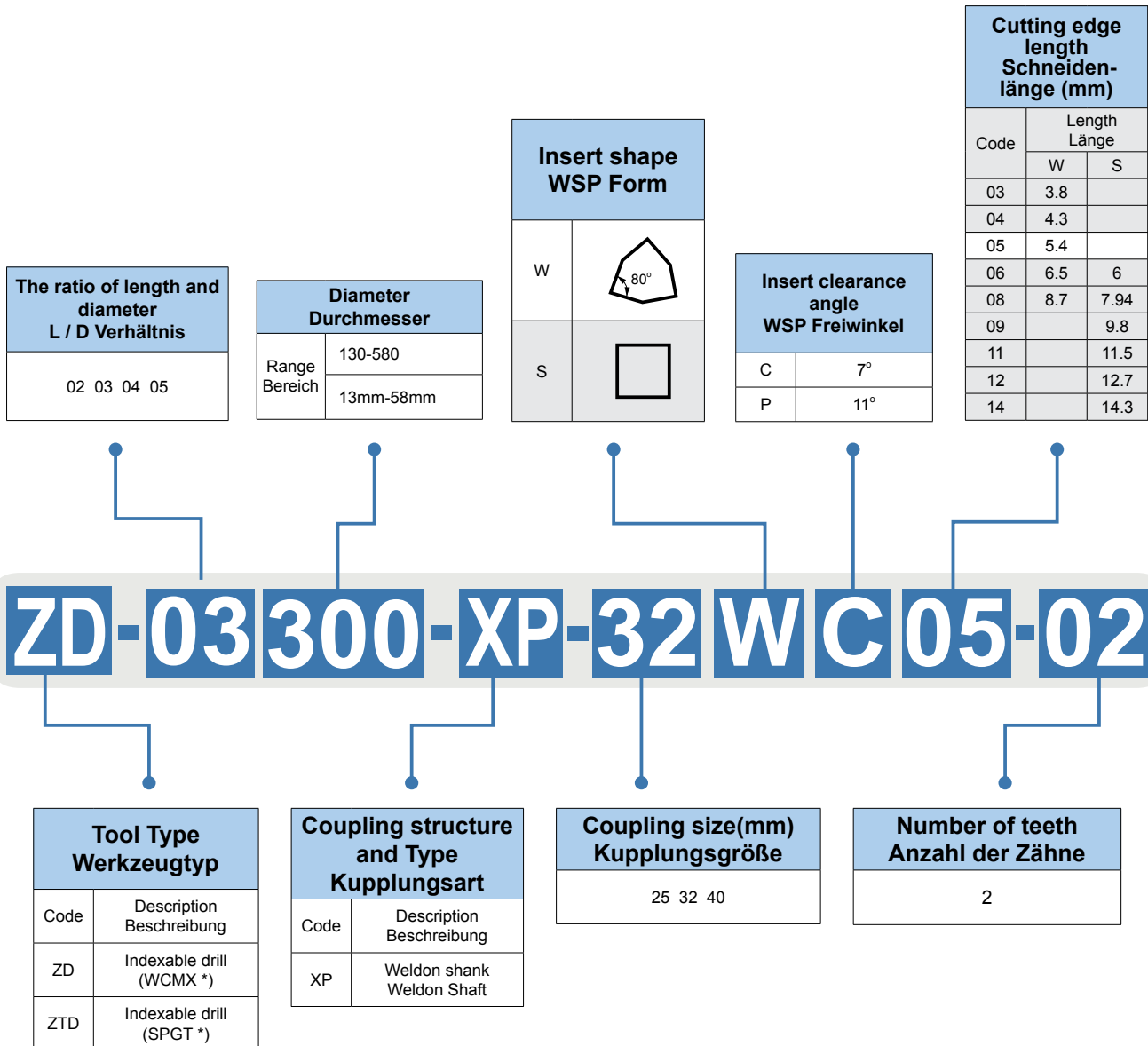
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WSP = Wendeschneidplatte    VHM = Vollhartmetall



### Indexable drill Code Key - ISO Kennzeichnung WSP- Bohrern



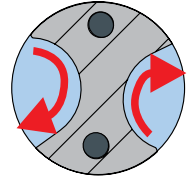
# Drilling - Bohren

Indexable drill - Wendeschneidplattenbohrer

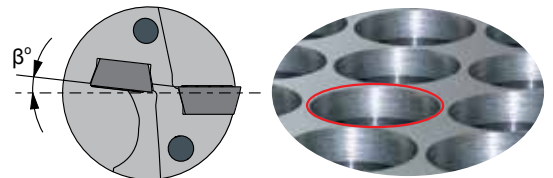
## ZTD - Serie

Tool holder with excellent stiffness and special surface coating. For higher feed rate and higher productivity.  
 Werkzeugträger mit exzellenter Torsionsteifigkeit und speziell beschichteter Oberfläche, ermöglicht höhere Vorschübe und Produktivität

Big chip pocket for better chip removal  
 Größer Spanraum für optimalen Spanabfluß



Optimised insert seat and clamping. Less vibration and higher tool life.  
 Optimierter Plattensitz und optimierte Plattenklemmung für vibrationsfreie Bearbeitung mit hohen Standzeiten



Double helix internal cooling for more effective cooling and good chip removal, also in deep hole boring.  
 Innenkühlung mit Doppelhelixdesign für effektivere Kühlmittelzufuhr und Spanabfluß speziell bei tieferen Bohrungen.

### Example · Beispiel

Type Typ	ZTD04-260-XP25-SP07-02 SPGT07T308-PM / YBG205 (outer insert / Außenschneide) SPGT07T308-PM / YBG212 (inner insert / Innenschneide)	Comparison Vergleich	<p>Number of drilling Anzahl Bohrungen</p> <p>ZTD04      Competitor A Wettbewerb A</p>
Workpiece Werkstückstoff	50Mn(HB240)		
Cooling system Kühlsystem	Doublehelix internal cooling Doppelhelix-Innenkühlung		
Cutting data Schnittdaten	$V_c=130\text{m/min}$ $f=210\text{mm/min}$ $a_p=90\text{mm}$		
Results Ergebnis		Chips Span- bildung	<p>ZTD04-260-XP25-SP07-02      Competitor A Wettbewerb A</p>

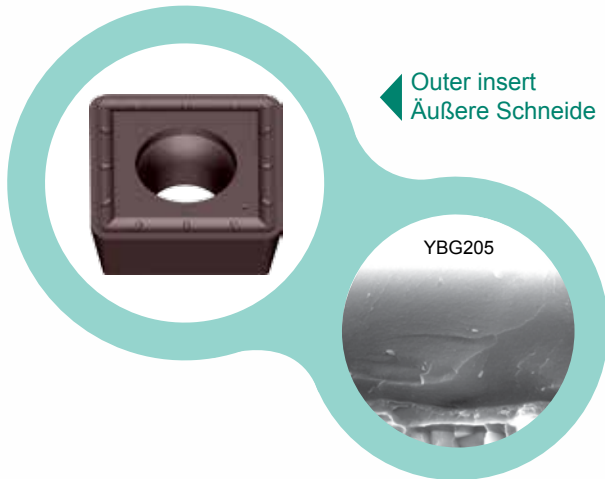
C

Indexable drills  
WPS-Bohrer

# ZTD-Serie

Optimised edge design for stable operation with new chip breaker design / *Optimierte Schneidkante, stabile Bearbeitung, neuartiger Spanbrecher*

Special grades for outer and inner insert for more efficiency in different material / *Optimierte Sorten für Innen- und Außenschneide für höhere Effizienz bei vielen Materialien*



## YBG205

New nano coating structure with good hardness and wear resistance, but also good toughness. Ultra fine surface design prevent friction for best chip flow. Excellent thermal and chemical wear resistance. Best choice for all material also for stainless steel and high alloy material.

*Neue Nano-Beschichtungsstruktur mit gleichzeitiger Härte und Verschleißfestigkeit bzw. Zähigkeit. Eine ultra glatte Schichtoberfläche vermindert die Reibung und garantiert einen optimierten Spanabfluß. Die exzellente thermische und chemische Widerstandsfähigkeit zeigt diese Sorte besonders bei der Bearbeitung von rostfreien Stählen und warmfesten Legierungen.*

## YBG212

Special Nano TiAlN coating with smooth surface for less friction and better chipflow / *Spezielle Nano TiAlN Beschichtung mit sehr glatter Oberfläche für weniger Reibung und besseren Spanablauf*

In combination with super fine grain size substrate good balance between wear resistance and toughness / *In Verbindung mit neuem Superfeinkorn-Substrat die ideale Kombination aus Verschleißfestigkeit und Zähigkeit*

Excellent thermal and oxidation resistance for more stable edge / *Mit sehr guter Temperatur- und Oxidationsbeständigkeit für optimalen Schneidkantenschutz*

For boring operation the cutting speed at inner insert is lower. Therefore the grade must be more tough to prevent breakage. YBG212 is best choice in that case. YBG205 is excellent for higher wear resistance.

*Bei der Bohrbearbeitung ist die Schnittgeschwindigkeit an der Innenschneide niedriger als an der Außenschneide. Mit solch ungünstigen Bearbeitungsbedingungen sollte die Innenschneide eine höhere Zähigkeit haben. Hier ist die YBG212 optimal einzusetzen. Die Außenplatte hat mit der YBG205 eine höhere Verschleißfestigkeit.*

### Example · Beispiel

		Cooling system Kühlsystem	Doublehelix Internal cooling Doppelhelix-Innenkühlung	
		Type Typ	ZTD04-240-XP25-SP07-02 SPGT07T308-PM/YBG205 (outer insert / Außenschneide) SPGT07T308-PM/YBG212 (inner insert / Innenschneide)	Competitor A Wettbewerb A
Workpiece Werkstückstoff	42CrMo(HRC25)	Compare Vergleich		
Cutting data Schnittdaten	$V_c=150\text{m/min}$ $f_r=0.12\text{mm}/\mu$ $a_p=80\text{mm}$	(after 15 min / nach 15 min)		

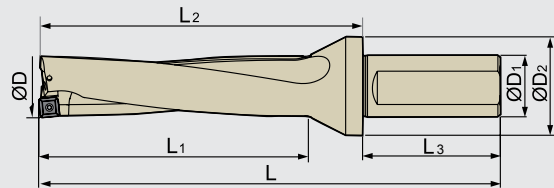


# Drilling · Bohren

Indexable drill · Wendeschneidplattenbohrer

## ZTD02

2D

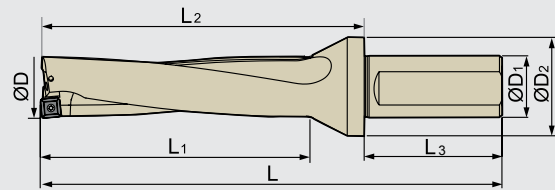


Type Typ	Stock Lager	Dimension Abmessung (mm)							Insert WSP	Screw Schraube	Wrench Schlüssel
		ØD	ØD1	ØD2	L3	L2	L1	L			
ZTD02-130-XP20-SP05-02	●	13	20	25	50	47	32	97	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-140-XP20-SP05-02	●	14	20	25	50	49	34	99	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-150-XP20-SP05-02	●	15	20	25	50	51	36	101	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-160-XP20-SP05-02	●	16	20	25	50	53	38	103	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-170-XP25-SP06-02	●	17	25	32	56	62	40	118	SPGT060204-PM/EM	160M2.2X5.5	WT07IP
ZTD02-180-XP25-SP06-02	●	18	25	32	56	64	42	120	SPGT060204-PM/EM	160M2.2X5.5	WT07IP
ZTD02-190-XP25-SP06-02	●	19	25	32	56	66	44	122	SPGT060204-PM/EM	160M2.2X5.5	WT07IP
ZTD02-200-XP25-SP06-02	●	20	25	32	56	68	46	124	SPGT060204-PM/EM	160M2.2X5.5	WT07IP
ZTD02-210-XP25-SP06-02	●	21	25	32	56	70	48	126	SPGT060204-PM/EM	160M2.2X5.5	WT07IP
ZTD02-220-XP25-SP07-02	●	22	25	32	56	72	50	128	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-230-XP25-SP07-02	●	23	25	32	56	74	52	130	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-240-XP25-SP07-02	●	24	25	32	56	76	54	132	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-250-XP25-SP07-02	●	25	25	32	56	78	56	134	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-260-XP25-SP07-02	●	26	25	32	56	80	58	136	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-270-XP25-SP07-02	●	27	25	32	56	82	60	138	SPGT07T308-PM/EM	160M2.5X6.5	WT07IP
ZTD02-280-XP32-SP09-02	●	28	32	37	60	87	62	147	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-290-XP32-SP09-02	●	29	32	37	60	89	64	149	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-300-XP32-SP09-02	●	30	32	37	60	91	66	151	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-310-XP32-SP09-02	●	31	32	37	60	93	68	153	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-320-XP32-SP09-02	●	32	32	37	60	95	70	155	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-330-XP32-SP09-02	●	33	32	37	60	97	72	157	SPGT090408-PM/EM	160M3.5X8	WT15IP
ZTD02-340-XP40-SP11-02	●	34	40	47	70	104	74	174	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-350-XP40-SP11-02	●	35	40	47	70	106	76	176	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-360-XP40-SP11-02	●	36	40	47	70	108	78	178	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-370-XP40-SP11-02	●	37	40	47	70	110	80	180	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-380-XP40-SP11-02	●	38	40	47	70	112	82	182	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-390-XP40-SP11-02	●	39	40	47	70	114	84	184	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-400-XP40-SP11-02	●	40	40	47	70	116	86	186	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-410-XP40-SP11-02	●	41	40	47	70	118	88	188	SPGT110408-PM/EM	160M4X10	WT15IP
ZTD02-420-XP40-SP14-02	●	42	40	52	70	130	90	200	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-430-XP40-SP14-02	●	43	40	52	70	132	92	202	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-440-XP40-SP14-02	●	44	40	52	70	134	94	204	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-450-XP40-SP14-02	●	45	40	52	70	136	96	206	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-460-XP40-SP14-02	●	46	40	52	70	138	98	208	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-470-XP40-SP14-02	●	47	40	52	70	140	100	210	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-480-XP40-SP14-02	●	48	40	52	70	142	102	212	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-490-XP40-SP14-02	●	49	40	52	70	144	104	214	SPGT140512-PM/EM	160M5X13	WT20IP
ZTD02-500-XP40-SP14-02	●	50	40	52	70	146	106	216	SPGT140512-PM/EM	160M5X13	WT20IP

● Ex Stock / ab Lager ○ On demand / auf Anfrage

### ZTD03

3D



Type Typ	Stock Lager	Dimension Abmessung (mm)							Insert WSP	Screw Schraube	Wrench Schlüssel
		ØD	ØD <sub>1</sub>	ØD <sub>2</sub>	L <sub>3</sub>	L <sub>2</sub>	L <sub>1</sub>	L			
ZTD03-130-XP20-SP05-02	●	13	20	25	50	67	44	111	SPGT050204-PM/PE	I60M2.0×4.3	WT06IP
ZTD03-140-XP20-SP05-02	●	14	20	25	50	67	47	114	SPGT050204-PM/PE	I60M2.0×4.3	WT06IP
ZTD03-150-XP20-SP05-02	●	15	20	25	50	64	50	114	SPGT050204-PM/PE	I60M2.0×4.3	WT06IP
ZTD03-160-XP20-SP05-02	●	16	20	25	50	67	53	120	SPGT050204-PM/PE	I60M2.0×4.3	WT06IP
ZTD03-170-XP25-SP06-02	●	17	25	32	56	79	56	135	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-180-XP25-SP06-02	●	18	25	32	56	82	59	138	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-190-XP25-SP06-02	●	19	25	32	56	84	62	140	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-200-XP25-SP06-02	●	20	25	32	56	87	65	143	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-210-XP25-SP06-02	●	21	25	32	56	90	68	146	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-220-XP25-SP06-02	●	22	25	32	56	93	71	149	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD03-230-XP25-SP07-02	●	23	25	40	56	96	74	153	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-240-XP25-SP07-02	●	24	25	40	56	102	77	159	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-250-XP25-SP07-02	●	25	25	40	56	102	80	159	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-260-XP25-SP07-02	●	26	25	40	56	105	83	162	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-270-XP25-SP07-02	●	27	25	40	56	108	86	165	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-280-XP25-SP07-02	●	28	25	40	56	111	89	168	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-290-XP32-SP07-02	●	29	32	45	60	117	92	178	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD03-300-XP32-SP09-02	●	30	32	45	60	120	95	181	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-310-XP32-SP09-02	●	31	32	45	60	123	98	184	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-320-XP32-SP09-02	●	32	32	45	60	126	101	187	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-330-XP32-SP09-02	●	33	32	45	60	129	104	190	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-340-XP32-SP09-02	●	34	32	45	60	132	107	193	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-350-XP32-SP09-02	●	35	32	45	60	135	110	196	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-360-XP32-SP09-02	●	36	32	45	60	138	113	199	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD03-370-XP40-SP11-02	●	37	40	55	70	147	117	217	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-380-XP40-SP11-02	●	38	40	55	70	150	119	220	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-390-XP40-SP11-02	●	39	40	55	70	153	122	223	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-400-XP40-SP11-02	●	40	40	55	70	160	125	231	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-410-XP40-SP11-02	●	41	40	55	70	158	128	229	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-420-XP40-SP11-02	●	42	40	55	70	161	131	232	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-430-XP40-SP11-02	●	43	40	55	70	169	134	240	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD03-440-XP40-SP14-02	●	44	40	60	70	178	138	248	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-450-XP40-SP14-02	●	45	40	60	70	181	141	251	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-460-XP40-SP14-02	●	46	40	60	70	184	144	254	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-470-XP40-SP14-02	●	47	40	60	70	187	147	257	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-480-XP40-SP14-02	●	48	40	60	70	189	149	260	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-490-XP40-SP14-02	●	49	40	60	70	192	152	263	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD03-500-XP40-SP14-02	●	50	40	60	70	195	155	266	SPGT140512-PM/EM	I60M5×13	WT20IP

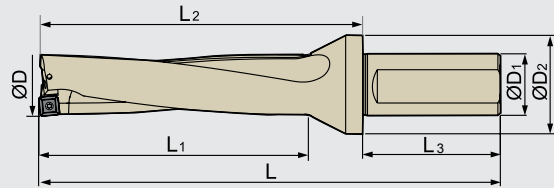




# Drilling - Bohren

Indexable drill - Wendeschneidplattenbohrer

## ZTD04

4D



Type Typ	Stock Lager	Dimension Abmessung (mm)							Insert WSP	Screw Schraube 	Wrench Schlüssel 
		ØD	ØD1	ØD2	L3	L2	L1	L			
ZTD04-130-XP20-SP05-02	○	13	20	25	50	74	57	124	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-140-XP20-SP05-02	●	14	20	25	50	78	61	128	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-150-XP20-SP05-02	●	15	20	25	50	82	65	132	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-160-XP20-SP05-02	●	16	20	25	50	86	69	136	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-170-XP25-SP06-02	●	17	25	32	56	95	73	152	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-180-XP25-SP06-02	●	18	25	32	56	99	77	156	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-190-XP25-SP06-02	●	19	25	32	56	103	81	160	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-200-XP25-SP06-02	●	20	25	32	56	107	85	163	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-210-XP25-SP06-02	●	21	25	32	56	111	89	167	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-220-XP25-SP06-02	●	22	25	32	56	115	93	171	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD04-230-XP25-SP07-02	●	23	25	40	56	119	97	176	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-240-XP25-SP07-02	●	24	25	40	56	123	101	180	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-250-XP25-SP07-02	●	25	25	40	56	127	105	184	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-260-XP25-SP07-02	●	26	25	40	56	131	109	188	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-270-XP25-SP07-02	●	27	25	40	56	135	113	192	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-280-XP25-SP07-02	●	28	32	45	60	143	118	203	SPGT070408-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-290-XP32-SP07-02	●	29	32	45	60	146	121	207	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD04-300-XP32-SP09-02	●	30	32	45	60	150	125	211	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-310-XP32-SP09-02	●	31	32	45	60	154	129	215	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-320-XP32-SP09-02	●	32	32	45	60	158	133	219	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-330-XP32-SP09-02	●	33	32	45	60	162	137	223	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-340-XP32-SP09-02	●	34	32	45	60	166	141	227	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-350-XP32-SP09-02	●	35	32	45	60	170	145	231	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-360-XP32-SP09-02	●	36	32	45	60	174	149	235	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD04-370-XP40-SP11-02	●	37	40	55	70	184	154	254	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-380-XP40-SP11-02	●	38	40	55	70	188	158	258	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-390-XP40-SP11-02	●	39	40	55	70	196	161	267	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-400-XP40-SP11-02	●	40	40	55	70	200	165	271	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-410-XP40-SP11-02	●	41	40	55	70	199	169	270	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-420-XP40-SP11-02	●	42	40	55	70	208	173	279	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-430-XP40-SP11-02	●	43	40	55	70	212	177	283	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD04-440-XP40-SP14-02	●	44	40	60	70	222	182	292	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-450-XP40-SP14-02	●	45	40	60	70	226	186	296	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-460-XP40-SP14-02	●	46	40	60	70	230	190	300	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-470-XP40-SP14-02	●	47	40	60	70	234	194	304	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-480-XP40-SP14-02	●	48	40	60	70	237	198	308	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-490-XP40-SP14-02	●	49	40	60	70	241	202	312	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD04-500-XP40-SP14-02	●	50	40	60	70	245	206	316	SPGT140512-PM/EM	I60M5×13	WT20IP

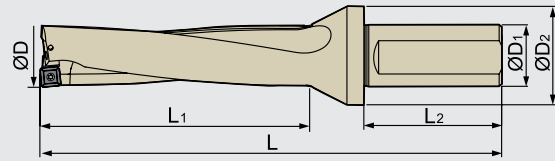


Indexable drills  
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### ZTD05

5D



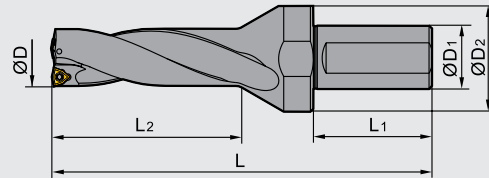
Type Typ	Stock Lager	Dimension Abmessung (mm)						Insert WSP	Screw Schraube	Wrench Schlüssel
		ØD	ØD1	ØD2	L1	L2	L			
ZTD05-170-XP25-SP06-02	●	17	25	32	91	56	169	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD05-180-XP25-SP06-02	●	18	25	32	96	56	174	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD05-190-XP25-SP06-02	●	19	25	32	101	56	179	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD05-200-XP25-SP06-02	●	20	25	32	106	56	184	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD05-210-XP25-SP06-02	●	21	25	32	111	56	189	SPGT060204-PM/EM	I60M2.2×5.5	WT07IP
ZTD05-220-XP25-SP07-02	●	22	25	32	115	56	194	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-230-XP25-SP07-02	●	23	25	32	120	56	199	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-240-XP25-SP07-02	●	24	25	32	125	56	204	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-250-XP25-SP07-02	●	25	25	32	130	56	209	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-260-XP25-SP07-02	●	26	25	32	135	56	214	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-270-XP25-SP07-02	●	27	25	32	140	56	219	SPGT07T308-PM/EM	I60M2.5×6.5	WT07IP
ZTD05-280-XP32-SP09-02	●	28	32	37	145	60	231	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-290-XP32-SP09-02	●	29	32	37	150	60	236	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-300-XP32-SP09-02	●	30	32	37	155	60	241	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-310-XP32-SP09-02	●	31	32	37	160	60	246	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-320-XP32-SP09-02	●	32	32	37	165	60	251	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-330-XP32-SP09-02	●	33	32	37	170	60	256	SPGT090408-PM/EM	I60M3.5×8	WT15IP
ZTD05-340-XP40-SP11-02	●	34	40	47	176	70	276	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-350-XP40-SP11-02	●	35	40	47	181	70	281	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-360-XP40-SP11-02	●	36	40	47	186	70	286	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-370-XP40-SP11-02	●	37	40	47	191	70	291	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-380-XP40-SP11-02	●	38	40	47	196	70	296	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-390-XP40-SP11-02	●	39	40	47	201	70	301	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-400-XP40-SP11-02	●	40	40	47	206	70	306	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-410-XP40-SP11-02	○	41	40	47	211	70	311	SPGT110408-PM/EM	I60M4×10	WT15IP
ZTD05-420-XP40-SP14-02	○	42	40	52	216	70	326	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-430-XP40-SP14-02	○	43	40	52	221	70	331	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-440-XP40-SP14-02	○	44	40	52	226	70	336	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-450-XP40-SP14-02	○	45	40	52	231	70	342	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-460-XP40-SP14-02	○	46	40	52	236	70	346	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-470-XP40-SP14-02	○	47	40	52	241	70	351	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-480-XP40-SP14-02	○	48	40	52	246	70	356	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-490-XP40-SP14-02	○	49	40	52	251	70	361	SPGT140512-PM/EM	I60M5×13	WT20IP
ZTD05-500-XP40-SP14-02	○	50	40	52	256	70	366	SPGT140512-PM/EM	I60M5×13	WT20IP

● Ex Stock / ab Lager ○ On demand / auf Anfrage

C

Indexable drills  
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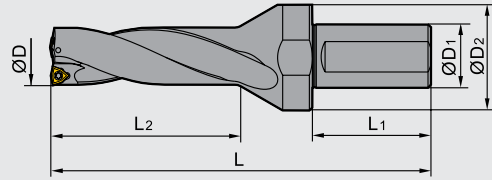
### ZD03



Type Typ	Stock Lager	Basic dimension(mm) Abmessungen						Inserts WSP	Screw Schraube	Wrench Schlüssel
		D	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L			
ZD03-160-XP25-WC03-02	●	16	25	32	56	52	129	WCMX030208	I60M2.5×6.5	WT07IP
ZD03-170-XP25-WC03-02	●	17	25	32	56	55	133	WCMX030208	I60M2.5×6.5	WT07IP
ZD03-180-XP25-WC03-02	●	18	25	32	56	58	137	WCMX030208	I60M2.5×6.5	WT07IP
ZD03-190-XP25-WC03-02	●	19	25	32	56	61	140	WCMX030208	I60M2.5×6.5	WT07IP
ZD03-200-XP25-WC03-02	●	20	25	32	56	64	143	WCMX030208	I60M2.5×6.5	WT07IP
ZD03-210-XP25-WC04-02	●	21	25	45	56	67	153	WCMX040208	I60M2.5×6.5T	WT08IP
ZD03-220-XP25-WC04-02	●	22	25	45	56	70	156	WCMX040208	I60M2.5×6.5T	WT08IP
ZD03-230-XP25-WC04-02	●	23	25	45	56	73	159	WCMX040208	I60M2.5×6.5T	WT08IP
ZD03-240-XP25-WC04-02	●	24	25	45	56	76	162	WCMX040208	I60M2.5×6.5T	WT08IP
ZD03-250-XP25-WC04-02	●	25	25	45	56	79	165	WCMX040208	I60M2.5×6.5T	WT08IP
ZD03-260-XP32-WC05-02	●	26	32	55	60	83	176	WCMX050308	I60M3×7	WT09IP
ZD03-270-XP32-WC05-02	●	27	32	55	60	86	180	WCMX050308	I60M3×7	WT09IP
ZD03-280-XP32-WC05-02	●	28	32	55	60	89	184	WCMX050308	I60M3×7	WT09IP
ZD03-290-XP32-WC05-02	●	29	32	55	60	92	188	WCMX050308	I60M3×7	WT09IP
ZD03-300-XP32-WC05-02	●	30	32	55	60	95	192	WCMX050308	I60M3×7	WT09IP
ZD03-310-XP40-WC06-02	●	31	40	60	70	98	203	WCMX06T308	I60M3×7	WT09IP
ZD03-320-XP40-WC06-02	●	32	40	60	70	101	206	WCMX06T308	I60M3×7	WT09IP
ZD03-330-XP40-WC06-02	●	33	40	60	70	104	209	WCMX06T308	I60M3×7	WT09IP
ZD03-340-XP40-WC06-02	●	34	40	60	70	107	212	WCMX06T308	I60M3×7	WT09IP
ZD03-350-XP40-WC06-02	●	35	40	60	70	110	215	WCMX06T308	I60M3×7	WT09IP
ZD03-360-XP40-WC06-02	●	36	40	60	70	113	218	WCMX06T308	I60M3×7	WT09IP
ZD03-370-XP40-WC06-02	●	37	40	60	70	116	221	WCMX06T308	I60M3×7	WT09IP
ZD03-380-XP40-WC06-02	●	38	40	60	70	119	225	WCMX06T308	I60M3×7	WT09IP
ZD03-390-XP40-WC06-02	●	39	40	60	70	122	228	WCMX06T308	I60M3×7	WT09IP

● Ex Stock / ab Lager    ○ On demand / auf Anfrage

### ZD03



Type Typ	Stock Lager	Basic dimension(mm) Abmessungen						Inserts WSP	Screw Schraube	Wrench Schlüssel
		D	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L			
ZD03-400-XP40-WC06-02	●	40	40	60	70	125	231	WCMX06T308	I60M3×7	WT09IP
ZD03-410-XP40-WC06-02	●	41	40	60	70	128	234	WCMX06T308	I60M3×7	WT09IP
ZD03-420-XP40-WC08-02	●	42	40	60	70	131	239	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-430-XP40-WC08-02	●	43	40	60	70	134	242	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-440-XP40-WC08-02	●	44	40	60	70	137	245	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-450-XP40-WC08-02	●	45	40	60	70	140	248	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-460-XP40-WC08-02	●	46	40	60	70	143	251	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-470-XP40-WC08-02	●	47	40	60	70	146	253	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-480-XP40-WC08-02	●	48	40	70	70	149	255	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-490-XP40-WC08-02	○	49	40	70	70	152	257	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-500-XP40-WC08-02	●	50	40	70	70	155	259	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-510-XP40-WC08-02	●	51	40	70	70	158	261	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-520-XP40-WC08-02	○	52	40	70	70	161	263	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-530-XP40-WC08-02	○	53	40	70	70	164	265	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-540-XP40-WC08-02	●	54	40	70	70	167	267	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-550-XP40-WC08-02	○	55	40	70	70	170	269	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-560-XP40-WC08-02	○	56	40	70	70	173	271	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-570-XP40-WC08-02	○	57	40	70	70	176	273	WCMX080412	I60M3.5×10.4	WT15IP
ZD03-580-XP40-WC08-02	●	58	40	70	70	179	275	WCMX080412	I60M3.5×10.4	WT15IP



# Drilling - Bohren

Indexable drill - Wendeschneidplattenbohrer

## Inserts Drills Code Key - ISO Kennzeichnung Wendeschneidplatten

Insert shape · Plattenform	
Code	Insert shap Plattenform
S	
W	

Tolerance · Toleranz							
Code	m Tolerance(mm) Toleranz	ØI.C Tolerance(mm) Toleranz	S Tolerance(mm) Toleranz	Code	m Tolerance(mm) Toleranz	ØI.C Tolerance(mm) Toleranz	S Tolerance(mm) Toleranz
A	±0.005	±0.025	±0.025	J	±0.005	±0.05-±0.13	±0.025
F	±0.005	±0.013	±0.025	K	±0.013	±0.05-±0.13	±0.025
C	±0.013	±0.025	±0.025	L	±0.025	±0.05-±0.13	±0.025
H	±0.013	±0.013	±0.025	M	±0.08-±0.18	±0.05-±0.13	±0.13
E	±0.025	±0.025	±0.025	N	±0.08-±0.18	±0.05-±0.13	±0.025
G	±0.025	±0.025	±0.13	U	±0.13-±0.38	±0.08-±0.25	±0.13

**W C M X**

Clearance angle of main cutting edge Freiwinkel der Hauptschneide			
Code	Clearance angle Freiwinkel	Code	Clearance angle Freiwinkel
A		B	
C		D	
E		F	
G		N	
P		O	Other clearance angle Anderer Freiwinkel

Chipbreaker and clamping system Spanformstufen und Klemmung							
Metric · Metrisch							
Code	With / Without hole Mit / Ohne Loch	With / Without chipbreaker Mit / Ohne Spanbrecher	Section plane of Insert Plattenform	Code	With / Without hole Mit / Ohne Loch	With / Without chipbreaker Mit / Ohne Spanbrecher	Section plane of Insert Plattenform
B	✓	-		N	-	-	
H	✓	Single-side Einseitig		R	-	Single-side Einseitig	
C	✓	-		F	-	Double-side Doppelseitig	
J	✓	Double-side Doppelseitig		A	✓	-	
W	✓	-		M	-	Single-side Einseitig	
T	✓	Single-side Einseitig		G	✓	Double-side Doppelseitig	
Q	✓	-		X	---	---	Special Spezial
U	✓	Double-side Doppelseitig					

**C**

Indexable drills  
WPS-Bohrer

Length of cutting edge Schneidenlänge		
Code	Length · Länge	
	W	S
03	3.8	
04	4.3	
05	5.4	
06	6.5	6.35
08	8.7	8.0
09		9.525
12		12.7

Insert thickness Dicke			
Thickness is defined as height from bottom of insert to the highest part of cutting edge Dicke ist definiert als Höhe von der Unterseite der WSP bis zur höchsten Stelle der Scheikante			
Code	Insert thickness WSP Dicke (mm)	Code	Insert thickness WSP Dicke (mm)
00	0.79	05	5.96
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		

**08 04 12 R - PG**

Nose radius Schneidenradius	
Code	Description Beschreibung
04	0.4mm
08	0.8mm
12	1.2mm

Cutting direction Vorschubrichtung	
Code	Description Beschreibung
R	Right hand / Rechts
L	Left hand / Links
N	Neutral

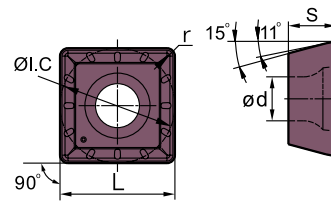
Chipbreaker code  
Spanformstufe



# Drilling - Bohren

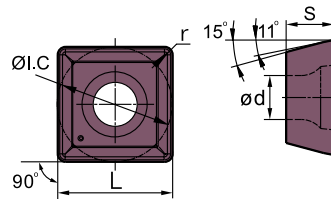
Indexable drill - Wendeschneidplattenbohrer

## ZTD 02 / 03 / 04 / 05



Type Typ	Dimension Abmessung (mm)						Grade Sorte	
	L	ØI.C	s	ød	α	r	YBG205 outer insert Außenschnide	YBG212 inner insert Innenschnide
SPGT050204-PM	5	5	2.4	2.2	15°, 7°	0.4	•	•
SPGT060204-PM	6	6	2.4	2.6	15°, 11°	0.4	•	•
SPGT07T308-PM	7.94	7.94	4	2.8	15°, 11°	0.8	•	•
SPGT090408-PM	9.8	9.8	4.3	4.2	15°, 11°	0.8	•	•
SPGT110408-PM	11.5	11.5	4.8	4.4	15°, 11°	0.8	•	•
SPGT140512-PM	14.3	14.3	5.2	5.75	15°, 11°	1.2	•	•

• ex stock / ab Lager ○ on demand / auf Anfrage



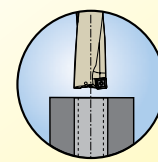
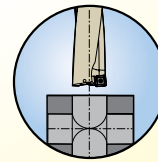
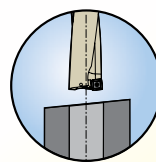
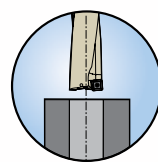
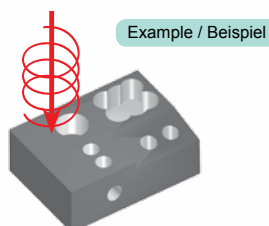
Type Typ	Dimension Abmessung (mm)						Grade Sorte	
	L	ØI.C	s	ød	r	YBG205 outer insert Außenschnide	YBG212 inner insert Innenschnide	
SPGT050204-EM	5	5	2.38	2.2	0.4	•	•	
SPGT060204-EM	6	6	2.38	2.6	0.4	•	•	
SPGT07T308-EM	7.94	7.94	3.97	2.8	0.8	•	•	
SPGT090408-EM	9.8	9.8	4.3	4.2	0.8	•	•	
SPGT110408-EM	11.5	11.5	4.76	4.4	0.8	•	•	
SPGT140512-EM	14.3	14.3	5.2	5.75	1.2	•	•	

• ex stock / ab Lager ○ on demand / auf Anfrage

## Material Overview - Material Übersicht

✓ = Very suitable · Sehr empfohlen  
 ✓ = Suitable · Empfohlen

Grade Sorte	Workpiece material · Werkstückstoff									
	Mild steel Baustahl HB≤180	Carbon steel Alloy Steel Kohlenstoff-, Legierter Stahl	Hardened steel · Gehärteter Stahl			Stainless steel Rostfreier Stahl	Cast iron Gusseisen	Nodular cast iron GGG Kugelgrah- itguss	Aluminum alloy Aluleg.	Copper alloy Kupferleg.
SPGT*- PM	✓	✓				✓	✓	✓		



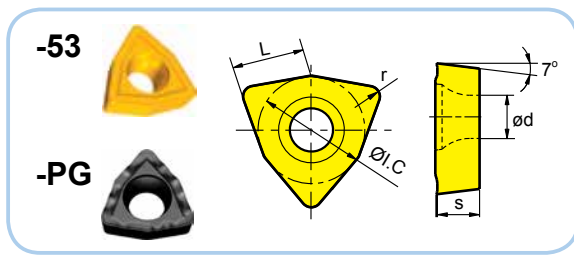
1 General boring  
Allgemeine Bohrung

2 Inclined plane  
Schiefe Ebene

3 Cross hole  
Kreuzbohrung

4 expansion boring  
Expansionsbohrung

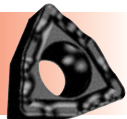
### Indexable inserts for drilling · WSP zum Bohren



Workpiece Material Werkstoffe	Ideal Machining Condition Gute Bearbeitungsbedingungen		Normal Machining Condition Normale Bearbeitungsbedingungen		Unfavorable Machining Condition Ungünstige Bearbeitungsbedingungen	
	●	●	●	●	●	●
<b>P</b> Steel / Stahl	●	●	●	●	●	●
<b>M</b> Stainless Steel Rostfreier Stahl	●	●	●	●	●	●
<b>K</b> Cast Iron Gusseisen	●	●	●	●	●	●
<b>N</b> Non-ferrite material Ne Metalle						●
<b>S</b> Heat-resistant steel Wärmfester Stahl	●					

Type Typ	Basic dimension(mm) · Basis Abmessungen					Grade · Sorte					
	L	I.C	s	d	r	YBG202	YBG205	YBG201	YBD252	YBG40	YD201
WCMX030208R-53	3.8	5.56	2.38	2.8	0.8	●		●	●	○	○
WCMX040208R-53	4.3	6.35	2.38	3.1	0.8	●		●	●	○	○
WCMX050308R-53	5.4	7.94	3.18	3.2	0.8	●		●	●	○	○
WCMX06T308R-53	6.5	9.525	3.97	3.7	0.8	●		●	●	○	○
WCMX080412R-53	8.7	12.7	4.76	4.3	1.2	●		●	●	○	○
WCMX030208-D	3.8	5.56	2.38	2.8	0.8				○	○	
WCMX040208-D	4.3	6.35	2.38	3.1	0.8				○	○	
WCMX050308-D	5.4	7.94	3.18	3.2	0.8				○	○	
WCMX06T308-D	6.5	9.525	3.97	3.7	0.8				○	○	
WCMX080412-D	8.7	12.7	4.76	4.3	1.2				○	○	
WCMX030208R-PG	3.8	5.56	2.38	2.8	0.8	●			○		
WCMX040208R-PG	4.3	6.35	2.38	3.1	0.8	●			○		
WCMX050308R-PG	5.4	7.94	3.18	3.2	0.8	●	○		○		
WCMX06T308R-PG	6.5	9.525	3.97	3.7	0.8	●			○		
WCMX080412R-PG	8.7	12.7	4.76	4.3	1.2	●			○		

### -PG chipbreaker -PG Spanbrecher



Unique design of waveform edge ensure high edge strength and good chip breaking performance for machining carbon steel and alloy steel.

Wellenförmige Schneide mit hoher Stabilität und Spankontrolle zur Bearbeitung von Kohlenstoffstahl, legiertem Stahl und Guss

### -53 chipbreaker -53 Spanbrecher



Sharp cutting edge benefits to achieve low roughness surface, mainly applicable for low load cutting of aluminum alloy, mild steel, stainless steel and cast iron.

Scharfe Schneidkante zur Erzielung exklusiver Oberflächen. Zur Bearbeitung von Alulegierungen, Baustahl, rostfreiem Stahl und Grauguss.

### -D chipbreaker -D Spanbrecher



Inserts for outer positioning with optimized chipbreaker geometry. And good chip breaking performance for machining, steel, stainless steel, cast iron for common cutting speed .

Optimierte Geometrie als Außenschneide einsetzbar. Gute Spankontrolle bei Stahl, rostfreiem Stahl, Grauguss bei mittleren Schnittgeschwindigkeiten.

# Drilling - Bohren

General technical information - Allgemeine Technische Information

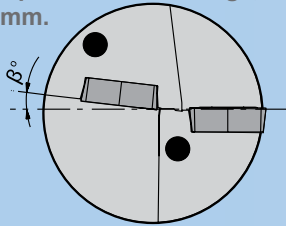
Comparison table for drilling Insert - Grades  
Bohrwendepplatten Übersichtstabelle - Sorten

Workpiece material Werkstück Material	ISO	Coating · Beschichtung		Cermet Cermet	uncoated carbide unb. Hartmetall	PCBN & PCD PCBN & PKD
		CVD	PVD			
<b>P</b> Steel · Stahl	P01					
	P10		YBG202 YBG205 YBG212			
	P20	YBD252				
	P30					
	P40					
<b>M</b> Stainless Steel Rostfreier Stahl	M01					
	M10		YBG202 YBG205 YBG212			
	M20					
	M30					
	M40					
<b>K</b> Cast Iron · Grauguss	K01					
	K10	YBD252		YBG202 YBG205 YBG212		
	K20					
	K30					
	K40					
<b>N</b> Non-ferrous materials Ne - Metalle	N01					
	N10					
	N20				YD201	
	N30					
<b>S</b> Heat-resistant steel Warmfester Stahl	S01					
	S10		YBG202 YBG205			
	S20					
	S30					
<b>H</b> Hardened material Gehärtete Werkstoffe	H01					
	H10					
	H20					
	H30					



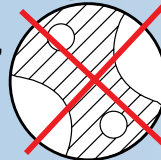
### Features of drill - Merkmale der WSP-Bohrer

- Perfect insert assembling angle makes balanced cutting force, low vibration in machining process, thus achieve excellent surface quality.
- Advanced flute design possesses large chip pocket for chip removal.
- Complete diameter range, from 16 mm to 58 mm.
- Perfekte WSP Positionierung für ausgewogene Schnittkraftverteilung. Zur Erzielung guter Oberflächen.
- Fortschrittlicher großer Spanraum für eine gute Spanabfuhr.
- kompletter Durchmesserbereich von 16 mm-58mm

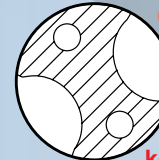


Small chip pocket  
Easy to generate chips  
jamming

kleiner Spanraum,  
Spanstau.



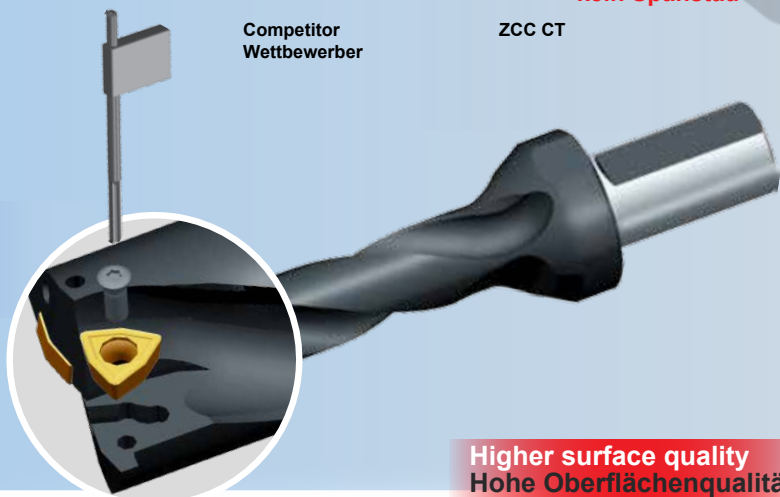
Competitor  
Wettbewerber



Large chip pocket  
Chip jamming  
free

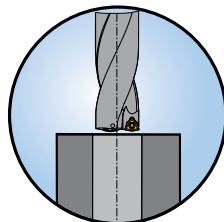
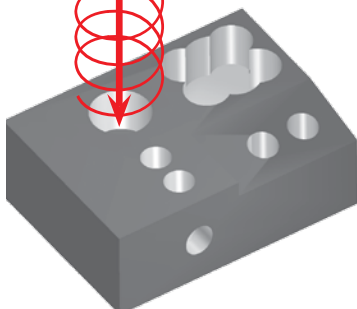
Großer  
Spanraum  
kein Spanstau

### Insert assembling WSP Wechsel

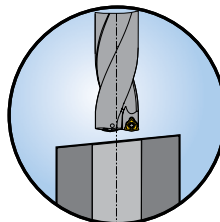


Higher surface quality  
Hohe Oberflächenqualität

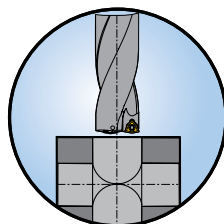
### Applications Anwendung



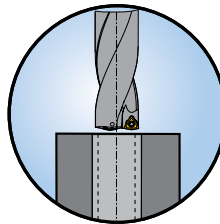
1. Common drilling  
Normalbohren



2. Slant face drilling  
Schrägbohren



3. Cross-hole drilling  
Bohren bei  
Querbohrungen



4. Counterboring  
Aufbohren



Better chip breaking performance  
Gute Spankontrolle

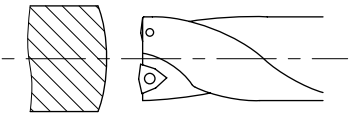
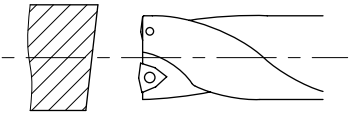
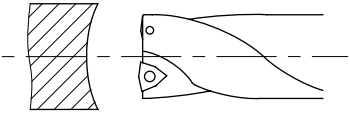
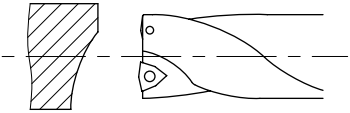
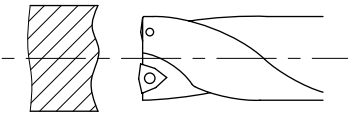


### Technical information for shallo drills · Technische Informationen über WSP-Bohrer

#### ■ initial drill penetration · Das Anbohren

Initial drill penetration is an important factor for successful drilling. One way of ensuring good hole quality is to make sure the penetration surface of the workpiece is vertical to the drill centre axis. In addition, an indexable drill can carry out initial penetration of convex, concave, inclined and irregular surfaces when accompanied with an adjustment of feed rates.

Das Anbohren ist ein wichtiger bzw. entscheidender Faktor für das erfolgreiche Bohren. Eine gute Bohrungsqualität und Standzeit erzielt man bei einer ebenen Anbohrfläche vertikal zur Bohrerachse. Beim Anbohren in konkaven, konvexen und unebenen Flächen soll der Vorschub entsprechend reduziert werden.

Workpiece surface Werkstück Oberflächen	Countermeasures Maßnahmen
	<p>For a convex surface, the conditions are relatively good and the centre of the drill ideally makes contact with the workpiece first, thus can adopt normal feed.</p> <p>Bei konvexen Anbohrflächen ist die Bearbeitungssituation relativ gut. Der erste Kontakt des Bohrers geschieht über die Zentrumschneide, so daß normale Vorschübe gewählt werden können.</p>
	<p>When penetrating an inclined surface, the cutting edges will be unevenly loaded which may result in the premature drill wear. If the angle of the inclined surface is larger than two degrees, the feed should be reduced to 1/3 of that recommended for the drill.</p> <p>Bei Schrägflächen wird der Bohrer aus dem Zentrum gedrückt. Dadurch wird der Bohrerverschleiß erhöht. Bei einem Winkel von über 2° sollte der Vorschub auf 1/3 der empfohlenen Werte reduziert werden.</p>
	<p>When drilling into concave surface, drill center axis normally tends to off-center, the feed should be reduced to 1/3 of that recommended for the drill.</p> <p>Beim Anbohren in konkaven Flächen kann der Bohrer aus dem Zentrum gedrückt werden. Vorschub auf 1/3 reduzieren.</p>
	<p>When drilling into non-symmetric curved surfaces, the drill tends to deviate from the centre because of penetrating against an inclined surface. The feed should be reduced to lower than that recommended for the initial penetration of concave surfaces.</p> <p>Beim Bohren in asymmetrischen Flächen sollte der Vorschub entsprechend reduziert werden, eventuell auf unter die Werte, die für das erste Eindringen in konkave Flächen empfohlen werden.</p>
	<p>When drilling into irregular surface, there is a risk of the inserts chipping and this may also occur when drilling through the workpiece. Therefore the feed rate should be reduced.</p> <p>Beim Bohren in stark asymmetrische Flächen können beim Anbohren und beim Austritt des Bohres aus dem Werkstück Ausbrüche an der Wendeschneidplatte entstehen. Auch hier den Vorschub entsprechend reduzieren.</p>



### Calculations for shallow drilling · Berechnungsbeispiele für WSP-Bohrer

#### • Cutting speed · Schnittgeschwindigkeit ( $V_c$ )

$$V_c = \frac{D_c \times \pi \times n}{1000}$$

$V_c$  (m/min): cutting speed  
Schnittgeschwindigkeit  
 $n$  (rev/min): rotating speed · Umdrehungen

$D_c$  (mm): drill diameter  
Bohrerdurchm.  $\varnothing$   
 $\pi \sim 3,14$

- Example Spindle speed is 1600 rev/min, drill diameter is 20mm, thus cutting speed is:  
Beispiel Spindelumdrehung beträgt 1600 u/min, Bohrerdurchmesser ist 20mm, dadurch ist die Schnittgeschw.:

$$V_c = \frac{D_c \times \pi \times n}{1000} = \frac{20 \times 3.14 \times 1600}{1000} = 100 \text{ (m/min)}$$

#### • Feed speed · Vorschub

$$V_f = fr \times n \text{ (mm/min)}$$

$V_f$  (mm/min): feed speed  
Schnittgeschwindigkeit  
 $n$  (rev/min): spindle speed · Umdrehungen

$fr$  (mm/rev): feed rate per revolution  
Vorschub pro Umdrehung

- Example Spindle speed is 1500 rev/min, feed rate per revolution is 0.1mm/rev, thus feed speed is:  
Beispiel Spindelumdrehung beträgt 1500 u / min, Vorschub pro Umdrehung = 0,1 mm / rev:

$$V_f = fr \times n = 0.1 \times 1500 = 150 \text{ (mm/min)}$$

#### • Machining time · Bearbeitungszeit

$$T_c = \frac{I_d \times i}{n \times f}$$

$T_c$  (min): machining time  
Bearbeitungszeit  
 $i$ : number of holes  
 $i$ : Anzahl der Bohrung.

$I_d$  (mm): drilling depth  
Bohrtiefe

$fr$  (mm/rev): feed rate per revolution  
Vorschub pro Umdrehung  
 $n$  (rev/min): spindle speed  
Drehzahl

- Example Calculate the drilling time, with following formular:  
Beispiel

drill diameter 20mm, depth 40mm  
cutting speed 100m/min  
feed rate 0,1/rev

$$n = \frac{V_c \times 1000}{D_c \times \pi} = \frac{100 \times 1000}{20 \times 3.14} = 1600 \text{ (rev/min)}$$

Berechnen Sie die Bohrzeit, mit folgender Formel:

Bohrerdurchm. 20mm, Bohrtiefe 40mm  
Schnittgeschwindigk. 100m/min  
Vorschub pro Umdrehung 0,1/re

$$T_c = \frac{I_d \times i}{n \times fr} = \frac{40 \times 1}{1600 \times 0.1} = 0.25 \text{ (min)}$$

#### • Metal removal rate · Zerspanungsvolumen

$$Q = \frac{V_f \times \pi \times D_c^2}{4 \times 1000}$$

$Q$  (cm<sup>3</sup>/min): metal removal rate  
 $Q$  (cm<sup>3</sup>/min): Zerspanungsvolumen  
 $V_f$  (mm/min): feed speed · Vorschub  
 $\pi \sim 3,14$

$D_c$ (mm): drill diameter  
 $D_c$ (mm): Bohrerdurchmesser

- Example Drill diameter is 20mm, feed speed is 160mm/min, thus metal removal rate is:  
Beispiel Bohrdurchmesser 20mm, Vorschub ist 160mm/min, dadurch liegt das Zerspanungsvolumen bei:

$$Q = \frac{V_f \times \pi \times D_c^2}{4 \times 1000} = \frac{160 \times 3.14 \times 20^2}{4 \times 1000} = 50.24 \text{ (cm}^3\text{/min)}$$

# Drilling · Bohren

Indexable drill · Wendeschneidplattenbohrer

## Recommended cutting data for shallow drills · Empfohlene Schnittdaten für WSP-Bohrern

ISO	Material	Hardness HB Härte HB	Diameter Ø Durchmesser [mm]	Feed rate Vorschub fn [mm/r]	Cutting speed Schnittgeschwindigkeit Vc [m/min]
<b>P</b>	Carbon steel Kohlenstoff- stahl	80-200	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.09 0.06-0.10 0.07-0.11 0.08-0.12	200(170-240)
	Low alloy steel Niedrigleg. Stahl	150-260	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.12 0.06-0.14 0.08-0.16 0.10-0.20	170(140-220)
	High alloy steel Hochleg. Stahl	150-320	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.12 0.06-0.16 0.08-0.18 0.10-0.22	150(120-180)
	Cast steel Gussstahl	180-250	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.08 0.05-0.08 0.06-0.10 0.07-0.11 0.07-0.12	140(120-170)
<b>M</b>	Stainless steel Ferrite Martensite Rostfreier Stahl	150-270	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.12 0.06-0.16 0.08-0.18 0.10-0.22	160(110-230)
	Austenite Austenit	150-275	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.11 0.06-0.13 0.08-0.14 0.10-0.16	140(110-220)
<b>K</b>	Malleable cast iron Temperguss	150-230	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.10 0.05-0.14 0.08-0.16 0.10-0.20 0.12-0.24	160(120-220)
	Gray cast iron Grauguss	150-220	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.10 0.05-0.14 0.08-0.16 0.10-0.20 0.12-0.24	200(170-240)
	Nodular cast iron GGG Kugelgra- phitguss	160-250	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.09 0.05-0.12 0.06-0.14 0.08-0.16 0.10-0.20	160(130-200)
<b>N</b>	Al alloy Alulegierung	60-110	16.0-23.0 24.0-30.0 31.0-38.0 39.0-46.0 47.0-58.0	0.05-0.10 0.05-0.14 0.08-0.16 0.10-0.20 0.12-0.24	300(250-350)

**C**

Indexable drills  
WSP-Bohrer

## Threading pre-hole diameter · Kernlochdurchmesser

- Metric Coarse thread
- Metrisch - Gewinde

- Metric fine screw fine
- Metrisch - Feingewinde

Thread code Gewindebez.	Pre-hole diameter (mm) Kerndurchmesser
M3×0.5	2.5
M3.5×0.6	2.9
M4×0.7	3.3
M5×0.8	4.2
M6×1.0	5.0
M7×1.0	6.0
M8×1.25	6.75
M9×1.25	7.75
M10×1.5	8.5
M11×1.5	9.5
M12×1.75	10.25
M14×2.0	12.0
M16×2.0	14.0
M18×2.5	15.5
M20×2.5	17.5
M24×3.0	21.0
M27×3.0	24.0
M30×3.5	26.5

Thread code Gewindebez.	Pre-hole diameter (mm) Kerndurchmesser
M3×0.35	2.65
M3.5×0.35	3.15
M4×0.5	3.5
M4.5×0.5	4.0
M5×0.5	4.5
M5.5×0.5	5.0
M6×0.75	5.25
M7×0.75	6.25
M8×1.0	7.0
M8×0.75	7.25
M9×1.0	8.0
M9×0.75	8.25
M10×1.25	8.75
M10×1.0	9.0
M10×0.75	9.25
M11×1.0	10.0
M11×0.75	10.25
M12×1.5	10.5
M12×1.25	10.75
M12×1.0	11.0

Thread code Gewindebez.	Pre-hole diameter (mm) Kerndurchmesser
M14×1.5	12.5
M14×1.0	13.0
M15×1.5	13.5
M15×1.0	14.0
M16×1.5	14.5
M16×1.0	15.0
M17×1.5	15.5
M17×1.0	16.0
M18×2.0	16.0
M18×1.5	16.5
M18×1.0	17.0
M20×2.0	18.0
M20×1.5	18.5
M20×1.0	19.0
M22×2.0	20.0
M22×1.5	20.5
M22×1.0	21.0
M24×2.0	22.0
M24×1.5	22.5
M24×1.0	23.0

## Surface roughness · Oberflächenrauigkeit

D

Technical Info  
Technische Info

Type Typ	Code	Calculation method · Berechnungsmethode	Calculation example (figure) · Meßaufnahme (Abb.)
Arithmetic average deviation of profile Mittlere Rauhtiefe	Ra	<p>Within sampling length <math>l</math>, the arithmetic average absolute value of profile deviation is</p> $R_a = \frac{1}{l} \int_0^l  y(x)  dx$ <p>In the formula, the profile deviation <math>y</math> is the distance between profile points and reference line in the measuring direction. Reference line is the profile least-square average line <math>O</math>. This line divide the profile and make the sum of squares of profile deviation to be the minimum within the sampling length.</p> <p>Der Mittelrauhwert <math>R_a</math> ist der arithmetische Mittelwert der absoluten Beträge der Abstände <math>y</math> des Rauheitsprofils von der Mittellinie innerhalb der Messstrecke. Dies ist gleichbedeutend mit der Höhe des Rechtecks, dessen Länge gleich der Gesamtstrecke <math>l</math> ist und das flächengleich mit der Summe der zwischen dem Rauheitsprofil und der Mittellinie eingeschlossenen Fläche ist <math>y=f</math></p>	
Irregularity ten-point high Gemittelte Rauhtiefe	Rz	<p>Within sampling length <math>l</math>, the sum of the average value of heights of five highest profile peak and the depths of five deepest profile valleys</p> $R_z = \frac{\sum_{i=1}^5 y_{pi} + \sum_{i=1}^5 y_{vi}}{5}$ <p>In the formula, <math>y_{pi}</math> means the height of 'i'th highest profile peak. In the formula, <math>y_{vi}</math> means the depth of 'i'th deepest profile valley. Maximum height of profile <math>R_y</math>: the distance between the top profile peak line and the bottom profile valley line in the longitudinal direction within the sampling length <math>l</math>.</p> <p>Die gemittelte Rauhtiefe <math>R_z</math> ist das arithmetische Mittel aus den Einzelrauhtiefen fünf aufeinander grenzender Einzelmessstrecken gleicher Länge. <math>R_z</math> wird ebenfalls in (<math>\mu m</math>) angegeben.</p>	
Maximum height of profile Maximale Rauhtiefe	Ry	<p>The distance between the inner profile peak line and the bottom profile valley line in the longitudinal direction within the sampling length <math>l</math>. Top profile peak line is the line that parallels to the reference line and passes through the highest point of profile peak. Bottom profile line is the line that parallels to the reference line and passes through the lowest point of profile valley.</p> <p>Die maximale Rauhtiefe <math>R_y</math> ist die größte der auf der Gesamtmeßstrecke <math>l</math> vorkommenden Einzelrauhtiefen, <math>R_y</math> wird auch in (<math>\mu m</math>) Mikrometer angegeben. (Bemerkung) Um <math>R_z</math> herausfinden, wird ein Anteil ohne außergewöhnliche Höhen und Tiefen als Stichprobenlänge ausgewählt und als Schwachstelle betrachtet.</p>	

## Material comparison table · Werkstoffe Vergleichstabelle

ISO	Country and Standard · Standardbezeichnung nach Länder										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
<b>P</b>	Alloy steel · Legierter Stahl										
	15	1015	1.0401	C15	080M15	-	1350	CC12	C15C16	F.111	-
	20	1020	1.0402	C22	050A20	2C	1450	CC20	C20C21	F.112	-
	35	1035	1.0501	C35	060A35	-	1550	CC35	C35	F.113	-
	45	1045	1.0503	C45	080M40	-	1650	CC45	C45	F.114	-
	55	1055	1.0535	C55	070M55	-	1655	-	C55	-	-
	60	1060	1.0601	C60	080A62	43D	-	CC55	C60	-	-
	Y15	1213	1.7015	9SMn28	230M07	-	1912	S250	CF9SMn28	11SMn28	SUM22
	-	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
	40Mn	1039	1.1157	40Mn4	150M36	15	-	35M5	-	-	-
	25	1025	1.1158	Ck25	-	-	-	-	-	-	S25C
	35Mn2	1335	1.1167	36Mn5	-	-	2120	40Mn5	-	36Mn5	SMn438(H)
	30Mn	1330	1.1170	28Mn6	150M28	14A	-	20M5	C28Mn	-	SCMn1
	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
	50	1050	1.1213	Cf53	060A52	-	1674	XC48TS	C53	-	S50C
	60Mn	1060	1.1221	Ck60	080A62	43D	1678	XC60	C60	-	S58C
	-	1095	1.1274	Ck101	060A96	-	1870	-	-	-	SUP4
	-	-	1.3401	X120Mn12	Z120M12	-	-	X120M12	XG120Mn12	X120Mn12	SCMnH/1
	Gr15;45Gr	52100	1.3505	100Cr6	534A99	31	2258	100C6	100Cr6	F.131	SUJ2
	-	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	-	



## Material comparison table · Werkstoffe Vergleichstabelle

ISO	Country and Standard · Standardbezeichnung nach Länder										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
P	Alloy steel · Legierter Stahl										
	-	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	-
	-	8620	1.6523	21NiCrMo2	850M20	362	2503	20NCD2	20NiCrMo2	20NiCrMo2	SNCCM220(H)
	-	8740	1.6546	40NiCrMo2	311-Type7	-	-	-	40NiCrMo2(KB)	40NiCrMo2	SNC240
	40CrNiMoA	4340	1.6582	34CrNiMo6	817M40	24	2541	35NCD6	35CrNiMo6(KB)	-	-
	-	-	1.6587	17CrNiMo6	820A16	-	-	18NCD6	-	14CrNiMo13	-
	15Cr	5015	1.7015	15Cr3	523M15	-	-	12C3	-	-	SCr415(H)
	35Cr	5132	1.7033	34Cr4	530A32	18B	-	32C4	34Cr4(KB)	35Cr4	SCr430(H)
	40Cr	5140	1.7035	41Cr4	530M40	18	-	42C4	41Cr4	42Cr4	SCr440(H)
	40Cr	5140	1.7045	42Cr4	-	-	2245	-	-	42Cr4	SCr440
	18CrMn	5115	1.7131	16MnCr15	(527M20)	-	2511	16MC5	16MnCr15	16MnCr15	-
	20CrMn	5155	1.7176	55Cr3	527A60	48	-	55C3	-	-	SUP9(A)
	30CrMn	4130	1.7218	25CrMo4	1717CDS110	-	2225	25CD4	25CrMo4(KB)	55Cr3	SCM420; SCM430
	35CrMo	4137;4135	1.7220	34CrMo4	708A37	19B	2234	35CD4	35CrMo4	34CrMo4	SCM432; SCRRM3
	40CrMoA	4140;4142	1.7223	41CrMo4	708M40	19A	2244	42CD4TS	41CrMo4	41CrMo4	SCM440
	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	-
	-	-	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
	-	-	1.8509	41CrAlMo7	905M39	41B	2940	40CAD6,12	41CrAlMo7	41CrAlMo7	-
	-	-	1.8523	39CrMoV139	897M39	40C	-	-	36CrMoV12	-	-

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## Material comparison table · Werkstoffe Vergleichstabelle

ISO	Country and Standard · Standardbezeichnung nach Länder										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
<b>P</b>	Tool steel · Werkzeugstahl										
	T10	W.110	1.1545	C105W1	-	-	1880	Y1105	C98KU C100KU	F.515 F.516	-
	T12A	W.112	1.1663	C125W	-	-	-	Y2120	C120KU	(C120)	SK2
	CrV;9SiCr	L3	1.2067	100Cr6	BL3	-	-	Y100C6	-	100Cr6	-
	Cr12	D3	1.2080	X210Cr12	BD3	-	-	Z200Cr12	X210Cr13KU X250Cr12KU	X210Cr12	SKD1
	4Cr5MoVSi	H13	1.2344	X40CrMoV5 1	BH13	-	2242	Z40CDV5	X35CrMoV05KU X40CrMoV51KU	X40CrMoV5	SKD61
	Cr6WV	A2	1.2363	X100CrMoV5 1	BA2	-	2260	Z100CDV5	X100CrMoV51KU	X100CrMoV5	SKD12
	CrWMo	-	1.2419	105WCr6	-	-	2140	105WC13	10WCr6 107WCr5KU	105WCr5	SKS31 SKS2 SKS3
	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
	Cr12MoV	-	1.2601	X165CrMoV 12	-	-	2310	-	X165CrMoW12KU	X160CrMoV12	SKD11
	5CrNiMo	L6	1.2713	55NiCrMoV6	-	-	-	55NCDV7	-	F.250.S	SKT4
	V	W210	1.2833	100V1	BW2	-	-	Y1105V	-	-	SKS43
	W6Mo5Cr4V2Co5	-	1.3243	S6-5-2-5	-	-	2723	Z85WDCV	HS6-5-2-5	HS6-5-2-5	SKH55
	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
	-	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	

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ISO	Country and Standard · Standardbezeichnung nach Länder					Main application Hauptanwendung
	China	USA	Germany	Japan	Daido Steel Co., Ltd (Japan)	
	GB	AISI/SAE	DIN	JIS	DAIDO	
P	<b>Plastic die steel · Gesenkstahl</b>					
	-	P20 mod.		-	PX5N	For mass production of large mirror dies. Automobile tail light, front fender of car, video camera, household electrical appliances etc Große hochglänzende Präzisionsgesenke für die Serienproduktion. Automobilteile, Videokameras, elektr. Haushaltsgeräte ect.
	-	-		-	NAK55	High precision mirror die. Video camera, music disc, Cosmetic Containers, transparent covers, transparent films etc Hochglänzende Präzisionsgesenke für Videokameras, Musik CDs, Kosmetik Behälter, Transparente Abdeckungen.
	-	-		-	NAK80	High precision mirror die. Video camera, music disc, Cosmetic Containers, transparent covers, transparent films etc Hochglänzende Präzisionsgesenke für Videokameras, Musik CDs, Kosmetik Behälter, Transparente Abdeckungen und Beläge.
	3Cr13	420 mod.		SUS420J2 mod.	S-STAR	For ultra-mirror corrosion resistant precise dies. Accessories of camera, CD, lens, watch case. Für ultra-fein spiegelnde korrosionsbeständige Gesenke für Zubehör von Kameras. CD, Linsen, Armbanduhren.
P	<b>Cold-working die steel · Kaltarbeitsstahl</b>					
	-	02	-	SKS93	YK30	Stamping die, gauge calipers, paper cutter, auxiliary tools Für Gesenkstempel, Meßkaliber, Papierschnidmesser, Werkzeuge
	9CrWMn	01 mod.	-	SKS3 mod.	GOA	Blanking die, gauge calipers, drawing die, taps, Perforated punch. Für Schnittmatrizen, Meßkaliber, Gewindebohrer, Perforationswerkzeuge, Kaltziehsteine
	Cr12MoV	D2	X165CrMoV12	SKD11	DC11	Blanking die, cold forming die, cold drawing die, forming roller, punch Für Schnittmatrizen, Kaltformpressgesenke, Kaltziehsteine, Formwalzen.
	-	D2 mod.	-	SKD11 mod.	DC53	Blanking die, cold forming die, cold drawing die, forming roll, punch Für Schnittmatrizen, Kaltformpressgesenke, Kaltziehsteine, Formwalzen.
P	<b>Hot-working die steel · Warmarbeitsstahl</b>					
	4Cr5MoSiV1	H13	X40CrMoV51	SKD61	DHA1	Aluminum-compression die, connecting parts of compression die, hot stamping die, hot extrusion die, thermal shear cutting blade Aluminium Druckgesenke, Verbindungsstücke für Druckgesenke, Heißpressgesenke, Heiß-Extruder-Gesenke, warmfeste Schnittmesser ect.
	-	-	-	-	DH21	Long life Aluminum compression die Alu-Druckgesenke für lange Lebensdauer
	-	-	-	-	DH31-S	Compression die, Druckgesenke
	-	-	-	-	DH2F	Compression die, plastic die Druckgesenke, Plastik-Gesenke

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ISO	Country and Standard · Standardbezeichnung nach Länder										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
M	Stainless steel · Rostfreier Stahl										
	0Cr13; 1Cr12	403	1.4000	X6Cr13	403S17	-	2301	Z6C13	X6Cr13	F.3110	SUS403
	-	-	1.4001	X7Cr14	-	-	-	-	-	F.8401	-
	1Cr13	410	1.4006	X10Cr13	410S21	56A	2302	Z10C14	X12Cr13	F.3401	SUS410
	1Cr17	430	1.4016	X6Cr17	430S15	60	220	Z8C17	X8Cr17	F.3113	SUS430
	2Cr13	410	1.4021	X20Cr13	S62	56B; 56C	-	Z20C13	X20C13	F.3401	SUS410
	-	-	1.4027	G-X20Cr14	420C29	56B	-	Z20C13M	-	-	SCS2
	4Cr13	-	1.4034	X46Cr13	420S45	56D	2304	Z40CM Z38C13M	X40Cr14	F.3405	SUS420J2
	1Cr17Ni2	431	1.4057	X20CrNi172	431S29	57	2321	Z15CNi6.02	X16CNi16	F.3427	SUS431
	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
	4Cr9Si2	HW3	1.4718	X45CrSi93	401S45	52	-	Z45CS9	X45CrSi8	F.322	SUH1
	0Cr13Al	405	1.4724	X10CrAl13	403S17	-	-	Z10C13	X10CrAl12	F.311	SUS405
	Cr17	430	1.4742	X10CrAl18	430S15	60	-	Z10CAS18	X8Cr17	F.3113	SUS430
	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 · Austenitischer Rostfreier Stahl										
	0Cr18Ni9	304	1.4301	X5CrNi1810	304S15	58E	2332	Z6CN18.09	X5CrNi1810	F.3551; F.3541; F.3504	SUS304
	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
	-	-	1.4308	G-X6CrNi189	304C15	-	-	Z6CN18.10M	-	-	SCS13
	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,
	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
	1Cr18Ni11Nb	347	1.4550	X6CrNiNb1810	347S17	58F	2338	Z6CNNb18.1	X6CrNiTi1811	F.3552	SUS347
Cr18Ni12Mo2Ti	316Ti	1.4571	X6CrNiMoTi17122	320S17	58J	2350	Z6NDT17.12	X6CrNiMoTi17	F.3535	-	

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ISO	Country and Standard · Standardbezeichnung nach Länder										
	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
	<b>Austenitic stainless steel · Austenitischer Rostfreier Stahl</b>										
	-	-	1.4581	G-X5CrNiMoNb1810	318C7	-	-	Z4CNDNb1812M	XG8CrNiMo18	-	SCS22
	Cr17Ni12Mo3Nb	318	1.4583	X10CrNiMoNb1812	-	-	-	Z6CNDNb1713B	X6CrNiMoTiNb17	-	-
	1Cr23Ni13	309	1.4828	X15CrNiSi2012	309S24	-	-	Z15CNS20.1	-	-	SUH309
	0Cr25Ni20	310S	1.4845	X12CrNi2521	310S24	-	2361	Z12CN2520	X6CrNi2520	F.331	SUH310
	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
	1Cr18Ni9Ti	321	1.4878	X12CrNiTi189	321S320	58C	-	Z6CNT18.12	X6CrNiTi1811	F.3523	SU321

ISO	Country and Standard · Standardbezeichnung nach Länder								
	China	USA	Germany	Great Britain	Sweden	France	Italy	Spain	Japan
	<b>Nodular cast iron · GGG</b>								
	QT400-18	60-40-18	GGG40	400/17	0717-02	FGS370-17	GS370-17	FGE38-17	FCD400
	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
	QT600-3	80-60-03	GGG60	600/7	0732-03	FGS600-2	GS600-2	FGE60-2	FCD600
	QT700-2	100-70-03	GGG70	700/2	0737-01	FGS700-2	GS700-2	FGE70-2	FCD700
	QT800-2	120-90-02	GGG80	800/2	0864-03	FGS800-2	GS800-2	FGE80-2	FCD800
	QT900-2	--	--	900/2	--	--	--	--	--
	<b>Grey cast iron · Grauguss</b>								
	--	NO.60	GG40	--	0140	FGL400	--	--	
	HT350	NO.50	GG35	350	0135	FGL350	G35	FG35	FC350
	HT300	NO.45	GG30	300	0130	FGL300	G30	FG30	FC300
	HT250	NO.35	GG25	250	0125	FGL250	G25	FG25	FC250
	HT200	NO.30	GG20	200	0120	FGL200	G20	FG20	FC200
	HT150	NO.20	GG15	150	0115	FGL150	G15	FG15	FC150
	HT100	--	--	100	0110	--	G10	--	FC100



## Fitting dimension tolerance · Passtoleranzen

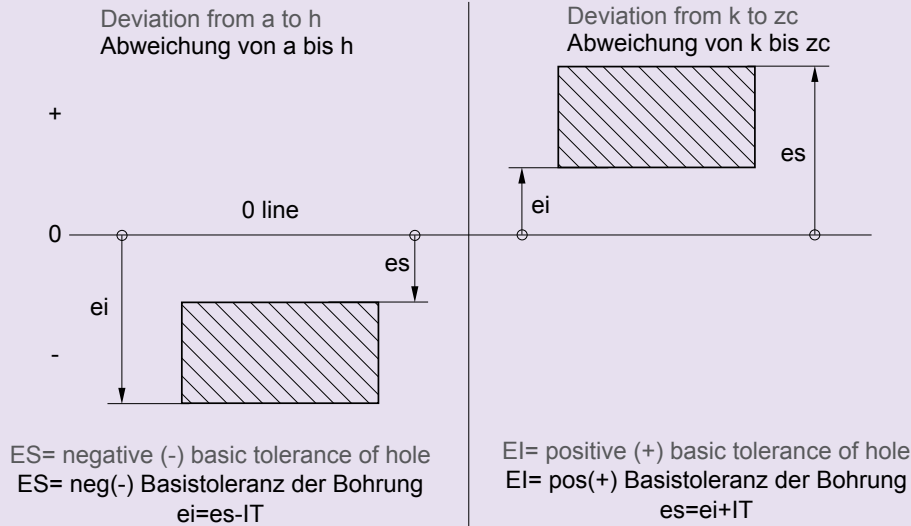
Basic dimensions (mm)		Standard tolerance class of holes · Standard-Toleranzklassen																	
		IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18
>	≤	µm											mm						
---	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.1	0.14	0.25	0.4	0.6	1	1.4
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.3	0.48	0.75	1.2	1.8
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.9	1.5	2.2
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.7	1.1	1.8	2.7
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.3	2.1	3.3
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1	1.6	2.5	3.9
50	80	2	3	5	8	13	19	30	46	74	120	190	0.3	0.46	0.74	1.2	1.9	3	4.6
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.4	2.2	3.5	5.4
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.4	0.63	1	1.6	2.5	4	6.3
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.9	4.6	7.2
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.3	2.1	3.2	5.2	8.1
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.4	2.3	3.6	5.7	8.9
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.5	4	6.3	9.7
500	630	9	11	16	22	32	44	70	110	175	280	440	0.7	1.1	1.75	2.8	4.4	7	11
630	800	10	13	18	25	36	50	80	125	200	320	500	0.8	1.25	2	3.2	5	8	12.5
800	1000	11	15	21	28	40	56	90	140	230	360	560	0.9	1.4	2.3	3.6	5.6	9	14
1000	1250	13	18	24	33	47	66	105	165	260	420	660	1.05	1.65	2.6	4.2	6.6	10.5	16.5
1250	1600	15	21	29	39	55	78	125	195	310	500	780	1.25	1.95	3.1	5	7.8	12.5	19.5
1600	2000	18	25	35	46	65	92	150	230	370	600	920	1.5	2.3	3.7	6	9.2	15	23
2000	2500	22	30	41	55	78	110	175	280	440	700	1100	1.75	2.8	4.4	7	11	17.5	28
2500	3150	26	36	50	68	96	135	210	330	540	860	1350	2.1	3.3	5.4	8.6	13.5	21	33

Note:  
From IT1 to IT5, the standard tolerance with basic dimension more than 500 mm is as trial.  
When the basic dimension 1 mm, the tolerances from IT4 to IT8 are invalid.

Bemerkung:  
Für die Standardt Toleranzen IT1 bis IT5 bei Durchmesser über 500 mm ist eine Anpassung notwendig. Bei Basis abmessungen unter 1 mm ist das Toleranzfeld IT4 bis IT8 ungültig.

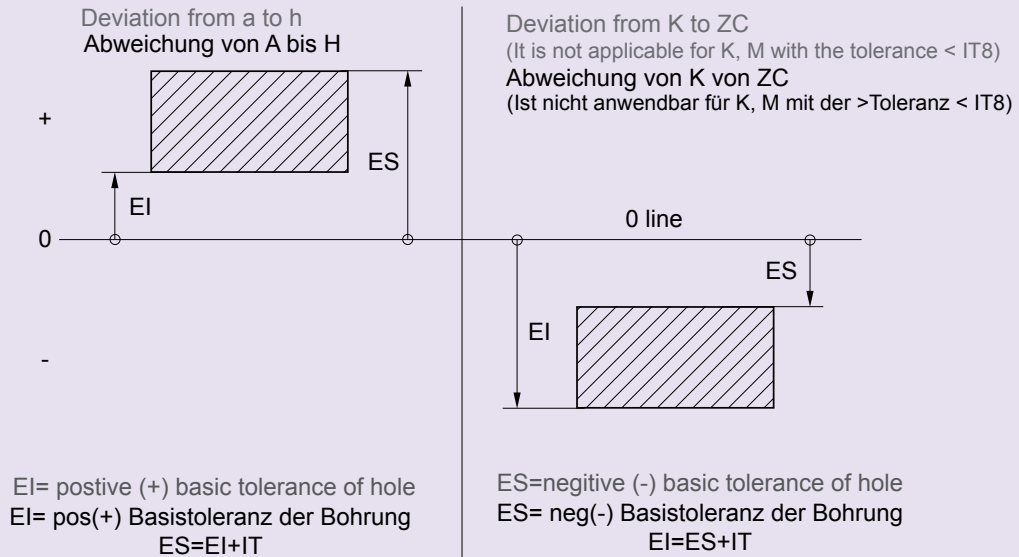
The shaft lower deviation( $ei$ ) and upper deviation ( $es$ ) can be obtained by basic tolerance and standard tolerance ( $IT$ ) of shaft.

Toleranz Einheitswelle: Die geringste Abweichung ( $ei$ ) und die größte Abweichung ( $es$ ) sind als Basis bzw. Standard-Toleranzen ( $IT$ ) in der Tabelle angegeben.



The hole lower deviation( $EI$ ) and upper deviation ( $ES$ ) can be obtained by basic tolerance and standard tolerance ( $IT$ ) of hole.

Toleranz Einheitsbohrung: Die geringste Abweichung ( $EI$ ) und die größte Abweichung ( $ES$ ) sind als Basis bzw. Standard-Toleranzen ( $IT$ )- Bohrung in der Tabelle angegeben.



For example: for a hole with diameter 3 mm and tolerance H7, we can find that the lower deviation  $EI=0$  in relation to H7 from the basic tolerance table, and the standard tolerance  $IT=10\mu\text{m}$  corresponding to H7, thus the upper deviation  $ES=EI+IT=10\mu\text{m}$ . Therefore the hole fitting

dimension is  $\varnothing 3_0^{+0.01}\text{mm}$ .

Beispiel: Bei einem Durchmesser von 3mm und einer Toleranz H7 ist bei der Basis Toleranz H7  $EI=0$  bei der Standard-Toleranz H7 ist es  $IT=10\mu\text{m}$ . Die größte Abweichung ist demzufolge:  $ES=EI+IT=10\mu\text{m}$ .

Die Bohrungstoleranz ist bei einem  $\varnothing 3_0^{+0.01}\text{mm}$ .

# General Technical Inform ▪ Allgemeine Technische Info

- Basic deviations value of shaft
- Basistoleranzwerte Einheitswelle

Diameter Durchmesser Ø (mm)		Basic deviation value · Basistoleranzwerte												
		Upper deviation es · Höchstabweichung												
		Standard tolerance class · Standard-Toleranzklasse												
>	≤	a	b	c	cd	d	e	ef	f	fg	g	h	js	
---	3	-270	-140	-60	-34	-20	-14	-10	-6	-4	-2	0	Die Formel für die Abweichung $\pm \frac{IT_n}{2}$ , ITn ist der IT Wert entsprechend zu "n" zugeordnet.	
3	6	-270	-140	-70	-46	-30	-20	-14	-10	-6	-4	0		
6	10	-280	-150	-80	-56	-40	-25	-18	-13	-8	-5	0		
10	14	-290	-150	-95		-50	-32		-16		-6	0		
14	18													
18	24	-300	-160	-110		-65	-40		-20		-7	0		
24	30													
30	40	-310	-170	-120		-80	-50		-25		-9	0		
40	50	-320	-180	-130										
50	65	-340	-190	-140		-100	-60		-30		-10	0		
65	80	-360	-200	-150										
80	100	-380	-220	-170		-120	-72		-36		-12	0		
100	120	-410	-240	-180										
120	140	-460	-260	-200		-145	-85		-43		-14	0		
140	160	-520	-280	-210										
160	180	-580	-310	-230										
180	200	-660	-340	-240										
200	225	-740	-380	-260		-170	-100		-50		-15	0		
225	250	-820	-420	-280										
250	280	-920	-480	-300		-190	-110		-56		-17	0		
280	315	-1050	-540	-330										
315	355	-1200	-600	-360		-210	-125		-62		-18	0		
355	400	-1350	-680	-400										
400	450	-1500	-760	-440		-230	-135		-68		-20	0		
450	500	-1650	-840	-480										
500	560					-260	-145		-76		-22	0		
560	630													
630	710					-290	-160		-80		-24	0		
710	800													
800	900					-320	-170		-86		-26	0		
900	1000													
1000	1120					-350	-195		-98		-28	0		
1120	1250													
1250	1400					-390	-220		-110		-30	0		
1400	1600													
1600	1800					-430	-240		-120		-32	0		
1800	2000													
2000	2240					-480	-260		-130		-34	0		
2240	2500													
2500	2800					-520	-290		-145		-38	0		
2800	3150													

Note: 1. If basic dimension ≤ 1mm, the basic deviation a and b are not adopted.

Bemerkungen: 1. Bei Abmessungen ≤ 1mm, sind die Basisabweichungen a und b nicht berücksichtigt.

# General Technical Inform - Allgemeine Technische Info

µm

Basic deviation value · Basistoleranzwerte Einheitswelle																			
Lower deviation ei · geringste Abweichung																			
IT5 IT6	IT7	IT8	IT4 IT7	≤IT3 >IT7	Standard tolerance class · Standard-Toleranzklasse														
j			k		m	n	p	r	s	t	u	v	x	y	z	zn	zb	zc	
-2	-4	-6	0	0	+2	+4	+6	+10	+14		+18		+20		+26	+32	+40	+60	
-2	-4		+1	0	+4	+8	+12	+15	+19		+23		+28		+35	+42	+50	+80	
-2	-5		+1	0	+6	+10	+15	+19	+23		+28		+34		+42	+52	+67	+97	
-3	-6		+1	0	+7	+12	+18	+23	+28		+33		+40		+50	+64	+90	+130	
												+39	+45		+60	+77	+108	+150	
-4	-8		+2	0	+8	+15	+22	+28	+35		+41	+47	+54	+63	+73	+98	+136	+188	
											+41	+48	+55	+64	+75	+88	+118	+160	+218
-5	-10		+2	0	+9	+17	+26	+34	+43		+48	+60	+68	+80	+94	+112	+148	+200	+274
											+54	+70	+81	+97	+114	+136	+180	+242	+325
-7	-12		+2	0	+11	+20	+32	+41	+53	+66	+87	+102	+122	+144	+172	+226	+300	+405	
								+43	+59	+75	+102	+120	+146	+174	+210	+274	+360	+480	
-9	-15		+3	0	+13	+23	+37	+51	+71	+91	+124	+146	+178	+214	+258	+335	+445	+585	
								+54	+79	+104	+144	+172	+210	+254	+310	+400	+525	+690	
-11	-18		+3	0	+15	+27	+43	+63	+92	+122	+170	+202	+248	+300	+365	+470	+620	+800	
								+65	+100	+134	+190	+228	+280	+340	+415	+535	+700	+900	
								+68	+108	+146	+210	+252	+310	+380	+465	+600	+780	+1000	
-13	-21		+4	0	+17	+31	+50	+77	+122	+166	+236	+284	+350	+425	+520	+670	+880	+1150	
								+80	+130	+180	+258	+310	+385	+470	+575	+740	+960	+1250	
								+84	+140	+196	+284	+340	+425	+520	+640	+820	+1050	+1350	
-16	-26		+4	0	+20	+34	+56	+94	+158	+218	+315	+385	+475	+580	+710	+920	+1200	+1550	
								+98	+170	+240	+350	+425	+525	+650	+790	+1000	+1300	+1700	
-18	-28		+4	0	+21	+37	+62	+108	+190	+268	+390	+475	+590	+730	+900	+1150	+1500	+1900	
								+114	+208	+294	+435	+530	+660	+820	+1000	+1300	+1650	+2100	
-20	-32		+5	0	+23	+40	+68	+126	+232	+330	+490	+595	+740	+920	+1100	+1450	+1850	+2400	
								+132	+252	+360	+540	+660	+820	+1000	+1250	+1600	+2100	+2600	
			0	0	+26	+44	+78	+150	+280	+400	+600								
								+155	+310	+450	+660								
			0	0	+30	+50	+88	+175	+340	+500	+740								
								+185	+380	+560	+840								
			0	0	+34	+56	+100	+210	+430	+620	+940								
								+220	+470	+680	+1050								
			0	0	+40	+66	+120	+250	+520	+780	+1150								
								+260	+580	+840	+1300								
			0	0	+48	+78	+140	+300	+640	+960	+1450								
								+330	+720	+1050	+1600								
			0	0	+58	+92	+170	+370	+820	+1200	+1850								
								+400	+920	+1350	+2000								
			0	0	+68	+110	+195	+440	+1000	+1500	+2300								
								+460	+1100	+1650	+2500								
			0	0	+76	+135	+240	+550	+1250	+1900	+2900								
								+580	+1400	+2100	+3200								



Technical Info  
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# General Technical Inform ▪ Allgemeine Technische Info

- Basic deviations value of hole
- Basistoleranzwerte Einheitsbohrung

Diameter Durchmesser Ø (mm)		Basic deviation value · Basis-Toleranzwerte Einheitswelle																					
		Lower deviation EI · geringste Abweichung EI											Upper deviation ES · Höchstabweichung ES										
		Standard tolerance class · Standard-Toleranzklasse											IT6	IT7	IT8	≤IT8	>IT8	≤IT8	>IT8	≤IT8	>IT8	≤IT7	
>	≤	A	B	C	CD	D	E	EF	F	FG	G	H	JS	J		K		M		N		P to ZC	
---	3	+270	+140	+60	+34	+20	+14	+10	+6	+4	+2	0	In the formula Deviation = ± $\frac{IT_n}{2}$ , ITn is the IT value corresponding to 'n'. Die Formel für die Abweichung = ± $\frac{IT_n}{2}$ , ITn ist der IT Wert entsprechend zu 'n' zugeordnet.	+2	+4	+6	0	0	-2	-2	-4	-4	Wenn IT ≥ IT7, wird der Δ wert zuaddiert.  If IT ≥ IT7, add a Δ value to the relevant value
3	6	+270	+140	+70	+46	+30	+20	+14	+10	+6	+4	0		+5	+6	+10	-1+Δ		-4+Δ	-4	-8+Δ	0	
6	10	+280	+150	+80	+56	+40	+25	+18	+13	+8	+5	0		+5	+8	+12	-1+Δ		-6+Δ	-6	-10+Δ	0	
10	14	+290	+150	+95		+50	+32		+16		+6	0		+6	+10	+15	-1+Δ		-7+Δ	-7	-12+Δ	0	
14	18													+8	+12	+20	-2+Δ		-8+Δ	-8	-15+Δ	0	
18	24	+300	+160	+110		+65	+40		+20		+7	0		+10	+14	+24	-2+Δ		-9+Δ	-9	-17+Δ	0	
24	30													+13	+18	+28	-2+Δ		-11+Δ	-11	-20+Δ	0	
30	40	+310	+170	+120		+80	+50		+25		+9	0		+16	+22	+34	-3+Δ		-13+Δ	-13	-23+Δ	0	
40	50	+320	+180	+130										+120	+72		+36		+12	0	+18	+26	
50	65	+340	+190	+140		+100	+60		+30		+10	0		+22	+30	+47	-4+Δ		-17+Δ	-17	-31+Δ	0	
65	80	+360	+200	+150										+170	+100		+50		+15	0	+25	+36	
80	100	+380	+220	+170		+120	+72		+36		+12	0		+29	+39	+60	-4+Δ		-21+Δ	-21	-37+Δ	0	
100	120	+410	+240	+180										+190	+110		+56		+17	0	+33	+43	
120	140	+460	+260	+200		+145	+85		+43		+14	0							-26		-44		
140	160	+520	+280	+210										+210	+125		+62		+18	0			
160	180	+580	+310	+230		+170	+100		+50		+15	0							0		-34	-56	
180	200	+660	+340	+240										+230	+135		+68		+20	0			
200	225	+740	+380	+260		+190	+110		+56		+17	0							0		-48	-78	
225	260	+820	+420	+280										+260	+145		+76		+22	0			
260	280	+920	+480	+300		+210	+125		+62		+18	0							0		-68	-110	
280	315	+1050	+540	+330										+260	+145		+76		+22	0			
315	355	+1200	+600	+360		+230	+135		+68		+20	0							0				
355	400	+1350	+680	+400										+290	+160		+80		+24	0			
400	450	+1500	+760	+440		+260	+145		+76		+22	0							0				
450	500	+1650	+840	+480										+320	+170		+86		+26	0			
500	560					+290	+160		+80		+24	0							0				
560	630													+350	+195		+98		+28	0			
630	710					+320	+170		+86		+26	0							0				
710	800												+390	+220		+110		+30	0				
800	900					+430	+240		+120		+32	0						0					
900	1000												+480	+260		+130		+34	0				
1000	1120					+520	+290		+145		+38	0						0					
1120	1250												+430	+240		+120		+32	0				
1250	1400					+480	+260		+130		+34	0						0					
1400	1600												+520	+290		+145		+38	0				
1600	1800					+520	+290		+145		+38	0						0					
1800	2000																						
2000	2240					+520	+290		+145		+38	0						0					
2240	2500																						
2500	2800					+520	+290		+145		+38	0						0					
2800	3150																						



# General Technical Inform - Allgemeine Technische Info

µm

Basic deviation value · Basis-Toleranzwerte Einheitswelle												Δ					
Upper deviation ES · Höchstabweichung ES																	
Standard tolerance class >IT7 · Standard-Toleranzklasse > IT7												Standard tolerance class Standard-Toleranzklasse					
P	R	S	T	U	V	X	Y	Z	ZA	ZB	ZC	IT3	IT4	IT5	IT6	IT7	IT8
-6	-10	-14		-18		-20		-26	-32	-40	-60	0	0	0	0	0	0
-12	-15	-19		-23		-28		-35	-42	-50	-80	1	1.5	1	3	4	6
-15	-19	-23		-28		-34		-42	-52	-67	-97	1	1.5	2	3	6	7
-18	-23	-28		-33		-40		-50	-64	-90	-130	1	2	3	3	7	9
					-39	-45		-60	-77	-108	-150						
-22	-28	-35		-41	-47	-54	-63	-73	-98	-136	-188	1.5	2	3	4	8	12
			-41	-48	-55	-64	-75	-88	-118	-160	-218						
-26	-34	-43	-48	-60	-68	-80	-94	-112	-148	-200	-274	1.5	3	4	5	9	14
			-54	-70	-81	-97	-114	-136	-180	-242	-325						
-32	-41	-53	-66	-87	-102	-122	-144	-172	-226	-300	-405	2	3	5	6	11	16
	-43	-59	-75	-102	-120	-146	-174	-210	-274	-360	-480						
-37	-51	-71	-91	-124	-146	-178	-214	-258	-335	-445	-585	2	4	5	7	13	19
	-54	-79	-104	-144	-172	-210	-254	-310	-400	-525	-690						
-43	-63	-92	-122	-170	-202	-248	-300	-365	-470	-620	-800	3	4	6	7	15	23
	-65	-100	-134	-190	-228	-280	-340	-415	-535	-700	-900						
	-68	-108	-146	-210	-252	-310	-380	-465	-600	-780	-1000						
-50	-77	-122	-166	-236	-284	-350	-425	-520	-670	-880	-1150	3	4	6	9	17	26
	-80	-130	-180	-258	-310	-385	-470	-575	-740	-960	-1250						
	-84	-140	-196	-284	-340	-425	-520	-640	-820	-1050	-1350						
-56	-94	-158	-218	-315	-385	-475	-580	-710	-920	-1200	-1550	4	4	7	9	20	29
	-98	-170	-240	-350	-425	-525	-650	-790	-1000	-1300	-1700						
-62	-108	-190	-268	-390	-475	-590	-730	-900	-1150	-1500	-1900	4	5	7	11	21	32
	-114	-208	-294	-435	-530	-660	-820	-1000	-1300	-1650	-2100						
-68	-126	-232	-330	-490	-595	-740	-920	-1100	-1450	-1850	-2400	5	5	7	13	23	34
	-132	-252	-360	-540	-660	-820	-1000	-1250	-1600	-2100	-2600						
-78	-150	-280	-400	-600													
	-155	-310	-450	-660													
-88	-175	-340	-500	-740													
	-185	-380	-560	-840													
100	-210 -220	-430 -470	-620 -680	-940 -1050													
-120	-250 -260	-520 -580	-780 -840	-1150 -1300													
-140	-300 -330	-640 -720	-960 -1050	-1450 -1600													
-170	-370	-820	-1200	-1850													
	-400	-920	-1350	-2000													
-195	-440 -460	-1000 -1100	-1500 -1650	-2300 -2500													
-240	-550 -580	-1250 -1400	-1900 -2100	-2900 -3200													

D

Technical Info  
Technische Info





## Hardness reference table (conversion of hardness and strength for ferrous metal) Härte Vergleichstabelle (Konversationstabelle von Härte und Zugfestigkeit für Stahl)

Hardness · Härte				Tensile strength Zugfestigkeit N/mm <sup>2</sup>	Hardness · Härte				Tensile strength Zugfestigkeit N/mm <sup>2</sup>
Rockwell hardness · Härte		Vickers hardn. · Härte	Brinell hardn. · Härte		Rockwell hardness · Härte		Vickers hardn. · Härte	Brinell hardn. · Härte	
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.  
Bemerkung: Die in der Tabelle aufgeführten Werte sind für Kohlenstoffstahl anwendbar.

# General Technical Inform - Allgemeine Technische Info

Comparison table for turning inserts chip breaker - Übersichtstabelle der WSP-Spanbrecher

Comparison table for turning inserts chip breaker - Übersichtstabelle der WSP-Spanbrecher																										
ISO	Application Anwendung	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 · Stahl	Wiper-finishing Wiper-Schlichten	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 Schlichten	DF EF	SF HF	PF UF	PF UF	FF1 MF1	FF1 F1	FF FN	11 UF LF	SF	NF3 NS6	PF4 PF5	FH FS	FJ FV	NLU NFA	NLU NFA	TF TS 17	PF01	DP GP VF	CF	VG VF VL	VF	FG FC VF	FASA FG		
	Semi-finishing Schichten-Mittlere Bearbeitung	DM EM	HM	PM QM	PM UM	MF2	F2	FN	MF	NF TF 14 16 17 19	NS6	PS5	SH SA	SW SV MV	NSX	NSU NSC	TS TM AS	PS	HQ CQ CJ	CK DP GP VF XP	VQ VC VB	HMP	WT ML	WT		
	Medium machining -light roughing Mittlere Bearb.-leichte Schruppbearbeitung	DM PM	HR	PM QM	PR UR	M3 MF3	F2	MN	MF	GN PP NR	NM4 NM6	PM5	MV MZ MA	MV MW	NGE NGU	NMU NSF	TM DM	PM	GS CS HS PS	HQ XQ GK G	VM	C25	PC MC MT MG PMR	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 Schruppen	DR		PR QR 31		M5 MR5 MR7		RP UN RN		TNM GN 19	NM9		GH MAT MT		NMU NMX		TH TR TU		PT GT HT	G St-form		HR		RT		
	Single Side roughing Einseitige WSP Schruppen	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	
	Wiper-finishing Wiper-Schlichten	WG		WF WL WMX	WF WK	W-MF2		FW MW	FW MW	WF			PF	SW	FW	NLU-W										
	Finishing Schlichten	EF DF	EF HF	MF	MF UF	FF1 F2 MF1	F1	FF FP	11 UF LF	NF VL	NF4	PF4 PF5	FS	FJ FV	NSU NLU	SS	SS	SS	GU			VF		FG		
	Semi-finishing Schichten-Mittlere Bearbeitung	EF EM	EF 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	SS SM	PS	MS	CK DP GP VF XP			VP2	HMP			
Medium machining -light roughing Mittlere Bearbeitung -leichte Schrubbearbeitung	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	SA S	PM	MS	HQ XQ GK G			HS VP3	C25	EM SU PMR WT	MT		
Wiper medium			WR WM	WM	W-M3		MW RW	MW	WG		PM	MW		NGU -W												
Roughing Schruppen	ER DR	HR	MR QR PR	MR	R7 R8		MP -P		HTW NR	NR4		GH HZ		NMU NMX NHG							VM		ET	CMX		
Single Side roughing Einseitige WSP Schruppen	ER DR HDR LR		HR QR		-56		RP		NM					NMP NHG NHP NHU NHW												

Stainless Steel · Rostfreier Stahl



# General Technical Inform - Allgemeine Technische Info

Comparison table for turning inserts chip breaker - Übersichtstabelle der WSP-Spanbrecher

Comparison table for turning inserts chip breaker - Übersichtstabelle der WSP-Spanbrecher																											
ISO	Application Anwendung	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	
Cast iron - Guss	Wiper-finishing Wiper-Schlichten	WG		WF WM	WF	W-MF2	W-F1	FW MW	FW MW	WF						NLU-W	NLU-W										
	Finishing - Schlichten	DF	HF	KF	F1	F1	FF FN	11 UF LF	NF SM	14 19	PS5				NSU	NSU	VM										
	Semi-finishing Schlichten-Mittlere Bearbeitung	PM	HM	KF KM	M3	F2	FN	MF	GN	14 19	NM5	PS5	GH		NUX NGU	NSU	CM										
	Medium machining light roughing Mittlere Bearbeitung-leichte Schruppbearbeitung	DR	HM HR	KM QM	M3	F2	UN	HP	GN NR		NM6	PM5			NUZ NGU NMI	NMU	CM										
	Wiper medium					W-M3 W-R4 W-R7	M5	MW	MW	WG	NM	PM			NGU-W												
	Roughing Schruppbearbeitung	DR +NMA	HR	KR QR	M5				NR	NR	NR6		GH		NMU												
	Finishing - Schlichten		LC	AL					LF	NF	PM2																
	Semi-finishing Schlichten-Mittlere Bearbeitung		LC	AL		AL		GP		NF PP	AS																
	Medium machining-high roughing Mittlere Bearbeitung- leichtes Schruppbearbeitung		LH	AL		AL		GG-FS MS	HP	NMS																	
	Heat resist. super alloys & Ti- alloys Warmf. Legl. & Ti-Legierung	Finishing - Schlichten	NF EF	NF	NGP	MF1		FS	GT-HP	SF PF	PF SM		PF4	FJ	NSU	NSU											
Semi-finishing Schlichten-Mittlere Bearbeitung		NF NM EM	NF	23	MM	MF1 M1		FS MS	GT-MF	SF PF	PF SM		MJ	NEX NUP	NSK												
Medium machining-high roughing Mittlere Bearbeitung- leichte Schruppen			NM EM	MF	MM UM	M1		MS	MT-LF	PP TF		PS5	MS	NMU	NSK												
Roughing Schruppbearbeitung		ER		SR	MR3 MR4		RP	TF HTW NR					GJ														

# General Technical Inform ▪ Allgemeine Technische Info

## Coated Cemeted Carbide CVD · beschichtetes Hartmetall CVD

ISO	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tunggaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	
P Steel · Stahl	P01	GC4005 GC4205	KCP05 KC9105	AC805P	UE6005 UE6105	T9005 T9105	CA5505	WPP01 WPP05	IC8150 IC9150	TP0500 TK1001		TT8115 TT8125	
	P10	GC1515 GC4015 GC4215 GC4025 GC4225	KCP05 KC9105 KCP10 KC9110	AC810P AC700G	UE6105 UC6110	T9005 T9015 T9115	CA5505 CA5515	WPP10 WPP05	IC8150 IC8250 IC9150 IC9250 IC9015	TP1500 TP0500 TK2001	NC3010	TT8115 TT8125	
	P20	GC4015 GC4215 GC4025 GC4225	KCP10 KCP25 KC9125	AC820P AC900G AC2000	UE6110 UE6020	T9015 T9115 T9025 T9125	CA5525 CA5535	WPP20 WPP10	IC8150 IC8250 IC9250 IC9025	TP2500 TP200	NC3220 NC3120		TT8125 TT3500 TT8115
	P30	GC4025 GC4225 GC4035 GC4235	KCP25 KCP30 KC9125 KC8050	AC830P AC820P AC3000	UE6020 UH6035 US735	T9025 T9125 T9035 T9135	CA5535	WPP30 WPP20	IC8250 IC8350 IC9350	TP2500 TP3500	NV3030 NC5330 NC500H		TT5100 TT8135
	P40	GC4035 GC4235	KCP40 KC9140	AC830P AC3000	UE6035 UH6400	T9035 T9135	CA5535	WPP30 WAP30	IC9350	TP3500 TP40	NC5330		TT8135 TT7100
	M10	GC2015 GC1515	KCM15	AC610M		T9115	CA6515	WAM10	IC8250 IC9250 IC6015	TP200 TM2000 TK2001			TT9215 TT9225
	M20	GC2015 GC2025	KCM15 KCM25 KC9225	AC610M AC630M	US7020	T6020 T9125	CA6515	WAM20	IC8250 IC9350 IC9025 IC6025	TM2000 TP200 TP2500	NC9025		TT5100 TT9225 TT9235
	M30	GC2025 GC4225 GC4235	KCM25 KCM35 KC8050 KC9225 KV9240	AC630M AC830P AV3000	US735	T6030	CA6525	WAM30 WAM20	IC8305 IC9305 IC9025	TP3500 TM4000			TT5100 TT7100 TT9235
	M40	GC4235	KCM35 KC9240 KC9245	AC630M AC830P AC3000	US735	T6030	CA6525	WAM30	IC635	TP3500 TP40			TT7100
	K01	GC3005 GC3205 GC3210	KCK05	AC405K AC410K	UC5005 UC5105 UC5015 UC5115	T5105	CA4505	WAK10	IC5005		NC6205		TT1300
	K10	GC4205 GC3210 GC3215 GC4215	KCK05 KCK15 KC9315 KC4215	AC410K AC415K AC420K AC700G	UC5005 UC5105 UC5015 UC5115	T5105 T5115	CA4505 CA4515 CA4010 CA4115	WAK10 WAK20	IC5005 IC9015 IC9007 IC8150 IC5010 IC428 IC4028 IC9150	TK1001 TK2001 TK1000 TK2000 TP0500	NC6210 NC315K		TT1300 TT7310
	K20	GC3210 GC3215 GC4205 GC4215	KCK15 KCK20 KC9315 KC9325	AC420K AC900G	UC5015 UC5115	T5115 T5125 T9125	CA4515 CA4010 CA4115 CA4125	WAK20	IC5010 IC428 IC4028 IC9150	TK2000 TK2001 TP1500 TP200	NC5330		
K30		KCK20 KC9320 KC9325			T5125	CA4515 CA4120	WAK30		TK2000 TP2500				



# General Technical Inform - Allgemeine Technische Info

## Coated Cemeted Carbide PVD - beschichtetes Hartmetall PVD

ISO	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Walter	Kyocera	Iscar	SECO	Korloy	Ingersoll Tague Tec
P Steel - Stahl	P01							PR915				
	P10	YBG102 YBG105	GC1515 GC1125 GC1025	KG5010 KCU10	VP15TF UP20M	AH710	WSM10	PR930 PR1005	IC507 IC570 IC907 IC908 IC520N			TT9030
	P20	YBG202 YBG205	GC1515 GC1125 GC1025	KG5010 KCU10	VP15TF VP20MF UP20M	AH725 SH730 AH120	WSM10 WSM20 WSM21	PR930 PR1005 PR1025 PR1225	IC520N IC530N IC507 IC570 IC907 IC908	TS2000 TS2500		TT7220 TT9020 TT9030
	P30	YBG302	GC1125 GC2035	KG5025 KCU25	AC530U	AH725 SH730 J740	WSM30	PR660 PR1025	IC3028 IC1008	TS2500	PC5300	TT8020 TT7220 TT9020
P40		GC2035			J740		PR660	IC3028 IC1008				TT8020
M Stainless Steel Rostfreier Stahl	M10	YBG102 YBG105	GC1105 GC1115 GC1025 GC1125 GC1515	KG5010 KCU10	VP15TF UP20M	AH710	WSM10	PR915 PR1005	IC520N IC520 IC507 IC570 IC807 IC907	TS2000	PC8110	TT5030 TT9030 TT9020 TT5080
	M20	YBG202 YBG205	GC1105 GC1115 GC1025 GC1125 GC1515	KG5010 KCU10	VP15TF VP20MF UP20M	AH120 AH725 SH730	WSM10 WSM20 WSM21	PR915 PR930 PR1025	IC530N IC507 IC807 IC907 IC3028 IC1008	TS2000 TS2500	PC5300	TT9030 TT9080 TT9020
	M30	YBG302	GC1125 GC2035	KG5025 KCU25	AC530U	AH725 SH730 J740	WSM20 WSM21 WSM30	PR930 PR1025 PR1125	IC3028 IC1008	TS2500	PC9330	TT8020
	M40		GC2035				WSM30	PR1125 PR1225				
K Cast Iron Guss	K01											
	K10	YBG102			VP15TF	GH110 AH110 AH710				TS2000		
	K20	YBG202	GC5025 KCU25		VP15TF	AH120 AH710			IC1008	TS2000 TS2500		
	K30	YBG302							IC1008	TS2500		TT5030 TT5080
S Heat resist. super all. & Ti- alloys Warmf. Legl. & Ti- Legierung	S01				VP05RT	AH905						
	S10	YBG102 YBG202 YBG105 YBG205	GC1105 GC1115	KG5010 KCU10 KC5510 KCS10	VP05RT VP10RT	AH725 AH110	WSM10	PR1305 PR1310 PR1325	IC507 IC807 IC907	TS2000	PC8110	TT5030 TT15080 TT9080
	S20	YBG202 YBG205	GC1205 GC1125 GC1515	KG5010 KCU10 KC5025 KCU25 KC5525	VP10RT VP15TF	AH725 SH730 AH120	WSM20 WSM21 WSM30	PR1325	IC507 IC807 IC907	TS2000 TS2500	PC5300	TT8020 TT9080
	S30	YBG302		AC520U	VP15TF		WSM30	PR1125	IC3028	TS2500		
N Nonferite Mat. Ne-metalle	N01											
	N10	YBG102 YBG105	GC1125 GC1025 GC1515	KG5410			WXN10		IC520			
	N20			KC5410								



# General Technical Inform - Allgemeine Technische Info

## Cutting material comparison table-Turning - Schneidstoff Vergleichstabelle-Drehen

### ■ Cermet

ISO	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Walter	Kyocera	Iscar	SECO	Korloy	Ingersoll Tague Tec	
P Steel - Stahl	P01	CT5005	KTP15	T110A				TN30 TN6010 PV30 PV60 PV7010	IC520N		CC105	PV3010 CT3000	
	P10	CT5005 CT5015 GC1525	HT2 TTI 15 KT315 KT325	T110A T1200A T1500A	NX1010 NX33 NX55 NX99 AP25N VP25N	NS520 NS730 AT520 GT530 GT730		TN30 TN60 PV90 TN6020 PV7020 PV7010 PV7025	IC520N IC530N IC20N	C15M CMP TP1020 TP1030	CN1000 CC115	PV3010 CT3000	
	P20	CT5015 GC1525 CT530	TTI 15 KT315 KT325	T1200A T1500A T2000Z	NX2525 NX33 NX99 AP25N VP25N UP35N	NS520 NS730 NS530 AT530 GT530 GT730 J530		TN60 TN6020 PV90	IC530N IC20N IC30N	C15M CMP	C125 CN20 CN2000		
	P30			T1200A T3000Z	UP35N VP45N	NS530		TN60 TN90 TN6020	IC30N		CN30		
M Stainless Steel	M10	CT5005 GC1525 CT530	HT2 KTP15 KT315 KT325	T1200A T1500A	NX2525 AP25N			TN60 TN90 TN6020 TN6010 TN7010 TN7025	IC520N IC530N IC20N	C15M		PV3010 CT300	
	M20	CT5015	HT2	T1200A T1500A T2000Z		J530		TN60 PV90 TN6020 PV7020 TN90	IC520N IC20N IC530N IC30N	C15M TP1020		PV3010 CT300	
	M30			T3000Z		J530			IC30N				
	M40												
K Cast Iron	K01		HT2 KTP15	T110A T1200A T1500A				TN30 PV7005			CN1000	PV3010 CT300	
	K10	CT5005 CT5015 AT520	HT2 KT315 KT325	T110A T1200A	NX1010 AP25N	NS520 GT520 NC530		TN30 PV30				PV3010 CT300	
	K20	CT5015		T110A	NX2525 AP25N	NS520 NS530 GT520							
	K30												
S Ti- alloys Warmt. Legl. & Ti-Legierung	S01												
	S10												
	S20												
	S30												
N Nonferre Mat. Ne-metalle	N01	CT5005	HT2 KT325										
	N10	CT5005 CT5015	HT2										
	N20												




Technical Info  
Technische Info



## Cutting material comparison table-Turning · Schneidstoff Vergleichstabelle-Drehen

### ■ Carbide uncoated · Hartmetall Unbeschichtet

ISO	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tunggaloy	Walter	Kyocera	Iscar	SECO	Korloy	Ingersoll Tague Tec
Nonferre Mat. Ne-metalle 	N01			H1	RT9005	KS05F						
	YD101 YD201	H10 H13A	THM-F HWK10 HWK15 K313 KU10 K68	H1	RT9005 HT110	KS05F	WK01 WK10	KW10	IC20	KX HX	H01	K10
	YD101 YD201		THM-F HWK10 HWK15						IC20	KX HX		



# General Technical Inform - Allgemeine Technische Info

## CVD milling grades - CVD Fräsen Klasse

Material / Class	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec
Steel - Stahl	P05	K20W GC4220			F7010							
	P10	K20W GC3040 GC4220 GC4230		ACP100	F7010				IC4100 IC5100	MP1500	NC5330 NCM325	IN6505 IN6520
	P20	GC3040 GC4230		CS3000	FH7020	T3130		WKP25 WKP25S	IC4050 IC4100 IC5100 IC5400	MP1500 MP2500 MS2500 T25M	NC5330 NCM325	IN6505 IN6520 IN7035
	P30	GC2040 GC4240	KC930M KC935M	CS3000	F7030	T3130		WKP35 WKP35S WTP35	IC4050 IC5400	MK3000 T25M T350M	NCM325	IN7035 IN6530
	P40	GC2040 GC4240								T350M		IN6530
Stainless Steel Rostfreier Stahl	M10	GC4230			F7010					MP1500	NCM325 NC5330	IN6520
	M20	GC4230			F7020	T3130			IC4050	MP1500 MP2500 MS2500 T25M	NCM325 NCM335	IN7035 IN6520 IN6505
	M30	GC2040 GC4240	KC930M KC935M		F7030	T3130		WTP35		MP2500 MS2500 T25M T350M	NCM335	IN6530 IN7035 IN6505
	M40	GC2040 GC4240								T350M		IN6530
Cast Iron - Guss	K05		KCK15		F7010 MC5020				DT7150 IC4100			
	K10	K20W	KCK15	ACK200	F7010 MC5020	T1115		WAK15	DT7150 IC4100 IC4010	MP1500 MK1500	NC5330	IN6520
	K20	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



Technical Info  
Technische Info

## CVD milling grades - CVD Fräsen Klasse

Material / Class	S05	S10	S20	S30	N05	N10	N20	H05	H10	H20
<b>Hadened materiel</b> Hd-metalle										
<b>Nonferrite materials</b> Ne-metalle										
<b>Super alloys</b> Ti-Legierung										
<b>ZCC-CT</b>										
<b>Sandvik</b>				GC2040					K20W	K20W GC3040
<b>Kennametal</b>										
<b>Sumitomo</b>										
<b>Mitsubishi</b>										
<b>Toshiba Tungaloy</b>										
<b>Kyocera</b>										
<b>Walter</b>						WTP35				
<b>Iscar</b>										
<b>SECO</b>	MK3000		MP2500 MS2500 T25M	MN4500 T350M			MP2500 25M			
<b>Korloy</b>										
<b>Ingersoll Tague Tec</b>			IN7035 IN6520							



# General Technical Inform - Allgemeine Technische Info

## PVD milling grades - PVD Fräsen Klasse

Material / Class	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tunggaloy	Kyocera	Walter	Iscar	SECO	Korloy	Ingersoll Tague Tec	
Steel - Stahl	P05			ACZ120	VP05HT	GH130			IC903				
	P10	GC1010 GC1025 GC1020	KC522M KC525M KC610M KC843M KC715M	ACZ10M ACZ20W	VP10H	AH120 GH130	PR730 PR1225 PR1525	WHX15 WHH15 WXM15	IC903 IC950 IC1008	F15M		IN2004 IN2006	
	P20	GC1020 GC1025 GC1010 GC2030	KC522M KC525M KC843M 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	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 IC908 IC908	F30M MP3000		PC3500 PC3600 PC5300 PC3545 PC9570T	IN1030 IN2005 IN2015 IN2030 IN2035 IN2040 IN2505 IN2530 IN4035
	P40	GC1030	KC735M	ACP300 ACZ350	ACP300 ACZ350	AH140 AH750		WXP45 WSP45 WSP46	IC300 IC328 IC928	F40M		PC5300 PC3545	IN2035 IN2040
	M10	GC1020	KC522M KC610M KC643M KC715M	ACZ20W ACZ350 EH20Z	ACZ20W ACZ350 EH20Z	AH330 GH110 GH130	PR730 PR1225 PR660 PR1525		PR730 PR660 PR1225 PR1525	F15M		PC8110	IN2505
	M20	GC1020 GC1025 GC1030 GC203	KC522M KC525M KC610M KC715M KC725M	ACP200 ACZ50M ACZ20M 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	GC1040 GC203	KC525M KC530M KC725M KC735M	ACP300 ACZ50M 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	ACP300 ACX80	AH140 AH750 GH330 GH640		WSM35 WSM36 WXM35		F40M		PC3545	IN1030 IN2030 IN2035 IN2530 IN4035
	K05	GC1010	KC510M	ACZ10M ACZ120 ACZ310		AH330	PR905 PR1210 PR1510			MH1000		PC8110	IN2510
	K10	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 IC908 IC908 IC1008	F25M MK2000 MC3000		PC6510 PC5300	IN1030 IN2004 IN2010 IN2015 IN2030 IN2505
K30	GC1020	KC620M KC725M	ACK300 ACZ50M					IC328 IC830 IC900 IC908 IC350 IC908 IC908	F30M F40M MP3000		PC5300 PC9570T	IN2005 IN2015 IN2030 IN2505	



Technical Info  
Technische Info

# General Technical Inform - Allgemeine Technische Info

## PVD milling grades - PVD Fräsen Klasse

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



## Uncoated milling grades · Unbeschichtet Fräsen Klasse

ISO	ZCC-CT	Sandvik	Kennametal	Sumitomo	Mitsubishi	Toshiba Tungaloy	Walter	Kyocera	Iscar	SECO	Korloy	Ingersoll Tague Tec
Nonferre Mat. Ne-metalle N	N01	H10	K115M K110M				WK10		IC20N		H01	IN04S
	N10	YD101	K313	EH520	HT110		WKM	GW25	IC08	H15	G10	IN10K IN05S
	N20	YD201	KMF	EH520	TF15		KMG40		IC28	H25		IN15K



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175.32-24	A96
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APKT-PF	B186
APKT-PM	B186
APKT-PR	B186
APMT_PDER	B187
APMT_PDR	B187

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CCGT-USF	A98
CCGW	A134
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CCGX-LH	A100
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CCMT-EF	A99
CCMT-EM	A99
CCMT-HF	A98
CCMT-HM	A99
CCMT-HR	A100
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SNMG-EM	A75
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Overview Parts of turning tools - Übersicht Ersatzteile für Drehwerkzeuge

Clamping system Klemmsystem	Tool Type Werkzeug Typ	Screw Schraube		Screw Schraube	Lever Kniehebel	Shim pin Rohrstift	Spring Feder	Clamp Stud Passstift	Clamp Pratze	Shim Unterlagen										Wrench Schlüssel																			
		CM* x A/B	CM* x C	SM* x*	FM x*	GB*→M*	DM* x X	LE M* x A	L* A	L* B	L* C	L* D	SP*	SPR*	P**	TM x*	C* RD	C* RH	C* R* T	C* R C	C* BM	D* BM	S* BM	T* BM	V* BM	W* BM	R* BM	C* BS	D* BS	V* BS	V* BSC	S* BS	P* T* S	W* T* P	W* H* L	W* RL			
		Page	Seite																																				
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	MSDNN																																						
	MTGNR/L																																						
	MTJNR/L																																						
	MTFNR/L																																						
	MVVNN																																						
	MVJNR/L																																						
	MWLNRL																																						
	MRGNRL																																						
	MRDNN																																						
	<b>S</b>	SCACR/L																																					
		SCLCR/L																																					
SDACR/L																																							
SDJCR/L																																							
SDNCN																																							
SVJBR/L																																							
SVABR/L																																							
SVVBN																																							
SVVCN																																							
SVJCR/L																																							
SSBCR/L																																							
SSDCN																																							
SSKCR/L																																							
SSSCR/L																																							
STACR/L																																							







































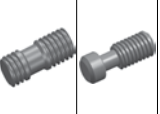
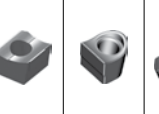
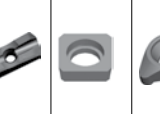
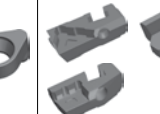
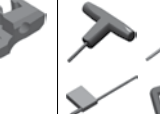




















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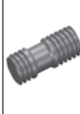
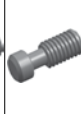











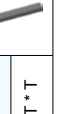

















Overview Parts of milling tools - Übersicht Ersatzteile für Fräser










Clamping system Klemmsystem	Tool Type Werkzeug Typ	Page Seite	Screw Schraube		Screw Schraube		Wedge Keil		Shim Unterlagen		Clamp Pratze	Cassette Kassette				Wrench Schlüssel					
																					
			SM* x*XA	IM* x*	GB*-M*	LO M* x*	DM* x*X	WM*x*	W*R/L	W*N	LLN*R-ZR	S*BS	WD**	LSE*R/L	LOF*R/L	LSP*R/L	LTP*R/L	WD*	CBH*R*	WT*IS	WT*P
	<b>FMA01</b> 		✓	✓						✓								✓		✓	
	<b>FMA02</b> 			✓														✓			
	<b>FMA03</b> 				✓	✓		✓				✓							✓	✓	
	<b>FMA04</b> 			✓														✓			
	<b>FMA04</b> 				✓	✓		✓					✓						✓	✓	
	<b>FMA07</b> 			✓														✓			✓
	<b>FMA07</b> 			✓														✓			✓
	<b>FMA11</b> 				✓	✓															
	<b>FMD02</b> 			✓														✓			
	<b>FMD02</b> 					✓			✓												✓
	<b>FMD03</b> 			✓						✓								✓			✓
	<b>FME02</b> 			✓														✓			
	<b>FME03</b> 				✓		✓	✓					✓								✓
	<b>FME04</b> 			✓						✓								✓			
	<b>FMP01</b> 				✓		✓	✓						✓				✓			
	<b>FMP02</b> 		✓	✓							✓							✓		✓	

Clamping system Klemmsystem	Tool Type Werkzeug Typ	Page Seite	Screw Schraube		Screw Schraube		Wedge Keil		Shim Unterlagen		Clamp Pratze	Cassette Kassette				Wrench Schlüssel					
																					
			SM* xXA	IM* x*	GB*-M*	LO M* x*	DM* xX	WM*x*	W*R/L	W*N	LLN*R-ZR	S* BS	WD**	LSE*R/L	LOF*R/L	LSP*R/L	LTP*R/L	WD*	CBH*R*	WT* IS	WT* P
	<b>FMP03</b> 			✓														✓			✓
	<b>FMR01</b> 			✓														✓			
	<b>FMR02</b> 			✓														✓			✓
	<b>FMR03</b> 			✓																	
	<b>FMR04</b> 			✓							✓										✓
	<b>EMP01</b> 			✓																	✓
	<b>EMP02</b> 			✓														✓			
	<b>EMP03</b> 			✓														✓			
	<b>EMP04</b> 			✓														✓			
	<b>EMP05</b> 			✓																	✓
	<b>BMR01</b> 			✓														✓	✓		
	<b>BMR02</b> 			✓														✓			
	<b>BMR03</b> 			✓												✓	✓	✓	✓		✓
	<b>BMR04</b> 			✓															✓		✓
	<b>SMP01</b> 			✓														✓			

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Overview Parts of milling tools · Übersicht Ersatzteile für Fräser

Clamping system Klemmsystem	Tool Type Werkzeug Typ	Page Seite	Screw Schraube		Screw Schraube		Wedge Keil		Shim Unterlagen		Clamp Pratze	Cassette Kassette					Wrench Schlüssel				
																					
			SM* x*XA	IM* x*	GB*-M*	LO M* x*	DM* x*X	WM*x*	W*R/L	W*N	LLN*R-ZR	S* BS	WD**	LSE*R/L	LOF*R/L	LSP*R/L	LTP*R/L	WD*	CBH*R*	WT* IS	WT* P
	<b>SMP03</b> 		✓															✓	✓		
	<b>FME03</b> 																				
	<b>XMR01</b> 		✓																✓		
	<b>XMP01</b> 		✓																✓		
	<b>TMP01</b> 		✓								✓							✓			✓
	<b>HMP01</b> 		✓															✓			
	<b>HMP01 EC</b> 		✓	✓														✓		✓	
	<b>CMZ01</b> 		✓															✓			
	<b>CMA01</b> 		✓															✓			
	<b>CMD01</b> 		✓															✓			
	<b>QCH-XPHT</b> 		✓													✓	✓	✓	✓		✓
	<b>QCH-SDMT</b> 		✓								✓							✓	✓		
	<b>QCH-WPGT</b> 		✓								✓								✓		
	<b>QCH-AZGT</b> 		✓															✓	✓		
	<b>QCH-RD</b> 		✓																✓		✓
	<b>QCH-ZOHX</b> 		✓																✓		✓

<b>Test Report Versuchsprotokoll</b>		ZCC Cutting Tools Europe GmbH			
<b>Date</b>					
<b>General</b>	<b>Allgemein</b>	End User / Anwender		Distributor / Händler	
Company	Firma				
Contact person	Gesprächspartner				
<b>Machine</b>	<b>Maschine</b>				
Type	Typ				
Producer	Hersteller				
Power (kW)	Leistung (kW)				
Adaptor / Tooling System	Werkzeugaufnahme				
<b>Workpiece</b>	<b>Werkstück</b>				
Material	Werkstoff				
Hardness / Tensile Strength	Härte / Zugfestigkeit N / mm <sup>2</sup>				
Heatreatment / Surface	Wärmebeh. / Oberfläche				
Interrupt cutting	Schnittunterbrechungen				
<b>Cutting tools</b>	<b>Werkzeug</b>				
Producer / Supplier	Hersteller (Halter)				
Toolholder / Milling body	Halter Bezeichnung				
Teeth Z	Zähnezahl Z				
Producer / Soppplier	Hersteller (Werkzeug)				
Insert type / Tool Nr.	Platten-Typ / Werkzeug Nr.				
Grade	Schneidstoff Sorte				
Solid carbide tools art	Vollhartmetallwerkzeug Nr.				
Cooling	Kühlmittel int. / ext.				
<b>Cutting Data</b>	<b>Schnittdaten</b>				
RPM $n = U / \text{min}$	Drehzahl $n = U / \text{min}$				
Cutting speed $V_c = m / \text{min}$	Schnittgeschw. $V_c = m / \text{min}$				
Feed rate $f = \text{mm} / r$	Vorschub $f = \text{mm} / U$				
Feed rate $V_f = \text{mm} / \text{min}$	Vorschubgeschw. $V_f = \text{mm} / \text{min}$				
Depth of cut $a_p$ mm	Schnitttiefe $a_p = \text{mm}$				
Depth of cut $a_e$ mm	Schnittbreite $a_e = \text{mm}$				
Machining length mm	Eingriffslänge mm				
Cutting time T min	Eingriffszeit T mm				
<b>Results</b>	<b>Ergebnis</b>				
Machined pieces / Edge	Anzahl Werkst. / Schneidkante				
Surface quality	Oberfläche Werkstück				
Flankwear VB	Freiflächenverschleiß VB				
Criteria	Kriterium				
Notch Wear	Kerbverschleiß				
Crater Wear	Kolkverschleiß				
Plastic deformation	Plastische Verformung				
Built-up edge	Aufbauschneidenbildung				
Insert breakage	Plattenbruch				
Cutting edge breakage	Schneidkantenbruch				
<b>Chipforms</b>	<b>Spanformen</b>				
<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">1</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">2</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">3</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">4</span>  </div> </div>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">5</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">6</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">7</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">8</span>  </div> <div style="display: flex; align-items: center;"> <span style="margin-right: 10px;">9</span>  </div> </div>	○	○	○	○
		<b>Conclusion / Zusammenfassung</b>			
<b>Fax: 0049-211-989240-111</b> E-mail: info@zccct-europe.com		Sign / Unterschrift _____			

