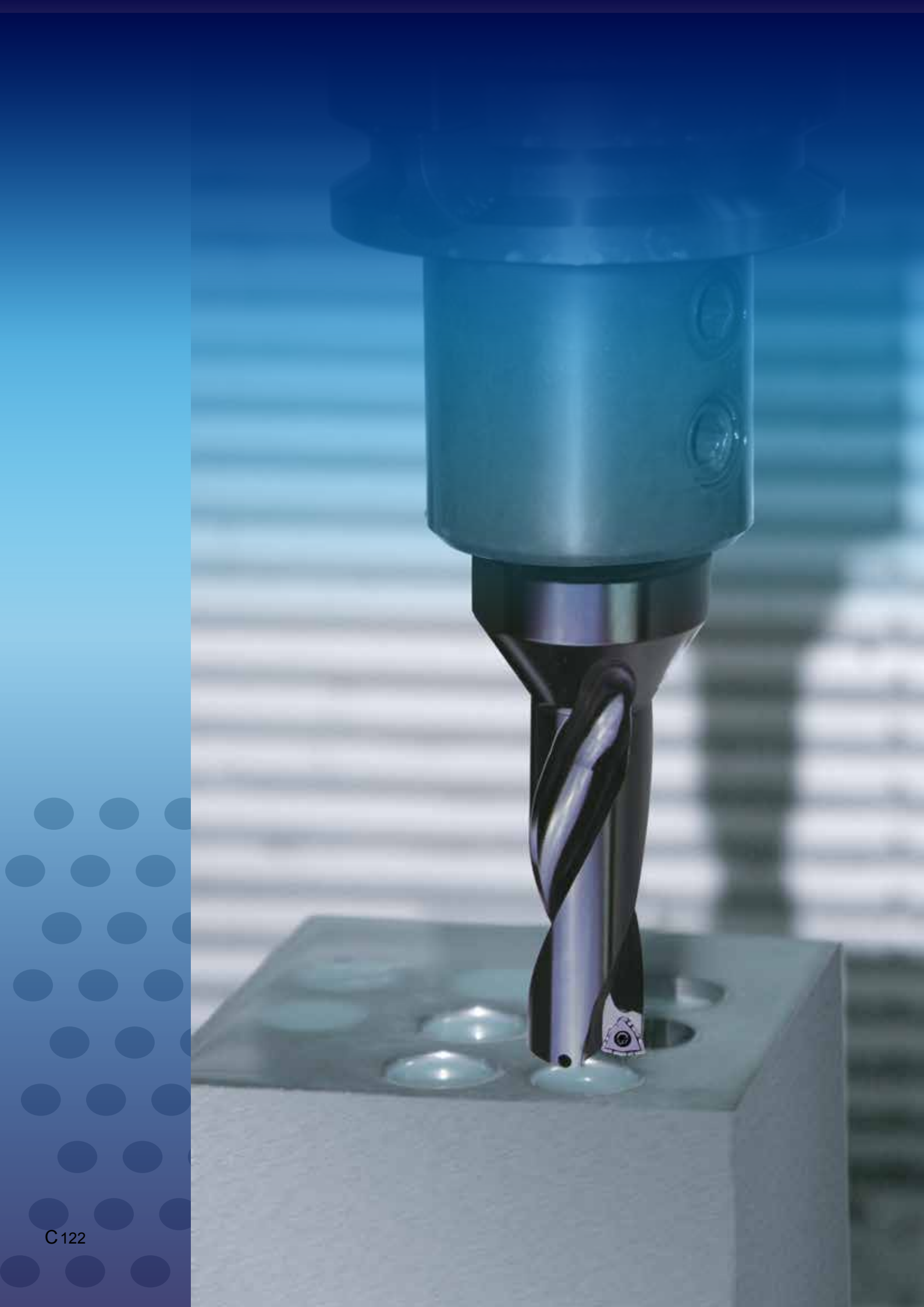


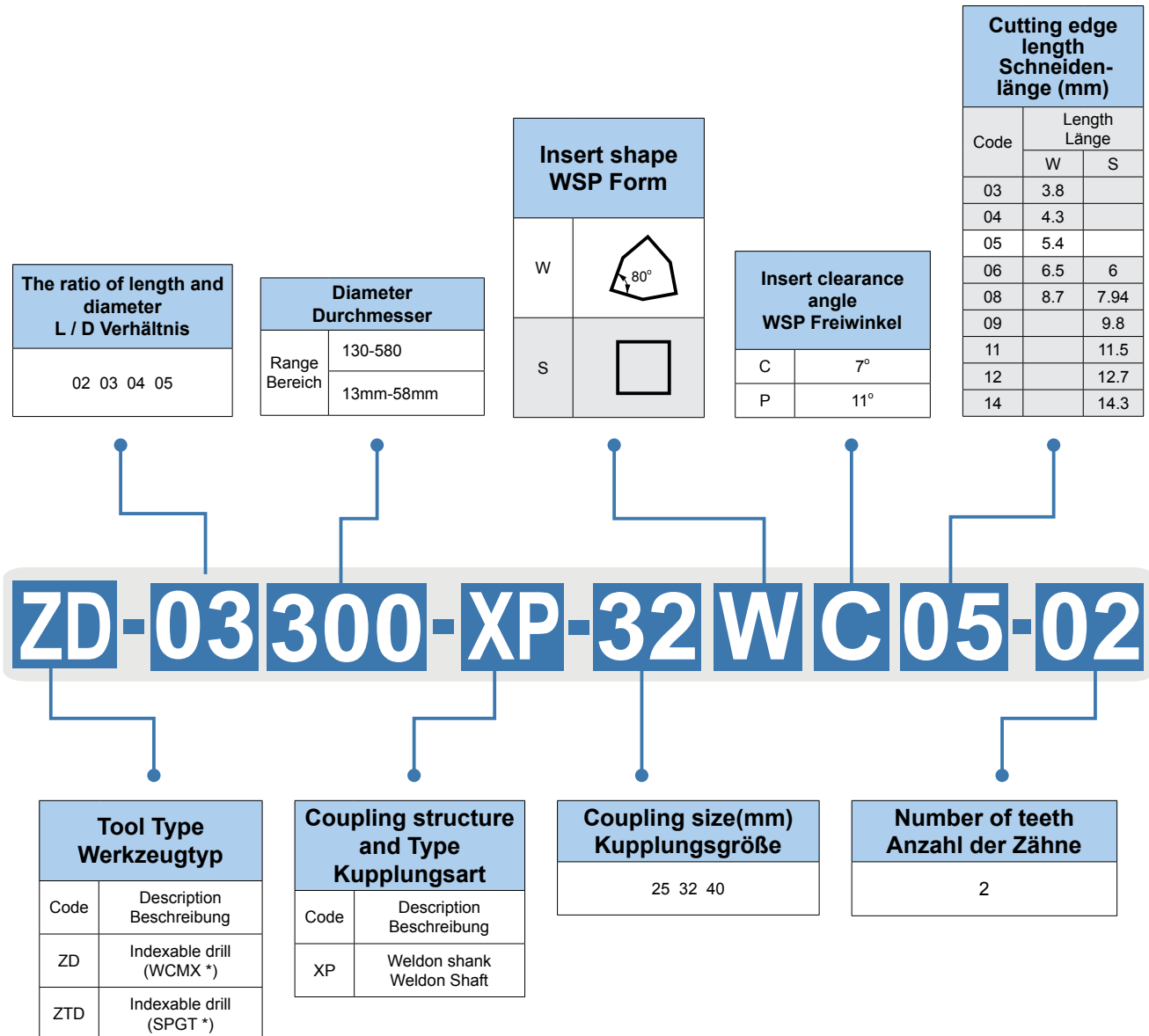
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	Milling - Solid Carbide Endmills Fräsen VHM - Schaftfräser	B 222 - B 498
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WSP = Wendeschneidplatte VHM = Vollhartmetall



Indexable drill Code Key · ISO Kennzeichnung WSP- Bohrern



C

Indexable drills
WPS-Bohrer

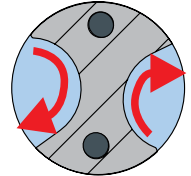
Drilling · Bohren

Indexable drill · Wendeschneidplattenbohrer

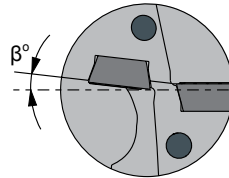
ZTD - Serie

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 / Außenschniede) SPGT07T308-PM / YBG212 (inner insert / Innenschniede)	Comparison Vergleich	Number of drilling Anzahl Bohrungen ZTD04 Competitor A Wettbewerb A	
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	ZTD04-260-XP25-SP07-02 Competitor A Wettbewerb A	

ZTD-Serie

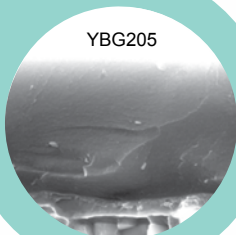
Optimised edge design for stable operation with new chip breaker design / *Optimierte Schneidkante, stabile Bearbeitung, neuartiger Spanbrecher*

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*



Outer insert
Äußere Schneide

YBG205



YBG205

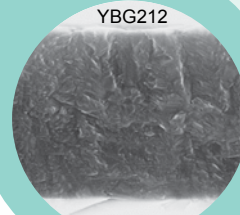
New nano coating structure with good hardness and wear resistance, but also good toughness. Ultra fine surface design prevent friction for best chip flow. Excellent thermal and chemical wear resistance. Best choice for all material also for stainless steel and high alloy material.

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.



Inner insert
Innere Schneide

YBG212



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

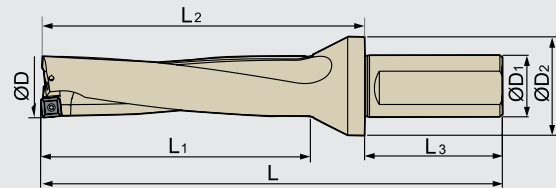
	42CrMo(HRC25)	Cooling system Kühlsystem	Doublehelix Internal cooling Doppelhelix-Innenkühlung	
		Type Typ	ZTD04-240-XP25-SP07-02 SPGT07T308-PM/YBG205 (outer insert / Außenschneide) SPGT07T308-PM/YBG212 (inner insert / Innenschneide)	Competitor A Wettbewerb A
		Compare Vergleich (after 15 min / nach 15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

Drilling ▪ Bohren

Indexable drill ▪ Wendeschneidplattenbohrer

ZTD02

2D

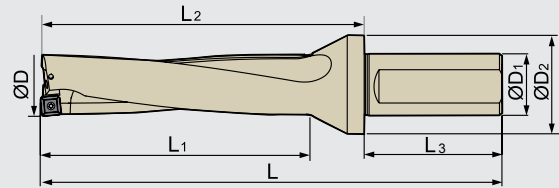


Type Typ	Stock Lager	Dimension Abmessung (mm)							Insert WSP	Screw Schraube	Wrench Schlüssel
		ØD	ØD1	ØD2	L3	L2	L1	L			
ZTD02-130-XP20-SP05-02	●	13	20	25	50	47	32	97	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-140-XP20-SP05-02	●	14	20	25	50	49	34	99	SPGT050204-PM/EM	160M2X4.3	WT06IP
ZTD02-150-XP20-SP05-02	●	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 ₁	ØD ₂	L ₃	L ₂	L ₁	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

C

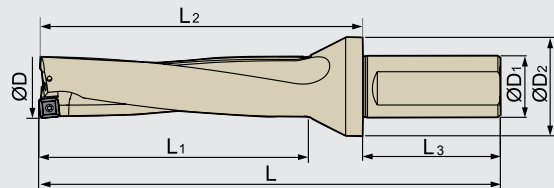
Indexable drills
WPS-Bohrer

Drilling • Bohren

Indexable drill • Wendeschneidplattenbohrer

ZTD04

4D



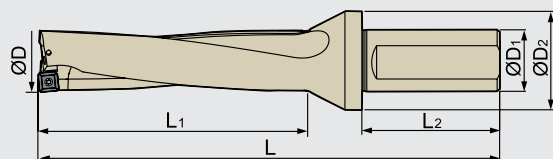
Type Typ	Stock Lager	Dimension Abmessung (mm)							Insert WSP	Screw Schraube	Wrench Schlüssel
		ØD	ØD1	ØD2	L3	L2	L1	L			
ZTD04-130-XP20-SP05-02	○	13	20	25	50	74	57	124	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-140-XP20-SP05-02	●	14	20	25	50	78	61	128	SPGT050204-PM/EM	I60M2.0×4.3	WT06IP
ZTD04-150-XP20-SP05-02	●	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

C

Indexable drills
WPS-Bohrer

ZTD05

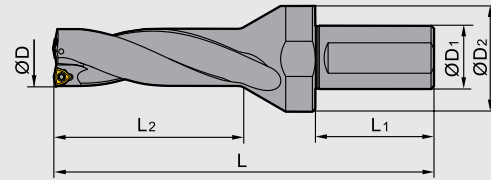
5D



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

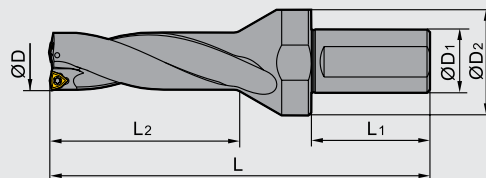
ZD03



Type Typ	Stock Lager	Basic dimension(mm) Abmessungen						Inserts WSP	Screw Schraube	Wrench Schlüssel
		D	D ₁	D ₂	L ₁	L ₂	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	D1	D2	L1	L2	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

C

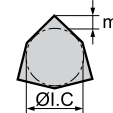
Indexable drills
WPS-Bohrer

Drilling · Bohren

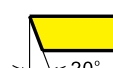
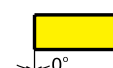
Indexable drill · Wendeschneidplattenbohrer

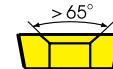
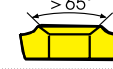
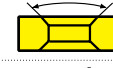
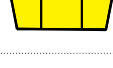
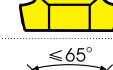
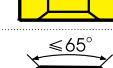
Inserts Drills Code Key · ISO Kennzeichnung Wendeschneidplatten

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					

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

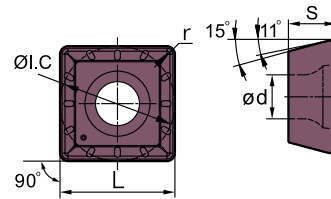
C

Indexable drills
WPS-Bohrer

Drilling · Bohren

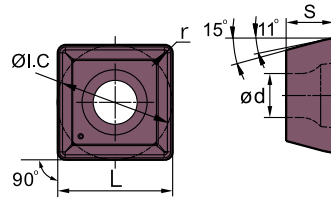
Indexable drill · Wendeschneidplattenbohrer

■ 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



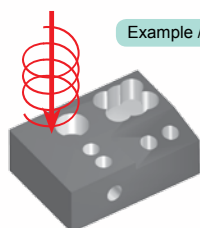
Type Typ	Dimension Abmessung (mm)						Grade Sorte	
	L	ØI.C	s	ød	r		YBG205 outer insert Außenschnide	YBG212 inner insert Innenschnide
SPGT050204-EM	5	5	2.38	2.2	0.4		•	•
SPGT060204-EM	6	6	2.38	2.6	0.4		•	•
SPGT07T308-EM	7.94	7.94	3.97	2.8	0.8		•	•
SPGT090408-EM	9.8	9.8	4.3	4.2	0.8		•	•
SPGT110408-EM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

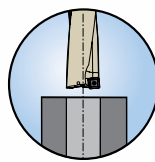
■ Material Overview · Material Übersicht

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

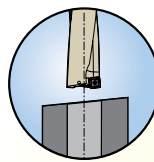
Grade Sorte	Workpiece material · Werkstückstoff										
	Mild steel Baustahl HB≤180	Carbon steel Alloy Steel Kohlenstoff-, Legierter Stahl	Hardened steel · Gehärteter Stahl			Stainless steel Rostfreier Stahl	Cast iron Gusseisen	Nodular cast iron GGG Kugelgraphitguss	Aluminum alloy Aluleg.	Copper alloy Kupferleg.	Heat resist. alloy Warmfeste Leg.
			~40HRC	~50HRC	~60HRC						
SPGT*- PM	✓	✓				✓	✓	✓			



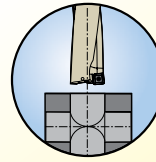
Example / Beispiel



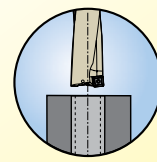
1 General boring
Allgemeine Bohrung



2 Inclined plane
Schiefe Ebene

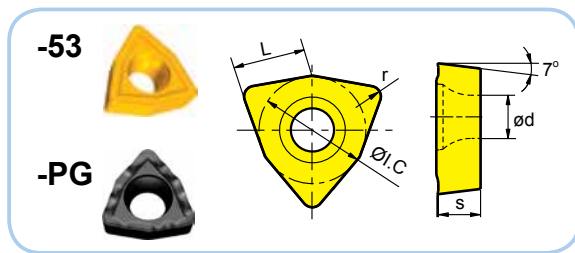


3 Cross hole
Kreuzbohrung



4 expansion boring
Expansionsbohrung

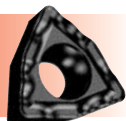
Indexable inserts for drilling · WSP zum Bohren



● Ideal Machining Condition Gute Bearbeitungsbedingungen		● Normal Machining Condition Normale Bearbeitungsbedingungen		● Unfavorable Machining Condition Ungünstige Bearbeitungsbedingungen	
Workpiece Material Werkstoffe					
P Steel / Stahl	●	●	●	●	●
M Stainless Steel Rostfreier Stahl	●	●	●	●	●
K Cast Iron Gusseisen	●	●	●	●	●
N Non-ferrous material Nichtmetalle					●
S Heat-resistant steel Wärmebeständiger 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
Bohrwendeplatten Übersichtstabelle - Sorten

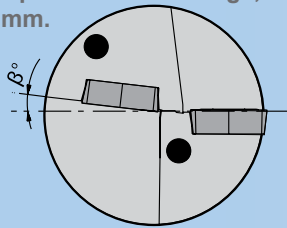
Workpiece material Werkstück Material	ISO	Coating - Beschichtung		Cermet Cermet	uncoated carbide unb. Hartmetall	PCBN & PCD PCBN & PKD
		CVD	PVD			
P Steel - Stahl	P01					
	P10		YBG202 YBG205 YBG212			
	P20	YBD252				
	P30					
	P40					
M Stainless Steel Rostfreier Stahl	M01					
	M10		YBG202 YBG205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

C

Indexable drills
WPS-Bohrer

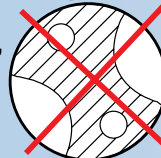
Features of drill · Merkmale der WSP-Bohrer

- 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

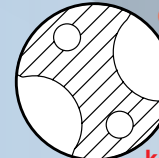


Small chip pocket
Easy to generate chips
jamming

kleiner Spanraum,
Spanstau.



Competitor
Wettbewerber

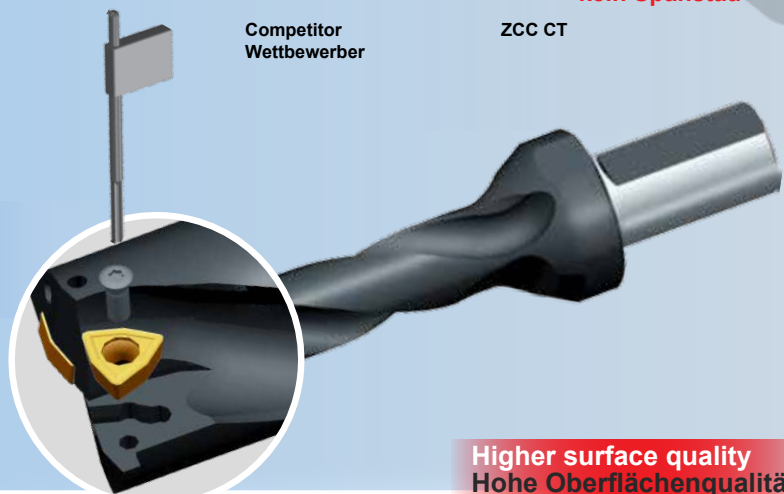


Large chip pocket
Chip jamming
free

Großer
Spanraum
kein Spanstau

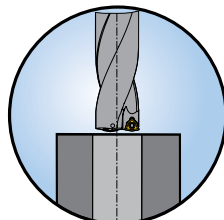
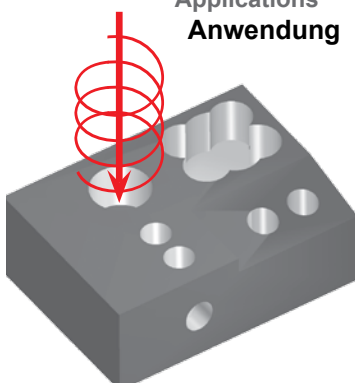
ZCC CT

Insert assembling WSP Wechsel

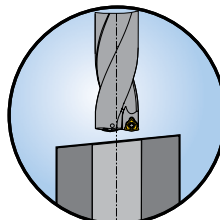


Higher surface quality
Hohe Oberflächenqualität

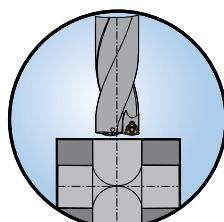
Applications Anwendung



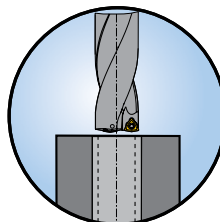
1. Common drilling
Normalbohren



2. Slant face drilling
Schrägbohren



3. Cross-hole drilling
Bohren bei
Querbohrungen



4. Counterboring
Aufbohren



Better chip breaking performance
Gute Spankontrolle

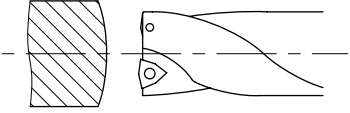
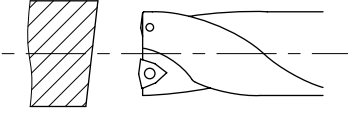
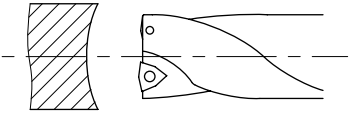
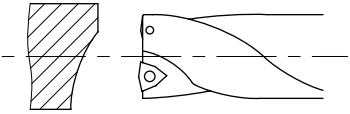
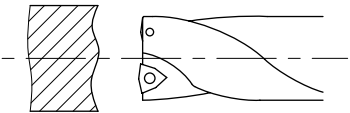


Technical information for shallo drills · Technische Informationen über WSP-Bohrer

■ 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
	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. Bei konvexen Anbohrflächen ist die Bearbeitungssituation relativ gut. Der erste Kontakt des Bohrers geschieht über die Zentrumschneide, so daß normale Vorschübe gewählt werden können.
	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. 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.
	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. Beim Anbohren in konkaven Flächen kann der Bohrer aus dem Zentrum gedrückt werden. Vorschub auf 1/3 reduzieren.
	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. 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.
	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. 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.

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. Ø

$\pi \sim 3,14$

- 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

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

V_f (mm/min): feed speed

Schnittgeschwindigkeit

n (rev/min): spindle speed · Umdrehungen

f_r (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:

$$V_f = f_r \times n = 0,1 \times 1500 = 150 \text{ (mm/min)}$$

• Machining time · Bearbeitungszeit

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

T_c (min): machining time
Bearbeitungszeit

i : number of holes

i : Anzahl der Bohrung.

I_d (mm): drilling depth

Bohrtiefe

f_r (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

$$T_c = \frac{I_d \times i}{n \times f_r} = \frac{40 \times 1}{1600 \times 0,1} = 0,25 \text{ (min)}$$

• Metal removal rate · Zerspanungsvolumen

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

Q (cm³/min): metal removal rate

Q (cm³/min): Zerspanungsvolumen

V_f (mm/min): feed speed · Vorschub

D_c (mm): drill diameter

D_c (mm): Bohrerdurchmesser

$\pi \sim 3,14$

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

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										
	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	-	-

Material comparison table · Werkstoffe Vergleichstabelle

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	China	USA	Germany		Great Britain		Sweden	France	Italy	Spain	Japan
	GB	AISI/SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
P	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	Plastic die steel · Gesenkstahl					
	-	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.
	Cold-working die steel · Kaltarbeitsstahl					
	-	02	-	SKS93	YK30	Stamping die, gauge calipers, paper cutter, auxiliary tools Für Gesenkstempel, Meßkaliber, Papierschneidmesser, 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.
	Hot-working die steel · Warmarbeitsstahl					
	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	X2CrNiMo17133	-	-	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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	GB	AISI/ SAE	W.-nr	DIN	BS	EN	SS	AFNOR	UNI	UNE	JIS
	Austenitic stainless steel · Austenitischer Rostfreier Stahl										
	-	-	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
K	Nodular cast iron · GGG								
	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	--	--	--	--	--
	Grey cast iron · Grauguss								
	--	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