















INFORMATION

- **TROUBLESHOOTING**
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TROUBLESHOOTING - TURNING & MILLING

TROUBLESHOOTING - DRILLING

Fault	Description	Solution
 Rapid flank wear	<ul style="list-style-type: none"> Inappropriate feed rate Cutting speed too high 	<ul style="list-style-type: none"> Adjust feed rate according to cutting depth and width Reduce cutting speed
 Thermal cracking	<ul style="list-style-type: none"> Insufficient coolant Cutting speed too high 	<ul style="list-style-type: none"> Increase coolant flow, or use dry cutting data (for milling) Reduce cutting speed
 Built-up edge	<ul style="list-style-type: none"> Cutting speed too low Insufficient coolant Rake angle too low 	<ul style="list-style-type: none"> Increase cutting speed Increase coolant flow Use insert with higher rake angle
 Notch wear	<ul style="list-style-type: none"> Scaling or work hardening of workpiece surface area Burrs in workpiece 	<ul style="list-style-type: none"> Vary cutting feed and depth of cut Change tool direction
 Fracture/Chipping	<ul style="list-style-type: none"> Feed rate too high Cutting speed too low Toolholder vibration Wrong insert shape or corner radius 	<ul style="list-style-type: none"> Reduce feed rate Increase cutting speed Reduce tool overhang Choose bigger insert or corner radius
 Cratering	<ul style="list-style-type: none"> Insufficient coolant supply Cutting speed and feed rate too high 	<ul style="list-style-type: none"> Increase coolant flow or concentration Reduce cutting speed and feed rate
 Plastic deformation	<ul style="list-style-type: none"> Cutting speed too high Insufficient coolant supply High stress applied to cutting edge 	<ul style="list-style-type: none"> Reduce cutting speed Increase cutting flow Choose bigger insert or corner radius

Fault	Solution
 Heavy/Rapid flank wear	<ul style="list-style-type: none"> Reduce cutting speed Increase feed rate
 Chipping on cutting edge	<ul style="list-style-type: none"> Reduce feed rate Check spindle and toolholder rigidity Check workpiece rigidity
 Chipping on corner	<ul style="list-style-type: none"> Reduce feed rate Check workpiece rigidity
 Built-up edge	<ul style="list-style-type: none"> Increase cutting speed Use different chipbreaker
 Scratching on drill body	<ul style="list-style-type: none"> Check workpiece rigidity Reduce feed rate Increase coolant flow

TERMINOLOGY

- n = Spindle speed in RPM
- v_c = Cutting speed in m/min
- f_n = Cutting feed in m/min
- v_f = Table feed rate in mm/min - Milling
- v_f = Penetration rate in mm/min - Drilling
- z_n = Number of teeth/flutes
- a_p = Axial depth of cut in mm
- a_e = Radial depth of cut in mm
- D_c = Cutter body diameter in mm
- D_m = Workpiece diameter in mm
- l_m = Machined length in mm
- k_c = Specific cutting force in N/mm²
- P_c = Power consumption in kW
- T_c = Tool engagement time in minutes
- M_c = Torque in Nm
- K_r = Drill point angle/2 in degrees
- F_f = Feed force in Newtons

TURNING FORMULAE

SPINDLE SPEED (n)	CUTTING SPEED (v _c)	MACHINING TIME (T _c)	POWER CONSUMPTION (P _c)
$n = \frac{v_c \times 1000}{\pi \times D_m}$ (rev/min)	$v_c = \frac{D_m \times \pi \times n}{1000}$ (m/min)	$T_c = \frac{l_m}{f_n \times n}$ (m/min)	$P_c = \frac{v_c \times a_p \times f_n \times k_c}{60 \times 10^3}$ (kW)

METAL REMOVAL RATE (Q)
$Q = f_n \times v_c \times a_p$ (cm ³ /min)

MILLING FORMULAE

SPINDLE SPEED (n)	CUTTING SPEED (v _c)	TABLE FEED RATE (v _f)	TORQUE (M _c)
$n = \frac{v_c \times 1000}{\pi \times D_c}$ (rev/min)	$v_c = \frac{D_c \times \pi \times n}{1000}$ (m/min)	$v_f = f_z \times z_n \times n$ (mm/min)	$M_c = \frac{P_c \times 30 \times 10^3}{\pi \times n}$ (Nm)

FEED PER TOOTH (f _z)	POWER CONSUMPTION (P _c)	METAL REMOVAL RATE (Q)
$f_z = \frac{v_f}{n \times z_n}$ (mm)	$P_c = \frac{a_p \times a_e \times v_f \times k_c}{60 \times 10^6}$ (kW)	$Q = \frac{a_p \times a_e \times v_f}{1000}$ (cm ³ /min)

DRILLING FORMULAE

SPINDLE SPEED (n)	CUTTING SPEED (v _c)	PENETRATION RATE (v _f)	TOOL FEED RATE (f _n)
$n = \frac{v_c \times 1000}{\pi \times D_c}$ (rev/min)	$v_c = \frac{D_c \times \pi \times n}{1000}$ (m/min)	$v_f = f_n \times n$ (mm/min)	$f_n = f_z \times 2$ (mm/rev)

FEED FORCE (F _f)	POWER CONSUMPTION (P _c)	TORQUE (M _c)
$F_f \approx 0.5 \times k_c \times \frac{D_c}{2} \times f_n \times \sin K_r$ (N)	$P_c = \frac{f_n \times v_c \times D_c \times k_c}{240 \times 10^3}$ (kW)	$M_c = \frac{P_c \times 30 \times 10^3}{\pi \times n}$ (Nm)

TOOL PARAMETERS ACCORDING TO ISO13399

Parameter	Definition	Parameter	Definition	Parameter	Definition
ALP	Clearance angle axial	L	Cutting edge length	TPX	Maximum thread pitch
ANN	Clearance angle minor	LB	Body length	TQ	Torque
APMX	Depth of cut maximum	LCF	Length chip flute	TSYC	Tool style code
B	Shank width	LE	Cutting edge effective length	ULDR	Usable length diameter ratio
BAWS	Body angle workpiece side	LF	Functional length	WB	Body width
BBD	Balanced by design	LGR	Regrind length	WF	Functional width
BBR	Balanced by rotational test	LH	Head length	WSC	Clamping width
BD	Body diameter	LPR	Protruding length	WT	Weight of item
BHTA	Body half taper angle	LS	Shank length	W1	Insert width
BS	Wiper edge length	LSC	Clamping length	ZEFF	Face effective cutting edge count
BSG	Basic standard group	LSCN	Clamping length minimum	ZEFP	Peripheral effective cutting edge count
CDX	Cutting depth maximum	LSCX	Clamping length maximum	ZWX	Maximum number of Wiper inserts
CHW	Corner chamfer width	LSD	Dead shank length		
CICT	Cutting item count	LU	Usable length (max. recommended)		
CND	Coolant entry diameter	MHD	Mounting hole distance		
CNSC	Coolant entry style code	MIID	Master insert identification		
COATING	Coating	MMCC	Code for preset torque		
CNT	Coolant entry thread size	NOF	Flute count		
CP	Coolant pressure	OAH	Overall height		
CRKS	Connection retention knob thread size	OAL	Overall length		
CTPT	Operation type	OAW	Overall width		
CUTDIA	Work piece parting diameter maximum	OHN	Overhang minimum		
CW	Cutting width	OHX	Overhang maximum		
CWTOLL	Cutting width lower tolerance	PHD	Premachined hole diameter		
CWTOLU	Cutting width upper tolerance	PHDX	Maximum premachined hole diameter		
CXSC	Coolant exit style code	PL	Point length		
CZC	Connection size code	PRFRAD	Profile radius		
CZC MS	Connection size code machine side	PRSPC	Profile specification		
CZC WS	Connection size code workpiece side	PSIR	Tool lead angle		
DAH	Diameter access hole	PSIRL	Cutting edge angle major left hand		
DAXIN	Axial groove inside diameter minimum	PSIRR	Cutting edge angle major right hand		
DAXX	Axial groove outside diameter maximum	RADH	Radial body height		
DBC	Diameter bolt circle	RADW	Radial body width		
DC	Cutting diameter	RE	Corner radius		
DCB	Connection bore diameter	RETOLL	Corner radius lower tolerance		
DCBN	Connection bore diameter minimum	RETOLU	Corner radius upper tolerance		
DCBX	Connection bore diameter maximum	RPMX	Rotational speed maximum		
DCF	Cutting diameter face contact	S	Insert thickness		
DCON	Connection diameter	SDL	Step diameter length		
DCSFMS	Contact surface diameter machine side	SIG	Point angle		
DCSFWS	Contact surface diameter workpiece side	SSC	Insert seat size code		
DCX	Cutting diameter maximum	SUBSTRATE	Substrate		
DIX	Tool changer interference diameter maximum	TCDC	Tolerance class cutting diameter		
DMIN	Minimum bore diameter	TCDMM	Shank diameter tolerance		
DMM	Shank diameter	TCHA	Achievable hole tolerance		
DN	Neck diameter	TCT	Tolerance class tool		
DSGN	Design	TCTR	Thread tolerance class		
D1	Fixing hole diameter	TD	Thread diameter		
FHA	Flute helix angle	TDZ	Thread diameter size		
FLGT	Flange thickness	TFLA	Tap floating length ahead		
FTDZ	For thread diameter size	TFLB	Tap floating length behind		
H	Shank height	THCHT	Threading chamfer type		
HF	Functional height	THFT	Form type		
HRY	Lowest point from reference plain	THLGTH	Thread length		
HTB	Body height	THUB	Hub thickness		
HTH	Height	TP	Thread pitch		
IC	Inscribed circle diameter	TPI	Threads per inch		
INSL	Insert length	TPIN	Threads per inch minimum		
IZC	Insert size code	TPIX	Threads per inch maximum		
KAPR	Tool cutting edge angle	TPN	Thread pitch minimum		
KCH	Corner chamfer	TPX	Maximum thread pitch		

P	VDI 3323 1		Non-alloyed steel		About 0.15% C, Annealed				≤125 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0037	St 37-2			4360 40 B	S235JR	E24-2	1311	Fe 360 B		
1.0038	St 37-3	A570.36		4360 40 C	S275J2G3	E28-3	1312	Fe 360 D FF		
1.0045	S 355 JR				S 1207	E36-2		Fe 510 BFN		
1.0050	St 50-2	A570 Gr. 50		4360 50 B	E 295	A50-2	2172	Fe 490		
1.0060	St 60-2	A572 Gr. 65		4360 55 E		A60-2	1650	Fe 60-2		
1.0114	S 235 J0			En 40C	S 235 J0	E24-3		Fe 360 CFN		
1.0143	S 275 J0				S 275 J0	E28-3	1414	Fe 430 C		
1.0144	St 44-3 N	A573 Gr. 81		4360 43C	S 275 J2 G3	E28-3	1412	Fe 430 D FF		
1.0149	Ro St 44-2			43C	S 275 J0 H		1412	Fe430C		
1.0301	C10	1010		045M10	C10	34C10, XC10		C10	F.1511	G10100
1.0330	St 12			DC 01	Fe P01	DC 01/Fe P01	1142	Fe P01		
1.0335	DD13 (StW 24)	A622(1008)		H S 3	D D 13	3C		FeP13		
1.0338	St 4	A620(1008)		14491CR	Fe P04	Fe 14	1147	DC04/FeP04		
1.0345	P235 GH	A516 Gr. 65		P 235 GH	P 235 GH	A 37 CP	1330	Fe E 235		K02503
1.0401	C15	1015		080M15		C18RR, XC18	1350	C15, C16	F.1110	G10170
1.0402	C22	1020		050 A 20	1 C 22	C20	1450	C 20	F.1120	G10200
1.0425	P265GH/H11					A42CP	1430	Fe4101KW		K02801
1.0443	GS-45	A2765-35		A1		E23-45M	1305			
1.0539	S355NH					TSE355-4	2134	Fe510B		
1.0545	S355N			4360-50E		E355R	2334	FeE355KG		
1.0546	S355NL			4360-50EE		E355FP	2135	FeE355KT		
1.0547	S355JOH			4360-50C		TSE355-3	2172	Fe510C		
1.0549	S355NLH						2135	Fe510D		
1.0533	St52-3U	A14880-10		4360-50C		320-560M	1606	Fe510C		
1.0562	StE355	A633 Gr.C		P355N		FeE355KGN	2132	FeE355KG		K12000
1.0565	WStE355			P355NH		P355NH	2106	FeE355KGW		K01600
1.0566	T St E 355			P 355 NL1		P 355 NL1	2107	Fe E 355 KT		
1.0570	St 52-3	1		4360-50 C	S355JR	E36-3	2172	Fe 510 B		
1.0715	9SMn28	1213		230M07		S250	1912	CFSMn28	F.2111	G12130
1.0718	9SMnPb28	12L13				S250Pb	1914	CF9SMnPb28	F.2112	G12134
1.0721	10S20	1108		10S20		10S20		CF10S20	F.2121	G11080
1.0722	10SPb20	11L08				10PbF2		CF10SPb20		G11084
1.0736	9SMn36	1215				S300		CF9Mn36	F.2113	G12150
1.0737	9SMnPb36	12L14				S300Pb	1926	CF9SMnPb36	F.2114	G12144
1.0972	S315MC			1501-40F30		E315D				
1.0976	S355MC			1501-43F35		E355D	2642	FeE355TM		
1.0982	S460MC			1501-50F45						
1.0984	S500MC					E490D	2662	FeE490TM		
1.0986	S500MC			1501-60F55		E560D		FeE560TM		
1.1121	Ck10	1010		040A10		XC10	1265	C10	F.1510	G10100
1.1141	Ck15	1015		040A15	32C	XC15	1370	C15	F.1110	G10150
1.1151	C22E	1020		055M15		2C22	1450	C20	F.1120	G10230
1.8900	StE380	A572-60		436055E			2145	FeE390KG		
	St44-2	A36		436043A		NFA35-501E28	1411			
	StE320-3Z			1501160			1421			

P	VDI 3323 2		Non-alloyed steel		About 0.45% C, Annealed				≤13 HRc ≤190 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0501	C35		1035	080A32		1C35	1572	C35	F.113	G10350
1.0503	C45		1045	060A47		XC42H1TS	1672	C45	F.114	G10450
1.0511	C40		1040	080M40		1C40		C40	F.114.A	G10400
1.0540	C50						1674	C50		G10500
1.0551	GS-52	A2770-36		A2		280-480M	1505			
1.0553	St52-3U	A14880-40		4360-50C		320-560M	1606	Fe510C		
1.0577	S 355 J 2 G 4	A738		Fe 510 D 2 FF		A52FP	2107			
1.0726	35S20		1140	212M36	8M	35MF6	1957			G11400
1.0727	45S20		1146			45MF4	1973			G11460
1.1157	40Mn4		1039	150M36	15	40M5				G10390
1.1158	C25E		1025	070M25		XC25		C25	F.1120	G10250
1.1166	34Mn5		1536						TO.B	G15360
1.1167	36Mn5		1335	150M36		40M5	2120	36Mn6	F.1203	G13350
1.1170	28Mn6		1330	150M28	14A	20M5		C28Mn	28Mn6	G13300
1.1178	C30E			080M30		XC32		C30	2C30	G10300
1.1180	C35R		1035	080A35		3C35	1572		F.1135	G10350
1.1181	C35E		1035	080A35		XC38	1572	C36	F.1130	G10340
1.1191	Ck45		1045	080A46		XC45	1672	C45	F.1140	
1.1206	C50E		1050	080M50		2C50	1674	C50		G10500
1.1213	Cf53		1050	070M55		XC48HTS	1674	C53		G10500

P	VDI 3323 3		Non-alloyed steel		About 0.45% C, Annealed				≤25 HRc ≤250 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0481	17 Mn 4/P 295 GH	A516 Gr. 70		224-460B	P 295 GH	A 48 CP	2102	Fe E 295	A47RCI	K03501
1.0501	C35		1035	080A32		1C35	1572	C35	F.1130	G10350
1.0503	C45		1045	060A47		XC42H1TS	1672	C45	F.1140	G10450
1.0614	C76D		1074			XC75				G10750
1.0616	C86D		1086			XC80		C85		G10860
1.0618	C92D		1095			XC90				G10950
1.0726	35S20		1140	212M36	8M	35MF6	1957			G11400
1.1157	40Mn4		1039	150M36	15	40M5				G10390
1.1165	30Mn5		1036	120M36		35M5		30Mn5	F.8211	K13300
1.1167	36Mn5		1335	150M36		40M5	2120	36Mn6	F.1203	G13350
1.1186	C40E		1040	060A40		2C40		C40		G10400
1.1191	Ck45		1045	080M46		2C45	1672	C45	F.1140	
1.1201	C45R		1049	080M46		3C45	1660	C45	F.1145	
1.1213	Cf53		1050	070M55		XC48HTS	1674	C53		G10500
1.7242	18CrMo4									
1.7337	16CrMo4-4	A387 Gr.12						A18CrMo45KW		K11564
1.7362	12CrMo195			3606-625		Z10CD5-05		16CrMo205		K41545
	17MnV6	A572-60		436055E		NFA35-501E36	2142			



P VDI 3323 4 Non-alloyed steel About 0.75% C, Annealed ≤28 HRC ≤270 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0603	C67	107	080A67		XC65		C67		G10700
1.0605	C75	1075	144980HS				C75		G10740
1.1203	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550
1.1209	C55R	1055	070M55		3C55		C55	F.1155	G10550
1.1221	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640
1.1231	C67E	1070	060A67		XC68	1770	C70	F.5103	G10700
1.1248	C75E	1074	060A78		XC75	1774	C75	F.5107	G10800
1.1269	C85E	1086			XC90		C90		G10900
1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	G10950
1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
1.1663	C125W	W112			Y2120				

P VDI 3323 5 Non-alloyed steel About 0.75% C, Quenched & Tempered ≤32 HRC ≤300 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0070	St70-2	1055	Fe690-2FN		A70-2	1655	Fe690	F.1150	
1.0535	C55	1055	070M55		1C55	1655	C55		J05000
1.0601	C60	1060	060A62	43D	1C60		C60		G10600
1.1203	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550
1.1221	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640
1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	G10950
1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
1.1663	C125W	W112			Y2120				
1.5120	38MnSi4								
1.5710	26NiCr6	3135	640A35	111A	35NC6				
1.7701	51CrMoV4						51CrMoV4		

P VDI 3323 6 Low-alloyed steel Annealed ≤10 HRC ≤180 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0116	St37-3	A570Gr.36	4360-40C	S235J2G3	E24-3	1312	Fe360D1(2)	AE235D	
1.0904	55Si7	9255	250A53	45	55S7	2085	55Si8	56Si7	G92550
1.0961	60SiCr7	9262			60SC6		60SiCr8	60SiCr8	G92620
1.2067	100Cr6	L3	BL3		Y100C6			100Cr6	
1.2108	90CrSi5	L1				2092	105WCR5		
1.2210	115CrV3	L2			100C3		107CrV3KU	F.250L	
1.2241	51CrV4								
1.2330	35CrMo4	4135	708A37		34CD4	2234	35CrMo4		
1.2419	105WCr6		105WC13		105WC13	2140	10WCr6		
1.2510	100MnCrW4	01	B01		90MWCV5	2140	95MnWCr5KU	F.5220	
1.2542	45WCrV7	S1	BS1			2710	45WCrV8KU		
1.2550	60WCrV7	S1			55WC20	2710	58WCrV9KU		
1.2713	55NiCrMoV6	L6			55NCDV7			F.520S	
1.2721	50NiCr13	L6			55NCV6	2550		F.528	
1.2842	90MnCrV8	02	B02		90MV8				T31502
1.3501	100Cr2	E50100							
1.3505	100Cr6	52100	2S135	31	100C6	2258	100Cr6	F.1310	
1.5024	46Si7				45S7		46Si7	F.1451	

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P VDI 3323 6 Low-alloyed steel Annealed ≤10 HRC ≤180 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.5025	51Si7	9259H		50Si7	51S7	2090	50Si7	F.1450	
1.5026	55Si7			56Si7	55S7	2085	55Si7	F.1440	G92550
1.5027	60Si7	9260	251A60	60Si7	60S7		60Si7	F.1441	G92600
1.5028	65Si7	9260H							
1.5415	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820
1.5419	20Mo4	4419	1503-243-430			2512	G20Mo5		G44190
1.5423	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522
1.5622	14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641	
1.5732	14NiCr10	3415			14NC11		16NiCr11		
1.5752	14NiCr14	3310	655M13	36A	12NC15				
1.6511	36NiCrMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)		
1.6523	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2		
1.6546	40NiCrMo2-2	8740	311-Type7				40NiCrMo2(KB)		
1.6566	17NiCrMo6-4								
1.6587	17NiCrMo6		820A16		18NCD6		14NiCrMo13		
1.6657	10NiCrMo13-4						14NiCrMo131		
1.7015	10Cr3	5015	523M15		12C3				G50150
1.7033	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300
1.7035	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400
1.7131	16MnCr5	5115	527M17		16MC5	2511	16MnCr5		G51150
1.7139	16MnCrS5					2127			
1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
1.7218	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)		
1.7220	34CrMo4	4135	708A37		35CD4	2234	34CrMo4		
1.7223	41CrMo4	4142					41CrMo4		
1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	
1.7228	55NiCrMoV6G		823M30	33		2512	655M31		
1.7262	15CrMo5				12CD4	2216	12CrMo4		
1.7321	20CrMo4					2625			
1.7335	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45		
1.7361	32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A	
1.7380	10CrMo9-10	A182-F22	1501-622		12CD9-10	2218	12CrMo9		
1.7715	14MoV6-3		1503-660-440				13MoCrV6		
1.8159	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4		G61500
1.8161	58CrV4								
1.8509	41CrAlMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAlMo7		
1.8523	39CrMoV13-9		897M39	40C			36CrMoV12		

P VDI 3323 7 Low-alloyed steel Quenched & Tempered ≤29 HRC ≤275 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.5415	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820
1.5423	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522
1.5622	14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641	
1.5732	14NiCr10	3415			14NC11		16NiCr11		
1.5752	14NiCr14	3310	655M13	36A	12NC15				
1.5755	31NiCr14		653M31		18NC13	2534		F.1270	

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P VDI 3323 7 Low-alloyed steel Quenched & Tempered ≤29 HRC ≤275 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.6565	40NiCrMo6	4340	817M40	24	35NCD6	2541	35NiCrMo6(KB)		
1.6587	17NiCrMo6		820A16		18NCD6		14NiCrMo13		
1.6657	10NiCrMo13-4						14NiCrMo131		
1.6957	26NiCrMoV14-5								
1.7015	10Cr3	5015	523M15		12C3				G50150
1.7262	15CrMo5				12CD4	2216	12CrMo4		
1.7335	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45		
1.7380	10CrMo9-10	A182-F22	1501-622		12CD9-10	2218	12CrMo9		
1.7715	14MoV6-3		1503-660-440				13CrMoV6		
1.7733	24CrMoV55				20CDV6		21CrMoV511		
1.7755	GS-45CrMoV10-4								
1.8070	21CrMoV511						35NiCr9		

P VDI 3323 8 Low-alloyed steel Quenched & Tempered ≤32 HRC ≤300 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.1730	C45W3	C45W			XC48				
1.2332	47CrMo4	4142	708M40	19A	42CD4	2244	42CrMo4		
1.5736	36NiCr10	3435			30NC11				
1.6523	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2		
1.7033	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300
1.7218	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)		
1.8515	32CrMo12		722M24	40B	30CD12	2240	32CrMo12	F.124A	

P VDI 3323 9 Low-alloyed steel Quenched & Tempered ≤38 HRC ≤350 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0904	55Si7	9255	250A3	45	55S7	2085	55Si8		G92550
1.0961	60SiCr7	9262			60SC6		60SiCr8		G92620
1.2067	100Cr6	L3	BL3		Y100C6		100Cr6		
1.2419	105WCr6		105WC13		105WC13	2140	10WCr6		
1.2542	45WCrV7	S1	BS1			2710	45WCrV8KU		
1.2713	55NiCrMoV6	L6			55NCDV7			F.250S	
1.4882	X50CrMnNiNbN219				Z50CMNnb21-09				
1.5120	38MnSi4								
1.5710	36NiCr6	3135	640A35	111A	35NC6				
1.5755	31NiCr14		830M31		18NC13	2534		F.1270	
1.6511	36CrNiMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)		
1.6546	40NiCrMo2-2	8740	311-Type7				40NiCrMo2(KB)		
1.7035	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400
1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
1.7220	34CrMo4	4135	708A37		35CD4	2234	34CrMo4		
1.7223	41CrMo4	4142					41CrMo4		
1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	
1.7361	32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A	

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P VDI 3323 9 Low-alloyed steel Quenched & Tempered ≤38 HRC ≤350 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.8159	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4	51CrV4	G61500
1.8161	58CrV4								
1.8509	41CrAiMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAiMo7		
1.8523	39CrMoV13-9		897M39	40C			36CrMoV12		

P VDI 3323 10 High-alloyed steel, Tool steel Annealed ≤15 HRC ≤200 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.0347	RRSt3	A619	CR3	FeP03	F13	1922	DC03/FeP03		
1.0723	15S22		210A15					F.210F	
1.2080	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403
1.2162	21MnCr5				20MC5				
1.2311	40CrMnMo7				40CMD8		35CrMo8KU		
1.2312	40CrMnMoS8.6	P20+S			40CMD8S				
1.2316	X36CrMo17			X38CrMo16					
1.2343	X38CrMoV5-1	H11	BH11		Z38CDV5		X37CrMoV51KU		T20811
1.2344	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV51KU	F.5318	T20813
1.2363	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227	
1.2379	X155CrMoV121	D2	BD2		Z160CDV12	2310	X165CrMoV51KU		T30402
1.2436	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F.5213	
1.2510	100MnCrW4	O1	B01		90MWCV5	2140	95MnWCr5KU	F.5220	T20821
1.2581	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	
1.2601	X165CrMoV12					2310	X160CrMoV12		
1.2606	X37CrMoW51	H12	BH12		Z35CWDV5		X35CrMoW5KU	F.537	T20812
1.2764	X19NiCrMo4								
1.2767	X45NiCrMo4				45NCD16		40NiCrMoV8KU		
1.2842	90MnCrV8	O2	B02		90MV8		90MnCrV8KU		T31502
1.3243	S6-5-2-5	T15			KCV06-05-05-04-02	2723	HS6-5-2-5		
1.3249	S18-1-2-5	T4	BT4		Z80WKCV18-05-04				
1.3343	S6-5-2	M2	BM2		Z85WDCV	2722	HS652	F.5604	
1.3348	S2-9-2	M7			Z100DCWV09-04-02	2782	HS292	F.5607	
1.3355	S18-0-1	T1	BT1		Z80WCV18-4-01				
1.4718	X45CrSi9-3	HNV3	401S45	52	Z45CS9		X45CrSi8	F.322	
1.5662	X8Ni9	ASMA353	502-650		9Ni		X10Ni9	F.2645	
1.5680	12Ni19	2515	12Ni19		Z18NS				

P VDI 3323 11 High-alloyed steel, Tool steel Quenched & Tempered ≤35 HRC ≤325 HB									
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.2080	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403
1.2344	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV51KU	F.5318	T20813
1.2363	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227	
1.2436	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F.5213	
1.2581	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	T20821
1.2601	X165CrMoV12					2310	X160CrMoV12		
1.2714	55NiCrMoV7	6F3/L6			55NiCrMoV7			F.520S	
1.3202	S12-1-4-5		BT15				HS12-1-5-5		

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P	VDI 3323 11		High-alloyed steel, Tool steel		Quenched & Tempered				≤35 HRC ≤325 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.3207	S10-4-3-10			BT42		Z130WKCDV				
1.3243	S6-5-2-5	T15				KCV06-05-05-04-02	2723	HS6-5-2-5		
1.3246	S7-4-2-5	M35				Z110WKCDV07-05-04		HS7-4-2-5		
1.3247	S2-10-1-8	M42		BM42		Z110WKCDV09-08-04		HS2-9-1-8		
1.3255	S18-1-2-5	T4		BT4		Z80WKCV18-05-04				
1.3343	S6-5-2	M2		BM2		Z85WDCV	2722	HS652	F.5604	
1.3348	S2-9-2	M7				Z100DCWV09-04-02	2782	HS292	F.5607	
1.3355	S18-0-1	T1		BT1		Z80WCV18-4-01				
1.4718	X45CrSi9-3	HNV3		401S45	52	Z45CS9		X45CrSi8	F.322	
1.4935	X20CrMoWV121	422								S42200
1.5680	12Ni19	2515		12Ni19		Z18N5				

M	VDI 3323 12		Stainless steel		Ferritic/Martensitic, Annealed				≤15 HRC ≤200 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4000	X6Cr13	403		403S17		Z6C13	2301	X6Cr13	F.3110	S40300
1.4001	X7Cr14	410S		403S7		Z8C13	2301		F.8401	
1.4002	X6CrAl13	405		405S17		Z6CA13	2302	X6CrAl13		S40500
1.4005	X12CrS13	416		416S21		Z11CF13	2380	X12CrS13	F.3411	S41600
1.4006	X12Cr13	410		410S21	56A	Z10C13	2302	X12Cr13	F.3401	S41000
1.4016	X6Cr17	430		430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000
1.4027	GX20Cr14			420C29		Z20C13M				
1.4028	X30Cr13	420		420S45		Z30C13	2304			S42020
1.4034	X46Cr13			420S45		Z40C14		X40Cr14	F.3405	
1.4057	X19CrNi17-2	431		431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100
1.4086	GX120Cr29			452C11						
1.4104	X12CrMoS17	430F		420S37		Z10CF17	2383	X10CrS17	F.3117	S43020
1.4112	X90CrMoV18	440B								S44003
1.4113	X6CrMo17	434		434S17		Z8CD17-01	2325	X8CrMo17		S43400
1.4313	X3CrNi13-4	CA6-NM		425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540
1.4341	GX40CrNi274									J92615
1.4417	X2CrNiMoSi195	S31500					2376			S39215
1.4418	X4CrNiMo165					Z6CND16-04-01	2387			
1.4510	X6CrTi17	XM8				Z4CT17		X6CrTi17	F.3115	S43035
1.4511	X6CrNb17					Z4CNb17		X6CrNb17	F.3122	
1.4512	X6CrTi12	409		LW19		Z3CT12		X6CrTi12		S40900
1.4720	X20CrMo13									
1.4724	X10CrA113	405		405S17		Z10C13		X10CrA112	F.311	
1.4742	X10CrA118	430		439S15	60	Z10CAS18		X8Cr17	F.3113	S43000
1.4747	X80CrNiSi20	HNV6		443S65	59	Z80CSN20-02		X80CrNiSi20	F.320B	S65006
1.4749	X18CrNi28	446								
1.4762	X10CrA124	446				Z10CAS24	2322	X16Cr26		S44600
1.4871	X53CrMnNi21-9	EV8		349S54		Z52CMN21-09		X53CrMnNi219		S63008
	X10CrNi15	429								
	X12CrNi18-9	302		302S31		Z10CN18-09	2330			

M	VDI 3323 13		Stainless steel		Martensitic, Quenched & Tempered				≤23 HRC ≤240 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4000	X6Cr13	403		403S17		Z6C13	2301	X6Cr13	F.3110	S40300
1.4001	X7Cr14	410S		403S7		Z8C13	2301		F.8401	
1.4006	X12Cr13	410		410S21	56A	Z10C13	2303	X12Cr13	F.3401	S41000
1.4016	X6Cr17	430		430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000
1.4021	X20Cr13	420		420S37		Z20C13	2303	14210	F.5261	S42000
1.4027	GX20Cr14			420C29		Z20C13M				
1.4031	X40Cr13	420				Z40C14	2304		F.3404	S42080
1.4034	X46Cr13			420S45		Z40C14		X40Cr14	F.3405	
1.4057	X19CrNi17-2	431		431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100
1.4104	X12CrMoS17	430F		420S37		Z10CF17	2383	X10CrS17	F.3117	S43020
1.4113	X6CrMo17	434		434S17		Z8CD17-01	2325	X8CrMo17		S43400
1.4313	X3CrNi13-4	CA6-NM		425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540
1.4544	A700	321		S.524		Z10CNT18-11		X6CrNiTi1811		J92630
1.4546	X5CrNiNb18-10	348		347S31				X6CrNiNb1811		J92640
1.4871	X53CrMnNi21-9	EV8		349S54		Z52CMN21-09		X53CrMnNi219		S63008
1.4922	X20CrMoV12-1						2317	X20CrMoNi1201		
1.4923	X22CrMoV12-1									

M	VDI 3323 14		Stainless steel		Austenitic				≤10 HRC ≤180 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4301	X5CrNi18-10	304		304S15		Z5CN18-09	2332		F.3551	S30409
1.4305	X10CrNiS18-10	303		303S21	58M	Z8CNF18-09	2346	X10CrNiS1809	F.3508	S30300
1.4306	X2CrNi1911	304L		304C12	X3CrNi1810KD	Z2CN18-09	2352	GX2CrNi1910	F.3503	S30403
1.4308	GX6CrNi18-9	CF-8		304C15	58E	Z6CN18-10M	2333			
1.4310	X10CrNi18-8	301		301S21		Z12CN17-07	2331	X2CrNi1807	F.3517	S30100
1.4311	X2CrNi1810	304LN		304S62		Z2CN18-10	2371	X2CrNi1810	F.3541	S30453
1.4312	GX10CrNi188	305		302C25		Z10CN18-9M				
1.4350	X5CrNi18-9	304		304S15	58E	Z6CN18-09	2332	X5CrNi1810	F.3551	S30400
1.4362	X2CrNiN234	S32304				Z2CN23-04AZ	2327			S32304
1.4371	X3CrMnNiN18887	202		284S16		Z8CMN18-08-05				
1.4401	X5CrNiMo17-12-2	316		316S13		Z3CND17-11-01	2347	X5CrNiMo17122	F.3534	S31600
1.4414	X2CrNiMo17-13-2	316L		316S11		Z2CND17-12	2348	X2CrNiMo1712	F.3533	S31603
1.4406	X2CrNiMo17-12-2	316LN		316S61		Z2CND17-12AZ		X2CrNiMoN1712	F.3542	S31653
1.4408	GX6CrNiMo18-10	CF-8M		316C16			2343	X7CrNiMo2010	F.8414	J92900
1.4410	GX10CrNiMo18-9	Super Duplex				Z5CND20-12M	2328			S32750
1.4429	X2CrNiMoN17-13-3	316LN		316S62		Z2CND17-13AZ	2375	X2CrNiMoN17133	F.3543	
1.4435	X2CrNiMo18-14-3	316L		316S11		Z3CND17-12-03	2375	X2CrNiMo17132	F.3533	S31603
1.4436	X3CrNiMo17-13-3	316		316S19		Z6CND18-12-03	2343	X5CrNiMo17122	F.3543	S31600
1.4438	X2CrNiMo18-16-4	317L		317S12		Z2CND19-15-04	2367	X2CrNiMo18164	F.3539	S31703
1.4439	X2CrNiMoN17-13-5	S31726				Z3CND18-14-06AZ				
1.4440	X2CrNiMo18-16									
1.4449	X5CrNiMo17-13-3	317		317S16				X5CrNiMo1815		S31700
1.4460	X8CrNiMo275	329					2324			S32900
1.4462	X2CrNiMoN2253	Duplex		318S13		Z3CND22-05AZ	2377			S31803
1.4500	X7NiCrMoCuNb25205					Z3NCNDU25-20M				J95150
1.4521	X2CrMoTi18-2	443/444					2326	X2CrMoTiNb182	F.3123	

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M	VDI 3323 14		Stainless steel				Austenitic			≤10 HRc ≤180 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
1.4539	X1NiCrMoCuN25205					Z2NCDU25-20	2562			N08904	
1.4541	X14CrNiTi18-10	321	321S31			Z6CNT18-10	2337	X6CrNiTi1811	F.3523	S32100	
1.4542	X5CrNiCuNb174	17-4PH									
1.4545	Z7CNU15.05	15-5PH				Z7CNU15-05				S15500	
1.4547	X1CrNiMoN20187	S31254					2378			S31254	
1.4550	X6CrNiNb18-10	347	347S31	58F		Z6CNNb18-10	2338	X6CrNiNb1811	F.3552	S34700	
1.4552	GX7CrNiNb18-9					Z4CNNb19-10M				J92710	
1.4568	X7CrNiAl177		316S111			Z9CAN17-7	2388	Z8CNA17-07		S17700	
1.4571	X6CrNiMoTi17-12-2	316Ti	320S31	58J		Z6NDT17-12	2350	X6CrNiMoTi1712	F.3535		
1.4581	GX5CrNiMoNb18		318C17			Z4CNDNb18-12M					
1.4583	X6CrNiMoNb18-12	318	303S21			Z15CNS20-12		X15CrNiSi212			
1.4585	GX7CrNiMoCuNb1818							X6CrNiMoTi1712		J94651	
1.4821	X20CrNiSi254					Z20CNS25-04				S44635	
1.4823	GX40CrNiSi274									J92604	
1.4828	X15CrNiSi20-12	309	309S24	58C		Z15CNS20-12			F.8414	S30900	
1.4833	X6CrNi2213	309S	309S13			Z15CN24-13				J93400	
1.4845	X12CrNi25-21	310S	310S24			Z12CN25-20	2361	X6CrNi2520	F.331	S31008	
1.4878	X12CrNiTi18-9	321	321S20	58B		Z6CNT18-12(B)	2337	X6CrNiTi1811	F.3553	S32100	
1.4891	X5CrNiNb18-10	S30415					2372				
1.4893	X8CrNiNb11	S30815					2368				
1.4948	X6CrNi1811	304H	304S51			Z5CN18-09	2333			S30480	
1.4980	X5NiCrTi2515	660					2570			S33286	
	X5NiCrN3525										
	X2CrNiMoN18134	S31753									
	X2CrNiMoN25227										

K	VDI 3323 15		Grey cast iron				Pearlitic/Ferritic			≤10 HRc ≤180 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.6010	GG10	A4820B	Grade 100	GJL-100	Ft10D	0100	G10	FG10			
0.6015	GG15	A4825B	Grade150	GJL-150	Ft15D	0115	G15	FG15	W06020		
0.6020	GG20	A4830B	Grade 220	GJL-200	Ft20D	0120	G20	FG20			
0.6025	GG25	A4840B	Grade 260	GJL-250	Ft25D	0125	G25	FG25			
0.6660	GGL-NiCr202	1050/700/7	Grade F2	GJLA-XNiCr20-2	L-NC202	0523				F41002	

K	VDI 3323 16		Grey cast iron				Pearlitic (Martensitic)			≤26HRc ≤260HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.6025	GG25	A4840B	Grade 260	GJL-250	Ft25D	0125	G25	FG25			
0.6030	GG30	A4845B	Grade 300	GJL-300	Ft30D	0130	G30	FG30			
0.6035	GG35	A4850B	Grade 350	GJL-350	Ft35D	0135	G35	FG35			
0.6040	GG40	A4860B	Grade 400	GJL-400	Ft40D	0140	G40	FG40			

K	VDI 3323 17		Nodular cast iron				Ferritic			≤3 HRc ≤160 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.7033	GGG35.3		350-22L40	GJS-350-22-LT	FGS370-17	0717-15					
0.7040	GGG40	60-40-18	SNG420-12	GJS-400-15	FGS400-12	0717-02	GS400-12	FGE38-17	F32800		
0.7042	GGG40.3	60-40-18	SNG370-17	GJS-400-18-LT	FGS370-17	0717-12	GSO42-17				

K	VDI 3323 18		Nodular cast iron				Pearlitic			≤25HRc ≤250HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.7050	GGG50	80-55-06	SNG500-7	GJS-500-7	FGS500-7	0727-02	GS500-7	FGE50-7	F33100		
0.7060	GGG60	80-55-06	SNG600-3	GJS-600-3	FGS60-3	0732-03	GS600-3	FGE60-2			
0.7070	GGG70	100-70-03	SNG700-2	GJS-700-2	FGS700-2	0737-01	GS700-2	FGE70-2	F34800		
0.7652	GGGNiMn13-7		Grade S6	GJSA-XNiMn13-7	FGSNI13Mn7	0772					
0.7660	GGGNiCr20-2	A436D2	Grade S2	GJSA-XNiCr20-2	FGSNI20Cr2	0776					

K	VDI 3323 19		Malleable cast iron				Ferritic			≤130 HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.8055	GTW55										
0.8135	GTS-35	32510	B340-12	GJMB350-10	Mn35-10	0815	GMN35	GTS35			
0.8145	GTS45	A220-40010	P440-7	GJMB450-6	Mn450-6	0815-00					

K	VDI 3323 20		Malleable cast iron				Pearlitic			≤21HRc ≤230HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
0.8155	GTS-55	50005	P510-4	GJMB-550-4	MP50-5	0854	GMN55				
0.8165	GTS-65	70003	P570-3	GJMB-650-2	MN650-3	0856	GMN65				
0.8170	GTS-70	90001	P690-2	GJMB-700-2	MN700-2	0862	GMN70				

N	VDI 3323 21		Aluminium wrought, alloyed				Not curable			≤60HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
3.0205	Al99	Al99									
3.0255	Al99.5	1000	L31			A59050C					
3.3315	AlMg1										

N	VDI 3323 22		Aluminium wrought, alloyed				Curable, hardened			≤100HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
3.1325	AlCuMg1										
3.1655	AlCuSiPb										
3.2314	AlMgSi1										
3.4345	AlZnMgCu0.5	7050	L86			AZ4GU/9051		811-04			
3.4365	AlZnMgCu1.5	7075	7075			7075		AlZn5.8MgCuCr			

N	VDI 3323 23		Aluminium cast, alloyed				≤12% Si, Not curable			≤75HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS	
3.2163	G-AISi9Cu3										
3.2382	GD-AISi10Mg										
3.2383	G-AISi10Mg(Cu)	A360.2	LM9				4253				
3.2581	G-AISi12										
2.3561	G-AlMg5										
3.5101	G-MgZn4sE1Zr1	ZE41	MAG5								
3.5103	MgSE3Zn27r1	EZ33	MAG6			G-TR3Z2					
3.5812	G-MgAl8Zn1	AZ81	NMAG1								
3.5912	G-MgAl9Zn1	AZ91	MAG7								

CONTINUED

N									
VDI 3323 23		Aluminium cast, alloyed		≤12% Si, Not curable				≤75HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
		A356-72	2789		NFA32-201				
		356.1	LM25			4244			
	G-AISI12	A413.2	LM6			4261			
	G-AISI12(Cu)	A413.1	LM20			4260			
	GD-AISI12	A413.0				4247			
	GD-AISI8Cu3	A380.1	LM24			4250			
VDI 3323 24									
VDI 3323 24		Aluminium cast, alloyed		≤12% Si, Curable, hardened				≤90HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.1871	G-AlCu4TiMg								
3.1754	G-AlCu5Ni1.5								
3.2371	G-AISI7Mg	4218B							
3.2373	G-AISI9MGWA	SC64D			A-S7G	4251			
3.2381	G-AISI10Mg								
3.5106	G-MgAg3SE2Zr1	QE22	MAG12						
	G-ALMG5	GD-AISI12	LM5		A-SU12	4252			
VDI 3323 25									
VDI 3323 25		Aluminium, alloyed		>12% Si & Li alloys				≤130HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
To this group belong all Aluminium alloys with >12% Si content and all Aluminium Lithium alloys									
VDI 3323 26									
VDI 3323 26		Copper & Cu alloys (Bronze/Brass)		Cutting alloys, >1% Pb				≤110HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0375	CuZn36Pb3								
2.1090	G-CuSn75Pb	C93200			U-E7Z5Pb4				
2.1096	G-CuSn5ZnPb	C83600	LG2						
2.1098	G-CuSn2ZnPb	C83600							
2.1182	G-CuPb15Sn	C2300	LB1		U-Pb15E8				
VDI 3323 27									
VDI 3323 27		Copper & Cu alloys (Bronze/Brass)		CuZn, CuSnZn (Brass)				≤90HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0240	CuZn15								
2.0321	CuZn37	C27200	CZ108		CuZn36, CuZn37		C2700		
2.0590	G-CuZn40Fe								
2.0592	G-CuZn35Al1	C86500	U-Z36N3		HTB1				
2.0596	G-CuZn34Al2	C86200	HTB1		U-Z36N3				
2.1293	CuCrZr	C18200	CC102		U-Cr0-8Zr				

N									
VDI 3323 28		Copper & Cu alloys (Bronze/Brass)		CuSn, Lead free copper & Electrolytic copper				≤100HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.0060	E-Cu57								
2.0966	CuAl10Ni5Fe4	C63000	Ca104		U-A10N				
2.0975	G-CuAl10Ni	B-148-52							
2.1050	G-CuSn10	C90700	CT1						
2.1052	G-CuSn12	C90800	Pb2		UE12P				
2.1292	G-CuCrF35	C81500	CC1-FF						
VDI 3323 29									
VDI 3323 29		Thermosetting & reinforced plastics				Acrylics etc.			
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
To this group belong all Acrylics, Nylons, Carbon Fibre reinforced plastics, Glass fibre reinforced plastics									
VDI 3323 30									
VDI 3323 30		Non-metals				Hard rubber, Wood etc			
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
To this group belong all non-metal materials such as Graphite, Hard rubber, Wood etc.									
S									
VDI 3323 31		Heat resistant super alloys		Fe based, annealed				≤15HRc ≤200HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4558	X2NiCrAlTi3220	N08800	NA15						
1.4562	X1NiCrMoCu32287	N08031							
1.4563	X1NiCrMoCuN31274	N08028			Z1NCDU31-27-03	2584			
1.4864	X12NiCrSi3616	330	NA17		Z12NCS3718				N08330
1.4865	GX40NiCrSi3818		330C40				XG50NiCr3919		J94605
1.4958	X5NiCrAlTi3120								
VDI 3323 32									
VDI 3323 32		Heat resistant super alloys		Fe based, aged				≤30HRc ≤280HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
1.4977	X40CoCrNi2020				Z42CNKDOWNb				
VDI 3323 33									
VDI 3323 33		Heat resistant super alloys		Ni or Co based, annealed				≤25HRc ≤250HB	
W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
2.4360	NiCu30Fe	Monel 400	NA13		NU30				N04400
2.4603	NiCr30FeMo	5390A			NC22FeD				
2.4610	NiMo16Cr16Ti	Hastelloy C-4							N26455
2.4630	NiCr20Ti	Nimonic 75	HR5, 203-4		NC20T				N06075
2.4631	NiCr20TiAl		HR40		NC20TA				N07080
2.4642	NiCr29Fe	Inconel 690			Nnc30Fe				N06690
2.4856	NiCr22Mo9Nb	Inconel 625	NA21		NC22FeDNb				N06625
2.4858	NiCr21Mo	Inconel 825	NA16		NC21FeDU				N08825

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S	VDI 3323 34		Heat resistant super alloys		Ni or Co based, aged				≤38HRc ≤350HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	2.4375	NiCu30Al	Monel k-500	NA18		NU30AT				N05500
	2.4662	NiFe35Cr14MoTi	5660			Z5NCDT42				N09901
	2.4668	NiCr19Fe19NbMo	Inconel 718	HR8		NC19eNB				N07718
	2.4670	S-NiCr13A16MoNb	5391	MAR-46		NC12AD				
	2.4694	NiCr16Fe7TiAl	Inconel							N07751
	2.4955	NiFe25Cr20NbTi								
	2.4964	CoCr20W15Ni	5772			KC20WN				
		CoCr22W14Ni	AMS5772			KC22WN				

S	VDI 3323 35		Heat resistant super alloys		Ni or Co based, cast				≤34HRc ≤320HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	2.4669	NiCr15Fe7TiAl	Inconel X-750			NC15TNbA				N07750
	2.4685	G-NiMo28	Hastelloy b							N10665
	2.4810	G-NiMo30	Hastelloy C							
	2.4973	NiCr19Co11MoTi	AMS5399			NC19KDT				
	3.7115	TiAl5Sn2								R54520

S	VDI 3323 36		Titanium alloys		Pure Titanium				Tensile strength 400 Rm	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	2.4674	NiCo15Cr10MoAlTi	AMS5397							N13100
	3.7025	Ti1	R50250	2TA1						R50250
	3.7225	Ti1pd	R52250	TP1						R52250

S	VDI 3323 37		Titanium alloys		Alpha + Beta alloys, hardened				Tensile strength 1050 Rm	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	3.7124	TiCu2		2TA21-24						
	3.7145	TiAl6Sn2Zr4Mo2Si	R54620							R54620
	3.7165	TiAl6V4	AMSR56400	TA10-13		T-A6V				
	3.7185	TiAlMo4Sn2		TA45-51						
	3.7195	TiAl3V2.5								R56320
		TiAl4Mo4Sn4Si0.5								
		TiAl5Sn2.5	AMSR54520	TA14/17		T-A5E				
		Ti6Al4VELI	AMSR56401	TA11						

H	VDI 3323 38		Hardened steel		Hardened				≤55HRc ≤550HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	1.1231	Ck67	1070	060A67	C67S	XC68	1770	C70	F.5103	
	1.1248	Ck75	1078, 1080	060A78	C75S	XC75	1774	C75	F.5107	
	1.1274	Ck101	1095	060A96	C100S	XC100	1870	C100	F.5117	
	1.1545	C105W1	W1	BW2	C105U	Y1105	1880	C100KU	F.5118	
	1.2762	75CrMoNiW67								
	1.3401	GX120Mn12	A128(A)			Z120M12	2183	GX120Mn12	F.8251	
	1.6746	32NiCrMo14-5		832M31	32NiCrMo145	35NCD14				
	1.7176	55Cr3	5155	527A60	48	55C3	2253	55Cr3		
	1.7225	42CrMo4	4140	708M40	42CrMo4	42CD4	2244	42CrMo4	F.1252	

H	VDI 3323 39		Hardened steel		Hardened				>55HRc	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
To this group belong all steels hardened higher than 55HRc										

H	VDI 3323 40		Chilled cast iron		Cast				≤42HRc ≤400HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	0.9620	GX260NiCr42	Ni-Hard 2	Grade 2A	GJN-HV250	FBNi4Cr2BC	0512			F45001
	0.9625	GX330NiCr42	Ni-Hard 1	Grade 2B	GJN-HV550	FBNi4Cr2HC	0513			F45000
	0.9630	GX300CrNiSi952	Ni-Hard 4	Grade 2C	GJN-HV600	FBCr9Ni5	0457			F45003
	09640	GX300CrMoNi1521								F45005
	0.9650	GX260Cr27		Grade 3D			0466			
	0.9655	GX300CrNiMo271		Grade 3E						
	1.4841	X15CrNiSi25-20	310	314S31	X15CrNiSi2520	Z15CNS25-20				S31400

H	VDI 3323 41		Hardened cast iron		Hardened				≤55HRc ≤550HB	
	W. Nr	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE/IHA	UNS
	0.9635	GX300CrMo153								
	0.9645	GX260CrMoNi2021							107WCr5KU	F45007
	0.9655	GX300CrNiMo271								