Grade Naming System

1	2	3	4	5	(6)
YG	**3**	**1**	**1**	**5**	**(G)**
YG Brand	Workpiece Material	Grade Version	Application Range (1st Digit)	Application Range (2nd Digit)	Minor Variation
Carbide CVD (4 Digits)	●	●	●	●	YG3115
Carbide PVD (3 Digits)	●	●	●		YG211
Carbide Uncoated (2 Digits)	●	●			YG10

1 - YG Brand

2 - Workpiece Material

Symbol	Workpiece Material	Turning	Milling	Drilling	Parting
1	K Cast Iron or N Non-Ferrous	●			
2	M Stainless Steel	●			
3	P Steel	●			
4	S Superalloys	●			
5	K Cast Iron or N Non-Ferrous		●	●	●
6	M Stainless Steel or Universal		●	●	●
7	P Steel		●	●	●
8	Universal	●			
9	Exotic Material		●		
0	Hardened Steel		●		

3 - Grade Version

4 & 5 - Application Range

Symbol	
05	Stable: Wear Resistant Grade, Stable Application, Continuous Cut, Finishing
10	
15	
20	General: Balanced Grade, High Versatility, General Application
25	
30	
35	
40	Unstable: Tougher Grade, Unstable Application, Interrupted Cut, Chipping Resistance, Roughing
45	

(6) - (Minor Variation)

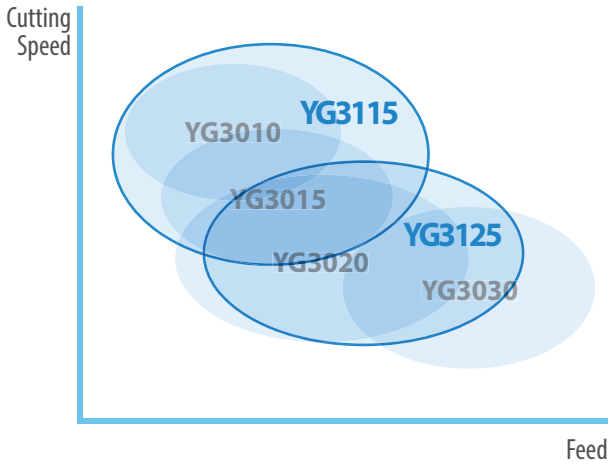
G - Gold Coated Version

Product Overview

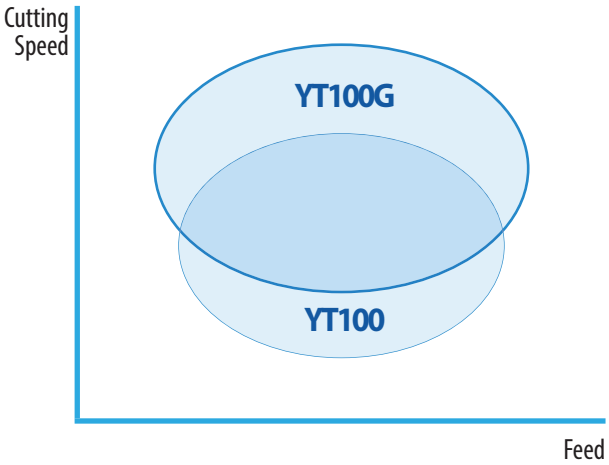
Turning Grades Map

Speed : Vc (m/min.)
Feed : Fn (mm/rev.)

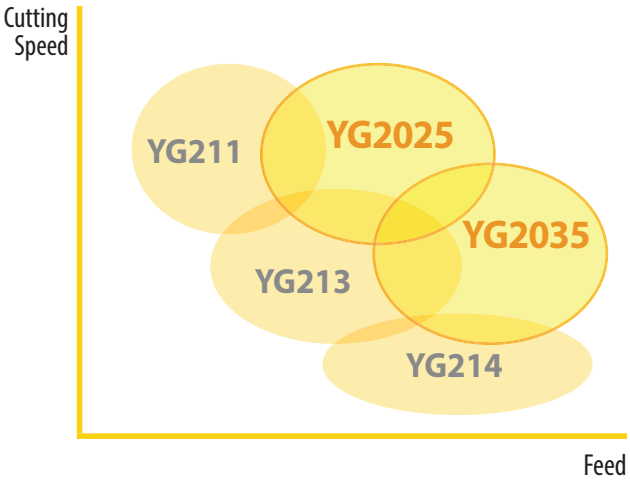
Steel



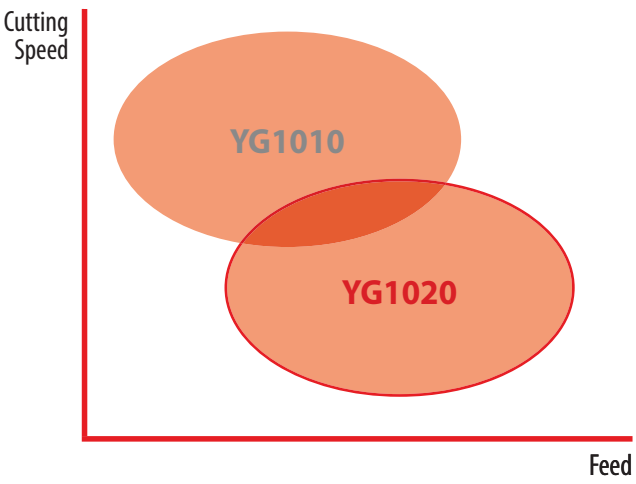
Steel - Cermet



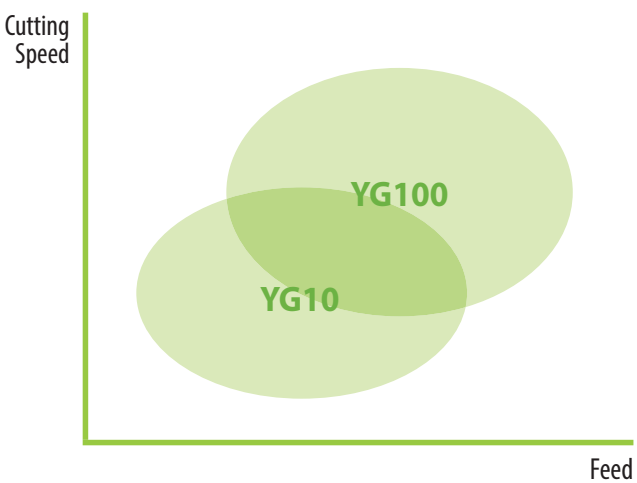
Stainless steel



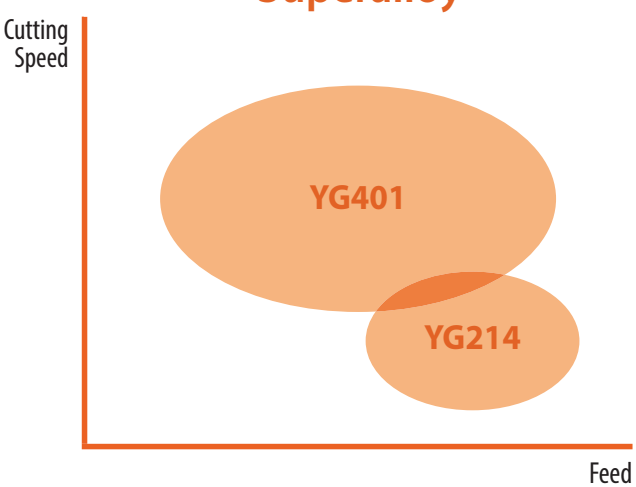
Cast iron



Non-ferrous Metal



Superalloy



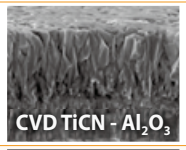
Product Overview

Turning Grades

Turning Grades		P Steel				M Stainless steel			K Cast iron			N Non-ferrous		S Superalloys	
		P10	P20	P30	P40	M10	M20	M30	K10	K20	K30	N10	N20	S10	S20
CVD	YG1010								1010						
	YG1001	1001								1001					
	YG1020									1020					
	YG3010	3010								3010					
	YG3015		3015												
	YG3115		3115												
	YG3125			3125											
	YG3020		3020												
	YG3030			3030											
	YG2025						2025								
	YG2035							2035							
PVD	YG801		801												
	YG211					211									
	YG213						213								
	YG214							214							214
	YG401													401	
Cermet	YT100	YT100				YT100			YT100						
	YT100G	YT100G				YT100G			YT100G						
DLC	YG100											100			
-	YG10											10			

YG1010

K05 - K15

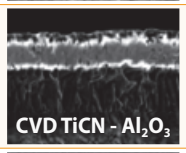


First Choice for Cast Iron

- Effective coating structure enables high speed machining
- Special post treatment for improved chipping resistance

YG1001

P01 - P10
K10 - K25

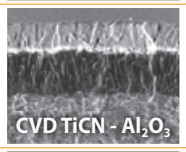


Stable Machining of Cast Iron

- Substrate especially designed for high wear resistance
- Thick Al_2O_3 layer ensures good wear resistance at high cutting speeds including dry machining

NEW YG1020

K15 - K25

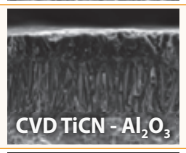


First choice for ductile cast iron

- Excellent wear and fracture resistance when machining ductile cast iron
- New coating ensures outstanding resistance to abrasion wear

YG3010

P05 - P20
K15 - K35

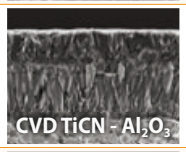


First choice for Finishing Steels, and Ductile Cast iron

- Finishing and light machining of steel under in stable condition
- New Al_2O_3 coating technology and excellent surface smoothness increase wear resistance and chipping resistance

YG3015

P10 - P25

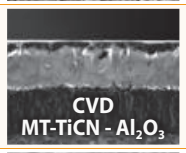


Balanced Productivity for Continuous cut

- High wear resistance and improved toughness ensures high productivity with less trouble

YG3115

P15 - P25

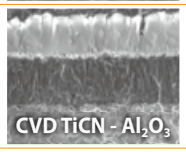


First choice grade for high cutting speed in Steels

- Suitable for mass production due to stable and predictable tool life
- Minimizing built up edge due to new post surface treatment in mild steels, low carbon steel and low carbon alloy steel.
- Best choice for both continuous as well as interrupted cuts

NEW YG3125

P20 - P30

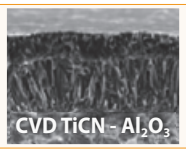
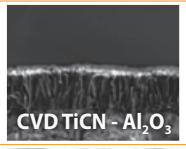
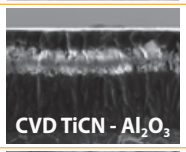
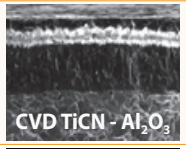
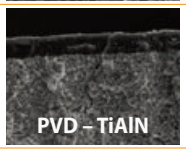
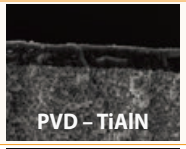
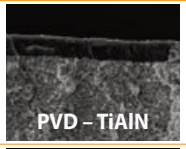
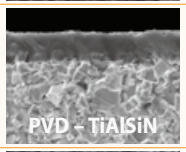
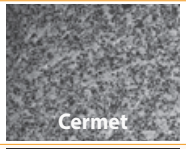
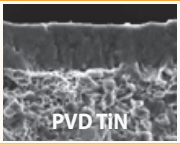
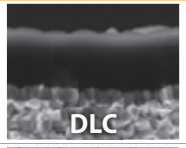
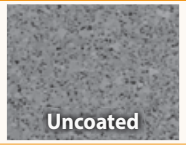


Recommended first grade for steel

- New substrates with a unique combination of good toughness and plastic deformation resistance
- General Machining on steel

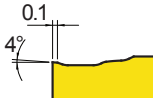
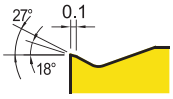
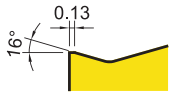
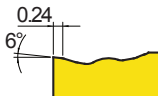
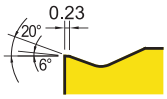
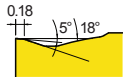
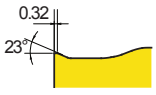
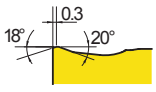
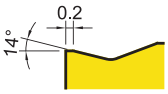
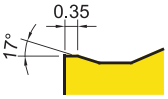
Product Overview

Turning Grades

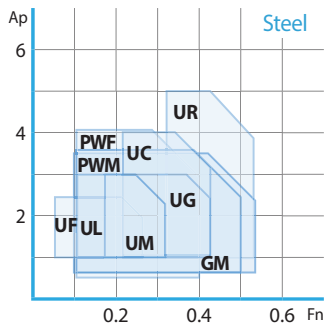
YG3020 P15 - P30		**First Choice Grade for General Steel Application** • Substrate especially designed for good toughness • Excellent surface smoothness increases wear resistance and reliability
YG3030 P20 - P35		**Interrupted Cutting of Steel and Stainless steel** • Substrate for heavy roughing in mild steel and low carbon alloy steel • New Al_2O_3 technology and optimized surface treatment achieves a good balance between wear resistance and chipping resistance
YG801 P10 - P30		**for Carbon Steel with Low Cutting Speed** • Recommended for mild steel and boring application • Substrate and special PVD coating for excellent wear resistance
YG2025 M15 - M35		**CVD grade for High Cutting Speed for Stainless steel** • Utilizing a new carbide substrate and new coating • Excellent combination of wear resistance and chipping resistance • Minimized built up edge due to post surface treatment
NEW **YG2035** M30 - M40		**CVD Coated Grade for stainless steel at Low Cutting Speed** • Substrate withstands heavy interruption, while the coating provides the wear resistance needed for a long tool life • Smooth surface resists build-up edge, even at low cutting speeds
YG211 M05 - M25		**High wear Resistance Grade for Stainless steel** • Finishing Stainless steel
YG213 M20 - M35		**First Choice Grade on Low Cutting Speed of Stainless steel** • First choice on Stainless steel for Low cutting speed • For Medium to low cutting speed
YG214 M30 - M40 S25 - S30		**Heavy Interrupted cut for Stainless steel** • For Heavy Interrupted cut on Stainless steel • Minimize risk of Mechanical fracture or Chipping
YG401 S10 - S20		**PVD Turning Grade for HRSA** • Highly heat-resistant TiAlSiN structure for excellent wear resistance • Greatly improved film coating realizes excellent boundary defect resistance • Top coating layer provides a smooth surface and lubricant effect
YT100 P10 - P20 M10 - M20 K10 - K20		**New Generation Cermet Grade** • Enhanced wear resistance & chipping resistance • Excellent fracture resistance • Superior surface finish with special edge preparation
NEW **YT100G** P5 - P20 M5 - M20 K5 - K20		**PVD-coated Cermet grade for turning** • Outstanding wear resistance and a low coefficient of friction enable high-speed turning of steels, stainless steels, and cast irons with extended tool life
YG100 N05 - N25		**First Choice Grade for Aluminum with DLC Coating** • Submicron carbide for high wear resistance • DLC coating minimizes Built Up Edge tendency. • Improve tool life in sticky non-ferrous alloy
YG10 N05 - N25		**Uncoated Grade for General Aluminum** • Substrate consisted of submicron carbide for high wear resistance • Shining surface to prevent built up edge

Product Overview

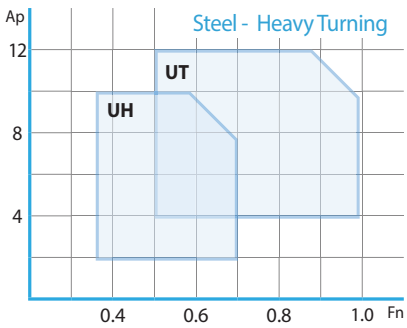
Turning Chipbreakers - Negative

P	M	K	N	S				Feed 0 0.1 0.2 0.3 0.4 0.5 0.6 Fn (mm/rev.)
P					UF		Finishing 	Fn 0.05~0.25 Ap 1.0~2.5
P					NEW PWF		Wiper-Finishing 	Fn 0.10~0.40 Ap 0.5~4.0
P					UL		Semi Finishing and sticky materials 	Fn 0.1~0.3 Ap 1.0~3.0
P					UM		Medium & Unstable conditions 	Fn 0.15~0.3 Ap 1.0~3.0
P					NEW GM		Medium machining for steel & Stainless steel 	Fn 0.17~0.50 Ap 0.8~5.0
P					UG		First Choice for Medium (Stable conditions) 	Fn 0.2~0.4 Ap 1.0~3.0
P					PWM		Wiper-Medium 	Fn 0.1~0.5 Ap 0.8~3.5
P					UH		Low cutting force 	Fn 0.35~0.7 Ap 2.0~9.0 →
P					UT		Heavy roughing 	Fn 0.5~1.0 → Ap 4.0~12.0 →
P		K			UC		Medium Roughing and First choice for Cast iron 	Fn 0.2~0.4 Ap 1.0~4.0
P		K			UR		Roughing and Heavy interrupted cut 	Fn 0.3~0.5 Ap 1.0~5.0
		K			..MA		Cast iron Heavy Roughing 	Fn 0.15~0.50 Ap 1.0~5.0

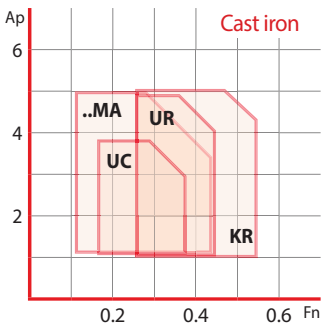
0 1 2 3 4 5 6
Depth of Cut Ap (mm)



*Insert : CNMG120408



*Insert : CNMM190616



*Insert : CNMG120408

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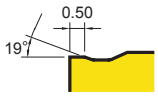
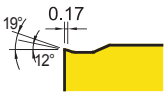
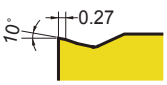
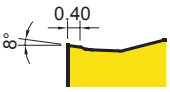
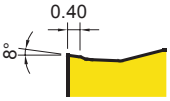
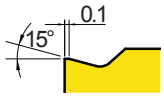
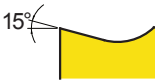
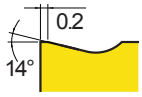
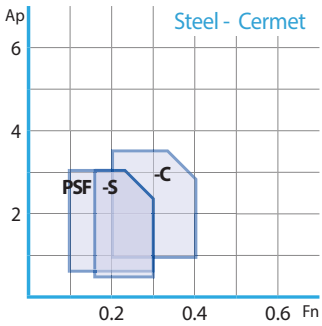
Product Overview

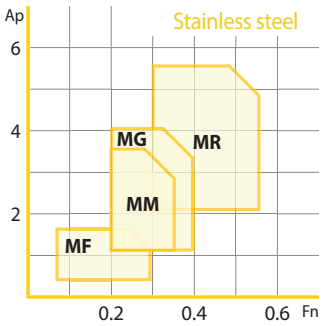
Turning Chipbreakers - Negative

P	M	K	N	S					Feed 0 0.1 0.2 0.3 0.4 0.5 0.6 Fn (mm/rev.)
		K			KR		Cast Iron Heavy Roughing		Fn 0.3~0.6 Ap 1.0~5.0
	M			S	MF		Stainless steel Finishing		Fn 0.07~0.30 Ap 0.2~1.5
P	M			S	MM		Stainless steel Medium and Low Carbon Steel		Fn 0.20~0.35 Ap 1.0~3.5
	M			S	MG		Stainless steel General		Fn 0.20~0.40 Ap 1.0 ~ 4.0
	M			S	MR		Stainless steel Roughing		Fn 0.30~0.55 Ap 2.0~5.5
				S	SF		HRSA Finishing		Fn 0.1~0.25 Ap 0.2~1.0
				S	SM		HRSA Medium		Fn 0.15~0.30 Ap 0.5~3.0
				S	SR		Roughing for HRSA		Fn 0.30~0.55 Ap 2.0~5.5
P	M	K			PSF		Cermet Finishing to Semi medium		Fn 0.10~0.30 Ap 0.6~3.0
P	M	K			NEW -S		Cermet Finishing		Fn 0.15~0.30 Ap 0.5~3.0
P	M	K			-C		Cermet Medium		Fn 0.20~0.40 Ap 1.0~3.5

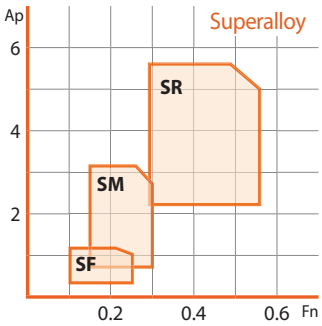
0 1 2 3 4 5 6 Depth of Cut Ap (mm)



*Insert : CNMG120408 / TNGG160408



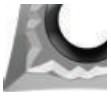
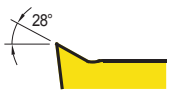
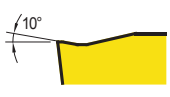
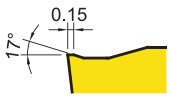
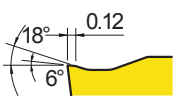
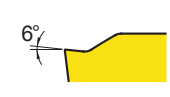
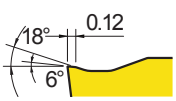
*Insert : CNMG120408



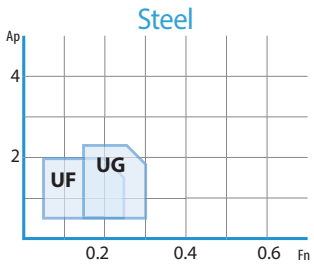
*Insert : CNMG120408

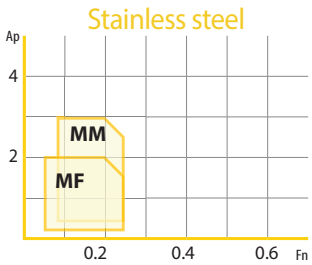
Product Overview

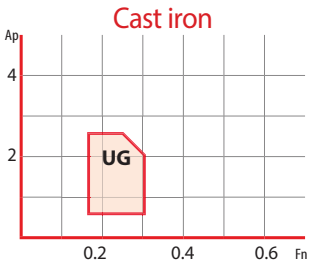
Turning Chipbreakers - Positive

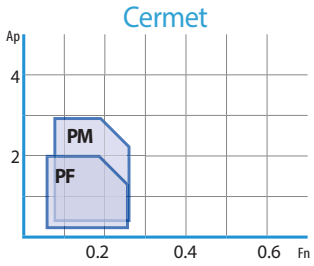
P	M	K	N	S				Feed 0 0.1 0.2 0.3 0.4 0.5 0.6 Fn (mm/rev.)
			N		AL		Aluminum application 	Fn 0.02~0.30 Ap 0.1~5.0
P	M				UF		Finishing application 	Fn 0.05~0.25 Ap 0.5~2.0
P		K			UG		Medium application 	Fn 0.15~0.30 Ap 0.5~2.5
	M				MF		Stainless steel Finishing 	Fn 0.04~0.30 Ap 0.1~2.0
	M				MM		Stainless steel Medium 	Fn 0.06~0.35 Ap 0.25~3.0
				S	SF		HRSA Finishing 	Fn 0.03~0.20 Ap 0.1~2.5
P	M	K			PF		Finishing 	Fn 0.06~0.25 Ap 0.1~2.0
P	M	K			PM		Medium 	Fn 0.08~0.25 Ap 0.25~3.0

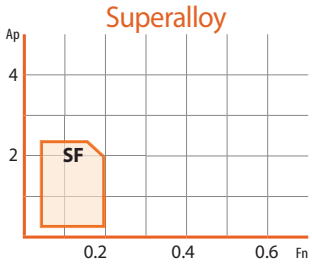
0 1 2 3 4 5 6
Depth of Cut Ap (mm)

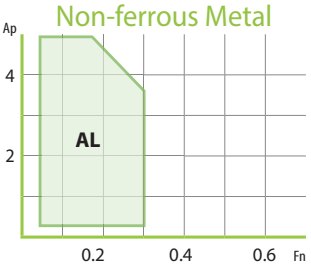












*Insert : CCMT09T304

Technical Information

Recommended cutting conditions

Turning

Cutting Speed			Vc (m/min.)																	
ISO	VDI	Sub Group	YG1010		YG1001		YG1020		YG3010		YG3015		YG3115		YG3125		YG3020		YG3030		YG801	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
P	1~5	Non-Alloyed Steel	-	-	220	480	-	-	230	450	200	430	180	500	150	400	160	380	130	350	120	200
P	6~9	Low-Alloyed Steel	-	-	220	420	-	-	180	380	150	350	170	450	130	350	140	320	130	280	70	200
P	10~11	High-Alloyed Steel	-	-	-	-	-	-	60	200	90	180	60	300	60	280	60	130	70	110	-	-
M	12~13	Ferritic & Martensitic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	14	Austenitic Stainless Steel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	15~16	Grey Cast Iron	300	450	250	420	180	350	120	300	-	-	-	-	-	-	-	-	-	-	-	-
K	17~18	Nodular Cast Iron	120	350	120	300	100	280	120	280	-	-	-	-	-	-	-	-	-	-	-	-
N	21~30	Non-Ferrous Metals (Al)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	31~37	Superalloys & Titanium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	38~41	Hard Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning

Cutting Speed			Vc (m/min.)																	
ISO	VDI	Sub Group	YG2025		YG2035		YG211		YG213		YG214		YG401		YT100		YT100G		YG100		YG10	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
P	1~5	Non-Alloyed Steel	-	-	-	-	-	-	-	-	-	-	-	-	150	480	170	500	-	-	-	-
P	6~9	Low-Alloyed Steel	-	-	-	-	-	-	-	-	-	-	-	-	160	480	180	500	-	-	-	-
P	10~11	High-Alloyed Steel	-	-	-	-	-	-	-	-	-	-	-	-	70	180	100	230	-	-	-	-
M	12~13	Ferritic & Martensitic	170	220	140	180	170	270	120	180	100	150	-	-	150	280	170	300	-	-	-	-
M	14	Austenitic Stainless Steel	150	200	120	165	150	230	40	160	100	150	-	-	130	260	140	270	-	-	-	-
K	15~16	Grey Cast Iron	-	-	-	-	-	-	-	-	-	-	-	-	130	450	140	500	-	-	-	-
K	17~18	Nodular Cast Iron	-	-	-	-	-	-	-	-	-	-	-	-	100	400	110	440	-	-	-	-
N	21~30	Non-Ferrous Metals (Al)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250	1200	250	800
S	31~37	Superalloys & Titanium	-	-	-	-	30	100	30	70	30	50	30	90	-	-	-	-	-	-	-	-
H	38~41	Hard Materials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Parting & Grooving

Cutting Speed			Vc (m/min.)			
ISO	VDI	Sub Group	YG602G (YG602)		YG603	
			Min	Max	Min	Max
P	1~5	Non-Alloyed Steel	120	180	-	-
P	6~9	Low-Alloyed Steel	100	140	-	-
P	10~11	High-Alloyed Steel	80	110	-	
M	12~13	Ferritic & Martensitic	70	160	50	90
M	14	Austenitic Stainless Steel	55	140	40	80
K	15~16	Grey Cast Iron	110	185	-	-
K	17~18	Nodular Cast Iron	110	140	-	-
N	21~30	Non-Ferrous Metals (Al)	250	440	-	-
S	31~37	Superalloys & Titanium	25	45	-	-
H	38~41	Hard Materials	25	50	-	-

Technical Information

Recommended cutting conditions

Nanocut

YG812 GRADE			Cutting Speed		Feed per Revolution (Fn)	
ISO	VDI	Sub Group	Vc (m/min.) Min	Vc (m/min.) Max	Fn (mm/rev.) Min	Fn (mm/rev.) Max
P	1~5	Non-Alloyed Steel	170	200	0.015	0.025
P	6~9	Low-Alloyed Steel	95	160	0.015	0.025
P	10~11	High-Alloyed Steel	85	95	0.015	0.025
M	12~13	Ferritic & Martensitic	105	140	0.015	0.025
M	14	Austenitic Stainless Steel	95	130	0.015	0.025
K	15~16	Grey Cast Iron	140	190	0.015	0.025
K	17~18	Nodular Cast Iron	140	190	0.015	0.025
N	21~30	Non-Ferrous Metals (Al)	-	-	-	-
S	31~37	Superalloys & Titanium	10	75	0.015	0.025
H	38~41	Hard Materials	-	-	-	-

Milling

Cutting Speed			Vc (m/min.)																			
ISO	VDI	Sub Group	YG012		YG712		YG713		YG622		YG612		YG602		YG613		YG501(G)		YG5020		YG904		YG50	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
P	1~5	Non-Alloyed Steel	180	280	170	300	200	300	140	400	180	280	180	270	100	210	-	-	-	-	-	-	-	-
P	6~9	Low-Alloyed Steel	150	250	180	250	170	270	120	320	150	250	150	240	70	180	-	-	-	-	-	-	-	-
P	10~11	High-Alloyed Steel	80	150	100	140	85	145	70	170	70	140	70	130	40	90	-	-	-	-	-	-	-	-
M	12~13	Ferritic & Martensitic	-	-	-	-	-	-	-	-	120	200	120	180	70	180	-	-	-	-	-	-	-	-
M	14	Austenitic Stainless Steel	-	-	-	-	-	-	-	-	130	250	30	230	70	200	-	-	-	-	-	-	-	-
K	15~16	Grey Cast Iron	-	-	-	-	-	-	120	270	-	-	120	250	-	-	160	300	200	350	-	-	-	-
K	17~18	Nodular Cast Iron	-	-	-	-	-	-	130	240	-	-	120	220	-	-	130	210	150	300	-	-	-	-
N	21~30	Non-Ferrous Metals (Al)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	800
S	31~37	Superalloys & Titanium	-	-	-	-	-	-	-	-	25	45	5	45	-	-	-	-	-	-	20	60	-	-
H	38~41	Hard Materials	70	120	-	-	-	-	40	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Drilling

Cutting Speed			Vc (m/min.)					
ISO	VDI	Sub Group	YG602		YG713		YG613	
			Min	Max	Min	Max	Min	Max
P	1~5	Non-Alloyed Steel	180	380	200	300	100	210
P	6~9	Low-Alloyed Steel	120	300	170	270	70	180
P	10~11	High-Alloyed Steel	70	150	85	145	40	90
M	12~13	Ferritic & Martensitic	120	200	130	230	70	180
M	14	Austenitic Stainless Steel	130	250	130	230	70	200
K	15~16	Grey Cast Iron	120	250	-	-	-	-
K	17~18	Nodular Cast Iron	130	220	-	-	-	-
H	38~41	Hard Materials	-	-	-	-	-	-

Technical Information

ISO 13399 Terms

AN	Clearance angle major	**INSD**	Insert diameter
APMX	Maximum depth of cut	**KAPR**	Tool cutting edge angle
AS	Clearance angle wiper edge	**KRINS**	Cutting edge angle major
B	Shank width	**KWW**	Keyway width
BS	Wiper edge length	**L**	Cutting edge length
CBDP	Connection bore depth	**LE**	Cutting edge effective length
CDX	Cutting depth maximum	**LF**	Functional length
CICT	Number of Inserts	**LH**	Head length
CW	Cutting width	**LS**	Shank length
CZC	Connection size code	**LU**	Usable length
DC	Cutting diameter	**LUX**	Usable length maximum
DCON	Connection diameter	**M**	Nose (or Wiper) Height
DCSFMS	Contact surface diameter machine side	**OAL**	Overall length
DCX	Cutting diameter maximum	**RE**	Corner radius
DMIN	Minimum bore diameter	**RMPX**	Maximum ramping angle
DMM	Shank diameter	**RPMX**	Rotational speed maximum
EPSR	Insert included angle	**S**	Insert thickness
H	Shank height	**TDZ**	Thread diameter size
HAND	Hand	**WF**	Functional width
IC	Inscribed circle diameter		

Technical Information

Hardness Conversion Table

HB	HRc	HRB	HV	N/mm²
199	15	93	199	667
203	16	94	201	680
208	17	95	210	696
212	18	95	218	706
216	19	96	222	716
223	20	97	227	755
229	21	98	235	775
233	22	99	241	794
240	23	100	247	824
245	24	100	252	838
250	25	101	255	853
255	26	102	258	870
262	27	103	262	880
264	28	103	271	892
271	29	104	277	941
277	30	105	285	971
290	31	106	292	990
300	32	107	303	1020
308	33	107	311	1035
314	34	108	320	1049
322	35	108	332	1089
331	36	109	342	1118
341	37	109	351	1157
348	38	110	361	1187
360	39	111	376	1236
373	40	111	388	1265
375	41	112	393	1314
388	42	113	406	1363
402	43	114	424	1390
415	44	114	438	1422
419	45	114	448	1447
430	46	115	458	1471
445	47	115	474	1520
456	48	116	490	1569
468	49	117	497	
469	50	117	505	
486	51	118	531	
504	52	118	549	
513	53	119	567	
534	54	120	589	
552	55		649	
572	56		694	
592	57		727	
601	58		746	
613	59			
627	60			
642	61			
658	62			
681	63			
695	64			
HB	HRc	HRB	HV	N/mm²

Application Guide

Steel Guide

Grade Recommendation based on Workpiece Material Condition

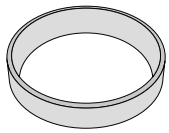
HARD

YG3115

YG3125

YG3030

TOUGH



Pre Machined Condition

No Outer Skin

Uniform hardness on material

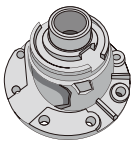
Has stable machining condition

Welded Condition

Soft / No Outer Skin

Weld Bead Could be of Different Hardness than Actual Part

Stock on Part could even except weld Seam during Machining causing shock loads

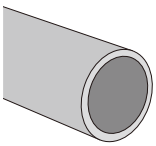


Cast Condition

Hard Outer Skin

Could have Sand Inclusion,- if Green Sand Cast

Component could have uneven Stock during machining



Hot Rolled Condition

Soft / No Outer Skin

Usually heat treated before machine to reduce Hardness

Component could have uneven Stock During Machining

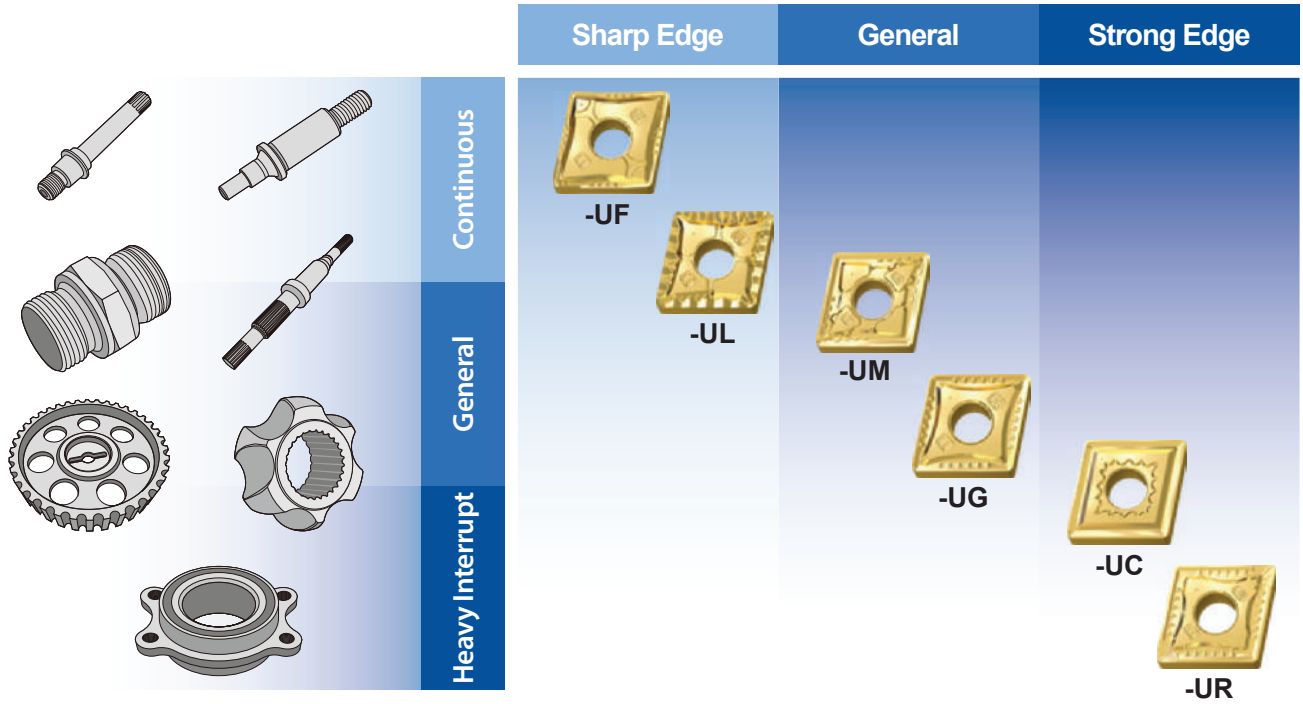
Forged Condition

Soft Outer Skin

Usually heat treated before machine to reduce Hardness

Component could have uneven Stock during machining

Chipbreaker, Feed Rate and Depth of Cut

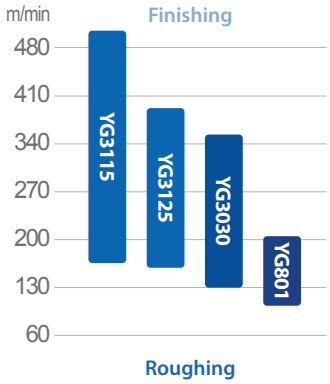


Application Guide

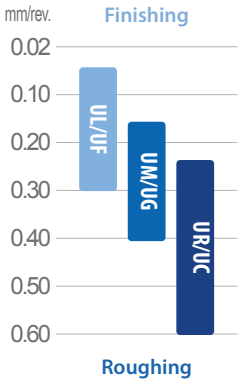
Steel Guide

P	Non Alloy Steel, About 0.15% C (Low Carbon Steel)									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
1	S15C	CK15	1.0401	1015	1350	XC18	C15	F.1110	080M15	15

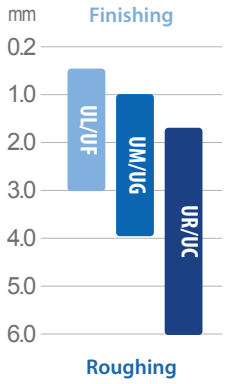
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)

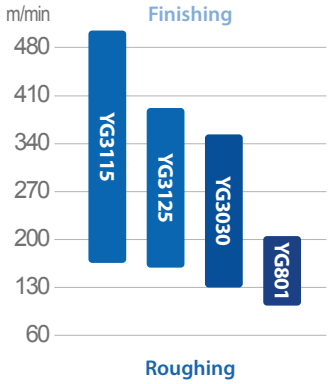


First Choice Grade and Value

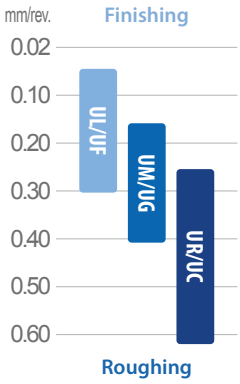
YG3030 - Vc 280m/min

P	Non Alloy Steel, About 0.45% C (Medium Carbon Steel)									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
2~3	S45C	C45	1.0503	1045	1672	XC42H1TS	C45	F.1140	060A47	45

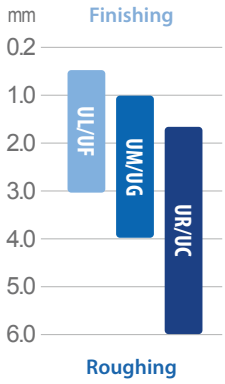
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)



First Choice Grade and Value

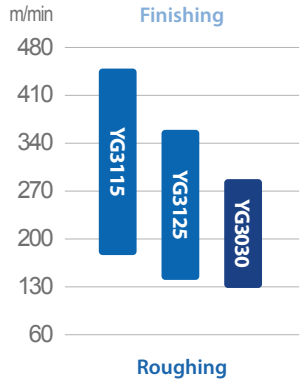
YG3125 - Vc 270m/min

Application Guide

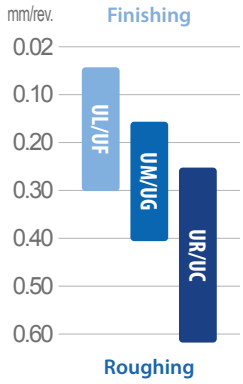
Steel Guide

P	Low-alloyed Steel									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
6~9	SCM440	42CrMo4	1.7225	4140	2244	42 CD 4	42CrMo4	F.1252	708M40	38HM

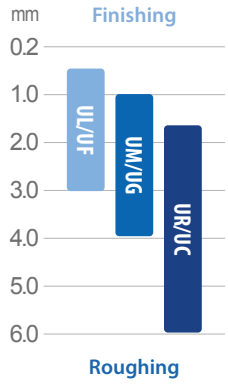
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)

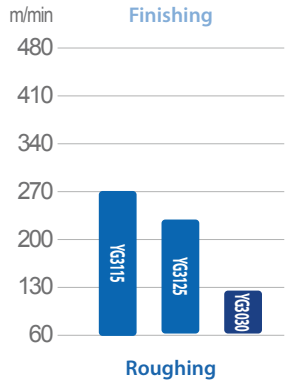


First Choice Grade and Value

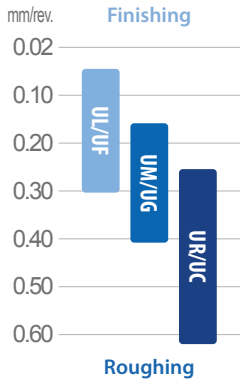
YG3125 - Vc 240m/min

P	High Alloyed Steel, and Tool Steel									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
10~11	SKD11	X155CrVMo121	1.2379	D2	2310	Z160CDV12	X165CrMoW12KU	F.5318	BD2	KH12MF

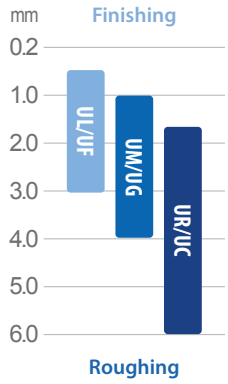
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)



First Choice Grade and Value

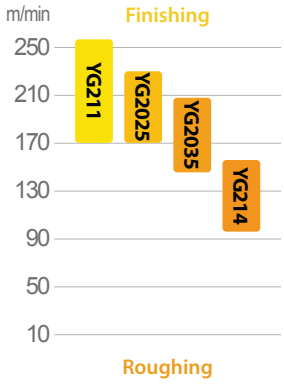
YG3115 - Vc 150m/min

Application Guide

Stainless steel Guide

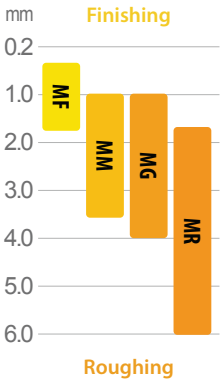
M	Ferritic / Martensitic Stainless									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
12~13	SUS430	X6Cr17	1.4016	430	2320	Z8C17	Z8C17	F.3113	430S15	12C17

Cutting Speed (Vc)



Feed Rate (Fn)

Depth of Cut (Ap)



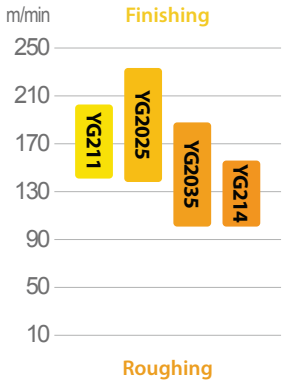
First Choice Grade and Value

Ferritic Stainless steel
YG213 - Vc 160m/min
YG2025 - Vc 190m/min

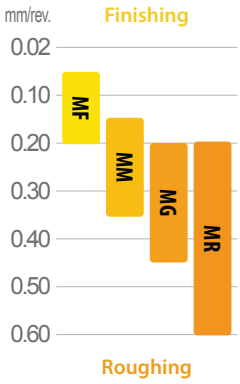
Martensitic
YG213 - Vc 130m/min
YG2025 - Vc 160m/min

M	Austenitic Stainless steel									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
14	SUS304	X5CrNi18 9	1.4350	304	2332	Z6CN18 09	X5CrNi18 10	F.3551	304S15	03KH18N11

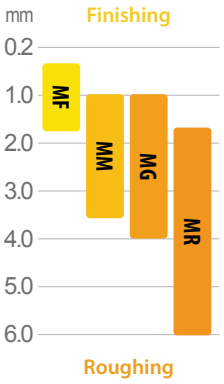
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)



First Choice Grade and Value

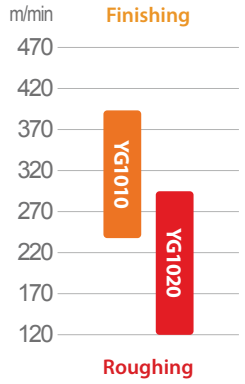
YG2025 - Vc 190m/min

Application Guide

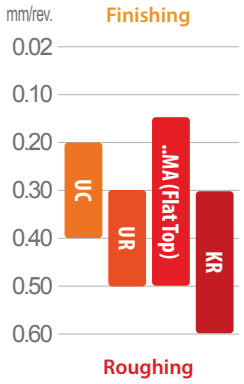
Cast iron Guide

K	Grey cast iron									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
15~16	FC250	GG25	0.6025	A48 40 B	0125	Ft 25 D	G25	FG25	Grade 260	Sc 25

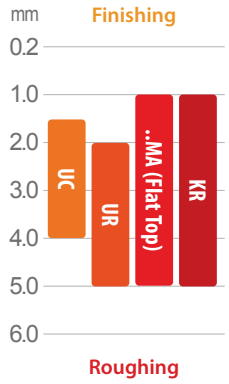
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)

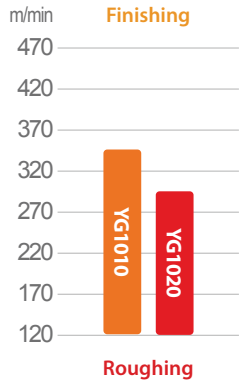


First Choice Grade and Value

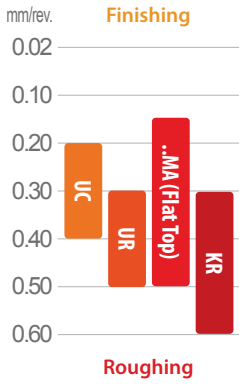
YG1010 - Vc 320m/min

K	Nodular cast iron									
VDI	JIS	DIN	Mat'l No.	AISI/ASTM	SS	AFNOR	UNI	UNE	BS	GOST
17~18	FCD500	GGG50	0.7050	80-55-06	0.7050	FGS 500-7	GS 500-7	FGE50-7	SNG 500-7	Vc 50-2

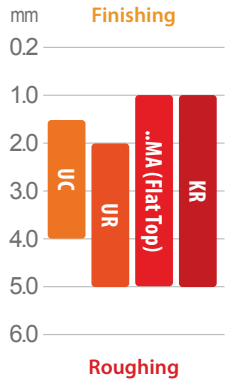
Cutting Speed (Vc)



Feed Rate (Fn)



Depth of Cut (Ap)



First Choice Grade and Value

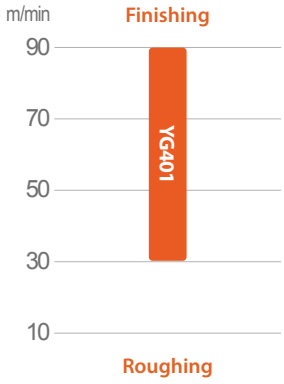
YG1020 - Vc 230m/min

Application Guide

HRSA Guide

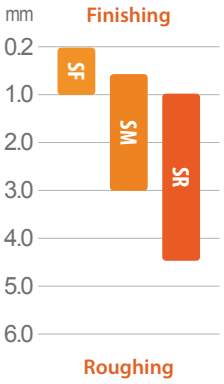
S	Superalloys & Titanium Alloys									
VDI	DIN	Mat'l No.	AISI/ASTM	AFNOR	BS	UNS	Brands	UNE	BS	GOST
31~37	NiCr19Fe19NbMo	2.4668	5383	NC19eNB	HR8	N07718	Inconel 718	F.3113	430S15	12C17

Cutting Speed (Vc)



Feed Rate (Fn)

Depth of Cut (Ap)



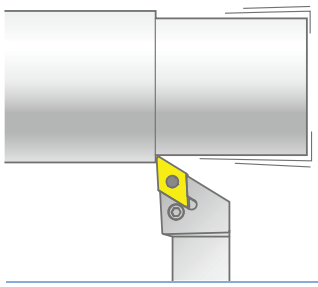
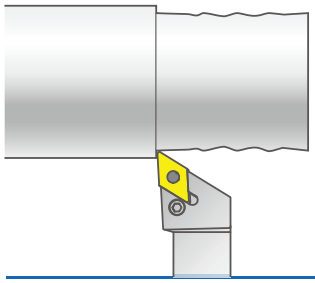
First Choice Grade and Value

YG401 - Vc 50m/min

Application Guide

Surface Roughness Guide

Trouble Shooting

Pattern	Reasons	Solutions
Vibration 	- High radial or tangential force - Unstable condition	- Lower depth of cut (ap) - Use sharper chipbreaker - Check stability, and position of tool and workpiece - Reduce the overhang (bigger and shorter tool)
Bad Surface 	- Work material is damaged by chips - Feed is too high for corner radius	- Different chipbreaker - Lower depth of cut (ap) - Lower feed - Larger corner radius

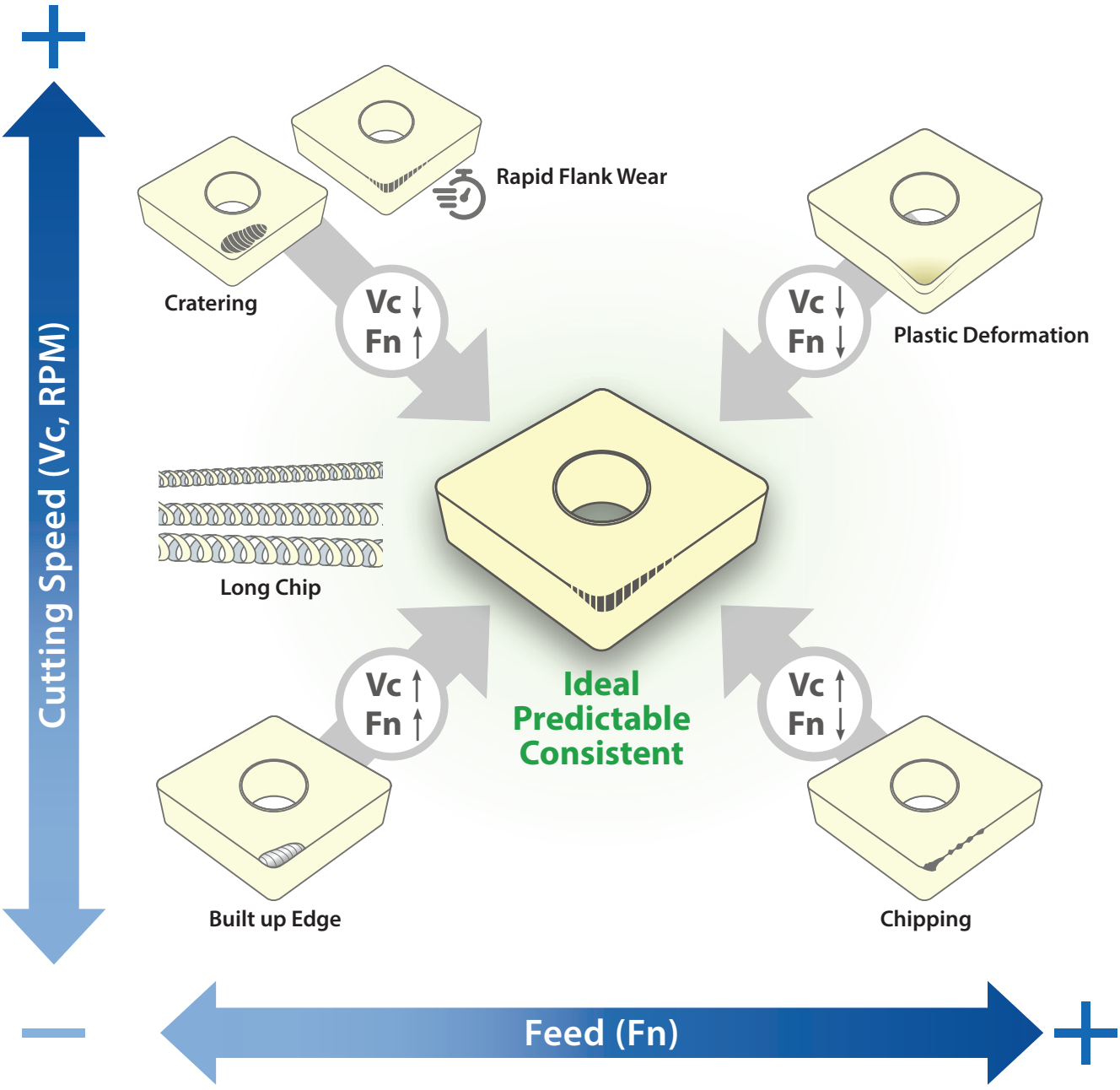
Theoretical Surface Roughness

Ra / Rz µm	Insert Corner Radius Code ISO					
	02	04	08	12	16	24
	Feed Rate mm/rev					
0.4 / 1.6	0.05	0.07	0.1	0.12	0.14	0.18
1.6 / 6.3	0.1	0.14	0.2	0.25	0.28	0.35
3.2 / 12.5	0.14	0.2	0.28	0.35	0.4	0.49
6.3 / 25	-	0.28	0.4	0.49	0.57	0.69
8 / 32	-	-	0.45	0.55	0.64	0.78

Application Guide

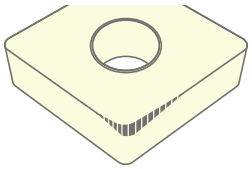
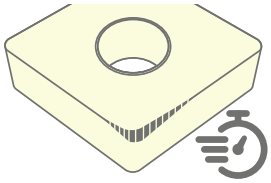
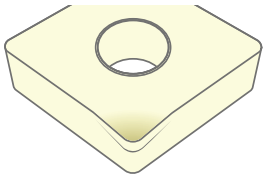
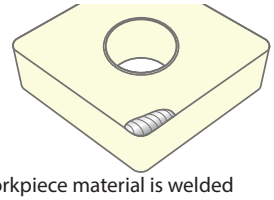
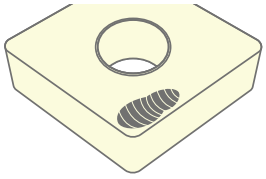
Trouble Shooting

Trouble Shooting Guide map



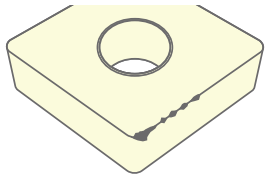
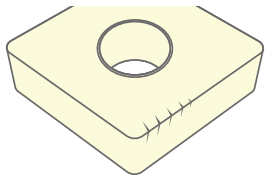
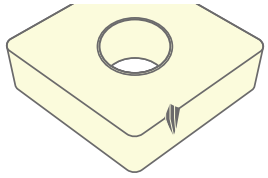
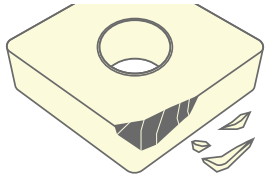
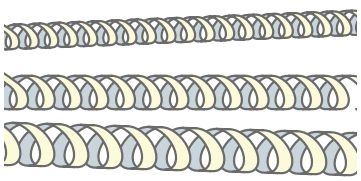
Application Guide

Trouble Shooting

Pattern	Reasons	Solutions
General Flank Wear  Flank face near by corner is abrased	- The most ideal wear - Consistent and predictable - General wear behavior when machining condition is normal	
Rapid Flank Wear  Looks same as general flank wear, but happens quickly	**Grade** - Not enough wear resistance - Too tough grade **Heat** - Cutting speed is too high - Not enough coolant	- More wear resistant grade - Reduce the cutting speed (Vc, SFM, RPM or SFPM) - Optimize coolant - Increase Feed (Fn) if feed is low
Plastic Deformation  Deformed Edge	- Excess thermal load - Excess mechanical load	- Reduce cutting temperature - More wear resistant grade - Reduce the cutting speed (Vc, SFM, RPM or SFPM) - Lower feed (Fn) - Lower depth of cut (ap) - Optimize coolant
Built up Edge  Workpiece material is welded on the cutting edge	- Sticky materials (low carbon steel, Stainless steel, non-ferrous metal, heat resistant super alloys) - Too low cutting speed	- Increase cutting speed - Lower feed rate - Sharper chipbreaker & geometry - Use high pressure coolant - Use PVD grade - Use Positive Insert
Cratering 	**Heat** - Cutting speed is too high - Too tough grade	- Reduce cutting temperature - Lower cutting speed (Vc, SFM, RPM or SFPM) - Adjust Feed (Fn) - Harder grade

Application Guide

Trouble Shooting

Pattern	Reasons	Solutions
Chipping 	- Unstable machining condition (Vibration) - Grade is too hard / brittle - Cutting edge is too sharp	- Focus on stabilizing cutting condition - Reduce overhang (shorter and bigger tool) - Tougher grade - Tougher chipbreaker
Thermal Crack 	- Thermal stress due to rapid change of temperature	- Tougher grade - Lower cutting speed (Vc, SFM, RPM or SFPM) - Lower feed (Fn) - Sharper chipbreaker - Change coolant / dry cut
Notching 	- Improved edge strength work piece has hardened skin	- More wear resistant grade - Reduce the cutting speed (Vc, SFM, RPM or SFPM) - Adjust Feed (Fn) - Lower depth of cut (ap) - Optimize coolant - Go for tougher chipbreaker
Breakage (Mechanical Fracture) 	- Mechanical load is too heavy (feed or depth is too high) - Heavy interrupted cut - Grade is too hard for work material - Unstable machining (vibration) - Cutting speed is too low - Impurities in work material	- Lower feed (Fn)or depth of cut (ap) - Tougher grade - Reduce overhang and check stability of tool and work material - Higher cutting speed (Vc, SFM, RPM or SFPM)
Long Chip 	- Feed is too low for chip breaking - Depth of cut is too shallow for corner radius - Chip area (Fn x Ap) too low	- Higher feed - Sharper chipbreaker - Higher depth of cut - Select a smaller corner radius

Technical Information

Comparison Chart - Turning Chipbreakers

Negative Inserts

ISO	Application	YG-1	Taegutec	SANDVIK	Kyocera	Tungaloy	Mitsubishi	Sumitomo	Korloy	ISCAR	KENNAMETAL	Seco	Walter	AchTech	ZCC
P	Finish	UF	FG, FLP, FC, FX	PF, LC	PP	TSF, PS, TS ZF, 11, 17, NS	SH	LU, FE, SU	VF, VB	F3P, NF	FN, K	MF2	NF4, NF3	-	-
	Semi Finish	PSF (Cermet)	FM	XF	PQ, HQ, CJ	AM, NM, TQ, 27	C	-	VQ(Cermet)	TF	-	-	MP3	-	-
		UL	MLP, FT	-	CQ, VC, VF	ZM	SA, SY	SE	VC, CP		LF, CT	-	NS6	PB3, BS	-
	Medium	UM	MC	-	-	-	-	SX	LP	-	-	MF5	MP3	PC3	-
		GM	PC, MGP	PM	PMG, PG	PM, TM	-	GE, GU	MP	-	-	-	-	-	-
		UG	MT	XM, QM, PMC	HK, GS, HS, PS	DM	MP, MA, MH	UG, UX	VM, HM	M3P, GN	MP, MN	M3	NM4, MP5, MU5, NM6	PD3, PL5	PM, DM
	Medium Roughing	UC	MG-	-	MG-	MG-	MG-	-	B25	MG-	MG-	M5	MG-	PC4	MG-
	Roughing	UR	RGP, RT	PR, XMR	PT, GT, HT, PH	65, TH, TRS	RP, GH	MU, ME, MX, MP	HR, GR, VR	R3P, NR	RP, RN	MR5, MR6, MR7	NR4, RP5, RP7	PD5	DR
	Heavy Roughing	UH	RX, RH	PR, QR, MR	PX	TRS	HL, HX, HR, HZ,HM	MP, HG	GH	R3P, NM	RM, RP, MR	R4, R5	NRF, NR6, HU3, HU5	PC8, PD8	LR
		UT	HT, HD, HY, HZ	HR	-	TU, TUS	HV	HP, HU, HW, HF	VH, VT	H3P, H4P, H5P	RH	R6 R7, R8, PR6, PR9, R56, R57, R68	NRR, HU7	PC9, PD9	DR, HDR, HPR
	Wiper Finish	PWF	WS, WA	WF, WL	WF, WP	AFW, FW	SW	LUW, SEW	VW	WF	FW	W-MF2	FW5	-	WCF
	Wiper Medium	PWM	WT	WM, WXM	WQ, WE	ASW, SW	MW	GUW	LW	WG	MW, RW	W-M3, W-M6, W-MF5	MW5	-	WGM
M	Finish	MF	EA, SF	MF, XF	MQ, SK	SF	LM	SU, EF	VP2	SF, F3M, NF	FF, FP	FF1, MF2	NF4, FM5	SC1, MB2	EF
	Medium	GM, MM, MG	MK, EM, MM, MP	MM, XM, MMC	MS, MU, (HU)	SS, SM	MM, GM, MA	EX, EG, GU	MM, HS	TF, M3M, VL	MP, UP, MR	MF3, MF4, M3	MMS, MU5	MC3	EM
	Rough	MR	ET	MR, XMR, MRR	SG	SH, S	RM	HM, EM, MU	RM, GS	GN, R3M, NR	RP	MF5, M5	NRS	MC4	ER
K	Medium	UC	MT, MG-	KM	KG, MG-, C	CM, MG-	MK, GK, MG-	GZ, UX	MK, B25	M3P, GN, MG-	-	M5	NM5, RK5	PC4	MG-
	Rough	UR	RT, KT	KR	KH, ZS,GC, PH	CH	RK	-	RK, GR	NR	UN, R P	MR7	MV7, RK7	KC4	DR
		KR, MA-	MA-	MA-, KRR	MA-	MA-	MA-	MA-	MA-	MA-	MA-	MA-	MA-RK5, MA-RK7	KD5	-
S	Finish	GG-SF	EA, SF	SF, GG-SGF	SQ, MQ, SK	HRF	GG-FJ, LS	EF	VP1	SF, F3M, F3S	FS, GG-FS	M1	NF4	SC1, MB2	GG-NF, GG-NCF
	Medium	SM	MK, MGS, MP	QM, SM, 23	MS, MU	HMM, HRM	MS	EG, EX	VP3	TF, M3M, VL	UP	MF4, MF5	NMS, NMT	SC3	-
	Rough	SR	ET	SR, SMR	SG, (R/L-SX)	-	RS, GJ	MU	VP4	MR	RP	MR4	NRS, NRT	MC4	-

Positive Inserts

ISO	Application	YG-1	Taegutec	SANDVIK	Kyocera	Tungaloy	Mitsubishi	Sumitomo	Korloy	ISCAR	KENNAMETAL	Seco	Walter	AchTech	ZCC
P	Finish	GT-SF Swiss	GT-SL, GT-SA, GT-SM	GT-UM	GT-CF, GT-GF, GT-SKS GT-GQ, GT-SK	GT-01	GT-SMG	-	GT-FS, GT-VP1	GT-FM, GT-SM	-	FF1	FP4	GT-LF, GT-UF	GT-SF
		PF	FA, FX	PF, UF	PP, XP, GK, GP, DP	PSF	FP, FV	FC, FB, LU, FP, FK	FP	PF	11	FF1	FP4	LF	-
		UF	FG	UM, XF	XQ, GK	TSF, PSS	LP, SV	SI, LB	VF, VL	F3P	UF	F1	FP4, PS5	UF, PB1, BS	HF
	Medium	PM	FM, GT-SH	PM, XM, PMC	HQ, GQ	TM, PS	MT-, MV	SC, SU, GU	HMP, MP	14, SM	LF, FP	MF2, M3	MP4	PC2, M2T	HM
		UG	MT, PC	PR, UR, XR	MT-	PM, TSF, TM	MP	MU	C25	M3P, 19	MF, MP	F2, M5	FP6, PM5, E47	KC2	HR
M	Finish	GT-SF Swiss	GT-SA	GT-UM	GT-CF, GT-GF, GT-GQ	GT-01	GT-SMG	-	GT-FS, GT-MS	GT-FM, GT-SM	GT-LF	GT-F1	-	GT-LF, GT-UF	GT-SF
		MF	FG	MF, UM	MQ, SKS, SK	PSF, PSS, PS	FM, FV, LM, SV	FC, SI LU, SU	VF, VL	SM, TF, F3M, 14	11, UF, FP	F1	FM4	PB1	EF
	Medium	MM	PC	MM, MMC	GQ	PM	MM, MV	MU	HMP, MP	M3M, SM	MP, MF	F2, MF2	MM4, RM4	PC2	EM
K	Medium	UG	MT	KM, KR	MT-	CM, MT-	MK, MT-	MU	C25	SM, 14	MT, C, MP, MF	M3, M5	F2, FK6, MK4, RK6	KC2	HR
N	Finish	GT-AL	FL	GX-AL	AP, AH	AL	AZ	AW, AG, AY	AK, AR	AF, AS	HP	AL	MN2	NC2	LC, LH
S	Super Finish	GT-SF	GT-FGS, GT-SA	GT-UM	GT-CF, GT-GF, GT-GQ	GT-01	GT-FS, GT-LS	-	GT-FS, GT-MS	GT-FM, GT-SM	GT-LF	GT-F1	GT-PF2	GT-UF	GT-NF, GT-NCF
	Finish	MF	FG	MF, UM	MQ, SKS, SK	PSF	FS	FC, SI	VP1, VL	SM, PF, F3M, 14	FP	F1, F2	PF4, PS5	PB1	NF
	Medium	MM	PC	MM	GQ	PSS, PM	LS, MS	SU, GU	MP	M3M, SM	LF	MF2	PM5	PC2	SNR

Technical Information

Comparison Chart - Turning Grades

	ISO	YG-1	ISCAR	SANDVIK	SECO	PRAMET	KENNAMETAL	TUNGALOY	MITSUBISHI	HITACHI	WALTER	TAEGUTEC	NTK	DIJET	KORLOY	SUMITOMO	KYOCERA
CVD Coated	P	YG3010	IC8150 IC9150 IC9015	GC4415 GC4305 GC4315	TP0501 TP1500 TP1501	T9310 T9315	KCP05B KCP05 KCPK05 KCP10B KCP10	T9205 T9105 T9215 T9115	UE6105 UE6110 MY5015 MC6015	HG8010	WPP10G WPP01 WPP05S WPP10S	TT8105B TT8115B TT8105 TT8115	CP7	-	NC3215	AC8015P AC810P AC700G	CA510 CA515 CA5505 CA5515
		YG3115	IC8150 IC9150	GC4315 GC4415	TP1501 TP1500	T9315	KCP10 KCP10B	T9115 T9215	MC9015 MC6115 UE6110		WPP10 WPP10S	TT8115 TT8115B	-	-	NC3215	AC8015P AC8020P AC810P	CA515 CA5515
		YG3020	IC8250 IC9250	GC4425 GC4325	TP2500 TP2501	T9325	KCP25 KCP25B	T9225 T9125	MC6025 UE6020	GM8020 HG8025 GM25	WPP20G WPP20S WMP20S	TT8125B TT8125 LC225P	CP5	JC110V JC215V	NC3120 NC3225	AC8025P AC820P	CA025P CA525 CA5525
		YG3125	IC8250 IC8350	GC4325 GC4425	TP2501 TP25 TP200	T9325	KCP25C	T9225 T9125	MC6125 MC6025 UE6020	GM8020 HG8025 GM25	WPP20S WPP20G	TT8125B TT8125	CP1	JC215V	NC3120 NC3225	AC8025P AC820P	CA125P CA025P CA525 CA5525
		YG3030	IC8350 IC9350	GC4235 GC2135 GC4035	TP3500 TP3501	T9335	KCP30B KCP30 KCP40B KCP40	T9235 T9135	MC6035 UE6035 UH6400	GM8035	WPP30G WPP30S WKP30S	-	-	JC325V	NC3030 NC5330	AC8035P AC830P	CA530 CA5535
	M	YG3030	IC6015 IC6025 IC9300 IC520M IC4050 IC635	GC2015 GC2025 GC2035 GC235	TM1501 TM2501 TM3501	T7325 T7330 T7335	KCM15B KCM15 KCM25B KCM25 KCM35B KCM35	T6120 T6020 T6130 T6030	MC7015 MC7025 US7020 US735 UH6400	GM25 GX30 HG8025 GH8035	WMP20S	TT9215 TT9225 TT9235	-	-	NC9115 NC9125 NC9135 NC5330	AC6020M AC610M AC6030M AC630M AC6040M AC830P	CA6515 CA6525
		YG2025	IC9025 IC9325	GC2220	TM2501 TM2000	-	KCM25	T6120 T9125	MC7025 US7020	-	-	TT9225 TT5100	-	-	-	AC6020M AC6030M	CA6525
		YG2035	IC6025	GC2025	TM3501	T7335	KCM35B KCM35	-	US735	GM25 GM8035	WMP20S	TT9225	-	JC525X	NC9135 NC3235	AC6030M	-
	K	YG1010 YG001	IC5005 IC5010 IC4028 IC8150	GC3205 GC3210 GC3215	TK0501 TK1501	T5305 T5315	KCK05 KCK05B KCK15 KCK15B KCK20 KCK20B KCPK05	T5105 T515 T5115 T1215 T1115 T5125 T5020	MC5005, UC5105, MC5015 UC5115 MY5015	HG3305 HG3315 HG3505 HG3515 GM8020 HG8010 HG8025	WKK10S WKK20S WAK30 WKP30S WKK10 WKK20	TT3005 TT7005 TT7310 TT7015	CP1 CP2 CP5	JC105V JC110V JC215V	NC6310 NC6315 NC5330	AC4010K AC405K AC4015K AC415K AC420K AC8025P	CA310 CA315 CA320 CA4505 CA4515
		YG1020	IC5010	GC3225	TK1501	T5315	KCK20B KCK20	T515 T5125 T1215 T1115	MC5125 MC5020	GM8020 HG8025	WKK20S WKP25S WAK20	TT7025	CP1	JC110V JC215V	NC6315 NC5320	AC4015K AC4125K AC420K	CA320 CA4515
PVD Coated	P	YG801	IC807 IC830 IC507 IC908	GC1025	TP1030 TP1020	T6310 T8430 T8345	KU10T KCU10 KT315 KU25T KC5010	AH330 AH725 AH730 SH725 SH730	VP10RT MS6015 VP15TF VP20MF VP20RT UP20M	IP2000 IP3000	WTA43 WTA41	TT4410 TT9020 TT4430 TT9080 TT8080	-	JC5003 JC5015	PC5300 PC5400 PC3035	AC1030U	PR930 PR1225 PR1535 PR1725
	M	YG211	IC3028 IC907	GC1105 GC1115 GC2015	TS2000 TS2050	T6310 T8315	KCU10 KCU5010	AH120 AH140 AH630 AH645	VP10RT	IP50S IP100S HG8025	WSM21 WSM01 WSM10S	TT5030	ZM3 QM3 VM1 TAS	JC5003 JC5015	PC8105 PC8110	SC520U AC1030U	-
		YG401	IC807	-	-	-	-	-	MP9005	-	-	TT5080	-	-	PC8115	AC5005S	-
		YG213	IC908	GC2025	CP200 CP500	T8330 M6330	KCU25 KCU5025	SH725 AH7025	VP15TF VP20MF VP20RT UP20M MP7025	GM25 GX30	WSM20S	TT9080	-	-	PC5300 PC8120 PC9030	AC530U	PR930 PR1225 PR1535 PR1725
		YG214	IC330 IC830	GC2035	CP600	T8430	-	SH730 GH330 GH730 AH4035	-	-	WSM30S	TT8080 TT8020	-	-	PC5400	-	-
	S	YG401	IC804 IC806 IC830 IC807 IC908	GC1025 GC1105 GC1125	TS2000 TS2050 TS2500 TH1000 CP200	M6330 T6310	KCS10 KCU10 KCU25 KC5010 KC5025	AH110 AH120	MP9005 VP05RT MP9015 VP10RT MP9025 VP20RT	-	WSM01 WSM10S WSM20S WSM21 WSM30S	TT3010 TT3020 TT5080 TT5030	-	-	PC8105 PC8110 PC8115 PC5300 PC5400	AC5015S SC5025S AC510U AC520U	PR005S PR015S PR1535 PR1125 PR1305 PR1310
Non Coated	N	YG10	IC20	-	KX	-	K313	-	HTi10	-	WK1	-	-	-	H01 H05	H1	KW10
Cermet	P10	YT100G	IC20N IC520N	-	-	-	KT315	NS520	AP25N NX1010 NX2525	-	-	PV3010	-	-	CC1500	T1000A T1500Z	PV710 PV720 PV7040 CCX
		YT100	IC30N	CT5005 CT5015 CT525 GC1525	TP1030 CMP CM	TT010 TT310	KT5020 KT125 KT150	GT730 GT530 NS520 NS720	UP35N	DC610	-	CT3000	T15 Z15 C7Z	AT200	CN1500 CN2500 CC125	T1500A T1000A T2500Z	TN60 TN610 TN620 TC40N

Technical Information

Comparison Chart - Milling Grades

ISO	YG-1	SANDVIK	SECO	KENNAMETAL	ISCAR	WALTER	TUNGALOY	MITSUBISHI	TAEGUTEC	KORLOY	SUMITOMO	KYOCERA	HITACHI	MOLDINO	DIJET	ZCC	Achteck
P	YG712	GC4220 GC1130	T250M MP3000	KC715M KC522M KC635M	-	WKP25S WKP25 WAM10	T3130 GH330	MP8010 MP6120 MP6130 MP9120	TT7070 TT7080 TT7030	PC3700 PC3600 PC3+M3: M24500	ACP2000 ACZ310	PR730	CY9020 JP4020 TB6045	-	JC5003	YBM251	AP301P AP301U
	YG713	GC4230 GC4330	T350M F25M	KC525M	IC950 IC1008	WAM20 WAM30	AH710 AH120 T3225	-	-	PC210F	ACP200 ACZ330	PR830 PR630	JP4120 CY250	JP4120	JC5015	YBM351	AP351M
	YG602	GC1030 GC4240	F30M	KC725M KC735M	IC900 IC808 IC908 IC330	WKP35G, WKP35S	T3130 AH3035 AH110	VP15TF VP20RT MP9130	TT9030 TT9080	NC5330 PC5300 NCM325 NC5350	ACP3000	PR1025 PR1225	PTH30E JS4060 JP4160	JP4020	JC5030 JC5040	YBG202	AP351U
	YG612	GC1030 GC1130 GC4340	MP3000 F40M F32M	KC522M KC725M KCPK30 KCPM40 KCSM30	IC330 IC928 IC830	WKP25 WKP35 WKP45	AH120 AH140 AH3035 AH3225	MP6130 VP15TF VP30RT UP20M	TT9080 TT8080 TT8020	PC3700 PC5300 PC5400	ACP300 ACP200 ACP3000 ACU2500	PR1525 PR1225 PR1835 PR830	-	JP4160 PTH40H PTH30E JP4120	JP5003	YBC251 YBC152 YBC202	-
	YG613	GC4340 GC1040	F40M T60M	KCPM20 KC935M KCPM40	IC830 IC928	WKP45S, WKP45X WSP45S	AH725 AH730 GH330 AH130 AH140	FH7020 VP30RT F7030	TT8020 TT8025 TT8080	NC5340 PC5400 NCM335	ACP300 ACZ350	PR1525 PR1230 PR660	JM4160 PTH40H	-	-	YGC302 YBG302	-
M	YG602	GC2030 GC1030	F25M	KC635M KC522M KC725M	IC330	WAM30 WXM35 , WSM35,	AH725 AH120 GH110 AH730	VP15TF MP7130 MP7030	TT9030 TT9080	PC210F PC5300 NCM325 NC5350	XCU2500 ACM100 ACP200 ACM300	PR1025 PR1225 PR1525 PR630	JX1015 TB6020 CY250 GX2160 JX1045	GX2160	JC5003 JC5015 JC5030	YBG205 YBG202 YBG302	AP351M
	YG612	GC1125 GC2140	MP2050	KC522M KC725M KCPM40 KCSM30 KCSM40	IC330 IC328 IC928	WSM35S WSP45	AH3135 AH6235	MP7140 MP9120	TT9030 TT8020	PC5300 PC9030 PC5400 PC6510	ACM300	PR1225	-	JX1060	JC5015	YBM253 YBM153	-
	YG613	GC2040	F30M F40M	KC722	IC928 IC328	WSP45	AH140 GH340	MP9030 MP7140 VP30RT	TT8080 TT8020	PC9530 NCM335 PC5400	ACP300 ACZ350 ACP400	PR660 PR1535 PR660	TB6045 JX1060 TB6060	-	JC5040	YBC302	AP403M
K	YG5020	GC3220 GC1020	MK1500 MP1500	KC915M	DT7150 IC5100 IC418	WAK15	T1015	VP15TF	TT6290 TT7515 TT6800	NC5330 PC8110	XCK2000	PR1510 PR510	-	-	JC5003	YBD152	AP301K
	YG501	GC3040	MK2050 MK2000	KCK15 KC520M	IC910 IC810	WKK25S WKP25	T1115 T1215 AH120	MP8010 MC5020	TT6080 TT6030	PC6510 NC5340	-	PR1210 PR905	-	-	JC5015	YBG102 YBG202	AP351K
	YG622	-	MK3000	-	-	WKP35	GH110	VP20RT		NC5350 PC5300	ACK300	CA420M	-	-	-	-	-
N	YG50	H10 H13A H10F	H15	K115M K110M K313	IC20 IC08	WK10	TH10	HTi10 MT2010	K10 UF10	H01 H05	H1	KW10 GW25	WH10			YD101	AW100K
S	YG602	GC1025 GC1040	F40M MM4500	KC510M KCU30M	IC328 IC408	WSM35S	-	VP15TF VP30RT	TT9030 TT8020 TT9540	PC5300 PC5400 PC9540	AC520U	CA6535 PR620	ACS05E	-	-	YBG102	-
	YG613	S30T S40T	MS2500	KC725M	IC903	WSM45S WSM45X	-	MP9130	TT8080 TT3540	UPC845	-	PR660 PR1535	-	-	-	-	-
	YG904	-	-	X700	-	WSP45G WMP45G W3536	-	-	TT3540 TT9540	UPC845 UNC840	-	-	-	-	-	-	-
H	YG012	GC1130 GC1030	MP1500 MP3000		IC1008			VP15TF						JP4120			

Technical Information

Formulas

Cutting Speed (Vc)	**Metric** Vc = D × RPM × 0.0031 (m/min.)	**Inch** Vc = D × RPM × .262 (ft/min.)
	Metric Vc to Inch Vc Inch Vc = Metric Vc × 3.28 (ft/min.)	
	Inch Vc to Metric Vc Metric Vc = Inch Vc × .305 (m/min.)	

Turning Formulas

Spindle Speed (RPM)	**Metric** RPM = Vc × 318.3 ÷ D (rev./min.)	**Inch** RPM = Vc × 3.82 ÷ D (rev./min.)
Feed Rate (Vf = Table Feed)	Vf = Fn × RPM (mm/min. or in/min.)	
Feed per Revolution (Fn)	Fn = Vf ÷ RPM (mm/rev. or in/rev.)	
Metal Removal Rate (Q)	**Metric** Q = Vc × Fn × Ap (cm^3/min.)	**Inch** Q = Vc × Fn × Ap × 12 (in^3/min.)
Cutting Time	T = L ÷ Vf (min.)	

Milling Formulas

Feed per Revolution (Fn)	Fn = Vf ÷ RPM (mm/rev. or in/rev.) = Fz x Number of tooth (mm/rev. or in/rev.)	
Feed per Tooth (Fz)	Fz = Vf ÷ RPM ÷ Number of tooth (mm/rev. or in/rev.) = Fn ÷ Number of tooth (mm/rev. or in/rev.)	
Metal Removal Rate (Q)	**Metric** Q = Ap x Ae x Vf ÷ 1000 (cm^3/min.)	**Inch** Q = Ap x Ae x Vf (in^3/min.)
Cutting Time	T = L ÷ Vf (min.)	
Power Consumption (Pc)	**Metric** Pc = Ap x Ae x Vf x Kc x 0.000000017 (kW)	**Inch** Pc = Ap x Ae x Vf x Kc x 0.00000253 (Hp)

Drilling Formulas

Power Consumption (Pc)	**Metric** Pc = Fn x Vc x D x Kc x 0.0000042 (kW)	**Inch** Pc = Fn x Vc x D x Kc x 0.0000076 (Hp)
Torque (Mc)	**Metric** Mc = Pc x 9554.1 ÷ RPM (Nm)	**Inch** Mc = Pc x 5255 ÷ RPM (lbf ft)
Thrust (T)	T ≒ 0.5 x Kc x DC/2 x Fn x sin KAPR (N)	

Terms

RPM (n)	Spindle Speed (Revolution per minute)
Vc	Cutting Speed
D	Work Diameter
Vf	Feed Rate (Table Feed)
Fn	Feed per Revolution
Ap	Depth of Cut
Q	Metal Removal Rate
L	Length of cut
T	Cutting Time (min.)

Technical Information

Material Groups

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRc	Examples
P	1	Non-alloyed steel	About 0.15% C	Annealed	125		S15C, C15, 1015
	2		About 0.45% C	Annealed	190	13	S45C, C45, 1045
	3		About 0.45% C	Quenched & Tempered	250	25	
	4		About 0.75% C	Annealed	270	28	SK5, Ck75, 1080
	5		About 0.75% C	Quenched & Tempered	300	32	
	6	Low-alloyed Steel		Annealed	180	10	SCM440, 42CrMo4, 410
	7			Quenched & Tempered	275	29	
	8			Quenched & Tempered	300	32	
	9			Quenched & Tempered	350	38	
	10	High-alloyed steel, and tool steel		Annealed	200	15	SKD, D2
	11			Quenched & Tempered	325	35	SKH, SUH, M42
M	12	Stainless Steel	Ferritic / Martensitic	Annealed	200	15	SUS 420, X40Cr13, 420
	13		Martensitic	Quenched & Tempered	240	23	
	14		Austenitic		180	10	SUS 316, 316, X5CrNiMo 17 12 2
K	15	Grey cast iron	Pearlitic / Ferritic		180	10	FC, GG, EN-GJL-250
	16		Pearlitic (Martensitic)		260	26	
	17	Nodular cast iron	Ferritic		160	3	FCD, GGG, EN-GJS-500-7
	18		Pearlitic		250	25	
	19	Malleable cast iron	Ferritic		130		FCMW, FCMP, GTS, GJMB350-10
	20		Pearlitic		230	21	
N	21	Aluminum-wrought alloy	Not Curable		60		SAE 1000, AlMg 1, 3.3315
	22		Curable	Hardened	100		SAE 7050, AlCuMg 1, 3.1325
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75		ADC12, G-AlSi12, 3.2581
	24		≤ 12% Si, Curable	Hardened	90		C4BS, G-AlSi10Mg, 3.2381
	25		> 12% Si, Not Curable		130		
	26	Copper and copper alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110		CuZn36Pb 3, 2.0375
	27		CuZn, CuSnZn (Brass)		90		CuZn 15, 2.0240
	28		CuSn, lead-free copper and electrolytic copper		100		G-CuZn40Fe, 2.0590
	29	Non-metallic materials	Duroplastic, Fiber Reinforced Plastic				CFRP
	30		Rubber, Wood, etc.				
S	31	Heat resistant super alloys	Fe Based	Annealed	200	15	X12 NiCrSi 36-16, 1.4864
	32			Aged	280	30	
	33		Ni or Co Based	Annealed	250	25	Inconel 718, NiCr20TiAl, 2.4631
	34			Aged	350	38	NiCu30Al, 2.4375
	35			Cast	320	34	G-X120Mn12, 1.3401
	36	Titanium alloys	Pure Titanium		400 Rm		
	37		Alpha + Beta Alloys	Hardened	1050 Rm		TiAl6V4, 3.7165
H	38	Hardened steel		Hardened	550	55	SK3
	39			Hardened	630	60	
	40	Chilled cast iron		Cast	400	42	
	41	Hardened cast iron		Hardened	550	55	

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	1	Non-alloyed steel	About 0.15% C, Annealed	125	

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0037	STKM 12 C	St 37-2	-	4360 40 B	S235JR	E24-2	1311	Fe 360 B			16D	
1.0038	STKM 12 A	St 37-3	A570.36	4360 40 C	S275J2G3	E28-3	1312	Fe 360 D FF			ST14KP	
1.0045	SM 490 YA	S 355 JR	-	-	S 1207	E36-2	-	Fe 510 BFN				
1.0050	SS 50	St 50-2	A570 Gr. 50	4360 50 B	E 295	A50-2	2172	Fe 490			ST5PS	
1.0060	SM 58	St 60-2	A572 Gr. 65	4360 55 E	-	A60-2	1650	Fe 60-2			ST6PS	
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	SM41C, SM400	St 44-3 N	A573 Gr. 81	4360 43C	S 275 J2 G3	E28-3	1412	Fe 430 D FF			ST14KP	
1.0149		Ro St 44-2	-	43C	S 275 J0 H	-	1412	Fe430C				
1.0301	S10C	C10	1010	045M10	C10	34C10, XC10		C10	F.1511	G10100	10	
1.0330	SPCC	St 12	-	DC 01	Fe P01	DC 01/Fe P01	1142	Fe P01			15KP	
1.0335	SPHE	D D 13 (StW 24)	A622(1008)	H S 3	D D 13	3C		FeP13			08KP	
1.0338	SPCE	St 4	A620(1008)	14491CR	Fe P04	Fe 14	1147	DC04/FeP04			08JU	
1.0345	SPV 50	P235 GH	A516 Gr. 65	P 235 GH	P 235 GH	A 37 CP	1330	Fe E 235		K02503		
1.0401	S15C	C15	1015	080M15	-	C18RR, XC18	1350	C15, C16	F.1110	G10170	15	
1.0402	S20C	C22	1020	050 A 20	1 C 22	C20	1450	C 20	F.1120	G10200	20	
1.0425	SPV315	P265GH/HII				A42CP	1430	Fe4101KW		K02801	16K	
1.0443	SC 450	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		S355J0H		4360-50C		TSE355-3	2172	Fe510C				
1.0549		S355NLH					2135	Fe510D				
1.0553	SM 520 M	St52-3U	A14880-40	4360-50C		320-560M	1606	Fe510C				
1.0562	SM490A	St E 355	A633 Gr. C	P 355 N		FeE355KGN	2132	Fe E 355 KG		K12000	15GF	
1.0565		W St E 355		P 355 NH		P 355 NH	2106	Fe E 355 KW		K01600		
1.0566	SLA 37	T St E 355		P 355 NL1		P 355 NL1	2107	Fe E 355 KT				
1.0570	SM 50 YA	St 52-3	1	4360-50 C	S355JR	E36-3	2172	Fe 510 B			17G1S	
1.0715	SUM22	9SMn28	1213	230M07		S250	1912	CFSMn28	F.2111	G12130		
1.0718	SUM22L	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	SUM25	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	S10C	Ck10	1010	040A10		XC10	1265	C10	F.1510	G10100	10	
1.1141	S15	Ck15	1015	040A15	32C	XC15	1370	C15	F.1110	G10150	15	
1.1151	S20C	C22E	1020	055M15		2C22	1450	C20	F.1120	G10230	20	
1.8900	S25C	StE380	A572-60	436055E			2145	FeE390KG				
		St44-2	A36	436043A		NFA35-501E28	1411					
		StE320-3Z		1501160			1421					

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	2	Non-alloyed steel	About 0.45% C, Annealed	190	13

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0501	S35C	C35	1035	080A32		1C35	1572	C35	F.113	G10350	35	
1.0503	S45C	C45	1045	060A47		XC42H1TS	1672	C45	F.114	G10450	45	
1.0511	S40C	C40	1040	080M40		1C40		C40	F.114.A	G10400	40	
1.0540	S 50 C	C50					1674	C50		G10500		
1.0551		GS-52	A2770-36	A2		280-480M	1505					
1.0553	SM 520 M	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	40	
1.0727		45S20	1146			45MF4	1973			G11460		
1.1157		40Mn4	1039	150M36	15	40M5				G10390	40G	
1.1158	S25C	C25E	1025	070M25		XC25		C25	F.1120	G10250	25	
1.1166	SMn433H	34Mn5	1536						TO.B	G15360		
1.1167	SMn438(H)	36Mn5	1335	150M36		40M5	2120	36Mn6	F.1203	G13350	35G2	
1.1170	SCMn1	28Mn6	1330	150M28	14A	20M5		C28Mn	28Mn6	G13300	30G	
1.1178	S 30 C	C30E		080M30		XC32		C30	2C30	G10300		
1.1180		C35R	1035	080A35		3C35	1572		F.1135	G10350		
1.1181	S35C	C35E	1035	080A35		XC38	1572	C36	F.1130	G10340	35	
1.1191	S45C	Ck45	1045	080A46		XC45	1672	C45	F.1140		45	
1.1206	S 50 C	C50E	1050	080M50		2C50	1674	C50		G10500	50	
1.1213	S50C	Cf53	1050	070M55		XC48HTS	1674	C53		G10500	50	

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	3	Non-alloyed steel	About 0.45% C, Annealed	250	25

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0481	SG365	17 Mn 4/P 295 GH	A516 Gr. 70	224-460B	P 295 GH	A 48 CP	2102	Fe E 295	A47RCI	K03501	14G2	
1.0501	S35C	C35	1035	080A32		1C35	1572	C35	F.1130	G10350	35	
1.0503	S45C	C45	1045	060A47		XC42H1TS	1672	C45	F.1140	G10450	45	
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	40	
1.1157		40Mn4	1039	150M36	15	40M5				G10390	40G	
1.1165	SMn433H	30Mn5	1036	120M36		35M5		30Mn5	F.8211	K13300	30G2	
1.1167	SMn438(H)	36Mn5	1335	150M36		40M5	2120	36Mn6	F.1203	G13350	35G2	
1.1186	S40C	C40E	1040	060A40		2C40		C40		G10400		
1.1191	S45C	Ck45	1045	080M46		2C45	1672	C45	F.1140		45	
1.1201	S50C	C45R	1049	080M46		3C45	1660	C45	F.1145		38HM	
1.1213	S50C	Cf53	1050	070M55		XC48HTS	1674	C53		G10500	50	
1.7242	SCM 418 H	18CrMo4										
1.7337		16CrMo4-4	A387 Gr.12					A18CrMo45KW		K11564	15C M	
1.7362	SCMV 6	12CrMo195		3606-625		Z10CD5-05		16CrMo205		K41545		
		17MnV6	A572-60	436055E		NFA35-501E36	2142					

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	4	Non-alloyed steel	About 0.75% C, Annealed	270	28

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0603	S 70 C -CSP	C67	107	080A67		XC65		C67		G10700		
1.0605		C75	1075	144980HS				C75		G10740	75	
1.1203	S55C	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550	55	
1.1209		C55R	1055	070M55		3C55		C55	F.1155	G10550		
1.1221	S58C	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640	60	
1.1231	S 70 C-CSP	C67E	1070	060A67		XC68	1770	C70	F.5103	G10700	65GA	
1.1248	C 75	C75E	1074	060A78		XC75	1774	C75	F.5107	G10800	75(A)	
1.1269	SK 5 -CSP	C85E	1086			XC90		C90		G10900	85(A)	
1.1274	SUP4	Ck 101	1095	060 A 96	C 100S	XC100	1870	C100	F.5117	G10950		
1.1545	SK 3	C 105 W1	W1	BW 2	C 105U	Y1 105	1880	C 100 KU	F.5118		U10A	
1.1663	SK 2	C125W	W112			Y2120					U13	

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	5	Non-alloyed steel	About 0.75% C, Quenched & Tempered	300	32

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0070		St 70-2	1055	Fe690-2FN	-	A70-2	1655	Fe 690	F.1150		55	
1.0535	S55C	C55	1055	070M55		1C55	1655	C55		J05000	55	
1.0601	S58C	C60	1060	060A62	43D	1C60		C60		G10600	60(G)	
1.1203	S55C	Ck55	1055	060A57		2C55	1655	C55	F.1150	G10550	55	
1.1221	S58C	Ck60	1060	060A62	43D	2C60	1678	C60	F.1150	G10640	60	
1.1274	SUP4	Ck 101	1095	060 A 96	C 100S	XC100	1870	C100	F.5117	G10950		
1.1545	SK 3	C 105 W1	W1	BW 2	C 105U	Y1 105	1880	C 100 KU	F.5118		U10A	
1.1663	SK 2	C125W	W112			Y2120					U13	
1.5120		38MnSi4										
1.5710	SNC236	36NiCr6	3135	640A35	111A	35NC6						
1.7701		51CrMoV4						51CrMoV4				

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	6	Low-alloyed Steel	Annealed	180	10

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0116		St 37-3	A570 Gr. 36	4360-40C	S 235 J2 G3	E24-3	1312	Fe 360 D1(2)	AE235D		ST3KP	
1.0904	SKH 1, SKT 4	55Si7	9255	250A53	45	55S7	2085	55Si8	56Si7	G92550	55S2	
1.0961	SUP 7	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.520L		11KHF	
1.2241		51CrV4										
1.2330	SCM435TK	35CrMo4	4135	708A37		34CD4	2234	35CrMo4			35KHM	
1.2419	SKS31	105WCr6		105WC13		105WC13	2140	10WCr6			CWG	
1.2510	SKS3	100MnCrW4	O1	BO1		90 MWCV 5	2140	95 MnWCr 5 KU	F.5220		9KHVG	
1.2542		45WCrV7	S1	BS1			2710	45WCrV8KU			5C W25F	
1.2550		60WCrV7	S1			55WC20	2710	58WCr9KU			5KHV2SF	
1.2713	SKT4	55NiCrMoV6	L6			55NCDV7			F.520S		5C NM	
1.2721		50NiCr13	L6			55NCV6	2550		F.528			
1.2842		90MnCrV8	O2	BO2		90MV8				T31502	9G2F	
1.3501		100Cr2	E50100									
1.3505	SUJ2	100Cr6	52100	2S135	31	100C6	2258	100Cr6	F.1310		SC C 15	
1.5024		46Si7				45S7		46SI7	F.1451			
1.5025		51Si7	9259H		50Si7	51S7	2090	50Si7	F.1450			
1.5026		55Si7			56Si7	55S7	2085	55Si7	F.1440	G92550	55S2	
1.5027		60Si7	9260	251A60	60Si7	60S7		60Si7	F.1441	G92600	60S2	
1.5028	SUP7	65Si7	9260H									
1.5415	STFA 12	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820		
1.5419	SCPH11	20Mo4	4419	1503-243-430			2512	G20Mo5		G44190		
1.5423	SB450M	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522		
1.5622		14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641			
1.5732	SNC415(H)	14NilCr10	3415			14NC11		16NiCr11				
1.5752	SNC815(H)	14NiCr14	3310	655M13	36A	12NC15					20X2H4A	
1.6511	SUP10	36CrNiMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)			40C N2MA	
1.6523	SNCM220(H)	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2			20C GNM	
1.6546	SNCM240	40NiCrMo2-2	8740	311-Tyre7				40NiCrMo2(KB)			38C GNM	
1.6566		17NiCrMo6-4										
1.6587		17CrNiMo6		820A16		18NCD6		14NiCrMo13				
1.6657		10NiCrMo13-4						14NiCrMo131				
1.7015	SCr415(H)	10Cr3	5015	523M15		12C3				G50150	15C	
1.7033	SCr430(H)	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300	35C	
1.7035	SCr440(H)	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400	40H	
1.7131	SCR 415	16MnCr5	5115	527M17		16MC5	2511	16MnCr5		G51150	12KHN2	
1.7139		16MnCrS5					2127				18HG	
1.7176	SUP9(A)	55Cr3	5155	527A60	48	55C3	2253	55Cr3			50C GA	
1.7218	SCM420	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)			20C M	
1.7220	SCM432	34CrMo4	4135	708 A 37		35CD4	2234	34CrMo4			35C M	
1.7223	SNB22-1	41CrMo4	4142					41CrMo4			40C FA	
1.7225	SCM 440 (H)	42CrMo4	4140	708 M 40	42 CrMo 4	42 CD 4	2244	42 CrMo 4	F.1252		38HM	
1.7228		55NiCrMoV6G		823M30	33		2512	653M31				
1.7262	SCM415(H)	15CrMo5				12CD4	2216	12CrMo4				
1.7321		20mOcR4					2625					
1.7335	SCM415(H)	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45			12C M	
1.7361		32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A			
1.7380		10CrMo9-10	A182F22	1501-622		12CD9-10	2218	12CrMo9			12KH8	

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Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	6	Low-alloyed Steel	Annealed	180	10

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.7715		14MoV6-3		1503-660-440				13MoCrV6				
1.8159	SUP 10	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4		G61500	50C GFA	
1.8161		58CrV4										
1.8509	SACM 645	41CrAlMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAlMo7				
1.8523		39CrMoV13-9		897M39	40C			36CrMoV12				

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	7	Low-alloyed Steel	Quenched & Tempered	275	29

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.5415	STFA 12	15Mo3	A204Gr.A	1503-243B		15D3	2912	16Mo3(KG)	F.2601	K11820		
1.5423	SB450M	16Mo5	4520	1503-245-420				16Mo5(KG)	F.2602	K11522		
1.5622		14Ni6	A350-LF5			16N6		14Ni6(KG)	F.2641			
1.5732	SNC415(H)	14NilCr10	3415			14NC11		16NiCr11				
1.5752	SNC815(H)	14NiCr14	3310	655M13	36A	12NC15					20X2H4A	
1.5755	SNC236	31NiCr14		653M31		18NC13	2534		F.1270			
1.6565	SNCM447	40NiCrMo6	4340	817M40	24	35NCD6	2541	35NiCrMo6(KB)			38C 2N2MA	
1.6587		17CrNiMo6		820A16		18NCD6		14NiCrMo13				
1.6657		10NiCrMo13-4						14NiCrMo131				
1.6957		26NiCrMoV14-5										
1.7015	SCr415(H)	10Cr3	5015	523M15		12C3				G50150	15C	
1.7262	SCM415(H)	15CrMo5				12CD4	2216	12CrMo4				
1.7335	SCM415(H)	13CrMo4-4	A182-F11	1501-620		15CD4-5	2216	14CrMo45			12C M	
1.7380		10CrMo9-10	A182F22	1501-622		12CD9-10	2218	12CrMo9			12KH8	
1.7715		14MoV6-3		1503-660-440				13MoCrV6				
1.7733		24CrMoV55				20CDV6		21CrMoV511				
1.7755		GS-45CrMoV10-4										
1.8070		21CrMoV511						35NiCr9				

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	8	Low-alloyed Steel	Quenched & tempered	300	32

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.1730		C45W3	C45W			XC48						
1.2332	SCM(440)	47CrMo4	4142	708M40	19A	42CD4	2244	42CrMo4				
1.5736	SNC 631 (H)	36NiCr10	3435			30NC11						
1.6523	SNCM220(H)	21NiCrMo2	8620	805M20	362	20NCD2	2506	20NiCrMo2			20C GNM	
1.7033	SCr430(H)	34Cr4	5132	530A32	18B	32C4		34Cr4(KB)		G51300	35C	
1.7218	SCM420	25CrMo4	4130	CDS110		25CD4	2225	25CrMo4(KB)			20C M	
1.8515		32CrMo12		722M24	40B	30CD12	2240	32CrMo12	F.124A			

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	9	Low-alloyed Steel	Quenched & Tempered	350	38

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0904	SKH 1, SKT 4	55Si7	9255	250A53	45	55S7	2085	55Si8		G92550	55S2	
1.0961	SUP 7	60SiCr7	9262			60SC6		60SiCr8		G92620		
1.2067		100Cr6	L3	BL3		Y100C6		100Cr6				
1.2419	SKS31	105WCr6		105WC13		105WC13	2140	10WCr6			CWG	
1.2542		45WCrV7	S1	BS1			2710	45WCrV8KU			5C W25F	
1.2713	SKT4	55NiCrMoV6	L6			55NCDV7			F.520S		5C NM	
1.4882		X50CrMnNiNbN219				Z50CMNNb21-09						
1.5120		38MnSi4										
1.5710	SNC236	36NiCr6	3135	640A35	111A	35NC6						
1.5755	SNC236	31NiCr14		830m31		18NC13	2534		F.1270			
1.6511	SUP10	36CrNiMo4	9840	816M40	110	40NCD3		36NiCrMo4(KB)			40C N2MA	
1.6546	SNCM240	40NiCrMo2-2	8740	311-Tyre7				40NiCrMo2(KB)			38C GNM	
1.7035	SCr440(H)	41Cr4	5140	530M40	18	42C4	2245	41Cr4		G51400	40H	
1.7176	SUP9(A)	55Cr3	5155	527A60	48	55C3	2253	55Cr3			50C GA	
1.7220	SCM432	34CrMo4	4135	708Aa37		35CD4	2234	34CrMo4			35C M	
1.7223	SNB22-1	41CrMo4	4142					41CrMo4			40C FA	
1.7225	SCM 440 (H)	42CrMo4	4140	708 M 40	42 CrMo 4	42 CD 4	2244	42 CrMo 4	F.1252		38HM	
1.7361		32CrMo12		722M24	40B	30CD12	2240	30CrMo12	F.124A			
1.8159	SUP 10	50CrV4	6150	735A50	47	50CrV4	2230	50CrV4	51CrV4	G61500	50C GFA	
1.8161		58CrV4										
1.8509	SACM 645	41CrAlMo7	A355A	905M39	41B	40CAD6-12	2940	41CrAlMo7				
1.8523		39CrMoV13-9		897M39	40C			36CrMoV12				

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	10	High-alloyed steel, and tool steel	Annealed	200	15

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.0347	SPCD	RR St 3	A619	CR 3	Fe P03	F 13		DC03/FeP03			08JU	
1.0723	SUM32	15S22		210A15			1922		F.210F			
1.2080	SKD1	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403	KH12	
1.2162	SCR 420 H	21MnCr5				20MC5						
1.2311		40CrMnMo7				40CMD8		35cRmO8KU				
1.2312		40CrMnMoS8.6	P20+S			40CMD8S						
1.2316		X36CrMo17			X38CrMo16							
1.2343	SKD 6	X38CrMoV5-1	H11	BH11		Z38CDV5		X37CrMoV51KU		T20811	4C 5MFS	
1.2344	SKD61	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV511KU	F.5318	T20813	4C 5MF1S	
1.2363	SKD12	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227		9KH5VF	
1.2379	SKD11	X155CrVMo121	D2	BD2		Z160CDV12	2310	X165CrMoW12KU		T30402	KH12MF	KRUPP2379
1.2436	SKD 2	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F.5213		KH12	

Technical Information

Material Groups

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	10	High-alloyed steel, and tool steel	Annealed	200	15

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.2510	SKS3	100MnCrW4	O1	BO1		90 MWCV 5	2140	95 MnWCr 5 KU	F.5220		9KHVG	
1.2581	SKD5	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	T20821	3C 2W8F	
1.2601		X165CrMoV12					2310	X160CrMoV12			KH12MF	
1.2606	SKD 62	X37CrMoW51	H12	BH12		Z35CWDV5		X35CrMoW05KU	F.537	T20812	5C NM	
1.2764		X19NiCrMo4										
1.2767		X45NiCrMo4				45NCD16		40NiCrMoV8KU				
1.2842		90MnCrV8	O2	B02		90MV8		90MnVCr8KU		T31502	9G2F	
1.3243	SKH55	S6-5-2-5	T15			KCV06-05-05-04-02	2723	HS6-5-2-5			R6M5K5	
1.3249	SKH 3	S18-1-2-5	T4	BT4		Z80WKCV18-05-04					R18K5F2	
1.3343	SKH51, SKH9	S6-5-2	M2	BM2		Z85WDCV	2722	HS652	F.5604		R6M5	
1.3348	SKH 58	S2-9-2	M7			Z100DCWV09-04-02	2782	HS292	F.5607			
1.3355	SKH 2	S18-0-1	T1	BT1		Z80WCV18-4-01					R18	
1.4718	SUH1	X45CrSi9-3	HNV3	401S45	52	Z45CS9		X45CrSi8	F.322		40C 9S2	
1.5662	SL9N60(53)	X8Ni9	ASMA353	502-650		9Ni		X10Ni9	F.2645			
1.5680		12Ni19	2515	12Ni19		Z18N5						

P	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	11	High-alloyed steel, and tool steel	Quenched & Tempered	325	35

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.2080	SKD1	X210Cr12	D3	BD3	X210Cr12	Z200C12		X205Cr12KU		T30403	KH12	
1.2344	SKD61	X40CrMoV5-1	H13	BH13		Z40CDV5	2242	X40CrMoV511KU	F.5318	T20813	4C 5MF1S	
1.2363	SKD12	X100CrMoV5-1	A2	BA2		Z100CDV5	2260	X100CrMoV51KU	F.5227		9KH5VF	
1.2436	SKD 2	X210CrW12	D4(D6)	BD6		Z200CD12	2312	X215CrW121KU	F.5213		KH12	
1.2581	SKD5	X30WCrV9-3	H21	BH21		Z30WCV9		X30WCrV93KU	F.526	T20821	3C 2W8F	
1.2601		X165CrMoV12					2310	X160CrMoV12			KH12MF	
1.2714	SKT 4	55NiCrMoV7	6F3/L6			55NiCrMoV7			F.520S		5KHNV	
1.3202		S12-1-4-5		BT15				HS12-1-5-5				
1.3207		S10-4-3-10		BT42		Z130WKCDV						
1.3243	SKH55	S6-5-2-5	T15			KCV06-05-05-04-02	2723	HS6-5-2-5			R6M5K5	
1.3246		S7-4-2-5	M35			Z110WKCDV07-05-04		HS7-4-2-5				
1.3247	SKH 51	S2-10-1-8	M42	BM42		Z110DKCWV09-08-04		HS2-9-1-8			R2AM9K5	
1.3255	SKH 3	S18-1-2-5	T4	BT4		Z80WKCV18-05-04					R18K5F2	
1.3343	SKH51, SKH9	S6-5-2	M2	BM2		Z85WDCV	2722	HS652	F.5604		R6M5	
1.3348	SKH 58	S2-9-2	M7			Z100DCWV09-04-02	2782	HS292	F.5607			
1.3355	SKH 2	S18-0-1	T1	BT1		Z80WCV18-4-01					R18	
1.4718	SUH1	X45CrSi9-3	HNV3	401S45	52	Z45CS9		X45CrSi8	F.322		40C 9S2	
1.4935	SUH 616	X20CrMoWV121	422							S42200		
1.5680		12Ni19	2515	12Ni19		Z18N5						

Technical Information

Material Groups

M | VDI 3323: 12 | Material Description: Stainless steel | Composition / Structure / Heat Treatment: Ferritic / Martensitic, Annealed | HB: 200 | HRc: 15

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.4000	SUS403	X6Cr13	403	403S17		Z6C13	2301	X6Cr13	F.3110	S40300	08C 13	ATI 410S
1.4001		X7Cr14	410 S	403S7		Z8C13	2301		F.8401		08C 13	
1.4002	SUS 405	X6CrAl13	405	405S17		Z6CA13	2302	X6CrAl13		S40500		
1.4005	SUS416	X12CrS13	416	416S21		Z11CF13	2380	X12CrSC13	F.3411	S41600		ATI 416
1.4006	SUS410	X12Cr13	410	410S21	56A	Z10C13	2302	X12Cr13	F.3401	S41000	12C 13	ATI 410
1.4016	SUS430	X6Cr17	430	430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000	12C 17	ATI 430
1.4027	SCS 2	GX20Cr14		420C29		Z20C13M					20C 13L	
1.4028	SUS420J2	X30Cr13	420	420S45		Z30C13	2304			S42020	20C 13	
1.4034	SUS420J2	X46Cr13		420S45		Z40C14		X40Cr14	F.3405			
1.4057	SUS431	X19CrNi17-2	431	431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100	20C 17N2	431 (HT)
1.4086		GX120Cr29		452C11								
1.4104	SUS430F	X12CrMoS17	430F	420S37		Z10CF17	2383	X10CrS17	F.3117	S43020		
1.4112	SUS 440 B	X90CrMoV18	440B							S44003	95KH18	
1.4113	SUS434	X6CrMo17	434	434S17		Z8CD17-01	2325	X8CrMo17		S43400		AL 434
1.4313	SCS5	X3CrNi13-4	CA6-NM	425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540		
1.4340		GX40CrNi274								J92615		
1.4417		X2CrNiM0Si195	S31500				2376			S39215		
1.4418		X4CrNiMo165				Z6CND16-04-01	2387					APX4
1.4510	SUS430LX	X6CrTi17	XM8			Z4CT17		X6CrTi17	F.3115	S43035	08C 17T	430 Ti
1.4511	SUS430LK	X6CrNb17				Z4CNb17		X6CrNb17	F.3122			AXC525
1.4512	SUH409	X6CrTi12	409	LW19		Z3CT12		X6CrTi12		S40900		
1.4720		X20CrMo13										
1.4724	SUS 405	X10CrA113	405	403S17		Z10C13		X10CrA112	F.311		10C 13SJU	
1.4742	SUS430	X10CrA118	430	439S15	60	Z10CAS18		X8Cr17	F.3113	S43000	15C 13SJU	
1.4747	SUH4	X80CrNiSi20	HNV6	443S65	59	Z80CSN20-02		X80CrSiNi20	F.320B	S65006		
1.4749		X18CrN28	446								15KH28	
1.4762	SUH446	X10CrA124	446			Z10CAS24	2322	X16Cr26		S44600		
1.4871	SUH35,SUH36	X53CrMnNiN21-9	EV8	349S54		Z52CMN21-09		X53CrMnNiN219		S63008	55C 20G9AN4	
		X10CrNi15	429									
		X12CrNi18-9	302	302S31		Z10CN18-09	2330					

M | VDI 3323: 13 | Material Description: Stainless steel | Composition / Structure / Heat Treatment: Martensitic, Quenched & Tempered | HB: 240 | HRc: 23

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.4000	SUS403	X6Cr13	403	403S17		Z6C13	2301	X6Cr13	F.3110	S40300	08C 13	ATI 410S
1.4001		X7Cr14	410 S	403S7		Z8C13	2301		F.8401		08C 13	
1.4006	SUS410	X12Cr13	410	410S21	56A	Z10C13	2302	X12Cr13	F.3401	S41000	12C 13	ATI 410
1.4016	SUS430	X6Cr17	430	430S15	X8Cr17	Z8C17	2320	X8Cr17	F.3113	S43000	12C 17	ATI 430
1.4021	SUS 420J1	X20Cr13	420	420S37		Z20C13	2303	14210	F.5261	S42000	20C 13	ATI 420
1.4027	SCS 2	GX20Cr14		420C29		Z20C13M					20C 13L	
1.4031	SUS 420 J2	X40Cr13	420			Z40C14	-2304		F.3404	S42080	40C 13	
1.4034	SUS420J2	X46Cr13		420S45		Z40C14		X40Cr14	F.3405			
1.4057	SUS431	X19CrNi17-2	431	431S29	57	Z15CN16-02	2321	X16CrNi16	F.3427	S43100	20C 17N2	431 (HT)
1.4104	SUS430F	X12CrMoS17	430F	420S37		Z10CF17	2383	X10CrS17	F.3117	S43020		
1.4113	SUS434	X6CrMo17	434	434S17		Z8CD17-01	2325	X8CrMo17		S43400		AL 434
1.4313	SCS5	X3CrNi13-4	CA6-NM	425C11		Z4CND13-04M	2385	(G)X6CrNi304		J91540		
1.4544		A 700	321	S.524		Z 10 CNT 18 11		X6CrNiTi1811		J92630	08C 18N12T	
1.4546		X5CrNiNb18-10	348	347S31				X6CrNiNb1811		J92640		ATI 348
1.4871	SUH35,SUH36	X53CrMnNiN21-9	EV8	349S54		Z52CMN21-09		X53CrMnNiN219		S63008	55C 20G9AN4	
1.4922		X20cRmV12-1					2317	x20cRmOnl1201				
1.4923		X22CrMoV121										Jethete X20

Technical Information

Material Groups

M	VDI 3323 14	Material Description	Composition / Structure / Heat Treatment	HB	HRc
		Stainless steel	Austenitic	180	10

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.4301	SUS 304	X5CrNi18-10	304	304S15		Z5CN18-09	2332		F.3551	S30409	08C 18N10	
1.4305	SUS303	X10CrNiS18-10	303	303S21	58M	Z8CNF18-09	2346	X10CrNiS18.09	F.3508	S30300	30C 18N11	ATI 303
1.4306	SCS19	X2CrNi1911	304L	304C12	X3CrNi1810KD	Z2CN18-09	2352	GX2CrNi1910	F.3503	S30403	03KH18N11	ATI 304L
1.4308	SUS304L	GX6CrNi18-9	CF-8	304C15	58E	Z6CN18-10M	2333					CF-8
1.4310	SUS 301	X10CrNi18-8	301	301S21		Z12CN17-07	2331	X2CrNi1807	F.3517	S30100	07KH16N6	ATI 301
1.4311	SUS304LN	X2CrNiN18 10	304LN	304S62		Z2CN18-10	2371	X2CrNiN1810	F.3541	S30453	03KH18N11	
1.4312	SCS12	GX10CrNi188	305	302C25		Z10CN18-9M					10C 18N9L	ATI 305
1.4350	SUS304	X5CrNi18-9	304	304S15	58E	Z6CN18-09	2332	X5CrNi1810	F.3551	S30400		ATI 304
1.4362		X2CrNiN234	S32304			Z2CN23-04AZ	2327			S32304		ATI 2304TM
1.4371		X3CrMnNiN18887	202	284S16		Z8CMN18-08-05						
1.4401	SUS316	X5CrNiMo17-12-2	316	316S13		Z3CND17-11-01	2347	X5CrNiMo17 12 2	F.3534	S31600	08KH17H13M2T	ATI 316
1.4404	SUS316L	X2CrNiMo17-13-2	316L	316S11		Z2CND17-12	2348	X2CrNiMo1712	F.3533	S31603		ATI 316L
1.4406	SUS316LN	X2CrNiMoN17122	316LN	316S61		Z2CND17-12AZ		X2CrNiMoN1712	F.3542	S31653	07C 18N	ATI 316LN
1.4408	SCS14	GX6CrNiMo18-10	CF-8M	316C16			2343	X7CrNiMo2010	F.8414	J92900	10G2S2MSL	
1.4410	SCS 14 A	GX10CrNiMo18-9				Z5CND20-12M	2328			S32750		
1.4429	SUS316LN	X2CrNiMoN17-13-3	316Ln	316S62		Z2CND17-13AZ	2375	X2CrNiMoN17133	F.3543		03KH16N15M3	
1.4435	SUS316L	X2CrNiMo18143	316L	316S11		Z3CND17-12-03	2375	X2CrNiMo17 13 2	F.3533	S31603	O3C 17N14M3	
1.4436	SUS316	X3CrNiMo17-13-3	316	316S19		Z6CND18-12-03	2343	X5CrNiMo17 12 2	F.3543	S31600		
1.4438	SUS317L	X2CrNiMo18164	317L	317S12		Z2CND19-15-04	2367	X2CrNiMo18 16 4	F.3539	S31703		ATI 317L
1.4439		X2CrNiMoN17135	(s31726)			Z3CND18-14-06AZ						
1.4440		X2CrNiMo18-16										
1.4449	SUS317	X5CrNiMo17133	317	317S16				X5CrNiMo1815		S31700		ATI 317
1.4460	SUS 329 J1	X8CrNiMo275	329				2324			S32900		10RE51
1.4462	SUS329J3L	X2CrNiMoN2253		318S13		Z3CND22-05Az	2377			S31803		ATI 2205TM
1.4500		X7NiCrMoCuNb2520				23NCDU25-20M				J95150		
1.4521	SUS444	X2CrMoTi18-2	443444				2326	X2CrMoTiNb18 2	F.3123			
1.4539		X1NiCrMoCuN25205				Z2NCDU25-20	2562			N08904		ATI 904L
1.4541	SUS321	X14CrNiTi18-10	321	321S31		Z6CNT18-10	2337	X6CrNiTi18 11	F.3523	S32100	06C 18N10T	ATI 321
1.4542	SUS630	X5CrNiCuNb174	630			Z7CNU15-05						UGIMA 4542
1.4545		Z7CNU15.05	15-5PH							S15500		ATI 15-5
1.4547		X1CrNiMoN20187	S31254				2378			S31254		Uranus B25 6Mo
1.4550	SUS347	X6CrNiNb18-10	347	347S17	58F	Z6CNNb18-10	2338	X6CrNiNb18 11	F.3552	S34700	08C 18N12B	ATI 347
1.4552	SCS 21	GX7CrNiNb18-9				Z4CNNb19-10M				J92710		
1.4568	SUS 631	X 7 CrNiAl 17 7		316S111		Z 9 CAN 17-7	2388	Z8CNA17-07		S17700	09C 17NJU1	17-7PH
1.4571	SUS 316Ti	X6CrNiMoTi17-12-2	316Ti	320S31	58J	Z6NDT17-12	2350	X6CrNiMoTi17 12	F.3535		10C 17N13M2T	ATI 316Ti
1.4581	SCS 22	GX5CrNiMoNb18		318C17		Z4CNDNb18-12M						
1.4583		X6CrNiMoNB18-12	318	303S21		Z15CNS20-12		X15CrNiSi2 12				
1.4585		GX7CrNiMoCuNb1818						X6CrNiMoTi17 12		J94651		
1.4821		X20CrNiSi254				Z20CNS25-04				S44635		
1.4823		GX40CrNiSi274								J92605		
1.4828	SCS17	X15CrNiSi20-12	309	309S24	58C	Z15CNS20-12			F.8414	S30900	20C 20N14S2	ATI 309
1.4833	SUS 309 S	X6CrNi2213	309S	309S13		Z15CN24-13				J93400		
1.4845	SUH310	X12CrNi25-21	310S	310S24		Z12CN25-20	2361	X6CrNi2520	F.331	S31008	20C 23N18	ATI 310S
1.4878	SUS321	X12CrNiTi18-9	321	321S20	58B	Z6CNT18-12(B)	2337	X6CrNiTi1811	F.3553	S32100		ACX315
1.4891		X5CrNiNb18-10	Ss30415				2372					
1.4893		X8CrNiNb11	S30815				2368					
1.4948		X6CrNi1811	304H	304S51		Z5CN18-09	2333			S30480		
1.4980		X5NiCrTi2515	660				2570			S66286		Incoloy A 286
		X5NiCrN3525										
		X2CrNiMoN18134	S31753									
		X2CrNiMoN25227										

Technical Information

Material Groups

K — VDI 3323 15

Material Description: Grey cast iron
Composition / Structure / Heat Treatment: Pearlitic / Ferritic
HB: 180
HRc: 10

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.6010	FC100	GG10	A48 20 B	Grade 100	GJL-100	Ft 10 D	0100	G10	FG10		Sc 10	
0.6015	FC150	GG15	A48 25 B	Grade 150	GJL-150	Ft 15 D	0115	G15	FG15		Sc 15	
0.6020	FC200	GG20	A48 30 B	Grade 220	GJL-200	Ft 20 D	0120	G20	FG20	W06020	Sc 20	
0.6025	FC250	GG25	A48 40 B	Grade 260	GJL-250	Ft 25 D	0125	G25	FG25		Sc 25	
0.6660		GGL-NiCr 20 2	1050/700/7	Grade F2	GJLA-XNiCr 20-2	L-NC 202	0523	-		F41002		Ni-Resist 2
1.4449	SUS317	X5CrNiMo17133	317	317S16				X5CrNiMo1815		S31700		ATI 317

K — VDI 3323 16

Material Description: Grey cast iron
Composition / Structure / Heat Treatment: Pearlitic (Martensitic)
HB: 260
HRc: 26

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.6025	FC250	GG25	A48 40 B	Grade 260	GJL-250	Ft 25 D	0125	G25	FG25		Sc 25	
0.6030	FC300	GG30	A48 45 B	Grade 300	GJL-300	Ft 30 D	0130	G30	FG30		Sc 30	
0.6035	FC350	GG35	A48 50 B	Grade 350	GJL-350	Ft 35 D	0135	G35	FG35		Sc 35	
0.6040	FC400	GG40	A48 60 B	Grade 400	GJL-400	Ft 40 D	0140	G40	FC40		Sc 40	

K — VDI 3323 17

Material Description: Nodular cast iron
Composition / Structure / Heat Treatment: Ferritic
HB: 160
HRc: 3

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.7033	FCD350-22L	GGG35.3	-	350/22L40	GJS-350-22-LT	FGS 370-17	0717-15	-				
0.7040	FCD400	GGG40	60-40-18	SNG 420-12	GJS-400-15	FCS 400-12	0717-02	GS 400-12	FG E38-17	F32800	Vc 42-12	
0.7043	FCD 370	GGG40.3	60-40-18	SNG 370-17	GJS-400-18-LT	FGS 370-17	0717-12	GSO 42-17			Vc 42-12	
0.6040	FC400	GG40	A48 60 B	Grade 400	GJL-400	Ft 40 D	0140	G40	FC40		Sc 40	

K — VDI 3323 18

Material Description: Nodular cast iron
Composition / Structure / Heat Treatment: Pearlitic
HB: 250
HRc: 25

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.7050	FCD500	GGG50	80-55-06	SNG 500-7	GJS-500-7	FGS 500-7	0727-02	GS 500-7	FG E50-7	F33100	Vc 50-2	
0.7060	FCD600	GGG60	80-55-06	SNG 600-3	GJS-600-3	FGS 600-3	0732-03	GS 600-3	FG E60-2		Vc 60-2	
0.7070	FCD700	GGG70	100-70-03	SNG 700-2	GJS-700-2	FGS 700-2	0737-01	GS 700-2	FG S70-2	F34800	Vc 70-2	
0.7652	FCDA-NiMn 13 7	GGG NiMn 13-7	-	Grade S6	GJSA-XNiMn 13-7	FGS Ni13 Mn7	0772	-				Nodumag
0.7660		GGG NiCr 20-2	A436 D2	Grade S2	GJSA-XNiCr 20-2	FGS Ni20 Cr2	0776	-				Ni-Resist D-2

Technical Information

Material Groups

K	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	19	Malleable cast iron	Ferritic	130	

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.8135	FCMW330	GTS-35	32510	B 340-12	GJMB350-10	MN 35-10	0815	GMN 35	GTS35		Kc 35-10	

K	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	20	Malleable cast iron	Pearlitic	230	21

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
0.8145	FCMW370	GTS-45	A220-40010	P 440-7	GJMB450-6	MN 450	0852	GMN 45				
0.8155	FCMP490	GTS-55	50005	P 510-4	GJMB-550-4	MP 50-5	0854	GMN 55			Kc 60-3	
0.8165	FCMP590	GTS-65	70003	P 570-3	GJMB-650-2	MN 650-3	0856	GMN 65				
0.8170	FCMP690	GTS-70	90001	P 690-2	GJMB-700-2	MN 700-2	0862	GMN 70			Kc 70-2	

Technical Information

Material Groups

N — VDI 3323 21

Material Description	Composition / Structure / Heat Treatment	HB	HRc
Aluminum-wrought alloy	Not Curable	60	

Mat'l No.	JIS	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
3.0205		Al99	Al99									
3.0255	(A1050)	Al99.5	1000	L31		A59050C					D1	
3.3315		AlMg1										

N — VDI 3323 22

Material Description	Composition / Structure / Heat Treatment	HB	HRc
Aluminum-wrought alloy	Curable, Hardened	100	

Mat'l No.	JIS	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
3.1325		AlCuMg1									AD35	
3.1655	A2011	AlCuSiPb										
3.2315		AlMgSi1									AK9	
3.4345		AlZnMgCuO,5	7050	L86		AZ4GU/9051		811-04				
3.4365	7075	AlZnMgCu1,5	7075	7075		7075		AlZn5.8MgCuCr			B95	

N — VDI 3323 23

Material Description	Composition / Structure / Heat Treatment	HB	HRc
Aluminum-cast, alloyed	≤ 12% Si, Not Curable	75	

Mat'l No.	JIS	DIN	AISI/ASTM/SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
3.2163		G-AlSi9Cu3									VAL8	
3.2382		GD-AlSi10Mg										
3.2383		G-AlSi0Mg(Cu)	A360.2	LM9			4253					
3.2581		G-AlSi12										
3.3561		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								
			A356-72	2789		NFA32-201						
	A5052		356.1	LM25			4244				AK7	
		G-AlSi12	A413.2	LM6			4261					
	ADC12	G-AlSi12(Cu)	A413.1	LM20			4260				AK12	
	A6061	GD-AlSi12	A413.0				4247					
	A7075	GD-AlSi8Cu3	A380.1	LM24			4250					

Technical Information

Material Groups

N — VDI 3323 24

Material Description: Aluminum-cast, alloyed

Composition / Structure / Heat Treatment: ≤ 12% Si, Curable, Hardened

HB: 90

HRc:

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.1871		G-AlCu4TiMg										
3.1754		G-AlCu5Ni1,5										
3.2371		G-AlSi7Mg	4218B								AK8	
3.2373	C4BS	G-AlSi9MgWA	SC64D			A-S7G	4251				AK9	
3.2381		G-AlSi10Mg									AK12	
3.5106		G-MgAg3SE2Zr1	QE22	mag12								
		G-ALMG5	GD-AlSi12	LM5		A-SU12	4252					

N — VDI 3323 26

Material Description: Copper and Copper Alloys (Bronze / Brass)

Composition / Structure / Heat Treatment: Cutting alloys, PB>1%

HB: 110

HRc:

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.0375		CuZn36Pb3									LS60-2	
2.1090		G-CuSn75pb	C93200			U-E7Z5pb4						
2.1096		G-CuSn5ZnPb	c83600	LG2								
2.1098		G-CuSn2Znpb	C83600									
2.1182		G-CuPb15Sn	C23000	LB1		U-pb15E8						

N — VDI 3323 27

Material Description: Copper and copper alloys (Bronze / Brass)

Composition / Structure / Heat Treatment: CuZn, CuSnZn (Brass)

HB: 90

HRc:

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.0240	C2300	CuZn15									L90	
2.0321		CuZn37	C27200	cz108		CuZn36,CuZn37		C2700			L63	
2.0590		G-CuZn40Fe										
2.0592		G-CuZn35Al1	C86500	U-Z36N3		HTB1						
2.0596		G-CuZn34Al2	C86200	HTB1		U-Z36N3					LTs23AD	
2.1293		CuCrZr	C18200	CC102		U-Cr0-8Zr						

N — VDI 3323 28

Material Description: Copper and copper alloys (Bronze / Brass)

Composition / Structure / Heat Treatment: CuSn, lead-free copper and electrolytic copper

HB: 100

HRc:

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.0060		E-Cu57										
2.0966		CuAl10Ni5Fe4	C63000	Ca104		U-A10N					BrAD	
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								

Technical Information

Material Groups

S — VDI 3323 31

Material Description: Heat resistant super alloys
Composition / Structure / Heat Treatment: Fe Based, Annealed
HB: 200
HRc: 15

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.4558	NCF 800TB	X2NiCrAlTi3220	N08800	NA15								
1.4562		X1NiCrMoCu32287	N08031									
1.4563		X1NiCrMoCuN31274	N08028			Z1NCDU31-27-03	2584				EK77	
1.4864	SUH330	X12NiCrSi36-16	330	NA17		Z12NCS37-18				N08330		
1.4865	SCH15	GX40NiCrSi38-18		330C40				XG50NiCr3919		J94605		
1.4958		X5NiCrAlTi3120										

S — VDI 3323 32

Material Description: Heat resistant super alloys
Composition / Structure / Heat Treatment: Fe Based, Aged
HB: 280
HRc: 30

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
1.4977		X40CoCrNi2020				Z42CNKDWNb						

S — VDI 3323 33

Material Description: Heat resistant super alloys
Composition / Structure / Heat Treatment: Ni or Co Based, Annealed
HB: 250
HRc: 25

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.4360		NiCu30Fe		NA13		NU30				N04400		Monel400
2.4603		NiCr 30 FeMo	5390A			NC22FeD						Hastelloy G-30
2.4610		NiMo16cR16Ti								N26455		HastelloyC-4
2.4630		NiCr20Ti		HR5,203-4		NC20T				N06075		Nimonic75
2.4631	NCF 80A	NiCr20TiAl		Hr40		NC20TA				N07080	KHN77TYuR	Nimonic 80A
2.4642	NCF 690	NiC29Fe				Nnc30Fe				N06690		Inconel 690
2.4856		NiCr22Mo9Nb		NA21		NC22FeDNb				N06625		Inconel 625
2.4858		NiCr21Mo		NA16		NC21FeDU				N08825	KHN38VT	Incoloy 825

S — VDI 3323 34

Material Description: Heat resistant super alloys
Composition / Structure / Heat Treatment: Ni or Co Based, Aged
HB: 350
HRc: 38

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.4375		NiCu30Al	4676	NA18		NU30AT				N05500		Monelk500
2.4662		NiFe35Cr14MoTi	5660			ZSNCDT42				N09901		Incoloy 901
2.4668		NiCr19Fe19NbMo	5383	HR8		NC19eNB				N07718		Inconel 718
2.4670		S-NiCr13A16MoNb	5391	Mar-46		NC12AD						Nimocast 713
2.4694		NiCr16fE7TiAl								N07751		Inconel 751
2.4955		NiFe25Cr20NbTi										
2.4964		CoCr20W15Ni	5772			KC20WN						Haynes 25
		CoCr22W14Ni	AMS 5772			KC22WN						

Technical Information

Material Groups

S	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	35	Heat resistant super alloys	Ni or Co Based, Cast	320	34

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.4669		NiCr15Fe7TiAl				NC15TNbA				N07750		Inconel X750
2.4685		G-NiMo28								N10665		Hastelloy B
2.4810		G-NiMo30										Hastelloy C
2.4973		NiCr19Co11MoTi	AMS 5399			NC19KDT					VT5-1	
3.7115		TiAl5Sn2								R54520	VT1-00	ATI Grade 6

S	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	36	Titanium alloys	Pure Titanium	400 Rm	

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
2.4674		NiCo15Cr10MoAlTi	AMS 5397							N13100		IN 100
3.7025		Ti1	R50250	2TA1						R50250		ATI 30 CP Gr. 1
3.7225		Ti1pd	R52250	TP1						R52250		

S	VDI 3323	Material Description	Composition / Structure / Heat Treatment	HB	HRc
	37	Titanium alloys	Alpha + Beta Alloys, Hardened	1050 Rm	

Mat'l No.	JIS	DIN	AISI/ASTM/ SAE	BS	EN	AFNOR	SS	UNI	UNE / IHA	UNS	GOST	Brands
3.7124		TiCu2		2TA21-24								
3.7145		TiAl6Sn2Zr4Mo2Si	R54620							R54620		
3.7165		TiAl6V4	AMS R56400	TA10-13		T-A6V					VT6	
3.7185		TiAl4Mo4Sn2		TA45-51								
3.7195		TiAl3V2.5								R56320		ATI 3-2.5
		TiAl4Mo4Sn4Si0.5										
		TiAl5Sn2.5	AMS R54520	TA14/17		T-A5E						
		Ti6Al4VELI	AMS R56401	TA11								