INCH

TURNline
INSERT MASTER

Member IMC Group
Ingersoll
Cutting Tools

Member IMC Group
Ingersoll Cutting Tools

A world class supplier of carbide cutting tools

Contents

"New Cutting Edge Technology" Better Quality, Longer Tool life

Features

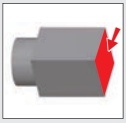
- Excellent surface finish on the workpiece
- Improved adhesion and insert chipping resistance
- Stable and extended tool life in continuous and interrupted cutting operations
- Reduced cutting friction and minimized built-up edge on exotic materials

Benefit of new cutting edge technology

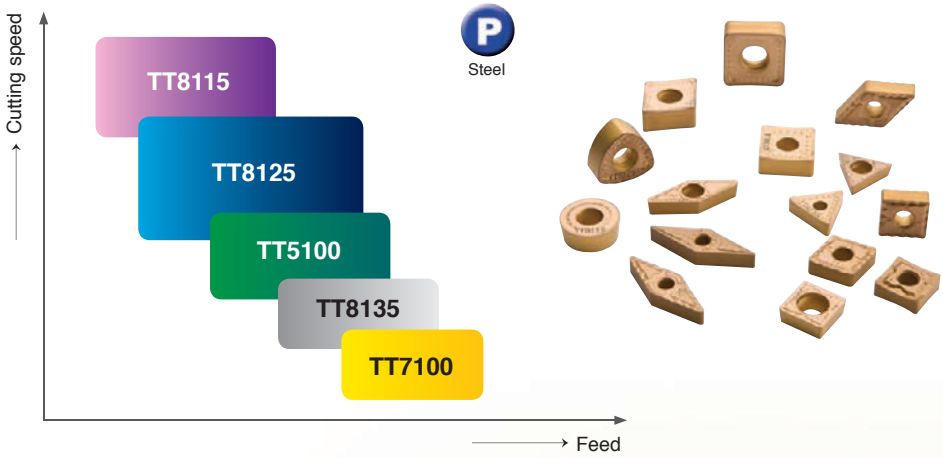
Material: 0.2% Carbon Steel (HB145-160)

Insert: CNMG 432 TT8115

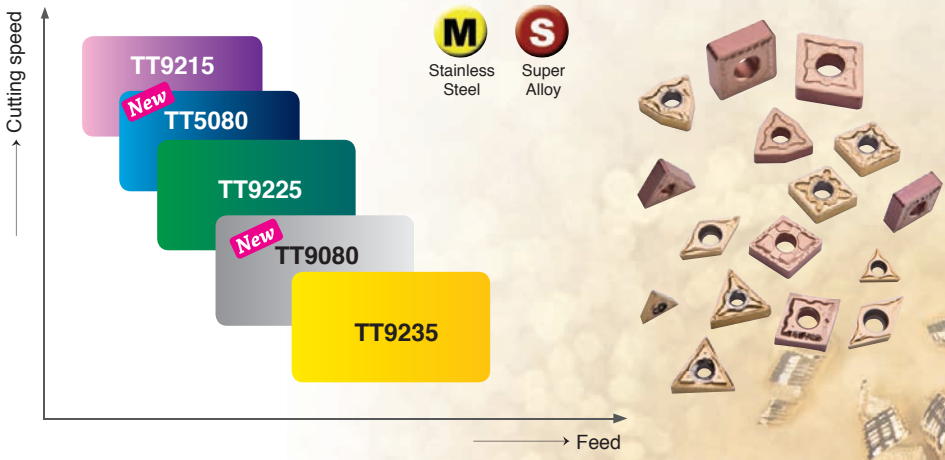
Cutting Condition
V=330sfm
f=.004ipr
d=.120"
Face Interrupted cut



Gold Rush grades for steel applications



Gold Rush grades for stainless steels and high-temp alloy applications



BLACK RUSH Grades for Cast iron

K Cast Iron

New **TT7005** : For high cutting speed in continuous cut on cast irons

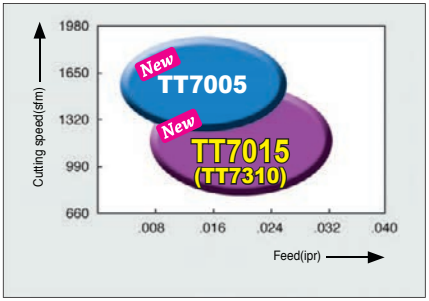
New **TT7015** : For general machining in continuous cut and interrupted cut on cast iron

The Best Choice, The Best Solution!

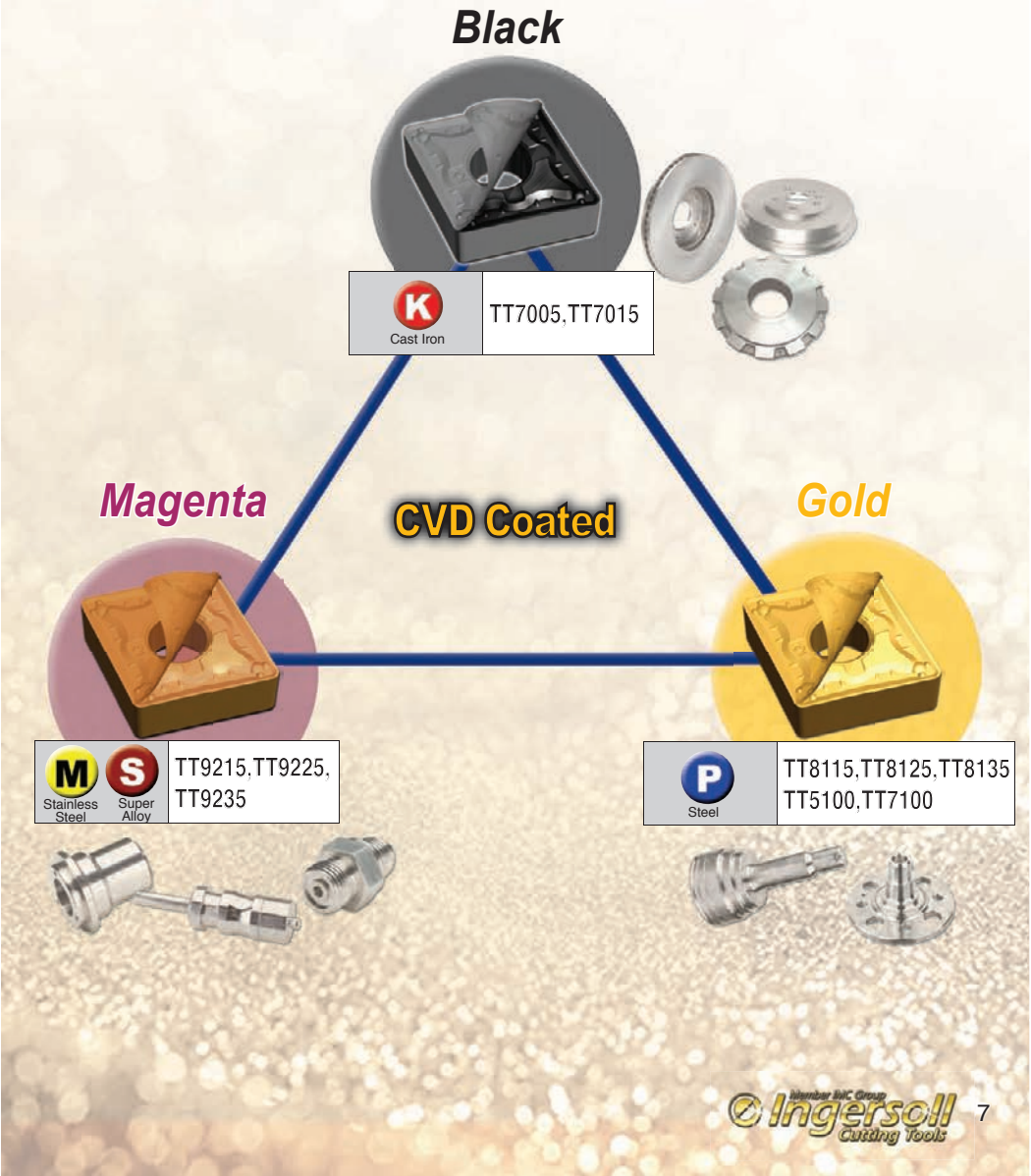
Features

- New grade dedicated to ductile cast iron machining
- Applied also for gray cast irons
- Excellent wear resistance and endurance to chipping

Application range



Easy to select insert color in CVD insert by workpiece material



T-CAST

The Best Solution for Cast Iron Machining

Satisfaction guaranteed with Ingersoll's T-CAST turning grades for cast iron machining

Ceramic
AW120, AB30, AS500, SC10, AS10
High Productivity

CBN
TB670, KB90A, TB730
Ultra High Cutting Speed and High Surface Finish, Longer Tool Life

T-CAST Grades

Cermet and PVD Coated
CT3000, PV3010
Improved Surface Finish

General Machining

CVD Carbide Coated
TT7005, TT7015(TT7310)





Insert Selection for Cast Iron Materials

Grade Selection by Workpiece Material

• Gray cast iron (HB180 - 220) • Ductile cast iron (HB200 - 240)

Workpiece condition	Grades											
	TB670	KB90A	TB730	AW120	AB30	AS500	SC10	AS10	PV3010	CT3000	TT7005	TT7015
Scale and severe interruption	●	●	●			●		● ●			●	● ●
Scale and light interruption	●	●	●		● ●	● ●	● ●	● ●			● ●	● ●
No scale, continuous cut	●	●	●	●	● ●	● ●	●	●	● ●	● ●	● ●	●

Recommended Cutting Parameters

Materials	Grades											
	TB670	KB90A	TB730	AW120	AB30	AS500	SC10	AS10	PV3010	CT3000	TT7005	TT7015
	Cutting speed (sfm), Feed rate (ipr)											
Gray cast iron (HB180 - 220)		2620 - 3940 .004 - .020	2620 - 3940 .004 - .012	1310 - 3280 .003 - .008	980 - 2620 .004 - .010	1310 - 3280 .008 - .024	980 - 3280 .008 - .024	980 - 2620 .008 - .024	330 - 1150 .004 - .010	330 - 980 .004 - .010	490 - 1480 .004 - .028	330 - 980 .004 - .028
Ductile cast iron (HB200 - 240)	660 - 1640 .002 - .008				820 - 1640 .002 - .008	660 - 1970 .004 - .020	820 - 1970 .008 - .024	820 - 1640 .008 - .024	330 - 980 .004 - .010	330 - 820 .004 - .010	390 - 1150 .004 - .020	330 - 820 .004 - .020

Chipbreaker and Grade Selection by Workpiece Material

• Gray cast iron (HB180 - 220)

Workpiece condition	Depth of cut (inch)	Chipbreaker/Grade Recommended cutting conditions (sfm, ipr)				
Roughing (Scale & severe interruption)	.160 - .240	RT/TT7005 980, .016	RT/TT7015 790, .016			
	.240 -	RT/TT7005 890, .016	RT/TT7015 720, .016			
Medium (Scale & light interruption)	.040 - .100	- NMN/KB90A 2490, .012	- NMN/KB90A 2490, .012	- NGA/AS500 1770, .014	MT/TT7005 1180, .014	RT/TT7005 1050, .016
	.100 - .160	- NMN/KB90A 2360, .014	- NGA/AS10 1770, .014	RT/TT7005 980, .016		
Finishing (No scale & continuous cutting)	- 0.04	- NMN/KB90A 2620, .008	- NGA/AW120 2620, .008	NGA/AB30 2300, .008	NGA/AS500 1970, .010	MT/TT7005 1310, .010

• Ductile cast iron (HB200 - 240)

Workpiece condition	Depth of cut (inch)	Chipbreaker/Grade Recommended cutting conditions (sfm, ipr)				
Roughing (Scale & severe interruption)	.160 - .240	RT/TT7015 740, .016				
	.240 -	RT/TT7015 690, .016				
Medium (Scale & light interruption)	.040 - .100	- NMA/TB670 1640, .008	- NGA/AB30 1540, .008	MT/TT7005 1000, .012	RT/TT7005 890, .014	
	.100 - .160	- NGA/AS10 1440, .012	MT/TT7015 850, .014	RT/TT7015 770, .014		
Finishing (No scale & continuous cutting)	- 0.04	- NMA/TB670 1800, .008	- NGA/AB30 1710, .008	MT/TT7005 1050, .008	MT/PV3010 1050, .008	MT/CT3000 950, .008

TURNline Grades

Coated Carbide, Cermet and Carbide Grades

Grades	Coating	ISO	Characteristics & Applications
BLACK-RUSH **TT7005** CVD Coated	TiN/TiCN/Al_2O_3	K01 – K15 P05 – P15	• For high speed machining of gray and ductile cast iron • Excellent wear resistance assures optimum performance in high-speed continous machining of cast iron • Secondary choice for alloy steel
BLACK-RUSH **TT7015** CVD Coated	TiN/TiCN/Al_2O_3	K10 – K25 P10 – P20	• For general machining of gray and ductile cast iron • For continuous and interrupted machining of gray and ductile cast iron • Secondary choice for alloy steel
TT7310 CVD Coated	TiN/TiCN/Al_2O_3	K10 – K25	• For general machining of gray and ductile cast iron
TT8115 CVD Coated	TiN/TiCN/Al_2O_3/TiN	P05 – P20	• For high speed turning continuous cutting on steels • Excellent wear resistance and heat-resistance
TT9215 CVD Coated	TiN/TiCN/Al_2O_3/TiN	S05 – S20 M05 – M20	• Excellent insert wear resistance • For high cutting speed & continuous cutting on stainless steels
TT5080 PVD Coated	AlTiN/TiN	S05 – S25 M05 – M25	• For a wide range of turning of high-temp alloys • Very hard submicron substrate
TT8125 CVD Coated	TiN/TiCN/Al_2O_3/TiN	P15 – P30	• For a wide range of turning on steels • Very good combination of wear resistance and toughness • For general use on steels
TT5100 CVD Coated	TiN/TiCN/Al_2O_3/TiN	P20 – P35	• For a wide range of turning of mild steel, low carbon steel and low carbon alloy steel • Excellent chipping resistance and sticking resistance
TT9225 CVD Coated	TiN/TiCN/Al_2O_3/TiN	S15 – S30 M15 – M30	• Excellent combination of insert wear resistance & fracture resistance • For general use on stainless steel • For continuous and interrupted cutting on stainless steel
TT9020 PVD Coated	TiCN	P20 – P40 M20 – M40	• Submicron substrate with PVD coating • For stainless steel
TT9080 PVD Coated	AlTiN/TiN	M20 – M40 S20 – S40	• Hard submicron substrate with good fracture toughness • For turning small components
TT8135 CVD Coated	TiN/TiCN/Al_2O_3/TiN	P25 – P40	• Tough carbide substrate • For a wide range of medium to roughing applications at low cutting speed on steels • For heavy turning
TT7100 CVD Coated	TiN/TiCN/Al_2O_3/TiN	P30 – P45	• Very tough carbide substrate base - with a CVD coating • This combination provides both excellent toughness and chipping resistance • For heavy turning
TT9235 CVD Coated	TiN/TiCN/Al_2O_3/TiN	S25 – S40 M25 – M40	• Excellent combination of insert wear resistance & toughness • For low cutting speed & interrupted cutting
TT8020 PVD Coated	TiCN	P30 – P50 M30 – M50 S30 – S50	• For medium to low speed turning of stainless steel, exotic alloys and low carbon steel • Toughest grade in turning grade • For interrupted cut on stainless steel and exotic alloys
PV3010 PVD Coated Cermet	TiN	P05 – P20 M05 – M20 K05 – K20	• For high surface finish turning of steel, stainless steel and cast iron • Excellent wear resistance and low coefficient of friction • Long tool life
CT3000 Uncoated Cermet		P10 – P20 M10 – M20 K10 – K20	• Excellent surface finish turning on steel, stainless steel and cast iron • Excellent wear resistance and low coefficient of friction
K10 Carbide		K05 – K15 N05 – N15 S05 – S15	• General turning of cast iron, exotic alloy and non-ferrous materials including aluminum and copper alloy • Excellent wear resistant grade

Recommended Cutting Speeds: V=sfm							
Materials							
Low Carbon Steel	Low Carbon Alloy Steel	Carbon Steel	Alloy Steel	Stainless Steel	High Temp. Alloy	Cast Iron	Aluminum Alloy
						490 - 1480	
						390 - 1380	
						390 - 1380	
1440 - 2620	1080 - 2170	560 - 1440	360 - 1250				
				560 - 820	130 - 260		
				490 - 820	100 - 330		
820 - 1970	490 - 1640	330 - 1150	260 - 980				
490 - 1640	230 - 1150	230 - 820	230 - 720				
				430 - 720	100 - 230		
				160 - 490			
				160 - 520	70 - 130		
330 - 1310	230 - 1050	230 - 820	230 - 720				
200 - 1150	200 - 980	230 - 660	230 - 590				
				360 - 560	100 - 200		
230 - 980	230 - 820	230 - 490	230 - 430	160 - 490	70 - 100		
980 - 2620	490 - 1970	490 - 1310	330 - 1150	660 - 980		330 - 980	
820 - 2300	490 - 1800	490 - 1150	330 - 1050	660 - 890		330 - 1150	
					70 - 160	260 - 590	200 - 4920

CBN, PCD and Ceramic Grades

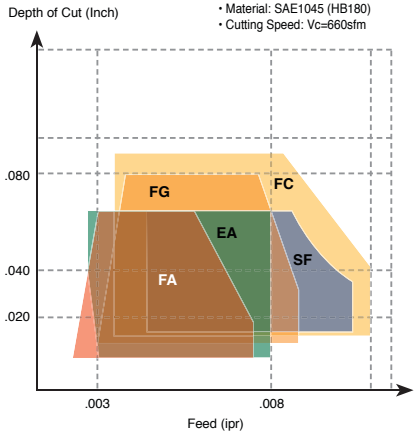
Grades	Composition	Characteristics & Applications
KP300 **TD810** PCD	PCD + Binder	• For general use on aluminum alloy • Excellent combination of wear resistance and toughness
New **TB610** CBN	CBN + Binder	• Excellent wear resistant grade with low CBN content • Continuous cutting at high cutting speeds on hardened steels
TB650 CBN	CBN + Binder	• High wear resistant grade with moderate fracture toughness • Can be applied to light interrupted cutting applications
New **TB670** CBN	CBN + Binder	• Excellent combination of wear resistance and toughness • For general use on hardened steel • For continuous and interrupted cutting
New **TB730** CBN	CBN + Binder	• Excellent toughness with high CBN content • For high speed machining of cast iron • Can be applied to interrupted cutting on hardened steel and other materials
KB90A CBN	CBN + Binder	• Solid CBN with excellent impact resistance • For high speed machining of cast iron • Can be applied to rough to medium machining of hardened steel
New **AW120** CERAMIC	Al_2O_3 + ZrO_2	• Excellent wear resistant grade with chemical stability and temperature resistance • For high speed continuous turning of cast iron • For finishing applications on hard materials
AB2010 COATED CERAMIC	(Al_2O_3 +TiCN) +TiN PVD Coating	• Excellent wear resistance and tool life • Very good combination with improved wear and fracture resistance • Finishing operations on hardened steels and hardened cast irons
AB20 CERAMIC	Al_2O_3 +TiCN	• High wear resistant grade with excellent cutting edge stability • For high speed continuous turning of hardened steel and other hard materials • For finishing applications on cast iron.
AB30 CERAMIC	Al_2O_3 +TiC	• Mixed ceramic with good toughness and wear resistance • For general use on hardened steel, cast iron and hard materials • Can be applied to interrupted cutting conditions
New **TC430** CERAMIC	Whisker	• SiC whisker reinforced ceramic grade • General turning and milling • For Ni-base superalloy, inconel, waspaloy and rene
New **AS500** CERAMIC	SiAlON	• For roughing to finishing cast iron applications • For higher cutting speeds compared to AS10 • Wet and dry cutting
SC10 COATED CERAMIC	AS10 + CVD	• Wear resistant grade with excellent toughness and thermal shock resistance • For high speed turning of cast iron • Wet and dry cutting
AS10 CERAMIC	Si_3N_4	• High wear resistant grade with excellent toughness and thermal shock resistance • For general use on cast iron • Wet and dry cutting
AS20 CERAMIC	Si_3N_4	• Very tough Si_3N_4 ceramic grade with high cutting edge stability • For roughing to finishing applications with high temperature nickel based alloys • Wet and dry cutting

Recommended Cutting Conditions: V=sfm, f=ipr							
Materials							
Grey cast iron (HB180-220)	Ductile cast iron (HB200-240)	Chilled cast iron (HB400-700)	H.S.S. Roll	Sintered metal	Hardened steel (HRC46-65)	Aluminum Alloy	Ni-Based super alloy
						1970 - 9840 .002 - .012	
					330 - 820 .002 - .008		
		260 - 490 .004 - .008	160 - 330 .008 - .024	330 - 980 .002 - .008	260 - 660 .002 - .008		
		260 - 490 .004 - .010	100 - 260 .008 - .024	330 - 980 .004 - .012	260 - 590 .004 - .012		
1640 - 3280 .004 - .012	980 - 2620 .004 - .012	260 - 490 .004 - .012		260 - 820 .004 - .010	200 - 490 .004 - .012		
1640 - 3280 .004 - .012	980 - 2300 .004 - .012	260 - 490 .004 - .012					
1310 - 3280 .004 - .020	980 - 1970 .004 - .008						
		160 - 660 .002 - .008			260 - 980 .002 - .008		
980 - 2620 .004 - .012		160 - 660 .002 - .008	160 - 330 .008 - .020		160 - 820 .002 - .008		
980 - 2620 .004 - .020	820 - 1640 .004 - .012	160 - 490 .002 - .008	160 - 260 .008 - .020		160 - 660 .004 - .010		
			160 - 330 .008 - .028				490 - 1310 .004 - .012
1310 - 3280 .008 - .024	660 - 1970 .004 - .020		70 - 200 .008 - .028				
980 - 3280 .008 - .032	820 - 1970 .008 - .024						
1310 - 2620 .008 - .032	660 - 1640 .008 - .024						
							330 - 980 .004 - .012

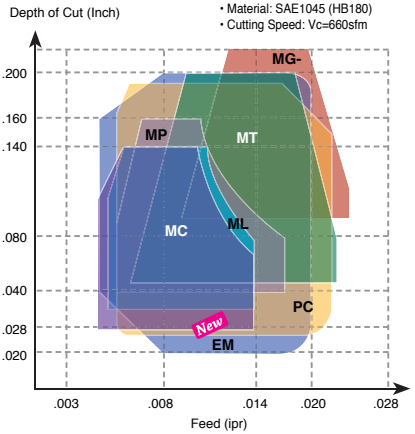
TURNline Chipbreakers

Negative Inserts

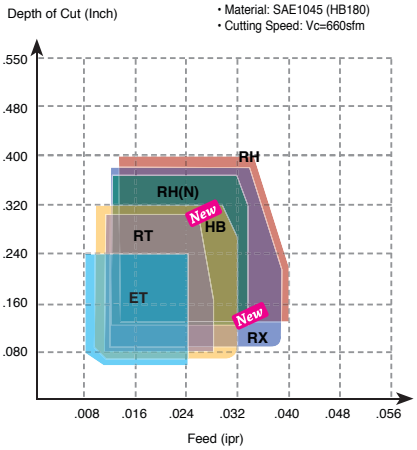
For Finishing Applications



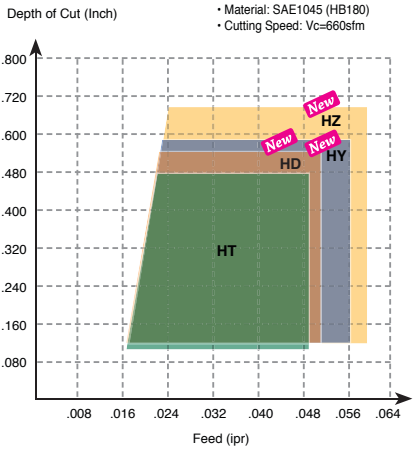
For Medium Applications



For Roughing Applications

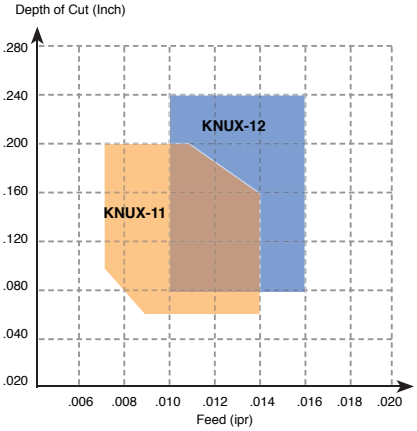


For Heavy Machining

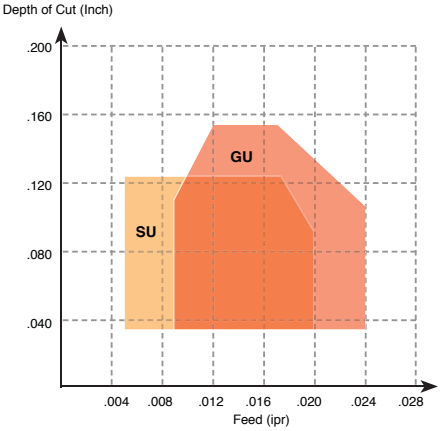


Negative Inserts

KNUX Type

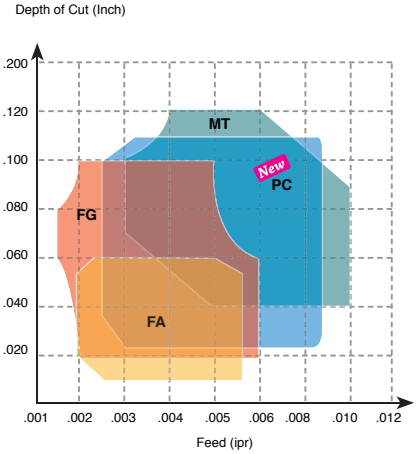


HNMG Type

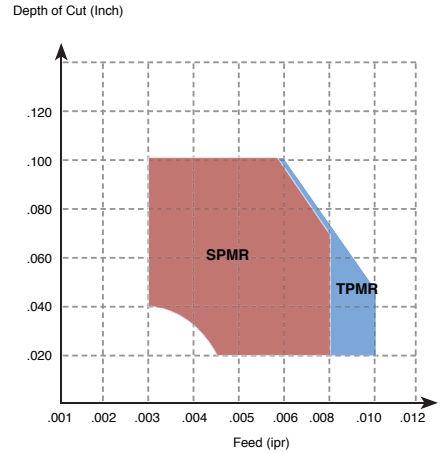


Positive Inserts

For Finish to Medium Applications



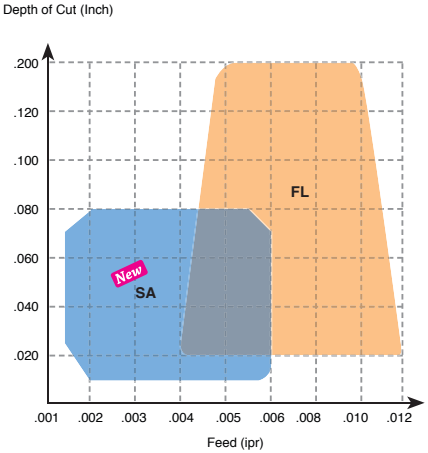
For Medium Applications



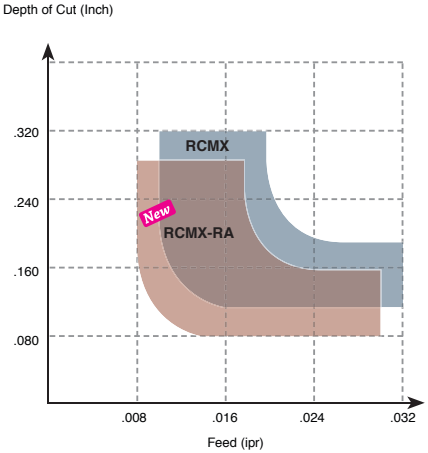
TURNline Chipbreakers

Positive Inserts

Ground Insert for Finishing Applications

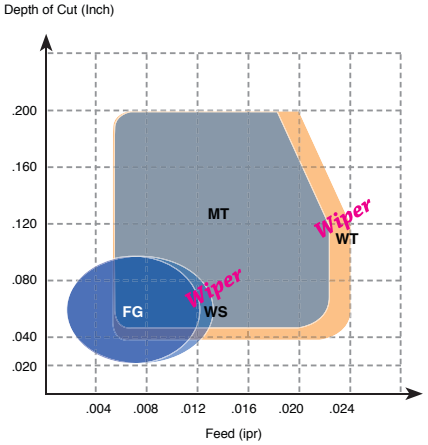


Round Insert for Roughing Applications

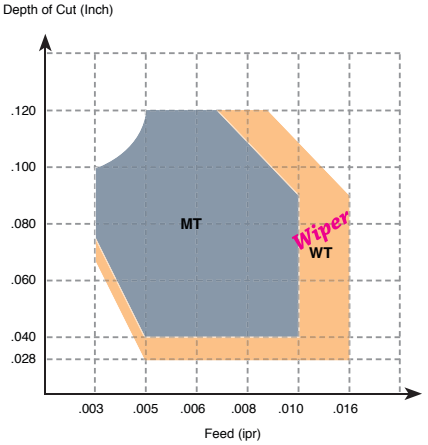


'WS' and 'WT' Wiper Inserts for High Feed Turning and/or Excellent Surface Finish

Negative Inserts

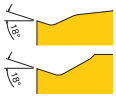
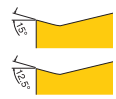
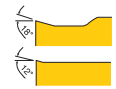
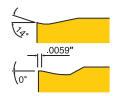
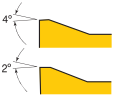
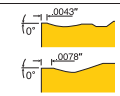
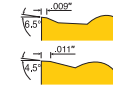
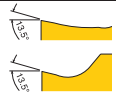
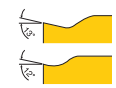
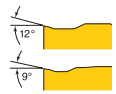
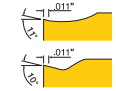
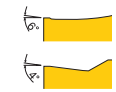


Positive Inserts

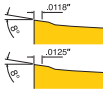
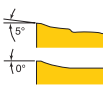
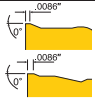
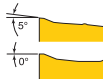
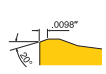
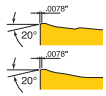
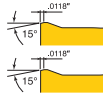
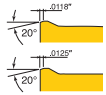
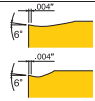


TURNline Chipbreakers

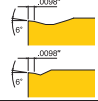
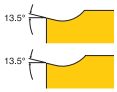
Negative Inserts

Chipbreaker Name and Geometry			Applications and Features
FA		CNMG 43 	• For super finish applications • Steel, stainless steel and heat resistant alloy machining • Excellent chip control
EA		CNMG 43 	• For finishing applications • Exotic materials • Excellent chip control at low feeds and depths of cut
FG		WNMG 33 	• For finish and semi finish applications • Steel, stainless steel and cast iron machining • Low cutting forces
SF		CNMG 43 	• For finishing applications • Stainless steel and heat resistant alloy machining • Low cutting forces
FC		CNMG 43 	• Ideal for finishing applications • Low carbon steel & low carbon alloy steel • Effective chip breaking in both turning and facing operations
MC		CNMG 43 	• For medium applications • Steel and cast iron machining • Strong rake geometry • Excellent chip control on medium turning applications
PC		CNMG 43 	• For medium to semi-finishing applications • Steel & Automotive component • Positive geometry • Excellent chip control on medium applications
VF		DNMG 43 	• For slender workpiece applications • Vibration free • Steel and stainless steel machining • High positive rake geometry to minimize cutting forces
ML		CNMG 43 	• For medium light applications • Stainless steel, steel and aluminum • Very high positive rake geometry to minimize built-up-edge and cutting forces
New EM		CNMG 43 	• For medium applications • Stainless steel machining • Sharp land design for low cutting force
MP		CNMG 43 	• For medium machining applications • Steel and stainless steel • High positive rake geometry to optimize machining and provide stable machining conditions
MT		WNMG 43 	• For medium rough applications • Steel, cast iron and stainless steel • Tough rake angle for general use

TURNline Chipbreakers

Chipbreaker Name and Geometry				Applications and Features
MG-		CNMG 43		• For medium rough applications • Steel and cast iron machining • Strong rake geometry • Suitable for manual lathes
ET		CNMG 43		• For roughing applications on exotic materials • Low cutting force • Wide chip control range when roughing
RT		CNMG 64		• For roughing applications • Steel and cast iron machining • Very strong rake geometry
New HB		CNMX 55		• For semi heavy roughing applications • Steel and alloy steel machining • Double sided semi-heavy turn insert • Stable contact surface with special seat
RH(N)		CNMM 64		• For high feed roughing applications • Steel, cast iron and stainless steel machining • Very strong rake geometry
New RX		CNMM 64		• For semi heavy roughing applications • Steel, stainless steel and cast iron machining • Strong cutting edge with flat land • Low cutting force
RH		CNMM 64		• For roughing applications • Steel, stainless steel and cast iron machining • Very strong rake geometry
HT		SNMM 64		• For heavy roughing applications • Low cutting force for low horse power machines • Excellent chip control due to variable land and a flexible chip breaker
New HD		CNMD 86		• For heavy roughing applications • For all kinds of shafts, connecting-rods and ship building components • Flexible chip breaker offers excellent chip evacuation
New HY		CNMM 86		• For heavy roughing applications • For large depth of cut and high feed • Strong cutting edge credit to a wide land and large land angle
New HZ		CNMM 86		• For heavy roughing applications • For large depth of cut and high feed • Extremely strong cutting edge credit to a wide land and large land angle • Suitable for high cutting conditions
Wiper WS		CNMG 43		• For super finish applications • Steel, cast iron and stainless steel machining • Excellent chip control and low cutting forces
Wiper WT		CNMG 43		• For medium to rough machining applications • Steel, cast iron and stainless steel machining • Stable cutting and low cutting forces at high feed rates

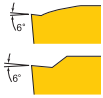
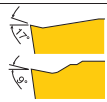
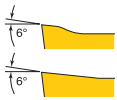
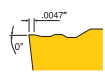
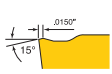
HNMG Type Inserts

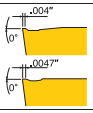
Chipbreaker Name and Geometry			Applications and Features
GU		HNMG 	• For medium applications • For general turning of steels and cast irons • Strong rake geometry
SU		HNMG 	• For exotic materials • Stainless steels, super alloys, low carbon steels, low carbon alloy steel machining • Sharp geometry to minimize built-up edge

KNUX Type Inserts

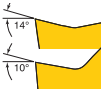
Chipbreaker Name and Geometry			Applications and Features
11		KNUX 333 	• For medium light to medium applications • Steel and stainless steel machining • Positive rake geometry to minimize cutting forces • Excellent chip control
12		KNUX 333 	• For medium to medium rough applications • Steel and stainless steel • Strong rake geomerty • Wide chip control range

Positive Inserts-Pressed

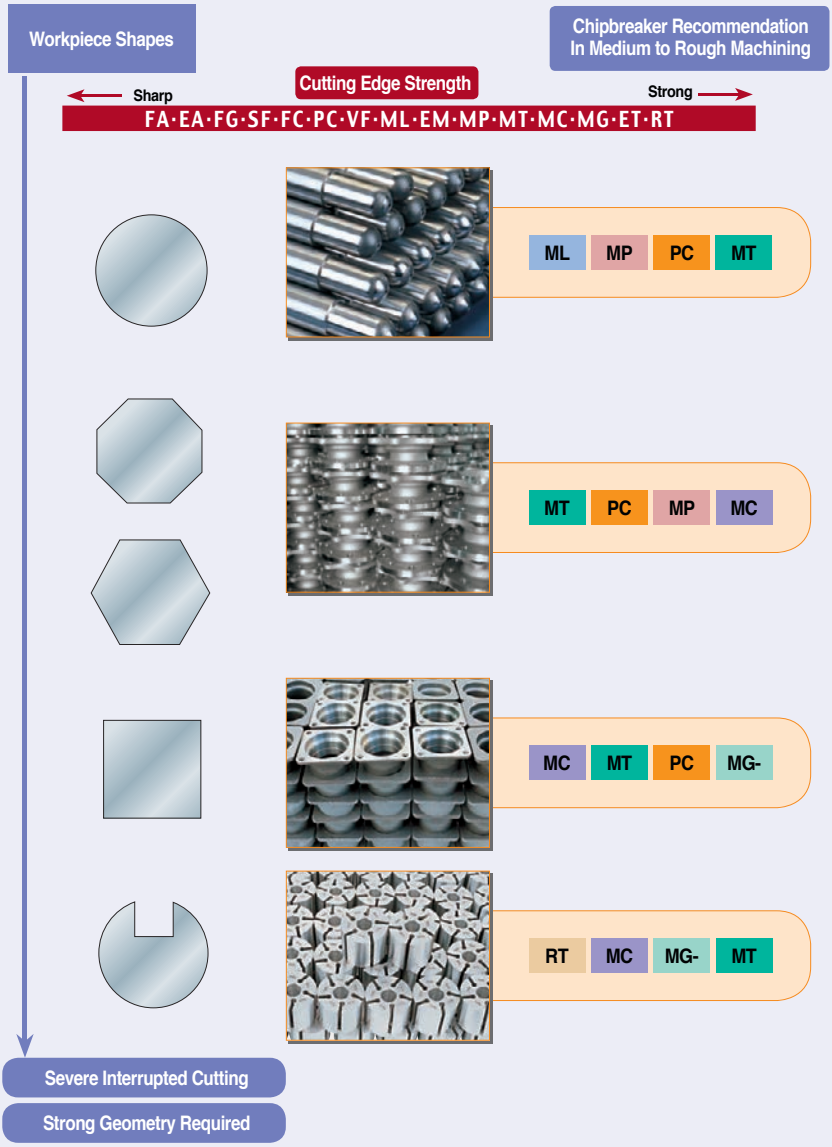
Chipbreaker Name and Geometry			Applications and Features
FA		DCMT 32.5 	• For super finish applications • Very tight chipbreaker • Excellent chip control
FG		CCMT32.5 	• For finish to medium light applications • Steel and stainless steel machining • Low cutting forces • Excellent chip control
New PC		CCMT 32.5 	• For medium applications • Suitable for a wide variety of materials • Low cutting force
MT		CCMT32.5 	• For medium to medium rough applications • Steel, stainless steel and cast iron machining • Negative rake geometry for general use
PMR-		TPMR 22 	• For medium to medium rough applications • Steel, stainless steel and cast iron • Positive rake geometry
New RA		RCMX 3209 	• For heavy and interrupted machining applications • Steel, stainless steel and cast iron machining • Optimized chip groove geometry
CMX-		RCMX 1204 	• For high feed roughing applications • Steel, stainless steel and cast iron machining • Strong rake geometry

Wiper WT		CCMT 32.5  A B	• For medium to rough machining applications • Steel, cast iron and stainless steel machining • Stable cutting and low cutting forces at high feed rates

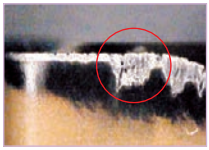
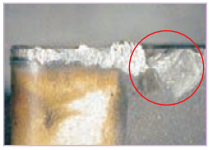
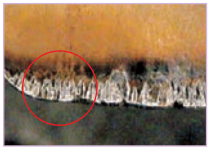
Positive Inserts-Ground

Chipbreaker Name and Geometry			Applications and Features
FF		CCGT1.21  A	• For finish to medium applications • For small component machining • Excellent surface finish
GF		CCET 21.5  A	• For super finish applications • Steel, stainless steel and alloy steel machining
GW		CCET21.5  A	• For super finish applications • Wiper geometry for good surface finish • Steel, stainless steel and alloy steel machining
FL		CCGT 43  A	• For finish to medium applications • Aluminum machining • Very high positive rake geomerty to minimize built-up-edge
SA		CCGT 32.5  A B	• For finish to medium applications • Steel , stainless steel, super alloy machining • Low cutting force

Insert Geometry by Workpiece Shape



Insert Failure Trouble Shooting

		Cause
Crater Wear		• Excessive cutting speed or feed rate (alloy steel and over 0.3% carbon steel) • Workpiece material contains high hardness chemical elements (tool steel, die steel)
Flank Wear		• Excessive cutting speed (alloy steel and over 0.3% carbon steel) • Workpiece material contains high hardness chemical elements (tool steel, die steel) • Increase cutting speed if abnormal flank wear is caused by a very slow cutting speed
Deformation		• Excessive cutting speed or feed rate
Chipping		• Excessive feed rate • Interrupted cutting
Notching		• Machining scale part • From machining work hardened materials
Built-Up-Edge		• Slow cutting speed • Sticky materials
Mechanical Fracture		• Excessive feed rates when interrupted cutting
Thermal Cracking		• Repeated thermal shock (interrupted cutting)

Solution

- Reduce cutting speed or feed rate or use more wear resistant grade
- Use coolant
- Use more positive rake geometry

- Reduce cutting speed or feed rate or use more wear resistant grade
- Use coolant

- Reduce cutting speed or feed rate or use more wear resistant grade
- Use coolant
- Use more positive rake geometry

- Reduce cutting speed or feed rate or use more wear resistant grade
- Use coolant

- Reduce cutting speed or feed rate or use more wear resistant grade
- Use coolant
- Use stronger insert geometry

- Reduce feed rate
- Use tougher grade
- Use stronger insert geometry
- Remove coolant completely or apply coolant correctly

- Use tougher grade
- Use stronger insert geometry
- Increase lead angle

- Use tougher grade
- Use more positive rake geometry
- Increase lead angle

- Increase cutting speed
- Use more positive rake geometry

- Use more positive rake geometry
- Use tougher grade

- Use tougher grade
- Use stronger insert geometry
- Reduce feed rate
- Remove coolant completely or apply coolant correctly
- Increase cutting speed

- Use tougher grade
- Use stronger insert geometry
- Reduce feed rate
- Remove coolant completely or apply coolant correctly

Change Grade

Harder

PV3010 > CT3000

TT7005 > TT7310 > TT7015 > TT8115 > TT9215 > TT5080 > TT8125 > TT5100 > TT9225 > TT9080> TT9020 > TT8135 > TT7100 > TT9235 > TT8020

Change Chipbreaker

Less B.U.E*
Less Heat

	SF												
FA	FG	ML	EM	MP	ET	PC	MT	WT	MC	MG-	RT	RH	HD
	FC	VF									HB	RX	HT
	WS												HY
	EA												HZ

Chip Control

Tight — Open

	FC												HD
	SF												HT
FA	FG	MC	PC	VF	ML	EM	MP	MT	MG-	ET	RT	RH	HY
	WS							WT			HB	RX	HZ
	EA												

*B.U.E: Built-Up-Edge

Workpiece Material Groups

Group No.	Material	See Pages	Chemical composition
A1-1	Low carbon steel	27p	- 0.26% C
A1-2	Medium carbon steel	34p	0.27 - 0.54% C
A1-3	High carbon steel	36p	0.51 - 0.95% C
A2-1	Low carbon alloy steel	30p	0.12 - 0.23% C + alloying elements < 5%
A2-2	Medium & High carbon alloy steel	38-43p	0.27 - 1.50% C + alloying elements < 5%
A3-1	Carbon tool steel	44p	0.60 - 1.50% C
A3-2	Alloy tool steel	45p	0.45 - 1.50% C + alloying elements < 5%
A3-3	High speed steel	46p	0.75 - 0.85% C + alloying elements > 5%
A3-4	Cold working die steel	48p	0.30 - 2.00% C + alloying elements > 5%
A4-1	Ferritic & Martensitic stainless steel	49p	11 - 18%Cr
A4-2	Austenitic stainless steel	50p	16 - 28% Cr + 3.5 - 22% Ni
A5	Ni based super alloy	61p	Ni base, Fe base, Co base
A6	Titanium alloy	63p	Ti-6Al -4V
A7-1	Grey cast iron	56p	1.7 - 6.67% C
A7-2	Ductile cast iron	59p	3.2 - 4.2% C + 0.04 - 0.08% Mg
A8-1	Low Si aluminium alloy	65p	12.2% < Si
A8-2	High Si aluminium alloy	67p	12.2% ≧ Si
A9	Copper alloy High hardness material	69p	Cu...
A10	High hardness material	54p	High W, C, Cr, Co...

Characteristics	General Insert Selection
Soft and Gummy. Difficult chip control. Watch for built-up-edge and burrs.	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Harder and stronger. Easy chip control. Watch for insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Harder and stronger. Abrasive. Watch for insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Soft and Gummy. Thicker chip. Difficult chip control. Watch for built-up-edge.	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Harder and stronger. More abrasive. Watch for insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Harder. Abrasive. Watch for insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Harder. More abrasive. Watch for rapid insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Harder and sticky. Watch for built-up-edge.	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Harder. Highly abrasive. Watch for rapid insert wear.	Use stronger rake geometry. Use good wear resistant grade.
Gummy. Thicker chip. Workhardens. Watch for built-up-edge and notching.	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Gummy. Abrasive. Thicker chip. Workhardens. Watch for built-up-edge, notching and rapid wear	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Workhardens. More abrasive. Sticky. Watch for built-up-edge, notching and rapid wear	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Workhardens. More abrasive. Sticky. Watch for built-up-edge, notching and rapid wear	Use high positive rake geometry. Use tougher and good chipping resistant grade.
Abrasive. Discontinuous chip.	Use stronger rake geometry. Use good Al2O3 coated grade.
More abrasive. Discontinuous chip.	Use stronger rake geometry. Use good Al2O3 coated grade.
Very soft and gummy.	Use very high positive rake geometry. Use good wear resistant grade such as PCD and K10.
Very abrasive. Watch for rapid wear and built-up-edge.	Use positive rake geometry. Use good wear resistant grade such as PCD and K10.
Soft and gummy. Watch for built-up-edge.	Use high positive rake geometry. Use good chipping resistant grade.
Harder and abrasive. Watch for rapid wear.	Use stronger rake geomerty. Use Ceramic, PCD & CBN.

Insert Selection by Workpiece Material

Check and follow these steps

1 Material to be machined

Check material to be machined and select corresponding page by material group classification
Refer to page 24 for full list of material group classifications

2 Select required cutting surface speed(sfm)

Select the appropriate grade to suit the application cutting speed

3 Select the required feed rate

4 Select the required depth of cut

Select the appropriate chipbreaker based on feed and depth of cut

: blue color indicates feed rate range
: Yellow color indicates depth of cut range

The range of FG chipbreaker is CNMG 331 size
All other negative inserts with CNMG(M) 432 size
Positive inserts are CCMT 32.51 size

5 Consideration should also be given to the material shape as detailed on page 21

6 Select insert style and insert corner radius to suit application

7 Use the Application Charts!!!

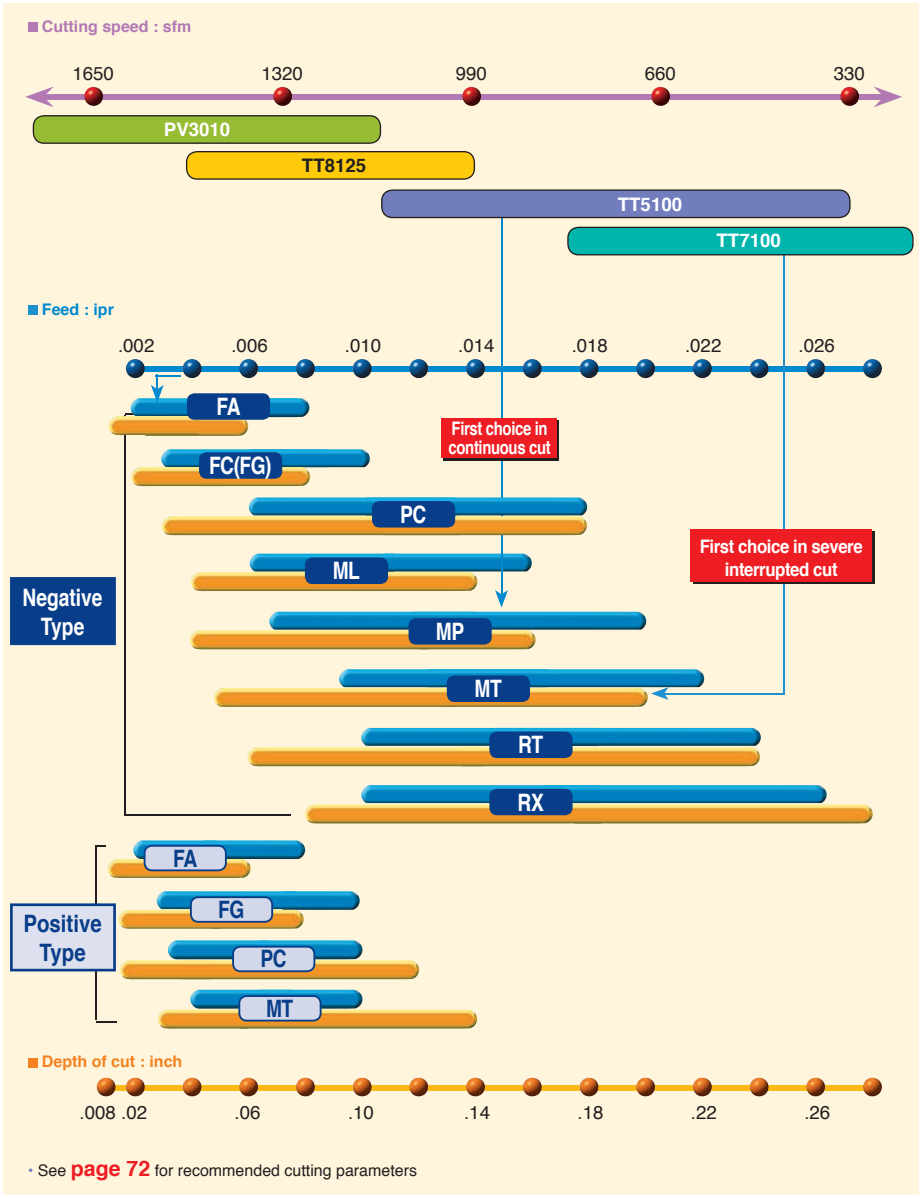
Use recommened cutting parameters to start machining if there are no cutting parameters,
or if existing parameters are not suitable for tool life or productivity.

Turning Formulas	
Cutting speed (surface feet/min) : V =.262 x D x N	Surface roughness of workpiece (inch) : Rmax = f_2 / 8r
Revolutions per minute : N = 3.82 x SFM(V) / D	Rate of metal removal (cubic in/min) : Q = 12 x ap x f x V
Feed rate (inch/min) : F = f x N	Horsepower required at spindle : Hps= Q x P
Cutting time (min) : T = L / F	Horsepower required at motor : Hpm = Hps / E

• D = Diameter of workpiece (inch) • f = Feed rate (inch/rev) • L = Length (inch) • r = Corner radius (inch) • ap = Depth of cut (inch)
• n = Efficiency of machine (typically .7-.85) • E = Efficiency of spindle drive (typically .45)
• P = Unit power factor, Horsepower per cubic inch per minute

P 0.15% Carbon Steel (HB≒150)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
XC12	1.0401	C15C16	S15C	F.111	1350	080M15	1015	SM15C



• See page 72 for recommended cutting parameters

Examples

Ex. 1

Component description : **Pulley, low carbon (0.1% C) steel**
Insert type : CNMG 432
Cutting parameters : **V=1635 - 1440sfm,** f=.008 - .012ipr, ap=.028"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 MC TT8125**

Ex. 2

Component description : **Pump, very low carbon steel**
Insert type : CNMG 433
Cutting parameters : **V=327sfm,** f=.022ipr, ap=.079"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 433 MT TT7100**

Ex. 3

Component description : **Pulley, low carbon(0.2% C) steel**
Insert type : CNMG 432
Cutting parameters : **V=984sfm,** f=.009ipr, ap=.02 - .028"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **CNMG 432 SF TT5100**

Ex. 4

Component description : **Case, low carbon steel (0.25%C)**
Insert type : CNMG 432
Cutting parameters : **V=920sfm,** f=.008ipr, ap=.02 - .04"
Wet cutting,
Face turning, continuous cut
Recommended insert : **CNMG 432 MP TT5100**

Ex. 5

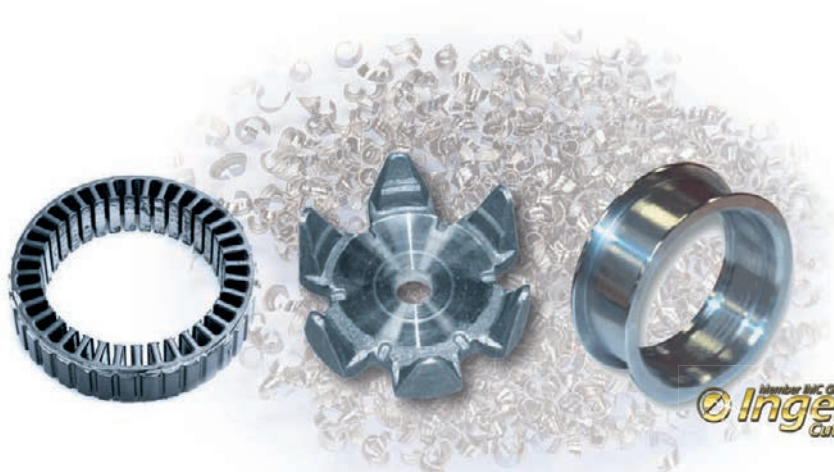
Component description : **Retainer, very low carbon steel**
Insert type : SNMG 433
Cutting parameters : **V=1760sfm,** f=.018ipr, ap=.020"
Wet cutting,
External turning, severe interrupted cut
Recommended insert : **SNMG 433 MT TT7100**

Ex. 6

Component description : **Impeller, very low carbon steel**
Insert type : CNMG 431
Cutting parameters : **V=804sfm,** f=.008ipr, ap=.02"
Dry cutting,
Internal turning, continuous cut
Recommended insert : **CNMG 431 SF TT5100**

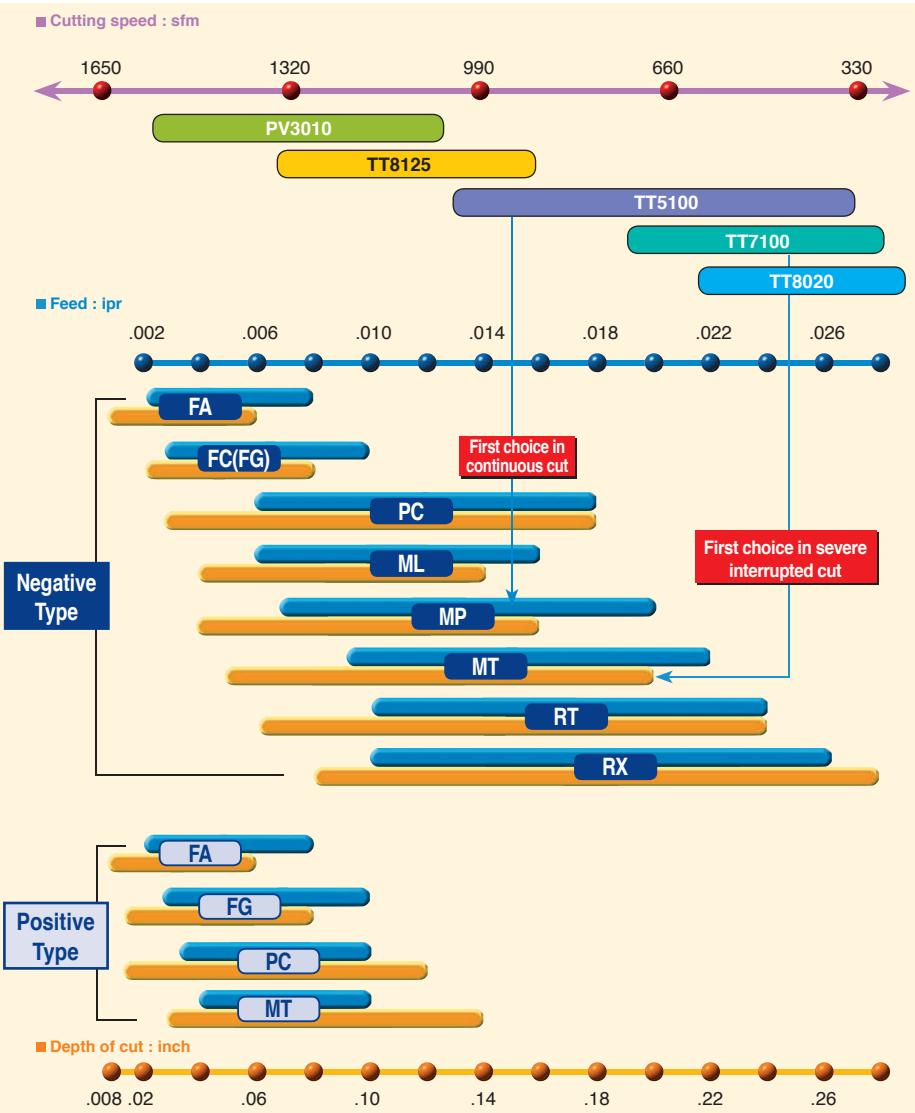
Ex. 7

Component description : **T-con assy, very low carbon steel**
Insert type : DNMG 432
Cutting parameters : **V=361sfm,** f=.008ipr, ap=.04"
Dry cutting,
Internal turning, continuous cut
Recommended insert : **DNMG 432 FG TT5100**



P Low Carbon (C=0.13-0.22%) Alloy Steel(HB150-180)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
12C3	1.7015	16MnCr5	SCr415	F16MnCr5	2511	523M15	5115	SCr415



• See page 73 for recommended cutting parameters

Examples

Ex. 1

Component description : **Pinion drive, low carbon(0.2% C) Cr-Mo alloy steel**
Insert type : DNMG 442
Cutting parameters : **V=820sfm,** f=.012ipr, ap=.039 - .079"
Wet cutting,
External turning, continuous cut
Recommended insert : **DNMG 442 PC TT8125**

Ex. 2

Component description : **Gear, low carbon(0.2% C) Cr-Mo alloy steel**
Insert type : CNMG 432
Cutting parameters : **V=1256sfm,** f=.016ipr, ap=.039"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **CNMG 432 MT TT8125**

Ex. 3

Component description : **Engine gear, low carborn(0.2% C) Cr-Mo alloy steel**
Insert type : CNMG 432
Cutting parameters : **V=984sfm,** f=.010ipr, ap=.051"
Wet cutting,
Face & External turning, continuous cut
Recommended insert : **CNMG 432 ML TT5100**

Ex. 4

Component description : **Idler gear, low carborn(0.2% C) Cr-Mo alloy steel**
Insert type : DNMG 442
Cutting parameters : **V=492-754sfm,** f=.006ipr, ap=.04 - .06"
Wet cutting,
External turning, interrupted & continuous cut
Recommended insert : **DNMG 442 ML TT8020**

Ex. 5

Component description : **Pivot, low carbon(0.2% C) Cr-Mo alloy steel**
Insert type : CNMG 432
Cutting parameters : **V=262 - 328sfm,** f=.006ipr, ap=.04"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 ML TT8020**

Ex. 6

Component description : **C/V joint outer race, low carbon(0.2% C) Ni-Cr-Mo alloy steel**
Insert type : VNMG 2.532
Cutting parameters : **V=787sfm,** f=.006 - .009ipr, ap=.012"
Wet cutting,
External turning, continuous cut
Recommended insert : **VNMG 2.532 FG TT5100**

Ex. 7

Component description : **C/V joint outer race, low carbon(0.2% C) Ni-Cr-Mo alloy steel**
Insert type : TNMG 332
Cutting parameters : **V=328 - 722sfm,** f=.009ipr, ap=.012"
Wet cutting,
External turning, continuous cut
Recommended insert : **TNMG 332 SF TT5100**

Ex. 8

Component description : **Bevel gear shaft, low carbon(0.2% C) Cr alloy steel**
Insert type : DNMG 442
Cutting parameters : **V=820sfm,** f=.011ipr, ap=.02"
Wet cutting,
External & face turning, continuous cut
Recommended insert : **DNMG 442 FG TT5100**

Ex. 9

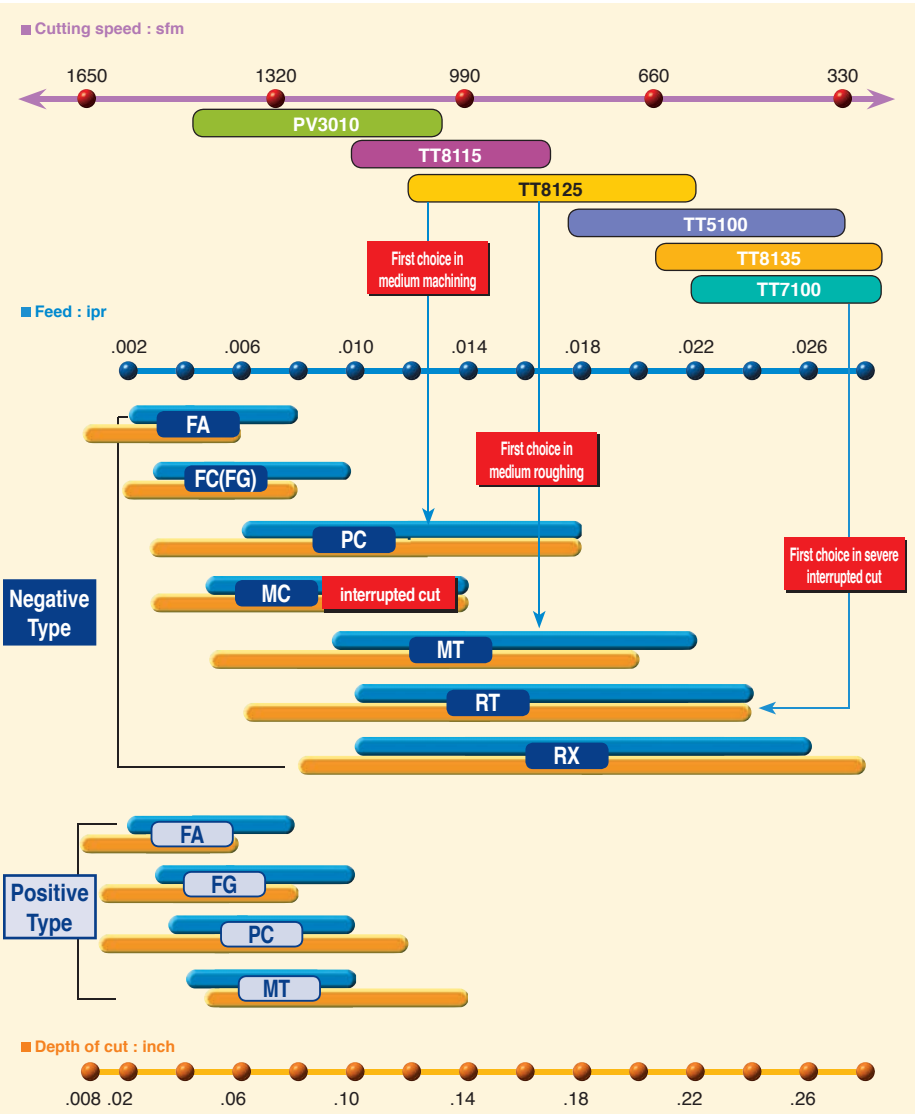
Component description : **Tripod housing, low carbon(0.2% C) Cr-Mo alloy steel**
Insert type : DNMG 442
Cutting parameters : **V=980sfm,** f=.009 - .010ipr, ap=.020"
Wet cutting,
External turning, light interrupted cut
Recommended insert : **DNMG 442 FC TT8115**

Ex. 10

Component description : **Tripod housing, low carbon(0.2% C) Cr-Mo alloy steel**
Insert type : CNMG 433
Cutting parameters : **V=920sfm,** f=.012ipr, ap=.098"
Wet cutting,
External turning, severe interrupted cut
Recommended insert : **CNMG 433 MT TT7100**

P 0.45% Carbon Steel (HB180-200)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
CC45	1.0503	C45	S45C	F.114	1650	080M46	1045	SM45C



• See page 72 for recommended cutting parameters

Examples

Ex. 1

Component description : **Front Hub, 0.43% carbon steel**
Insert type : CNMG 432
Cutting parameters : **V=818sfm,** f=.008 - .010ipr, ap=.039 - .059"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 MC TT8115**

Ex. 2

Component description : **Diff drive gear, 0.38% carbon steel**
Insert type : DNMG 442
Cutting parameters : **V=1490sfm,** f=.014ipr, ap=.039"
Wet cutting,
External turning, continuous cut
Recommended insert : **DNMG 442 PC TT8115**

Ex. 3

Component description : **Flat gear, 0.45% carbon steel**
Insert type : CNMG 432
Cutting parameters : **V=915sfm,** f=.008ipr, ap=.079"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 PC TT8125**

Ex. 4

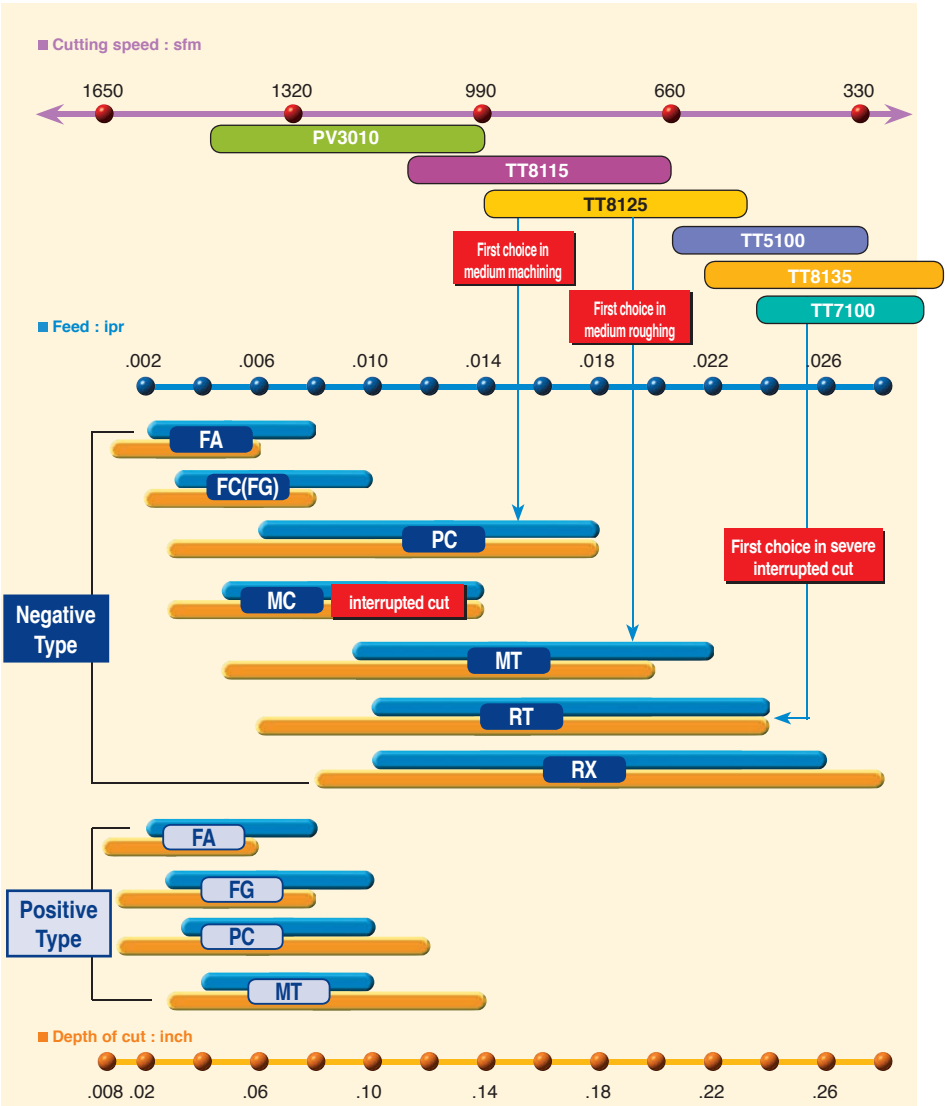
Component description : **Compasion harge, 0.45% carbon steel**
Insert type : CNMG 432
Cutting parameters : **V=1128sfm,** f=.012ipr, ap=.118"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 MT TT8125**

Ex. 5

Component description : **Nipple, 0.45% carbon steel**
Insert type : CNMG 432
Cutting parameters : **V=690sfm,** f=.008ipr, ap=.059 - .078"
Wet cutting,
External turning, interrupted cut
Recommended insert : **CNMG 432 MC TT8125**

P 0.55% Carbon Steel (HB200-220)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
XC55	1.0535	C55	S55C	C55K	1655	070M55	1055	SM55C



· See page 72 for recommended cutting parameters

Examples

Ex. 1

Component description : **CV Joint, 0.55% carbon steel**
Insert type : CNMG 432
Cutting parameters : **V=1128 - 408sfm,** f=.010ipr, ap=.039 - .079"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 MC TT8115**

Ex. 2

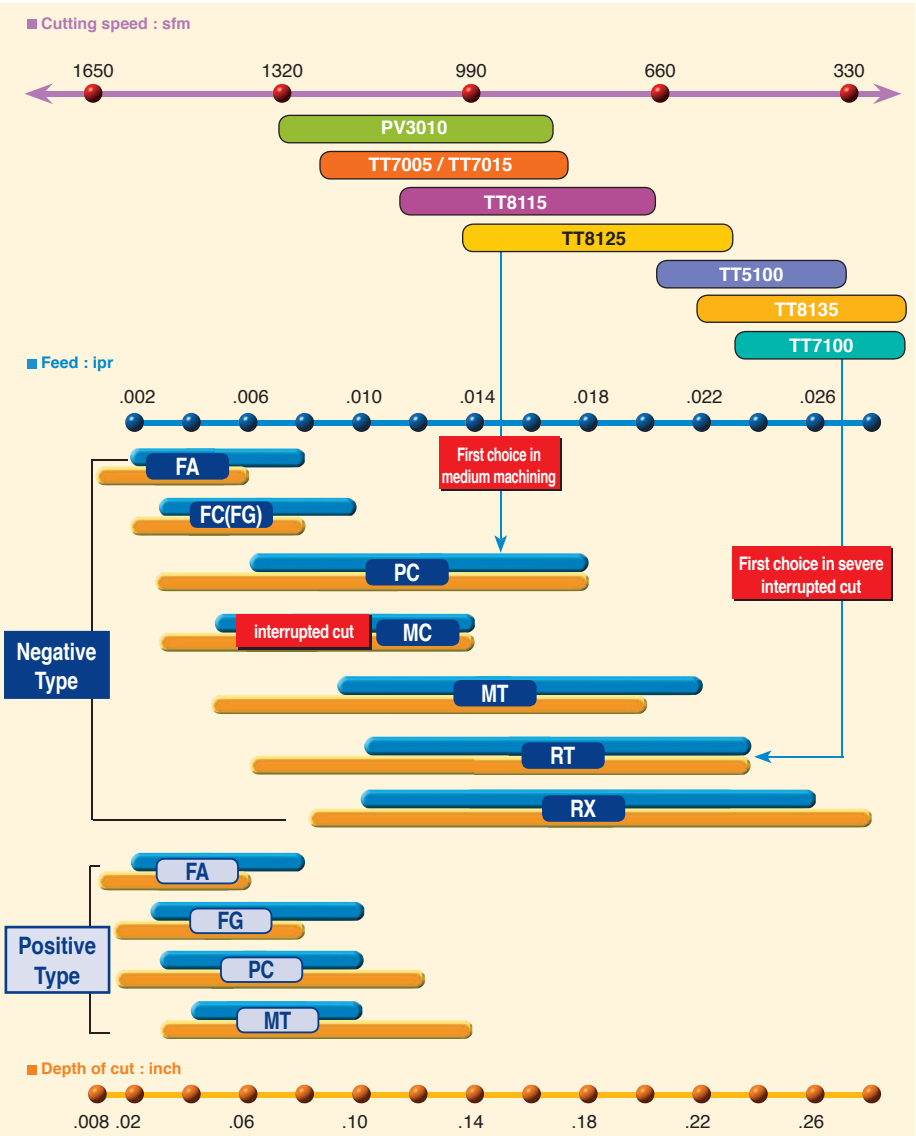
Component description : **Hub, 0.55% carbon steel**
Insert type : WNMG 432
Cutting parameters : **V=916sfm,** f=.014ipr, ap=.079"
Wet cutting
External turning, continuous cut
Recommended insert : **WNMG 432 MT TT8115**

Ex. 3

Component description : **Outer Race, 0.55% carbon steel**
Insert type : WNMG 432
Cutting parameters : **V=654sfm,** f=.016ipr, ap=.078"
Wet cutting,
External turning, interrupted cut
Recommended insert : **WNMG 432 RT TT5100**

P Cr-Mo Alloy Steel (HB200-220)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
42CD4	1.7225	42CrMo4	SCM440	42CrMo4	2244	708M40	4140	SCM440



· See page 73 for recommended cutting parameters

Examples

Ex. 1

Component description : **Body Valve, Cr-Mo alloy steel**
Insert type : DNMG 442
Cutting parameters : **V=750sfm,** f=.012ipr, ap=.039"
Wet cutting,
External turning, continuous cut
Recommended insert : **DNMG 442 MC TT8125**

Ex. 2

Component description : **Pin, Cr-Mo alloy steel**
Insert type : WNMG 432
Cutting parameters : **V=523sfm,** f=.012ipr, ap=.118"
Wet cutting,
External turning, continuous cut
Recommended insert : **WNMG 432 PC TT8125**

Ex. 3

Component description : **Gear Shaft, Cr-Mo alloy steel**
Insert type : TNMG 332
Cutting parameters : **V=720sfm,** f=.013ipr, ap=.078"
Wet cutting,
External turning, continuous cut
Recommended insert : **TNMG 332 PC TT8125**

Ex. 4

Component description : **Shaft, Cr-Mo alloy steel**
Insert type : CNMG 433
Cutting parameters : **V=523sfm,** f=.016ipr, ap=.118"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 433 PC TT8125**

Ex. 5

Component description : **Front Hub, Cr alloy steel**
Insert type : WNMG 433
Cutting parameters : **V=850 - 536sfm,** f=.015ipr, ap=.059"
Wet cutting,
External turning, continuous cut
Recommended insert : **WNMG 433 MT TT8115**

Ex. 6

Component description : **Shaft, Cr-Mo alloy steel(240-270BHN)**
Insert type : DCMT 32.51
Cutting parameters : **V=1200sfm,** f=.006ipr, ap=.01"
Wet cutting,
External turning, continuous cut
Recommended insert : **DCMT 32.51 FG PV3010**

Ex. 7

Component description : **Roller, Cr-Mo alloy steel**
Insert type : CNMG 432
Cutting parameters : **V=1079sfm,** f=.010ipr, ap=.079 - .098"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 PC TT8115**

Ex. 8

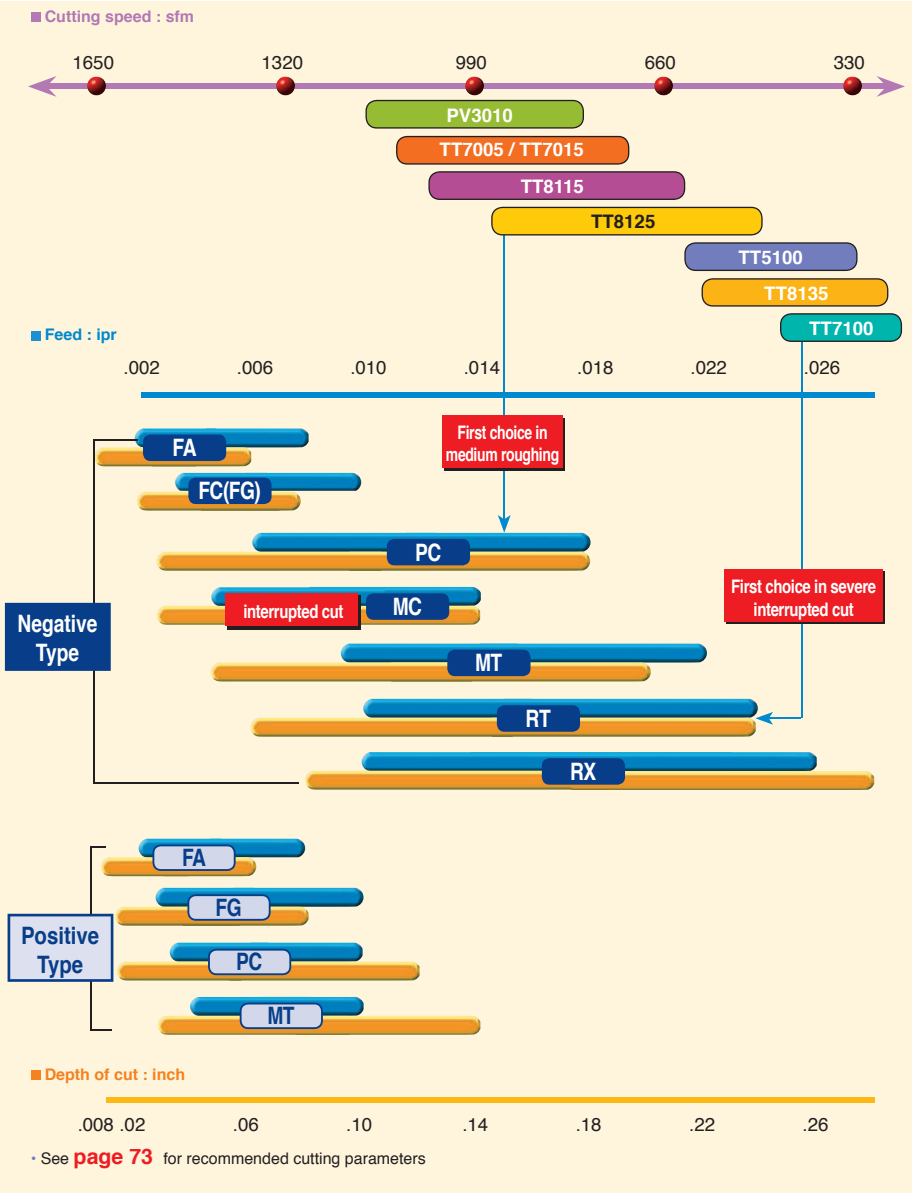
Component description : **Tie Rod, Cr-Mo alloy steel**
Insert type : CCMT 32.52
Cutting parameters : **V=588sfm,** f=.007 - .008ipr, ap=.059"
Wet cutting,
External turning, continuous cut
Recommended insert : **CCMT 32.52 PC TT8125**

Ex. 9

Component description : **Bushing, Cr-Mo alloy steel**
Insert type : TNMG 332
Cutting parameters : **V=654sfm,** f=.010ipr, ap=.098"
Wet cutting,
External turning, continuous cut
Recommended insert : **TNMG 332 PC TT8125**

P Ni-Cr-Mo Alloy Steel (HB200-220)

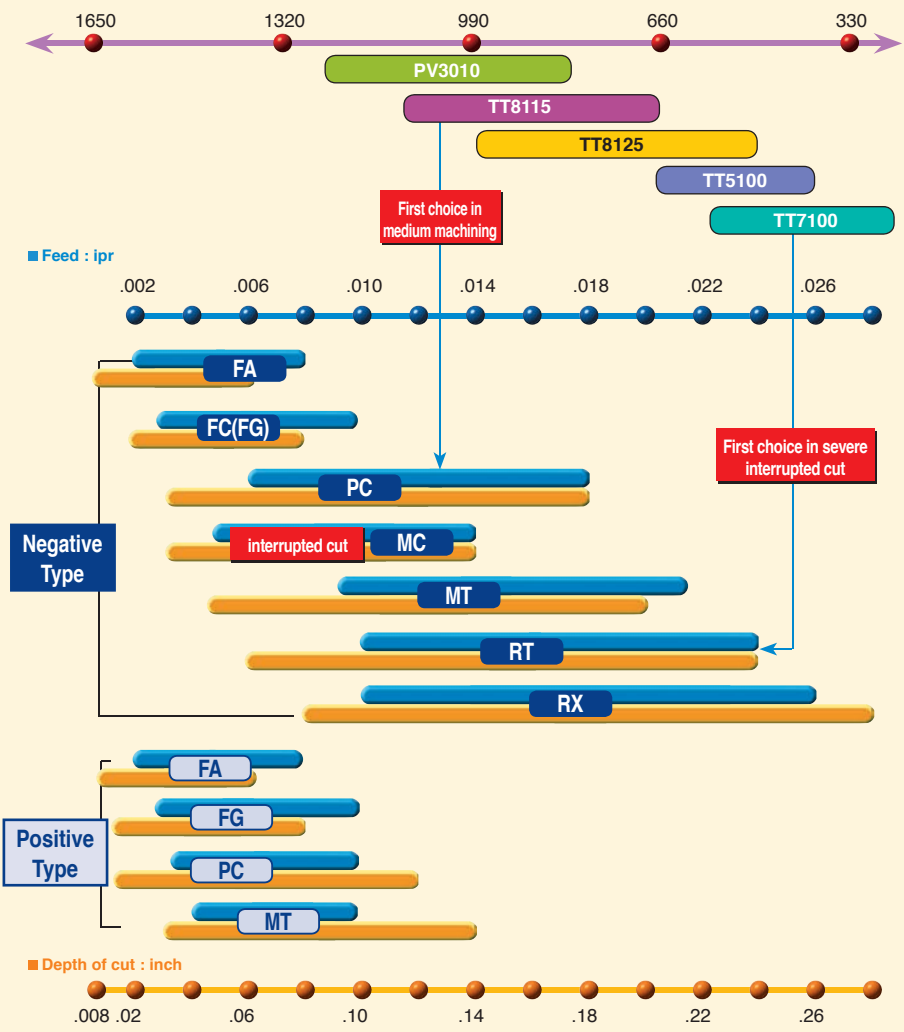
France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
	1.6511		SNCM439				4340	SNCM439



· See page 73 for recommended cutting parameters

P Bearing Steel (HB200-220)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
	1.2067		SUJ2				52100	STB2



· See page 74 for recommended cutting parameters

Examples

Ex. 1

Component description : **Bearing, bearing steel**
Insert type : DNMG 442
Cutting parameters : **V=720 - 915sfm,** f=.004 - .008ipr, ap=.020 - .039"
Wet cutting,
External turning, continuous cut
Recommended insert : **DNMG 442 FG TT8115**

Ex. 2

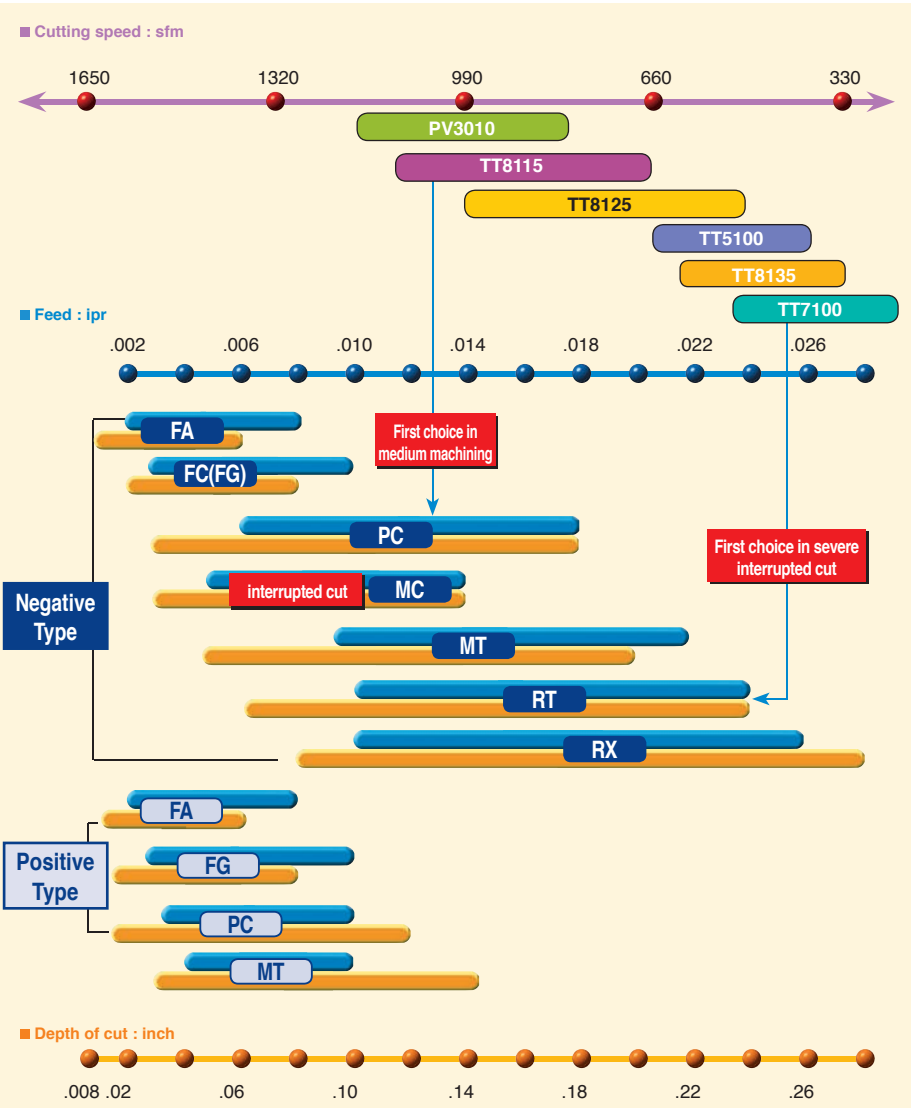
Component description : **Inner ball bearing, bearing steel**
Insert type : CNMG 432
Cutting parameters : **V=948sfm,** f=.012ipr, ap=.079"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **CNMG 432 PC TT8115**

Ex. 3

Component description : **Bearing, bearing steel**
Insert type : DNMG 442
Cutting parameters : **V=1275sfm,** f=.007ipr, ap=.016"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **DNMG 442 FA TT8115**

P Carbon Tool Steel : C= 1.0-1.1% (HB200-220)

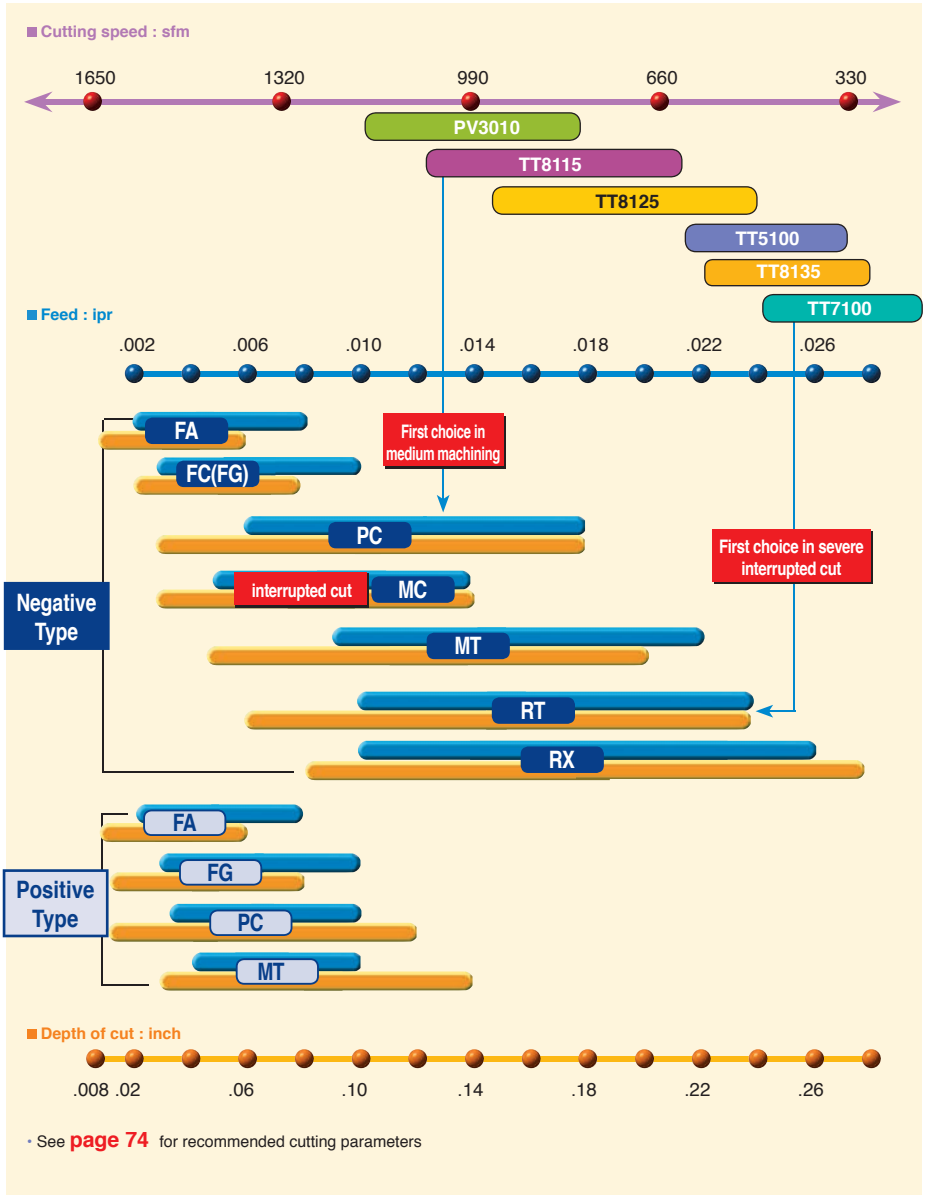
France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
	1.1274		SK3				WI-10	STC3



· See page 74 for recommended cutting parameters

P Alloy Tool Steel (HB200-220)

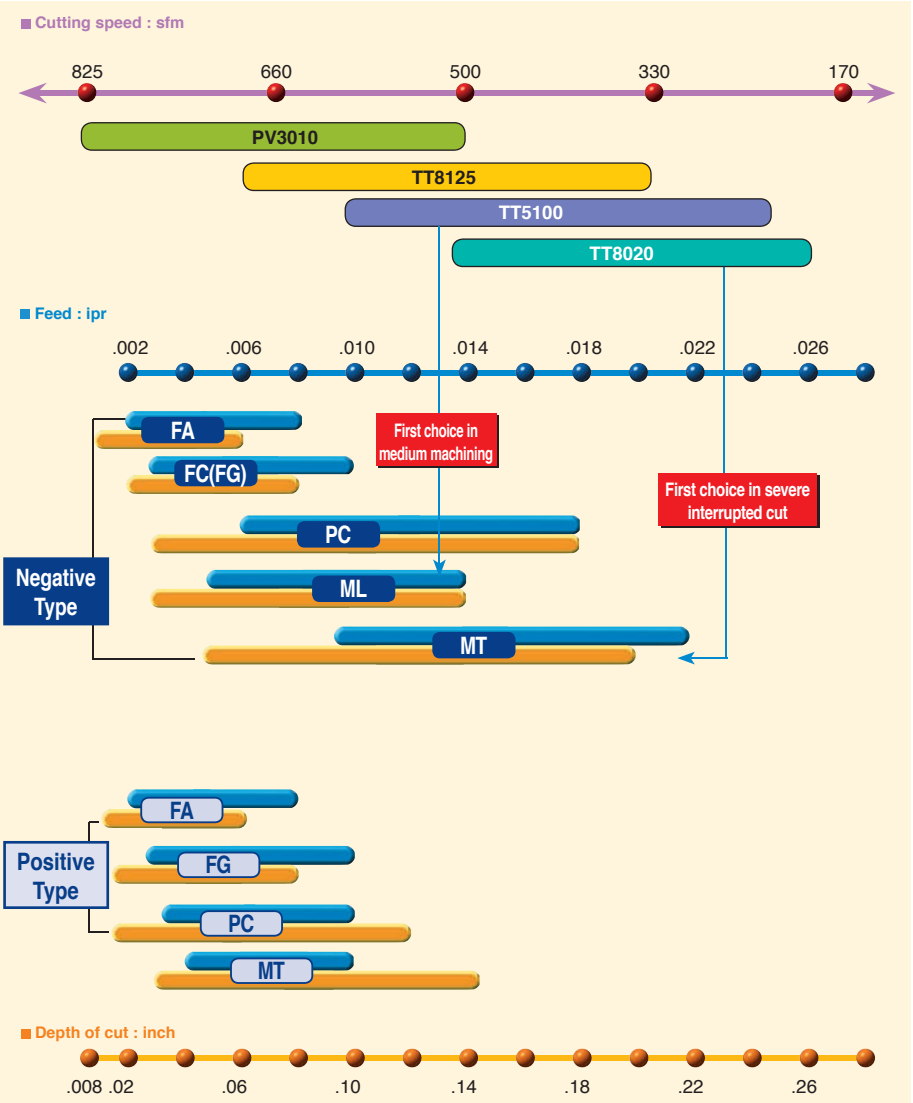
France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Y105V	1.2833		SKS43			BW2	W2	STS3



• See page 74 for recommended cutting parameters

P High Speed Steel (HB220-260)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Z80WKCV	1.3255	X78WC01805KU	SKH3	HS18-1-1-5		BT4	T4	SKH3



• See page 75 for recommended cutting parameters

Examples

Ex. 1

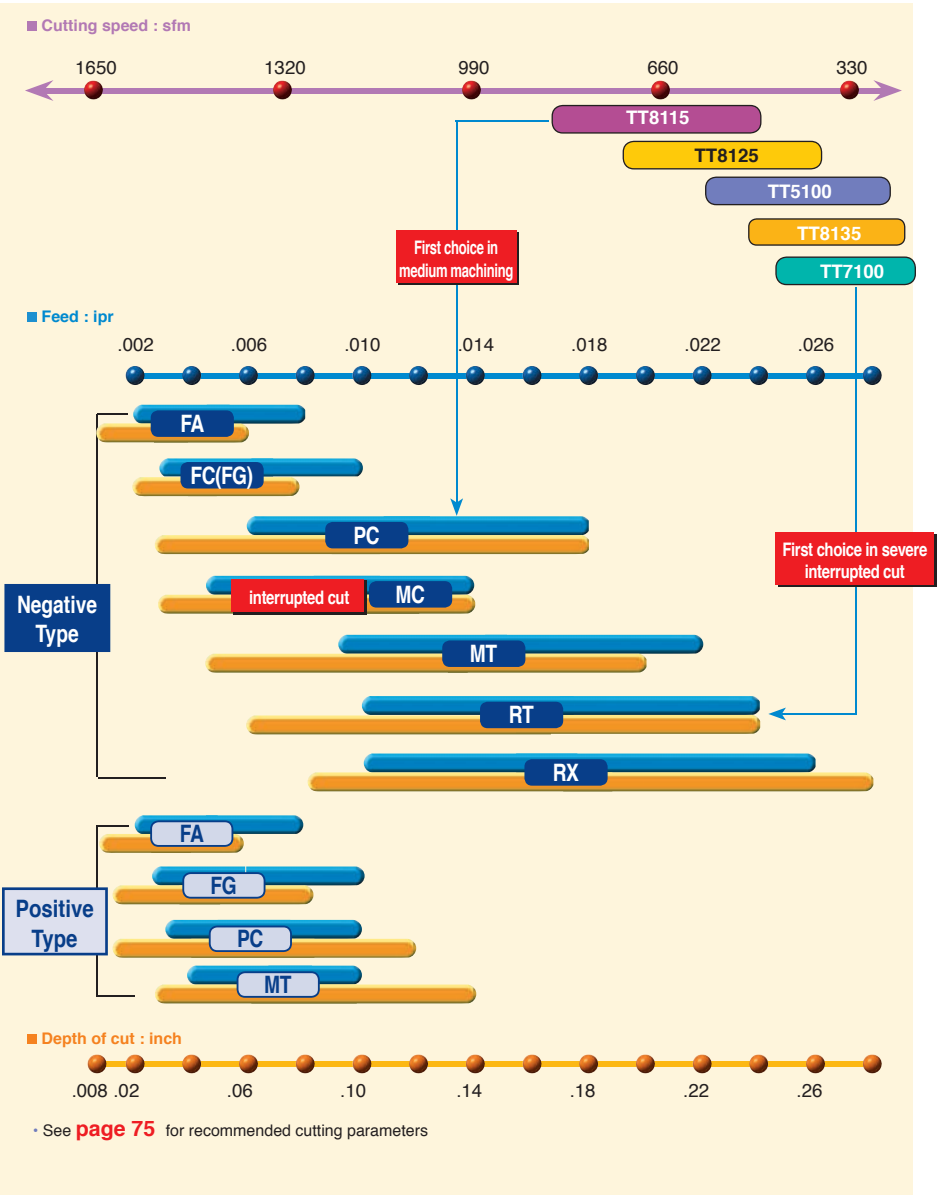
Component description : **Tap, 8% cobalt high speed steel**
Insert type : DNMG 442
Cutting parameters : **V=558sfm,** f=.006ipr, ap=.02"
Wet cutting,
External turning, continuous cut
Recommended insert : **DNMG 442 ML TT5110**

Ex. 2

Component description : **Endmill, High speed steel**
Insert type : TNMG 331
Cutting parameters : **V=164sfm,** f=.003ipr, ap=.067"
Wet cutting,
External turning, continuous cut
Recommended insert : **TNMG 331 R-FS TT5100**

P Cold working die Steel (HB220-260)

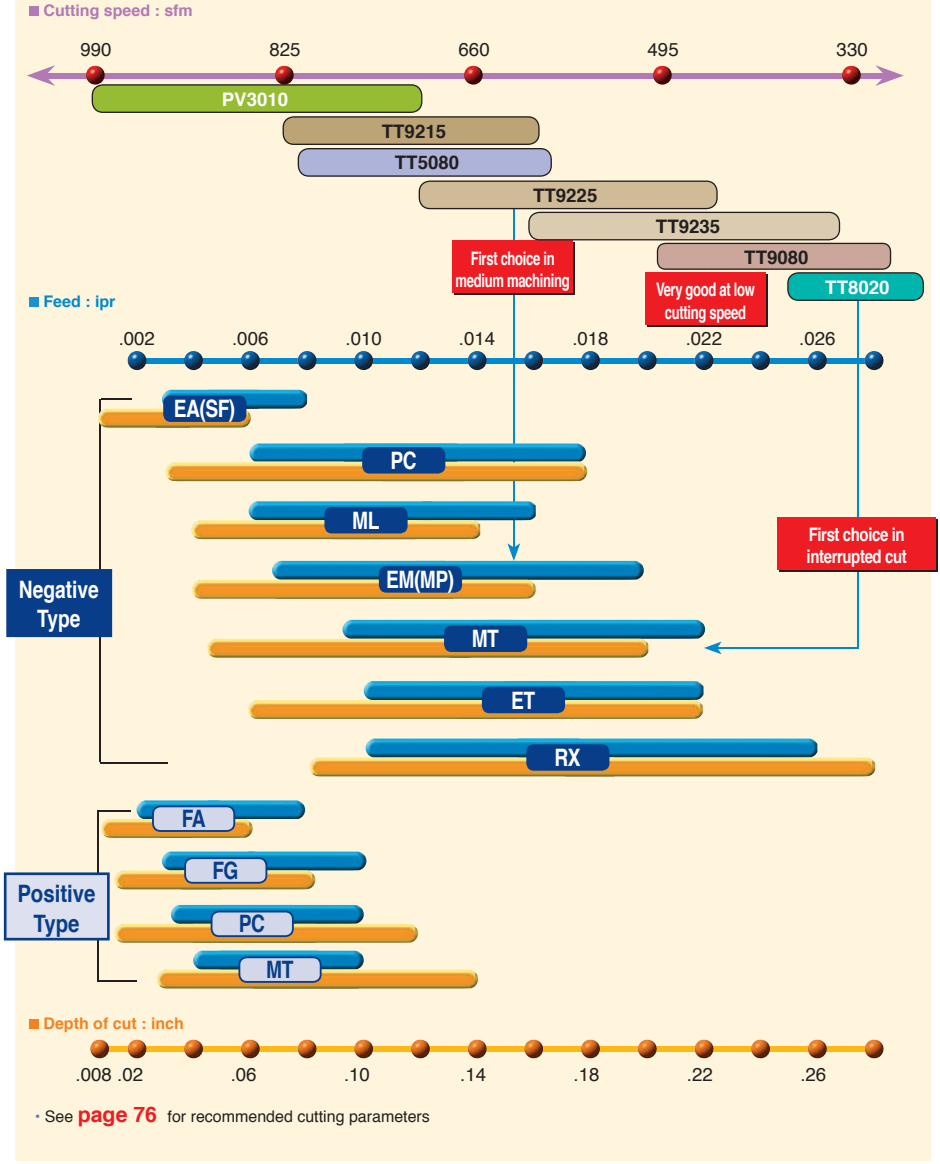
France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Z40CDV5	1.2344	X35CrMoV05KU	STD61	X40CrMoV5	2242	BH13	H13	STD61



• See page 75 for recommended cutting parameters

M Martensitic/Ferritic Stainless Steel (HB180-200)

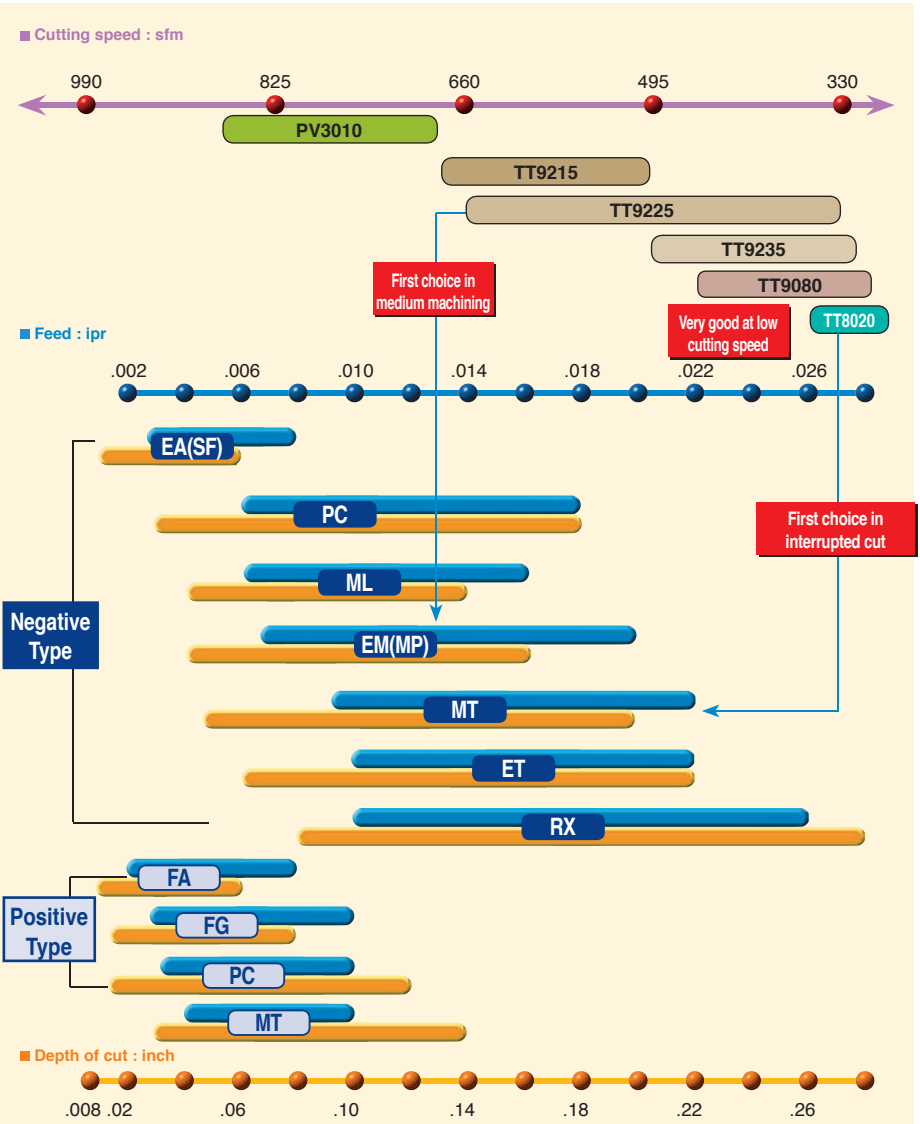
France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Z8C17	1.4016	X6Cr17	SUS430	F.3113	2320	430S15	430	STS430



• See page 76 for recommended cutting parameters

M Austenitic Stainless Steel (HB180-200)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Z6CND17.11	1.4401	X5CrNiMo17-12	SUS316	F.3543	2347	316S16	316	STS316



· See page 76 for recommended cutting parameters

Examples

Ex. 1

Component description : **Bearing housing, cast 316 stainless steel(43-44HRC)**
Insert type : CNMG 642
Cutting parameters : **V=272 - 748sfm,** f=.006ipr, ap=.040 - .157"
Dry cutting,
Face turning, interrupted cut
Recommended insert : **CNMG 642 MT TT8020**

Ex. 2

Component description : **Axle, 316L stainless steel**
Insert type : CNMG 643
Cutting parameters : **V=260sfm,** f=.016ipr, ap=.157"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 643 ET TT9225**

Ex. 3

Component description : **Nut, 304 stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=623sfm,** f=.006ipr, ap=.039 - .079"
Wet cutting,
External facing, light interrupted cut
Recommended insert : **CNMG 432 PC TT9225**

Ex. 4

Component description : **Valve, 316L stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=492sfm,** f=.008ipr, ap=.039"
Wet cutting,
External facing, light interrupted cut
Recommended insert : **CNMG 432 RT TT9225**

Ex. 5

Component description : **Plug, duplex stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=525sfm,** f=.008ipr, ap=.079"
Wet cutting,
External facing
Recommended insert : **CNMG 432 EM TT9225**

Examples

Ex.6

Component description : **Gesket Ring, 316 stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=590sfm,** f=.004ipr, ap=.012"
Wet cutting
External facing
Recommended insert : **CNMG 432 FC TT9225**

Ex.7

Component description : **Sleeve, 304 stainless steel**
Insert type : TNMG 332
Cutting parameters : **V=426sfm,** f=.006ipr, ap=.031"
Wet cutting,
External and facing
Recommended insert : **TNMG 332 EM TT9225**

Ex.8

Component description : **Impeller, 316 stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=328sfm,** f=.005ipr, ap=.028"
Wet cutting,
External interrupted cut
Recommended insert : **CNMG 432 MP TT9235**

Ex.9

Component description : **Shaft, 304 stainless steel**
Insert type : CNMG 433
Cutting parameters : **V=492sfm,** f=.014ipr, ap=.098"
Wet cutting,
External continuous cut
Recommended insert : **CNMG 433 ET TT9235**

Ex. 10

Component description : **Flange, 316 stainless steel**
Insert type : CNMG 433
Cutting parameters : **V=492sfm,** f=.014ipr, ap=.079"
Wet cutting,
External continuous cut
Recommended insert : **CNMG 433 RT TT9235**

Ex.11

Component description : **Ball Valve, 316 stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=656sfm,** f=.006ipr, ap=.079"
Wet cutting
Internal continuous cut
Recommended insert : **CNMG 432 EM TT9080**

Ex. 12

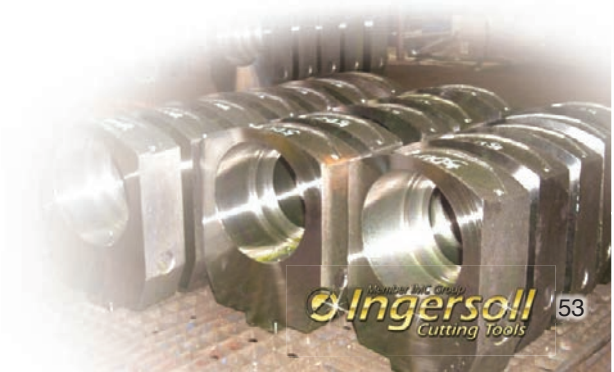
Component description : **Ball Body, 316 stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=656sfm,** f=.006ipr, ap=.079"
Wet cutting,
Face interrupted cut
Recommended insert : **CNMG 4328 PC TT9080**

Ex. 13

Component description : **Flange, 316F stainless steel**
Insert type : WNMG 433
Cutting parameters : **V=426sfm,** f=.008ipr, ap=.039"
Wet cutting,
Face turning
Recommended insert : **WNMG 433 PC TT9080**

Ex. 14

Component description : **Flange, 304L stainless steel**
Insert type : CNMG 432
Cutting parameters : **V=558sfm,** f=.009ipr, ap=.118"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 EM TT9225**



H High Hardness Material (40HRC)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS

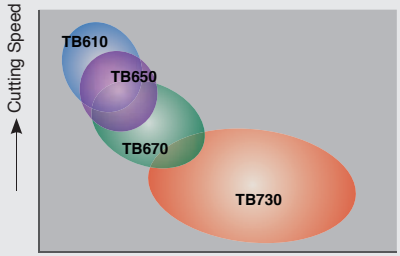
Hardened Die Steel , Hardened Alloy Steel, Chilled Cast Iron, Stellite etc

■ Hardness (HRC)

60 — 50 — 40

CBN	TB610	For finishing(No interrupted cut required)
	TB650	Stable for both continuous cut and light interrupted cut
	TB670	First choice in finising to roughing machining For General use
	TB730	For severe interrupted cut

■ Application Range



CERAMIC	AB2010	For finishing(No interrupted cut)
	AB20	For finishing(No interrupted cut): HRC > 50
	AB30	For roughing and interrupted cut: HRC 40-50

· See page 75 for recommended cutting parameters

Examples

CBN

Ex. 1

Component description : **Annulus gear, hardeded steel(58-60HRC)**
Insert type : CNMA 432
Cutting parameters : **V=394sfm,** f=.006ipr, ap=.008"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMA 432 LN TB670**

Ex. 2

Component description : **Sleeve, hardened steel(45-50HRC)**
Insert type : CCMW 32.52
Cutting parameters : **V=453sfm,** f=.004ipr, ap=.004"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **CCGW 32.52 LS TB650**

Ex. 3

Component description : **Seal ring, chiled casting hardened steel(59-62HRC)**
Insert type : CNMA 432
Cutting parameters : **V=410sfm,** f=.004ipr, ap=.024 - .031"
Dry cutting
External turning, continuous cut
Recommended insert : **CNMA 432 LN TB670**

Ceramic

Ex. 1

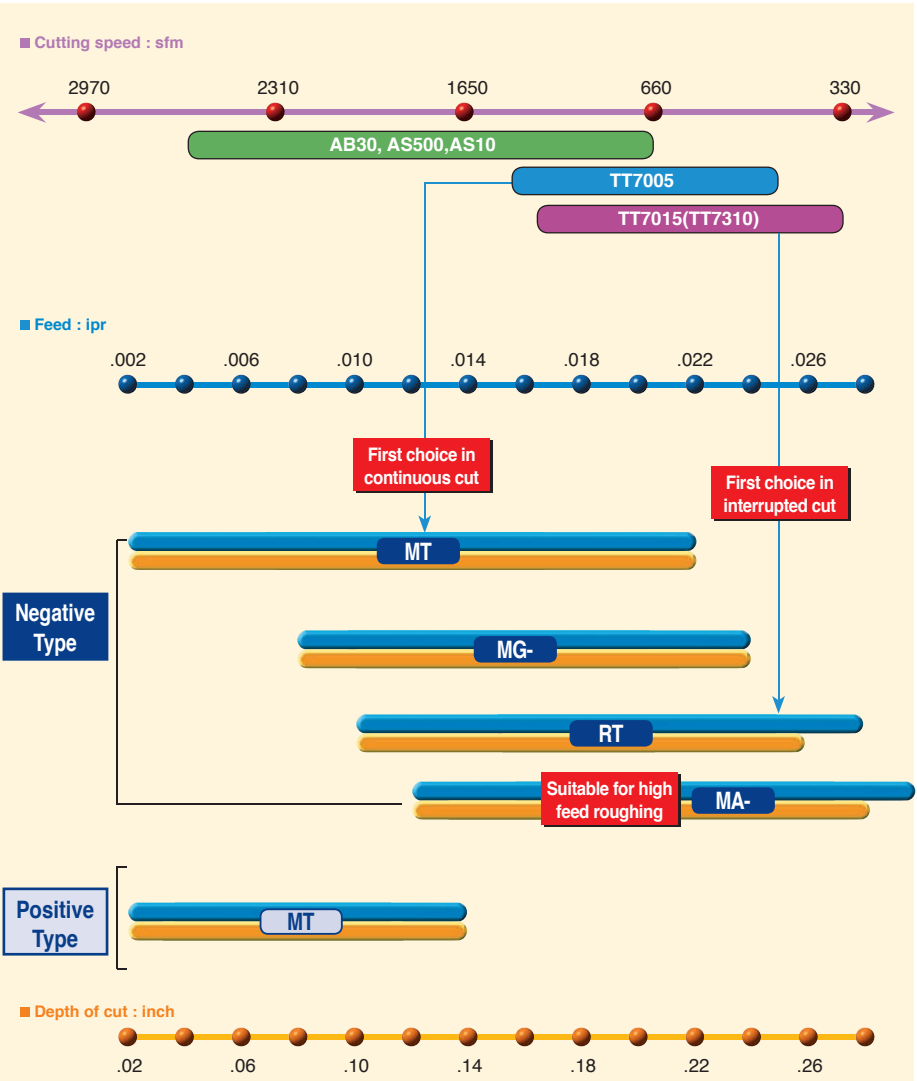
Component description : **Roller, hardened steel(45-55HRC)**
Insert type : TPG 732
Cutting parameters : **V=590sfm,** f=.009ipr, ap=.031"
Dry cutting
External turning, continuous cut
Recommended insert : **TPG 732 AB20**

Ex. 2

Component description : **Pinion, hardened steel(60HRC)**
Insert type : TNGA 332
Cutting parameters : **V=492sfm,** f=.002ipr, ap=.012"
Dry cutting
External turning, continuous cut
Recommended insert : **TNGA 332 AB2010**

Gray Cast Iron (HB180-220)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
Ft30D	0.6030	G30	FC300		0130	Grade 300	N045B	GC300



• See page 78 for recommended cutting parameters

Examples

Coated Carbide

Ex. 1

Component description : **Top Plange, gray cast iron**
Insert type : CNMG 433
Cutting parameters : **V=1197sfm,** f=.012 - .020ipr, ap=.059"
Wet cutting
Internal turning, light interrupted cut
Recommended insert : **CNMG 433 RT TT7005**

Ex. 2

Component description : **Drum, gray cast iron**
Insert type : CNMG 433
Cutting parameters : **V=1180sfm,** f=.010ipr, ap=.118"
Wet cutting
External turning, continuous cut
Recommended insert : **CNMG 433 RT TT7005**

Ex. 3

Component description : **Break disc, gray cast iron**
Insert type : CNMG 433
Cutting parameters : **V=1968sfm,** f=.012ipr, ap=.078"
Wet cutting
External turning, continuous cut
Recommended insert : **CNMG 433 RT TT7005**

Ex. 4

Component description : **Clutch, gray cast iron**
Insert type : CNMG 433
Cutting parameters : **V=935 -1722sfm,** f=.009ipr, ap=.118"
Wet cutting
External Face turning, continuous cut
Recommended insert : **CNMG 433 RT TT7005**

Ex. 5

Component description : **Brake disc, gray cast iron**
Insert type : CNMG 433
Cutting parameters : **V=1148sfm,** f=.012ipr, ap=.079"
Wet cutting
External turning, continuous cut
Recommended insert : **CNMG 433 RT TT7005**

Ceramic

Ex. 1

Component description : **Brake drum, gray cast iron(180-230HB)**
Insert type : CNGN 454
Cutting parameters : **V=1804sfm,** f=.018ipr, ap=.12 - .16"
Wet cutting
External & face turning, continuous cut
Recommended insert : **CNGX 454 CH AS10**

Ex. 2-1

Component description : **Brake disc**
Insert type : CNG 453
Cutting parameters : **V=1968sfm,** f=.018ipr, ap=.098"
Wet cutting
External turning, continuous cut
Recommended insert : **CNGX 453 CH AS500**

Ex. 2-2

Component description : **Brake disc**
Insert type : CNG 453
Cutting parameters : **V=1968sfm,** f=.018ipr, ap=.098"
Wet cutting
External turning, continuous cut
Recommended insert : **CNGX 453 CH AS500**

Ex. 3

Component description : **Brake disc**
Insert type : SNG 544
Cutting parameters : **V=1968sfm,** f=.026ipr, ap=.098"
Wet cutting
External face turning, continuous cut
Recommended insert : **SNGX 554 AS500**

Ex. 4

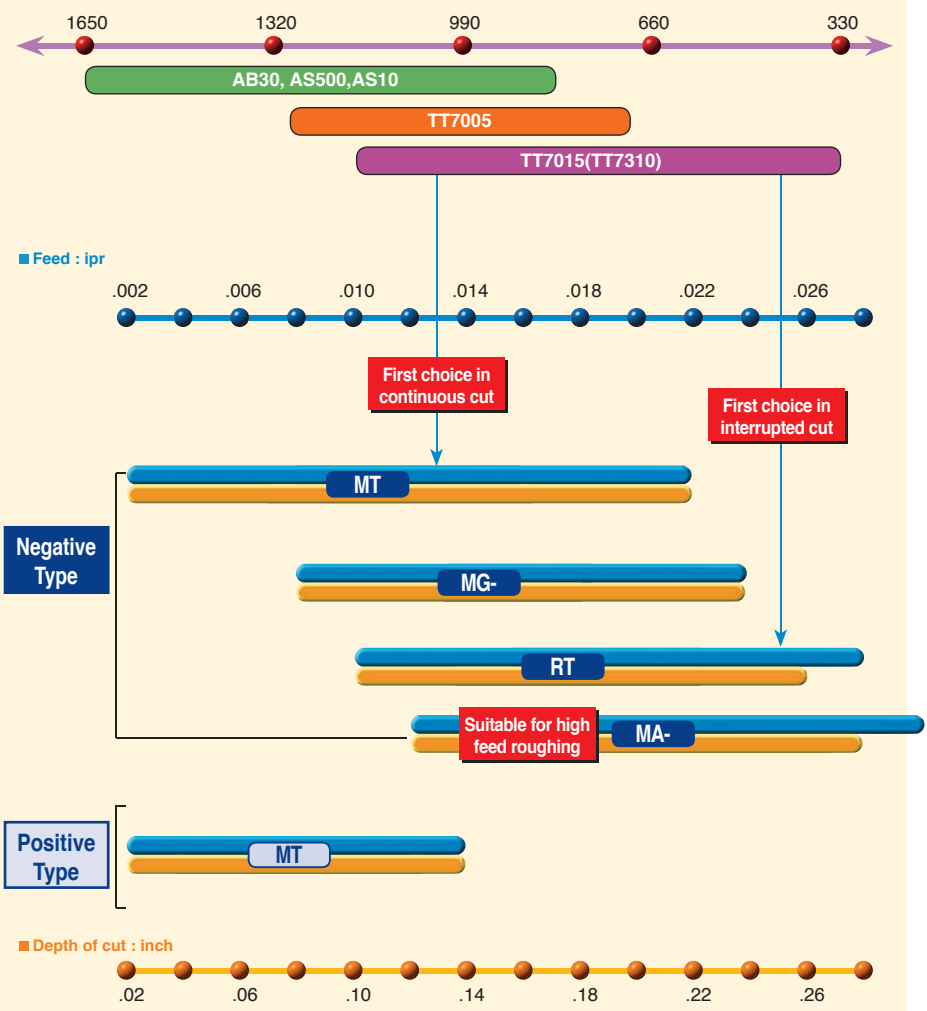
Component description : **Cylinder jam, gray cast iron(180-230HB)**
Insert type : TNG 332
Cutting parameters : **V=2624sfm,** f=.014ipr, ap=.02"
Wet cutting
External turning, continuous cut
Recommended insert : **TNG 332 AB30**

Ex. 5

Component description : **Brake disk, gray cast iron(180-230HB)**
Insert type : SNG 454
Cutting parameters : **V=3034sfm,** f=.016ipr, ap=.02"
Wet cutting
External turning, continuous cut
Recommended insert : **SNG 454 AW120**

K Ductile Cast Iron (HB180-220)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
FGS400-12	0.7040	GS400-12	FCD400		07 17-02	SNG 420/12	60-40-18	GCD400



• See page 78 for recommended cutting parameters

Examples

Coated Carbide

Ex. 1

Component description : **Pump cover, ductile cast iron**
Insert type : WNMA 432
Cutting parameters : **V=722sfm,** f=.012ipr, ap=.079 - .118"
Wet cutting,
External & face turning, continuous cut
Recommended insert : **WNMA 432 TT7015**

Ex. 2

Component description : **Pressure plate, ductile cast iron**
Insert type : CNMG 432
Cutting parameters : **V=886sfm,** f=.008 - .019ipr, ap=.020"
Wet cutting,
Face turning, continuous & severe interrupted cut
Recommended insert : **CNMG 433 RT TT7015**

Ex. 3

Component description : **Hub, ductile cast iron**
Insert type : CNMG 433
Cutting parameters : **V=656sfm,** f=.007 - .012ipr, ap=.098"
Wet cutting,
Face turning, continuous & interrupted cut
Recommended insert : **CNMG 433 RT TT7015**

Ex. 4

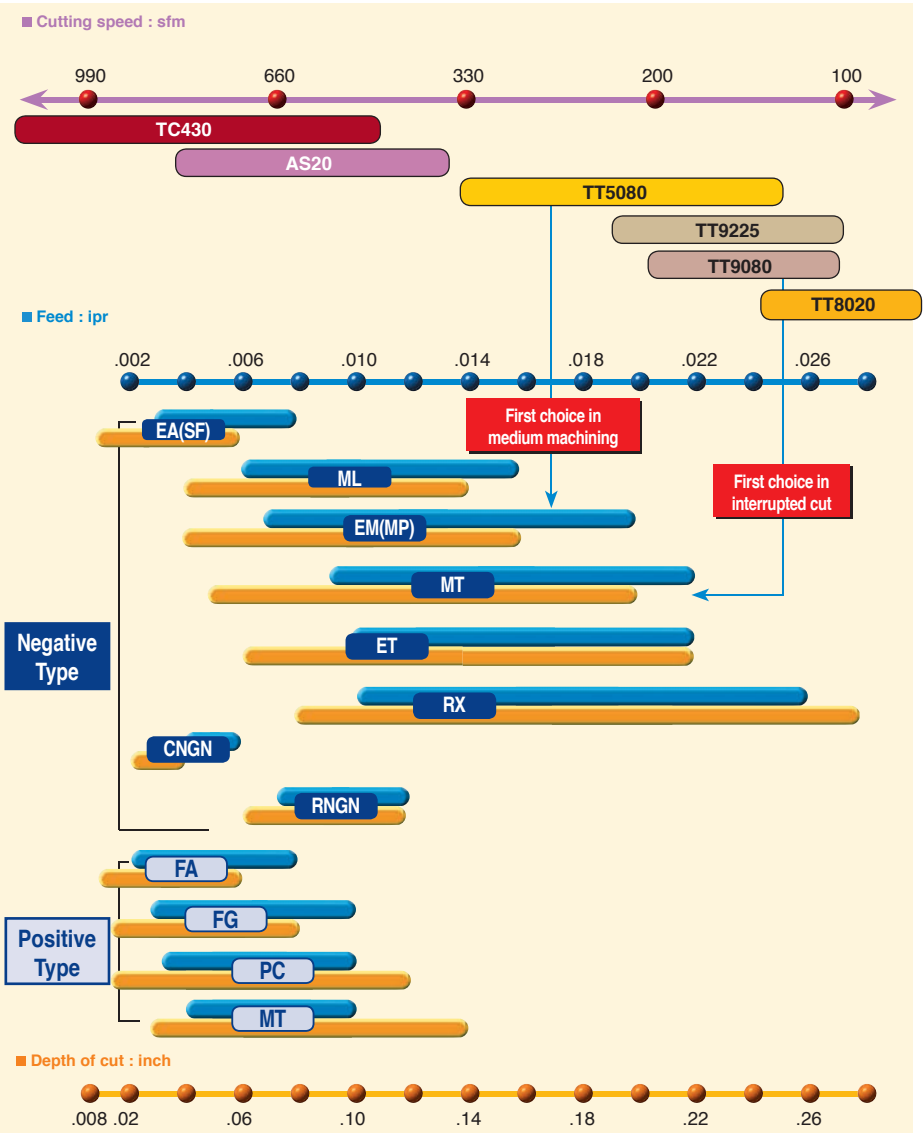
Component description : **Axle housing, ductile cast iron**
Insert type : CNMG 433
Cutting parameters : **V=853sfm,** f=.009ipr, ap=.197"
Wet cutting,
External turning, continuous & interrupted cut
Recommended insert : **CNMG 433 RT TT7015**

Ceramic

Ex. 1

Component description : **Fly wheel, ductile cast iron**
Insert type : CNG 453
Cutting parameters : **V=2624sfm,** f=.016ipr, ap=.098"
Wet cutting
External & face turning, continuous cut
Recommended insert : **CNGX 453 CH AS500**

S Ni Based Super Alloy



• See page 77 for recommended cutting parameters

Examples

Coated Carbide

Ex. 1

Component description : **Ball, Inconel 625**
Insert type : CNMG 432
Cutting parameters : **V=1312sfm,** f=.008ipr, ap=.020"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **CNMG 432 ML TT5080**

Ex. 2

Component description : **Long shaft, Inconel 718**
Insert type : CNMG 432
Cutting parameters : **V=197sfm,** f=.008ipr, ap=.031"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 EM TT5080**

Ex. 3

Component description : **Long shaft, Inconel 718**
Insert type : CNMG 432
Cutting parameters : **V=197sfm,** f=.007ipr, ap=.031"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 EM TT5080**

Ex. 4

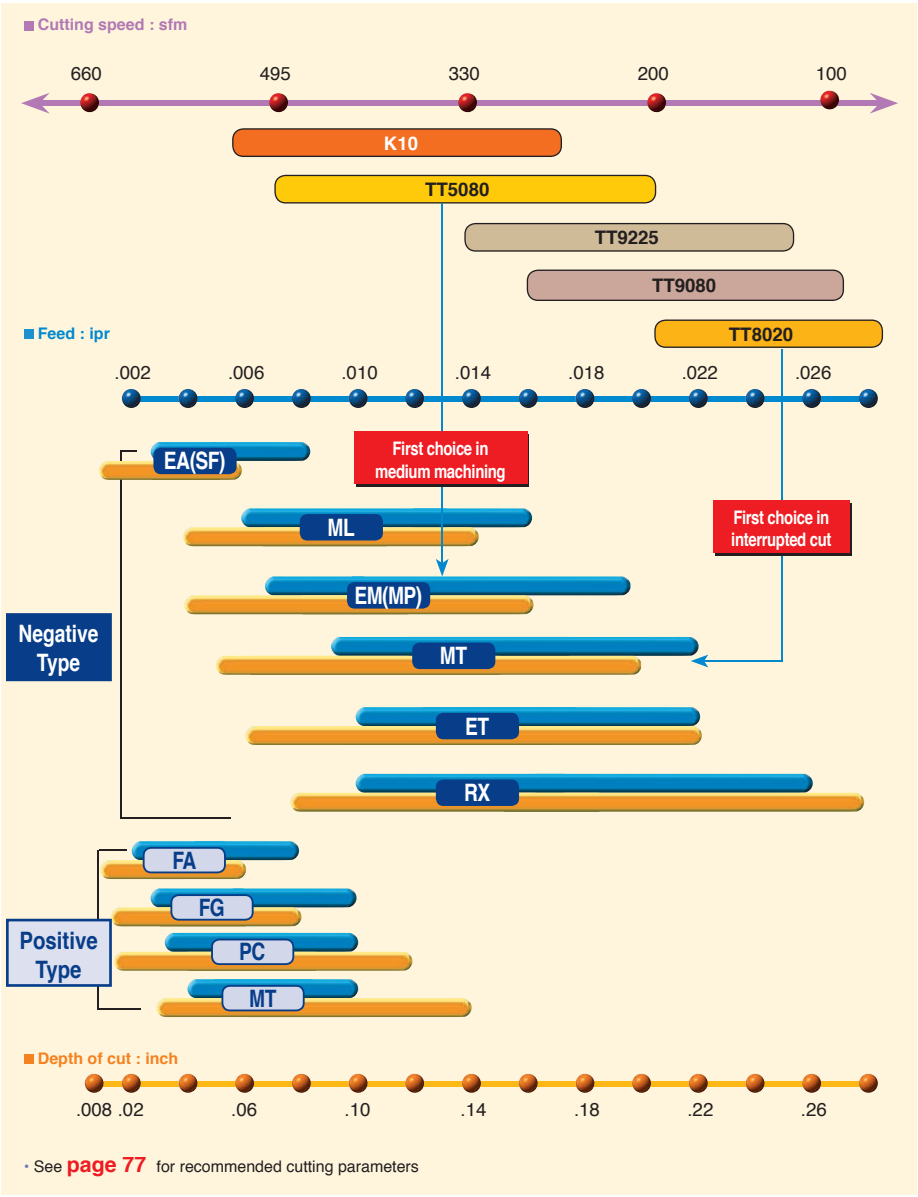
Component description : **Turbine disk, Inconel 718**
Insert type : CNMG 432
Cutting parameters : **V=82sfm,** f=.009ipr, ap=.059"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 EM TT9080**

Ceramic

Ex. 1

Component description : **Sleeve, Inconel 718**
Insert type : RNG 45
Cutting parameters : **V=590sfm,**
Wet cutting
External turning, continuous cut
Recommended insert : **RNG 45 T7 TC430**

S Titanium Alloy



• See page 77 for recommended cutting parameters

Examples

Ex. 1

Component description : **Sleeve, Titanium alloy**
Insert type : CNMG 432
Cutting parameters : **V=279sfm,** f=.012ipr, ap=.098"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 MP TT5080**

Ex. 2

Component description : **Pin, Titanium alloy**
Insert type : CNMG 432
Cutting parameters : **V=197sfm,** f=.012ipr, ap=.079"
Wet cutting,
External turning, continuous cut
Recommended insert : **CNMG 432 EM TT5080**

Ex. 3

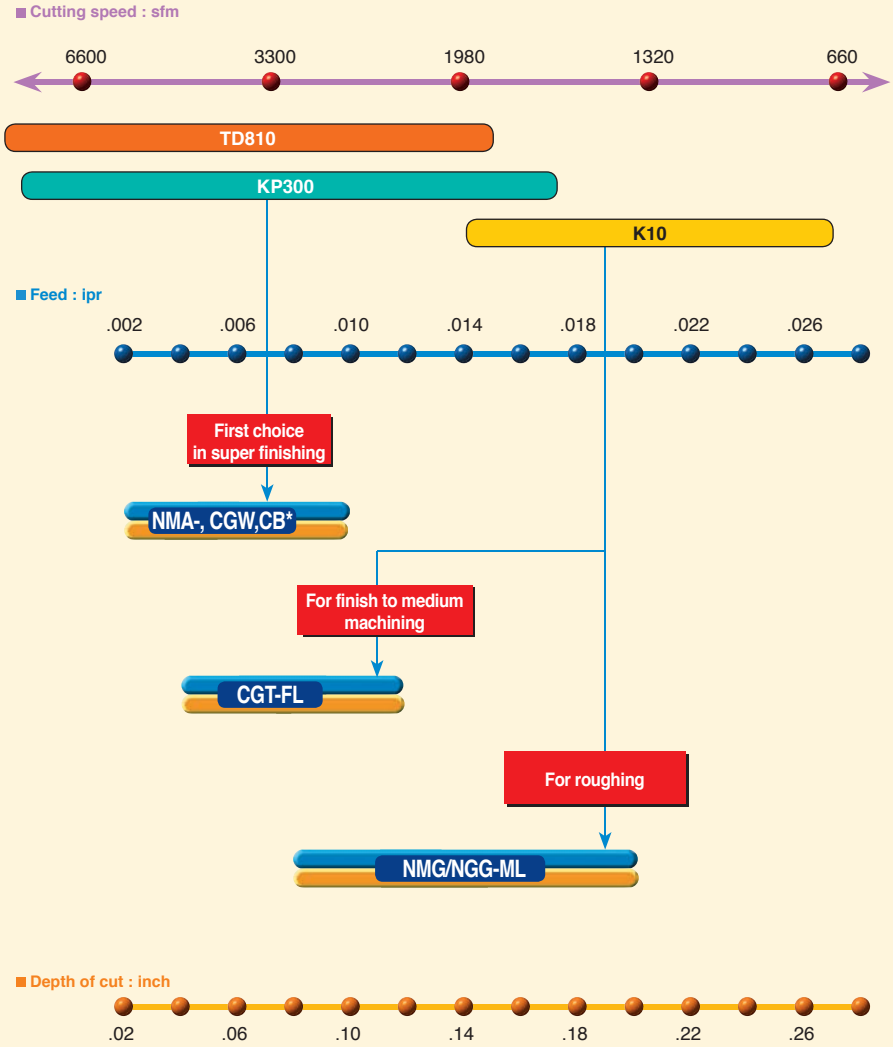
Component description : **Valve spindle, Titanium alloy**
Insert type : CCMT 32.51
Cutting parameters : **V=131sfm,** f=.005ipr, ap=.019"
Wet cutting,
External turning, continuous cut
Recommended insert : **CCMT 32.51 PC TT9225**

Ex. 4

Component description : **Pin**
Insert type : WNMG 432
Cutting parameters : **V=164sfm,** f=.005ipr, ap=.012"
Wet cutting,
External turning, continuous cut
Recommended insert : **WNMG 432 EA TT9080**

Low Si Aluminium Alloy (12.2%<Si)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
	3.2982		ADC1		4247	LM20	A413.0	



• See page 79 for recommended cutting parameters
• CB*: PCD chipbreaker type

Examples

Ex. 1

Component description : **Aluminium wheel, Aluminium alloy with 7% Si**

Roughing;
Insert type : DCGT 32.52
Cutting parameters : **V=4920sfm,** f=.012ipr, ap=.08"
Wet cutting
internal turning, continuous cut
Recommended insert : **DCGT 32.52 FL K10**

Finishing;
Insert type : VCGT 332
Cutting parameters : **V=6560sfm,** f=.006ipr, ap=.008"
Wet cutting
internal turning, continuous cut
Recommended insert : **VCGW 332 LN-7 KP300**

Ex. 2

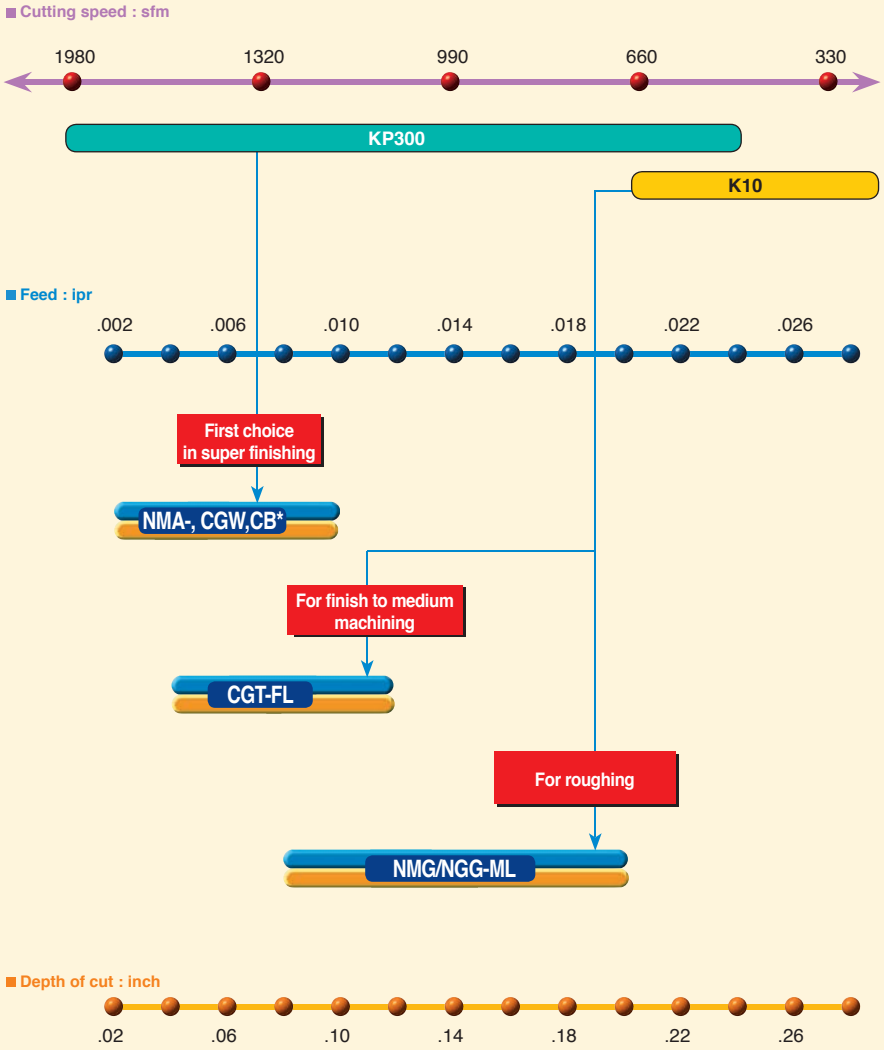
Component description : **Pump case, Aluminium alloy with 8% Si**
Insert type : TCGT 32.52
Cutting parameters : **V=1410sfm,** f=.004ipr, ap=.069"
Wet cutting,
Internal turning, continuous cut
Recommended insert : **TCGT 32.52 FL K10**

Ex. 3

Component description : **Cylinder head, aluminum alloy with 12% Si**
Insert type : TCGT 21.52
Cutting parameters : **V=1640sfm,** f=.009ipr, ap=.059"
Wet cutting,
External turning, continuous cut
Recommended insert : **TCGT 21.52 CB KP300**

N High Si Aluminium Alloy (12.2% ≧ Si)

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS
			AC4D		4247	LM16	B55.0	



• See page 79 for recommended cutting parameters
• CB*: PCD chipbreaker type

Examples

Ex. 1

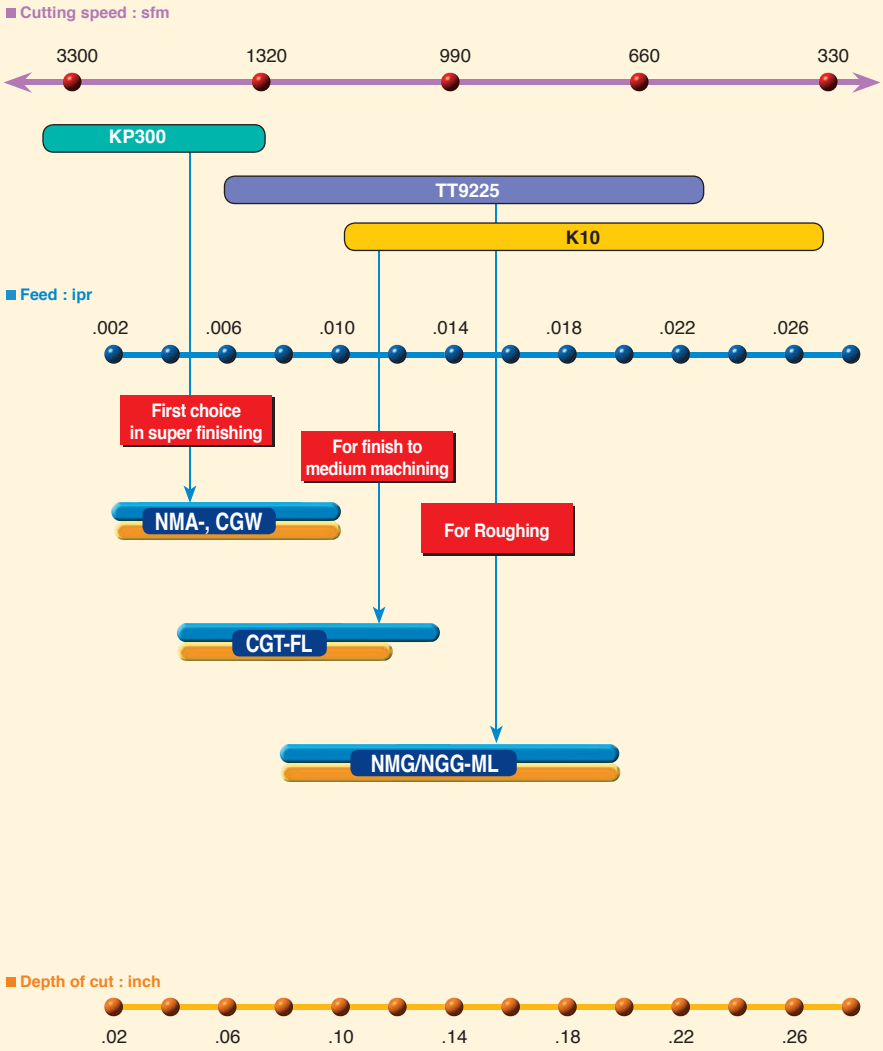
Component description : **Piston for diesel engine, Aluminium alloy with18% Si**

Roughing;
Insert type : SCGT 432
Cutting parameters : **V=590sfm,** f=.013ipr, ap=.04"
Wet cutting
External turning, continuous cut
Recommended insert : **SCGT 432 FL K10**

Finishing;
Insert type : CCGT 32.52
Cutting parameters : **V=984sfm,** f=.006ipr, ap=.008"
Wet cutting
External turning, continuous cut
Recommended insert : **CCGW 32.52 LN-7 KP300**

N Copper Alloy

France	Germany	Italy	Japan	Spain	Sweden	U.K	USA	Korea
AFNOR	DIN	UNI	JIS	UNF	SS	BS	AISI/SAE	KS



· See page 79 for recommended cutting parameters

Examples

Ex. 1

Component description : **Ring, Brass**
Insert type : TCGT 32.52
Cutting parameters : **V=230sfm,** f=.006ipr, ap=.024"
Wet cutting
External turning, continuous cut
Recommended insert : **TCGT 32.52 FL K10**

Ex. 2

Component description : **Pipe, Brass**
Insert type : SNMG 643
Cutting parameters : **V=820sfm,** f=.018ipr, ap=.12 - .16"
Wet cutting
External turning, continuous cut
Recommended insert : **SNMG 643 MT TT9225**

Ex. 3

Component description : **Guide ring, Brass**
Insert type : DCGT 32.51
Cutting parameters : **V=1279sfm,** f=.005ipr, ap=.06"
Dry cutting
Internal turning, continuous & interrupted cut
Recommended insert : **DCGT 32.51 FL K10**

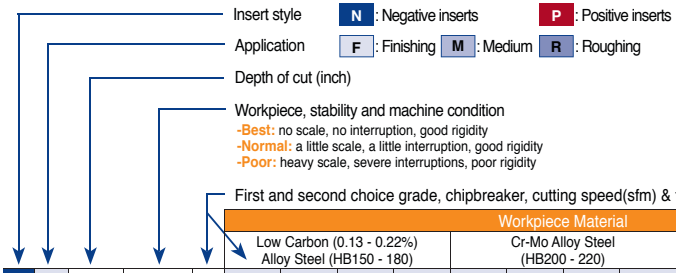
Insert Selection by Workpiece Material

Recommended cutting parameters to start machining

Insert style — N : Negative inserts, P : Positive inserts
Application — F : Finishing, M : Medium, R : Roughing
Depth of cut (inch)
Workpiece, stability and machine condition
-Best: no scale, no interruption, good rigidity
-Normal: a little scale, a little interruption, good rigidity
-Poor: heavy scale, severe interruptions, poor rigidity
First and second choice grade, chipbreaker, cutting speed(sfm) & feed rate(ipr)

					Workpiece Material											
					0.15% Carbon Steel (HB ≈ 150)				0.45% Carbon Steel (HB180 - 200)				0.55% Carbon Steel (HB200 - 220)			
N	F	- .04	Best	1	PV3010	FC	1560	.005	PV3010	FG	1160	.006	PV3010	FG	1080	.006
				2	CT3000	FC	1410	.005	TT8115	FG	1120	.006	TT8115	FG	1030	.006
	M	.04 - .10	Best	1	TT5100	ML	1080	.008	TT8115	MP	1080	.012	TT8115	MP	1000	.012
				2	TT8125	ML	1380	.008	TT8125	MP	980	.012	TT8125	MP	920	.012
			Normal	1	TT5100	MP	1030	.009	TT8115	PC	1020	.012	TT8115	PC	950	.012
				2	TT8125	MP	1310	.009	TT8125	PC	920	.012	TT8125	PC	850	.012
			Poor	1	TT8020	MT	770	.009	TT8135	RT	620	.013	TT8135	RT	590	.013
				2												
		.10 - .16	Best	1	TT5100	PC	980	.011	TT8115	PC	1020	.014	TT8115	MP	950	.014
				2	TT8125	PC	1260	.011	TT8125	PC	920	.014	TT8125	PC	850	.014
			Normal	1	TT5100	MT	930	.011	TT8125	PC	920	.014	TT8125	MT	850	.014
				2	TT8125	MT	1210	.011	TT8125	MT	870	.016	TT8125	MG-	800	.016
			Poor	1	TT8020	MT	710	.009	TT8135	RT	590	.014	TT8135	RT	590	.014
				2												
	R	.16 -.28	Normal	1	TT5100	RT	750	.018	TT8125	RT	850	.022	TT8125	RT	790	.022
				2	TT8125	RT	1050	.018	TT8115	RT	950	.022	TT8135	RT	890	.022
			Poor	1	TT8020	RT	590	.014	TT8135	RT	590	.018	TT8135	RT	520	.018
				2												
		.28 -	Normal	1	TT5100	RH	690	.022	TT8125	RH	800	.028	TT8125	RH	740	.028
				2												
			Poor	1	TT8020	RH	540	.018	TT8135	RH	540	.022	TT8135	RH	490	.022
				2												
P	F	- .04	Best	1	PV3010	FG	1560	.005	PV3010	FG	1160	.006	PV3010	FG	1080	.006
				2	CT3000	FG	1380	.005	CT3000	FG	1030	.006	CT3000	FG	970	.006
	M	.04 - .14	Best	1	TT5100	MT	930	.007	TT8115	MT	1020	.008	TT8115	MT	930	.008
				2	TT8125	MT	1210	.007	TT8125	MT	920	.008	TT8125	MT	840	.008
			Normal	1	TT5100	MT	900	.007	TT8125	MT	920	.008	TT8125	MT	840	.008
				2	TT8125	MT	1150	.007	TT5100	MT	710	.008	TT5100	MT	640	.008
			Poor	1	TT8020	MT	720	.007	TT8135	MT	620	.008	TT8135	MT	590	.008
				2												

Recommended cutting parameters to start machining



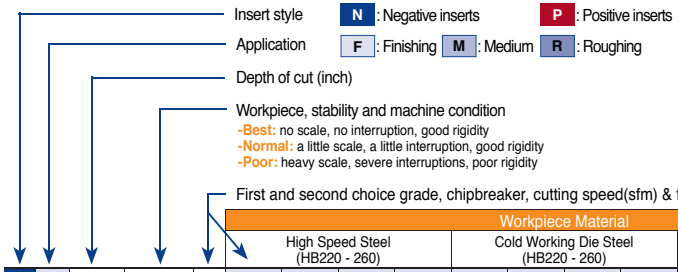
					Workpiece Material											
					Low Carbon (0.13 - 0.22%) Alloy Steel (HB150 - 180)				Cr-Mo Alloy Steel (HB200 - 220)				Ni-Cr-Mo Alloy Steel (HB200 - 220)			
N	F	- .04	Best	1	PV3010	FC	1380	.005	PV3010	FG	1080	.006	PV3010	FG	1050	.006
				2	CT3000	FC	1250	.005	TT8115	FG	1030	.006	TT8115	FG	1000	.006
	M	.04 - .10	Best	1	TT5100	ML	970	.008	TT8115	MP	1000	.012	TT8115	MP	970	.012
				2	TT8125	ML	1230	.008	TT8125	MP	920	.012	TT8125	MP	890	.012
			Normal	1	TT5100	PC	930	.009	TT8115	PC	950	.012	TT8115	PC	920	.012
				2	TT8125	PC	1200	.009	TT8125	MC	850	.012	TT8125	PC	820	.012
			Poor	1	TT8020	MT	670	.009	TT8135	RT	590	.013	TT8135	RT	560	.013
				2												
		.10 - .16	Best	1	TT5100	PC	870	.011	TT8115	PC	950	.014	TT8115	PC	920	.014
				2	TT8125	PC	1120	.011	TT8125	PC	850	.014	TT8125	PC	820	.014
			Normal	1	TT5100	MT	840	.011	TT8125	MT	850	.014	TT8125	MT	820	.014
				2	TT8125	MT	1030	.011	TT8125	MG-	800	.016	TT8125	MG-	790	.016
			Poor	1	TT8020	MT	620	.009	TT8135	RT	590	.014	TT8135	RT	560	.014
				2												
	R	.16 -.28	Normal	1	TT5100	RT	670	.018	TT8125	RT	790	.022	TT8125	RT	770	.022
				2	TT8125	RT	820	.018	TT8115	RT	890	.022	TT8115	RT	850	.022
			Poor	1	TT8020	RT	520	.014	TT8135	RT	520	.018	TT8135	RT	520	.018
				2												
		.28 -	Normal	1	TT5100	RH	610	.022	TT8125	RH	740	.028	TT8125	RH	720	.028
				2						RT	740	.025	TT8125	RT	720	.025
			Poor	1	TT8020	RH	490	.018	TT7100	RH	460	.022	TT8135	RH	490	.022
				2												
P	F	- .04	Best	1	PV3010	FG	1380	.005	PV3010	FG	1080	.006	PV3010	FG	1050	.006
				2	CT3000	FG	1250	.005	CT3000	FG	970	.006	CT3000	FG	930	.006
	M	.04 - .14	Best	1	TT5100	MT	870	.007	TT8115	MT	930	.008	TT8115	MT	900	.008
				2	TT8125	MT	1130	.007	TT8125	MT	840	.008	TT8125	MT	820	.008
			Normal	1	TT5100	MT	840	.007	TT8125	MT	840	.008	TT8125	MT	820	.008
				2	TT8125	MT	1080	.007	TT5100	MT	640	.008	TT5100	MT	620	.008
			Poor	1	TT8020	MT	670	.007	TT8135	MT	590	.008	TT8135	MT	560	.008
				2												

Recommended cutting parameters to start machining

Insert style — N : Negative inserts, P : Positive inserts
Application — F : Finishing, M : Medium, R : Roughing
Depth of cut (inch)
Workpiece, stability and machine condition
-Best: no scale, no interruption, good rigidity
-Normal: a little scale, a little interruption, good rigidity
-Poor: heavy scale, severe interruptions, poor rigidity
First and second choice grade, chipbreaker, cutting speed(sfm) & feed rate(ipr)

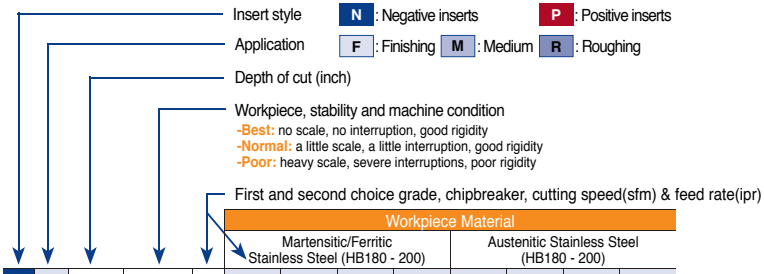
					Workpiece Material											
					Bearing Steel (HB200 - 220)				Carbon Tool Steel (HB200 - 220)				Alloy Tool Steel (HB200 - 220)			
N	F	- .04	Best	1	PV3010	FG	1080	.006	PV3010	FG	1080	.006	PV3010	FG	1050	.006
				2	TT8115	FG	1030	.006	TT8115	FG	1030	.006	TT8115	FG	1000	.006
	M	.04 - .10	Best	1	TT8115	MP	1000	.012	TT8115	MP	1000	.012	TT8115	MP	970	.012
				2	TT8125	MP	920	.012	TT8125	MP	920	.012	TT8125	MP	820	.012
			Normal	1	TT8115	PC	950	.012	TT8115	PC	950	.012	TT8115	PC	920	.012
				2	TT8125	PC	850	.012	TT8125	PC	850	.012	TT8125	PC	820	.012
			Poor	1	TT8135	RT	590	.013	TT8135	RT	590	.013	TT8135	RT	560	.013
				2												
		.10 - .16	Best	1	TT8115	PC	950	.014	TT8115	MT	950	.014	TT8115	PC	920	.014
				2	TT8125	PC	850	.014	TT8125	MT	850	.014	TT8125	PC	820	.014
			Normal	1	TT8125	MT	850	.014	TT8125	MT	850	.014	TT8125	MT	820	.014
				2	TT8125	MG-	800	.016	TT8125	MG-	800	.016	TT8125	MG-	790	.016
			Poor	1	TT8135	RT	590	.014	TT8135	RT	590	.014	TT8135	RT	560	.014
				2												
	R	.16 - .28	Normal	1	TT8125	RT	790	.022	TT8125	RT	790	.022	TT8125	RT	770	.022
				2	TT8115	RT	890	.022	TT8115	RT	890	.022	TT8115	RT	850	.022
			Poor	1	TT8135	RT	520	.018	TT8135	RT	520	.018	TT8135	RT	460	.018
				2												
		.28 -	Normal	1	TT8125	RH	740	.028	TT8125	RH	740	.028	TT8115	RH	720	.028
				2												
			Poor	1	TT8135	RH	490	.022	TT8135	RH	490	.022	TT8135	RH	460	.022
				2												
P	F	- .04	Best	1	PV3010	FG	1080	.006	PV3010	FG	1080	.006	PV3010	FG	1050	.006
				2	CT3000	FG	970	.006	CT3000	FG	970	.006	CT3000	FG	930	.006
	M	.04 - .14	Best	1	TT8115	MT	930	.008	TT8115	MT	930	.008	TT8115	MT	900	.008
				2	TT8125	MT	840	.008	TT8125	MT	840	.008	TT8125	MT	820	.008
			Normal	1	TT8125	MT	840	.008	TT8125	MT	840	.008	TT8125	MT	820	.008
				2	TT5100	MT	640	.008	TT5100	MT	640	.008	TT5100	MT	620	.008
			Poor	1	TT8135	MT	590	.008	TT8135	MT	590	.008	TT8135	MT	560	.008
				2												

Recommended cutting parameters to start machining



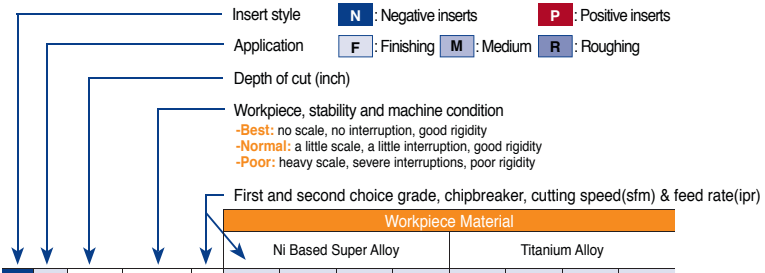
					Workpiece Material											
					High Speed Steel (HB220 - 260)				Cold Working Die Steel (HB220 - 260)				High Hardness Material (40 ≤ HRC)			
N	F	- .04	Best	1	PV3010	FG	750	.004	TT8115	FG	790	.006	AB2010		390	.004
				2	CT3000	FG	690	.004	TT8125	FG	690	.006	TB610		390	.004
	M	.04 - .10	Best	1	TT5080	ML	590	.006	TT8115	MP	750	.011	AB2010		390	.006
				2	TT5100	ML	520	.006	TT8125	MP	690	.011	TB670		390	.006
			Normal	1	TT5080	MP	560	.008	TT8115	PC	710	.011	AB20		330	.006
				2	TT5100	MP	490	.008	TT8125	PC	640	.011	TB730		330	.006
			Poor	1	TT5100	MT	440	.01	TT8135	RT	430	.011	AB30		260	.004
				2									KB90A		260	.004
		.10 - .16	Best	1	TT5080	MP	560	.008	TT8115	PC	710	.013	AB20		330	.006
				2	TT5100	MP	480	.008	TT8125	PC	640	.013	KB90A		330	.006
			Normal	1	TT5080	MT	520	.01	TT8125	MT	570	.013	AB20		330	.006
				2	TT5100	MT	440	.01	TT8125	MG-	610	.015	KB90A		330	.006
			Poor	1	TT8135	RT	460	.01	TT8135	RT	430	.013	AB30		260	.004
				2									KB90A		260	.004
	R	.16 -.28	Normal	1					TT8125	RT	590	.02				
				2					TT8115	RT	670	.02				
			Poor	1					TT8135	RT	410	.016				
				2												
		.28 -	Normal	1					TT8125	RH	560	.026				
				2												
			Poor	1					TT8135	RH	380	.02				
				2												
P	F	- .04	Best	1	PV3010	FG	750	.004	PV3010	FG	820	.006	TB670		490	.004
				2	CT3000	FG	690	.004	CT3000	FG	740	.006	AB20		390	.004
	M	.04 - .14	Best	1	TT5080	MT	540	.006	TT8115	MT	710	.007	TB670		490	.005
				2	TT5100	MT	480	.006	TT8125	MT	640	.007	AB20		390	.005
			Normal	1	TT5080	MT	520	.006	TT8125	MT	710	.007	AB20		330	.005
				2	TT5100	MT	460	.006	TT5100	MT	640	.007	TB670		330	.005
			Poor	1	TT8135	MT	440	.006	TT8135	MT	520	.007	AB30		260	.003
				2									KB90A		260	.003

Recommended cutting parameters to start machining



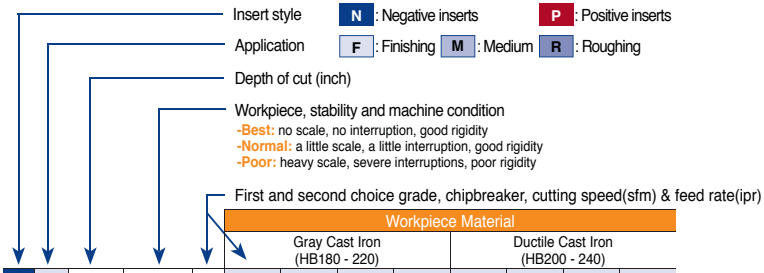
					Workpiece Material							
					Martensitic/Ferritic Stainless Steel (HB180 - 200)				Austenitic Stainless Steel (HB180 - 200)			
N	F	- .04	Best	1	PV3010	SF	1080	.005	PV3010	SF	870	.005
				2	TT9215	EA	850	.005	TT9215	EA	690	.005
	M	.04 - .10	Best	1	TT9215	EM	750	.008	TT9215	EM	660	.008
				2								
			Normal	1	TT9225	EM	690	.009	TT9225	EM	610	.009
				2	TT9235	MP	590	.009	TT9235	MP	480	.009
			Poor	1	TT9080	MT	560	.009	TT9080	MT	440	.009
				2								
		.10 - .16	Best	1	TT9225	EM	660	.009	TT9225	EM	520	.009
				2								
			Normal	1	TT9225	MP	620	.011	TT9225	MP	490	.011
				2	TT9235	MT	540	.011	TT9235	MT	440	.011
			Poor	1	TT9080	MT	540	.009	TT9080	MT	410	.009
				2								
	R	.16 -.28	Normal	1	TT9225	ET	560	.018	TT9225	ET	430	.018
				2								
			Poor	1	TT9080	ET	490	.014	TT9080	ET	360	.014
				2								
		.28 -	Normal	1	TT9225	RX	520	.025	TT9225	RX	390	.025
				2								
			Poor	1	TT9080	RX	440	.022	TT9080	RX	330	.022
				2								
P	F	- .04	Best	1	PV3010	FG	1080	.005	PV3010	FG	870	.005
				2	TT9215	FG	890	.005	TT9215	FG	720	.005
	M	.04 - .14	Best	1	TT9225	PC	640	.007	TT9225	PC	520	.007
				2								
			Normal	1	TT9225	PC	610	.007	TT9225	PC	490	.007
				2	TT9235	MT	520	.007	TT9235	MT	430	.007
			Poor	1	TT9080	MT	490	.007	TT9080	MT	390	.007
				2								

Recommended cutting parameters to start machining



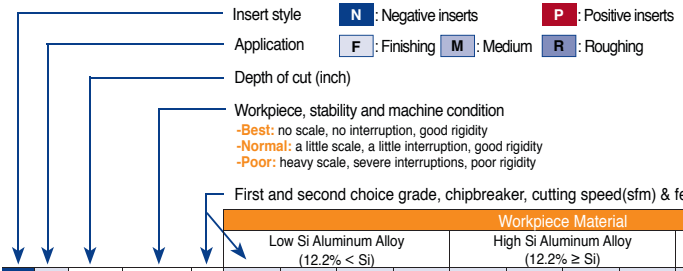
					Workpiece Material							
					Ni Based Super Alloy				Titanium Alloy			
N	F	- .04	Best	1	TC430		820	.006	TT5080	EA	330	.006
				2	TT5080	EA	200	.006				
	M	.04 - .10	Best	1	TC430		820	.006	TT5080	EM	300	.008
				2	TT5080	EM	200	.008				
			Normal	1	TT5080	MP	160	.008	TT5080	MP	260	.008
				2								
			Poor	1	TT9080	MT	110	.008	TT8020	MT	160	.008
				2								
		.10 - .16	Best	1	TT5080	EM	160	.008	TT5080	EM	260	.008
				2								
			Normal	1	TT5080	MP	150	.008	TT5080	MP	230	.008
				2								
			Poor	1	TT9080	MT	100	.008	TT8020	MT	150	.008
				2								
	R	.16 -.28	Normal	1	TT5080	ET	130	.008	TT5080	ET	200	.008
				2								
			Poor	1	TT9080	ET	80	.008	TT8020	ET	130	.008
				2								
		.28 -	Normal	1								
				2								
			Poor	1								
				2								
P	F	- .04	Best	1	TT5080	FG	200	.004	TT5080	FG	330	.004
				2								
	M	.04 - .14	Best	1	TT5080	PC	160	.006	TT5080	PC	260	.006
				2								
			Normal	1	TT5080	PC	150	.006	TT5080	PC	250	.006
				2								
			Poor	1	TT9080	MT	100	.006	TT8020	MT	160	.006
				2								

Recommended cutting parameters to start machining



					Workpiece Material							
					Gray Cast Iron (HB180 - 220)				Ductile Cast Iron (HB200 - 240)			
N	F	- .04	Best	1	AS500		1970	.01	AS500		1440	.008
				2	TT7005	MT	1310	.01	TT7005	MT	1050	.008
	M	.04 - .10	Best	1	AS500		1870	.014	AS500		1380	.012
				2	TT7005	MT	1250	.014	TT7005	MT	1000	.012
			Normal	1	AS10		1770	.014	AS10		1310	.012
				2	TT7005	MT	1180	.014	TT7005	MT	950	.012
			Poor	1	TT7005	RT	1050	.016	TT7015	RT	820	.014
				2	TT7015	RT	890	.016				
		.10 - .16	Best	1	AS10		1770	.014	AS10		1310	.012
				2	TT7005	MT	1180	.014	TT7005	MT	900	.012
			Normal	1	AS10		1670	.014	AS10		1250	.012
				2	TT7005	RT	1050	.016	TT7015	MT	850	.014
			Poor	1	TT7005	RT	980	.016	TT7015	RT	770	.014
				2	TT7015	RT	840	.016				
	R	.16 - .28	Normal	1	TT7005	RT	980	.024	TT7015	RT	790	.02
				2								
			Poor	1	TT7015	RT	790	.024	TT7015	RT	740	.02
				2								
		.28 -	Normal	1	TT7005	RT	890	.031	TT7015	RT	690	.028
				2								
			Poor	1	TT7015	RT	720	.031	TT7015	RT	660	.028
				2								
P	F	- .04	Best	1	TT7005	MT	1310	.007	TT7005	MT	1050	.006
				2	TB730		2300	.006				
	M	.04 - .14	Best	1	TT7005	MT	1250	.01	TT7005	MT	1000	.008
				2								
			Normal	1	TT7005	MT	1180	.01	TT7005	MT	950	.008
				2	TT7015	MT	1000	.01	TT7015	MT	820	.008
			Poor	1	TT7015	MT	950	.01	TT7015	MT	770	.008
				2								

Recommended cutting parameters to start machining



					Workpiece Material											
					Low Si Aluminum Alloy (12.2% < Si)				High Si Aluminum Alloy (12.2% ≥ Si)				Copper Alloy			
N	F	- .04	Best	1	KP300	-	4260	.004	KP300	-	1970	.004	KP300	-	3610	.004
				2	K10	ML	1640	.006	K10	ML	490	.006	TT9225	ML	1640	.006
	M	.04 - .10	Best	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	ML	1640	.014	K10	ML	490	.012	TT9225	ML	1310	.01
			Normal	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	ML	1640	.014	K10	ML	490	.012	TT9225	ML	1310	.01
			Poor	1	KP300	-	3280	.006	KP300	-	1970	.006	KP300	-	2950	.006
				2	K10	ML	1310	.014	K10	ML	390	.012	TT9225	MP	1050	.01
		.10 - .16	Best	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	ML	1640	.014	K10	ML	490	.012	TT9225	MP	1310	.012
			Normal	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	ML	1640	.014	K10	ML	490	.012	TT9225	MP	1310	.012
			Poor	1	KP300	-	3280	.006	KP300	-	1970	.006	KP300	-	2950	.006
				2	K10	ML	1310	.014	K10	ML	390	.012	TT9225	MT	1050	.012
P	F	- .04	Best	1	KP300	-	4260	.004	KP300	-	1970	.004	KP300	-	3610	.004
				2	K10	FL	1640	.006	K10	FL	490	.005	TT9225	FG	1310	.006
	M	.04 - .14	Best	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	FL	1640	.01	K10	FL	490	.009	TT9225	FG	1310	.008
			Normal	1	KP300	-	4260	.006	KP300	-	1970	.006	KP300	-	3610	.006
				2	K10	FL	1640	.01	K10	FL	490	.009	TT9225	FG	1310	.008
			Poor	1	KP300	-	3280	.006	KP300	-	1640	.006	KP300	-	2950	.006
				2	K10	FL	1310	.01	K10	FL	390	.01	TT9225	MT	1050	.008

Insert Designation System

1 Shape

C

D

E

H

K

R

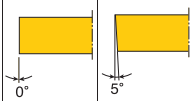
S

T

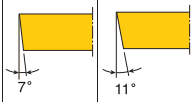
V

W

2 Clearance Angle



N B



C P

4 Type

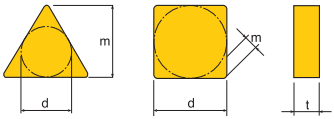
A G M

R B, W T.H

Special Z,X

C	N	M	G
1	2	3	4

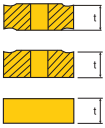
3 Tolerance



Class	m	t	d
A	±.0002	±.001	±.001
F	±.0002	±.001	±.0005
C	±.0005	±.001	±.001
H	±.0005	±.001	±.0005
E	±.001	±.001	±.001
G	±.001	±.005	±.001
M	±.003 - ±.007	±.005	±.002 - ±.005
U	±.005 - ±.015	±.005	±.003 - ±.010

Diameter of IC	Tolerance			
	On m		On d	
	Class M	Class U	Class M	Class U
.250	±.003	±.005	±.002	±.003
.375	±.003	±.005	±.002	±.003
.500	±.005	±.008	±.003	±.005
.625	±.006	±.011	±.004	±.007
.750	±.006	±.011	±.004	±.007
1.000	±.007	±.015	±.005	±.010
1.250	±.007	±.015	±.005	±.010

6 Thickness



ANSI	ISO	Value
1	01	.063
-	T1	.078
1.5	02	.094
-	T2	.109
2	03	.125
2.5	T3	.156
3	04	.187
-	05	.219
4	06	.250
5	07	.313
6	09	.375

7 Corner Radius

Symbol		Dimensions	
ANSI	ISO	inch	mm
0	00	0-.005	0-.127
0.5	02	.008	0.2
1	04	.016	0.4
-	05	.020	0.5
2	08	.031	0.8
3	12	.047	1.2
4	16	.063	1.6
5	20	.079	2.0
6	24	.094	2.4
8	32	.125	3.2

8 Hand of Insert

R: Right hand

L: Left hand

9 Chipbreaker

For chipbreakers, see pages 14 - 20

4	3	2	(	R	)	MP
5	6	7		8		9

5 Cutting Edge Length

I.C.				C	D	E	R	S	T	V	W	K	H
ANSI Symbol	ISO Symbol	inch	mm										
1.2 (5)*		.156	3.97	03	04			03	06		02		
1.5 (6)*		.188	4.76	04	05			04	08	08			
1.8 (7)*		.219	5.56	05	06			05	09	09	03		
2		.250	6.35	06	07			06	11	11	04		
2.5		.313	7.94	08	09			07	13	13	05		
	08		8.0				08						
3		.375	9.52	09	11		09	09	16	16	06	16	
	10		10.0				10						
	12		12.0				12						
4		.500	12.7	12	15	13		12	22	22	08		05
5		.625	15.88	16	19		15	15	27	27	10		
	16		16.0				16						
6		.750	19.05	19	23		19	19	33	33	13		10
	20		20.0				20						
	25		25.0				25						
8		1.000	25.4	25	31		25	25	44	44	17		
10		1.250	31.75	32	38			31	54	54	21		
	32		32.0				32						

* As measured in 1/32" increments

Negative 80° Rhombic Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	CNMA 331	.006 - .024	.039 - .157			●	●																
	332	.006 - .028	.039 - .157			●	●																
 For Medium	CNMG 331	.004 - .018	.020 - .157			●	●																
	332	.004 - .020	.020 - .157			●	●																
	333	.004 - .022	.020 - .157			●	●																
 For Finishing	CNMG 331 EA	.002 - .012	.005 - .059									●	●	●			●			●			
	332 EA	.003 - .020	.006 - .059									●	●	●			●			●			
 For Medium	CNMG 331EM	.005 - .020	.020 - .157									●	●	●			●			●			
	332 EM	.006 - .020	.028 - .157									●	●	●			●			●			
 For Finishing	CNMG 331 FG	.003 - .012	.008 - .079						●	●					●								
	332 FG	.004 - .014	.020 - .079						●	●					●								
	333 FG	.006 - .016	.020 - .079						●	●					●								
 For Finishing	CNMG 331 FM	.003 - .012	.010 - .079		●				●	●	●				●								
	332 FM	.004 - .014	.012 - .079		●				●	●	●				●								
	333 FM	.006 - .016	.014 - .079		●				●	●	●				●								
 For Medium	CNMG 331 FT	.003 - .012	.016 - .138						●	●	●				●								
	332 FT	.004 - .016	.020 - .138						●	●	●				●								
	333 FT	.006 - .020	.024 - .138						●	●	●				●								
 For Medium	CNMG 331 MM	.006 - .018	.016 - .157						●	●	●	●	●	●	●								
	332 MM	.008 - .020	.020 - .157						●	●	●	●	●	●	●								
	333 MM	.009 - .020	.028 - .157						●	●	●	●	●	●	●								
 For Medium	CNMG 331 MT	.004 - .014	.031 - .177						●	●	●				●								
	332 MT	.006 - .018	.039 - .177						●	●	●				●								
	333 MT	.008 - .022	.047 - .177						●	●	●				●								
 For Medium	CNMG 331 PC	.004 - .012	.016 - .157						●	●	●				●								
	332 PC	.006 - .016	.020 - .157						●	●	●				●								
	333 PC	.007 - .020	.024 - .157						●	●	●				●								

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

Negative 55° Rhombic Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																			
				Cermet		CVD Coated												PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	DNMG 3.53.51	.004 - .018	.020 - .157			●	●																
	3.53.52	.004 - .020	.020 - .157			●	●																
	3.53.53	.004 - .022	.020 - .157			●	●																
 For Finishing	DNMG 3.53.51 EA	.002 - .012	.005 - .059									●	●	●			●			●			
	3.53.52 EA	.003 - .016	.006 - .059									●	●	●			●			●			
 For Medium	DNMG 3.53.52 EM	.005 - .016	.020 - .157									●	●	●			●			●			
	3.53.53 EM	.006 - .016	.028 - .157									●	●	●			●			●			
 For Finishing	DNMG 3.53.51 FG	.003 - .012	.008 - .079						●	●					●								
	3.53.52 FG	.004 - .014	.020 - .079						●	●					●								
	3.53.53 FG	.006 - .016	.020 - .079						●	●					●								
 For Finishing	DNMG 3.53.51 FM	.003 - .012	.010 - .079		●				●	●	●				●								
	3.53.52 FM	.004 - .014	.012 - .079		●				●	●	●				●								
	3.53.53 FM	.006 - .016	.014 - .079		●				●	●	●				●								
 For Medium	DNMG 3.53.51 FT	.003 - .012	.010 - .138						●	●	●				●								
	3.53.52 FT	.004 - .016	.012 - .138						●	●	●				●								
	3.53.53 FT	.006 - .020	.014 - .118						●	●	●				●								
 For Medium	DNMG 3.53.51 MM	.006 - .018	.016 - .177						●	●	●	●	●	●	●								
	3.53.52 MM	.008 - .020	.020 - .177						●	●	●	●	●	●	●								
	3.53.53 MM	.009 - .020	.028 - .177						●	●	●	●	●	●	●								
 For Medium	DNMG 3.53.51 MT	.004 - .014	.031 - .177						●	●	●				●								
	3.53.52 MT	.006 - .018	.039 - .177						●	●	●				●								
	3.53.53 MT	.008 - .022	.047 - .177						●	●	●				●								
 For Medium	DNMG 3.53.51 PC	.004 - .012	.016 - .157						●	●	●				●								
	3.53.52 PC	.006 - .016	.020 - .157						●	●	●				●								
	3.53.53 PC	.007 - .020	.024 - .157						●	●	●				●								

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

TOTANK

Negative Square Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	SNMG 331	.004 - .018	.020 - .157			●	●																
	332	.004 - .020	.020 - .157			●	●																
	333	.004 - .022	.020 - .157			●	●																
 For Finishing	SNMG 331 EA	.002 - .012	.005 - .059									●	●	●			●			●			
	332 EA	.003 - .016	.006 - .059									●	●	●			●			●			
 For Medium	SNMG 331 EM	.005 - .016	.020 - .157									●	●	●			●			●			
	332 EM	.006 - .016	.028 - .157									●	●	●			●			●			
 For Finishing	SNMG 331 FG	.003 - .012	.008 - .079						●	●					●								
	332 FG	.004 - .014	.020 - .079						●	●					●								
	333 FG	.006 - .016	.020 - .079						●	●					●								
 For Finishing	SNMG 331 FM	.003 - .012	.010 - .079		●				●	●	●				●								
	332 FM	.004 - .014	.012 - .079		●				●	●	●				●								
	333 FM	.006 - .016	.014 - .079		●				●	●	●				●								
 For Medium	SNMG 331 MM	.006 - .018	.016 - .157						●	●	●	●	●	●	●								
	332 MM	.008 - .020	.020 - .157						●	●	●	●	●	●	●								
	333 MM	.009 - .020	.028 - .157						●	●	●	●	●	●	●								
 For Medium	SNMG 331 MT	.004 - .014	.031 - .157						●	●	●				●								
	332 MT	.006 - .018	.039 - .157						●	●	●				●								
	333 MT	.008 - .022	.047 - .157						●	●	●				●								
 For Medium	SNMG 331 PC	.004 - .012	.016 - .138						●	●	●				●								
	332 PC	.006 - .016	.020 - .138						●	●	●				●								
	333 PC	.007 - .020	.024 - .138						●	●	●				●								

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

Negative Triangular Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	TNMG 2.531	.004 - .018	.020 - .157			●	●																
	2.532	.004 - .020	.020 - .157			●	●																
	2.533	.004 - .022	.020 - .157			●	●																
 For Finishing	TNMG 2.531 EA	.002 - .012	.005 - .059									●	●	●			●			●			
	2.532 EA	.003 - .016	.006 - .059									●	●	●			●			●			
 For Medium	TNMG 2.531 EM	.005 - .016	.020 - .157									●	●	●			●			●			
	2.532 EM	.006 - .016	.028 - .157									●	●	●			●			●			
 For Finishing	TNMG 2.531 FG	.003 - .012	.010 - .059						●	●					●								
	2.532 FG	.004 - .014	.012 - .059						●	●					●								
	2.533 FG	.006 - .016	.014 - .059						●	●					●								

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

Ingersoll Cutting Tools

Negative Triangular Inserts (cont.)

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated												PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	TNMG 2.531 FM	.003 - .012	.010 - .059	•					•	•	•				•									
	2.532 FM	.004 - .014	.012 - .059	•					•	•	•				•									
	2.533 FM	.006 - .016	.014 - .059	•					•	•	•				•									
 For Medium	TNMG 2.531 FT	.003 - .012	.010 - .098						•	•	•				•									
	2.532 FT	.004 - .016	.012 - .098						•	•	•				•									
	2.533 FT	.006 - .020	.014 - .098						•	•	•				•									
 For Medium	TNMG 2.531 MM	.006 - .018	.016 - .138						•	•	•	•	•	•	•									
	2.532 MM	.008 - .020	.020 - .138						•	•	•	•	•	•	•									
	2.533 MM	.009 - .020	.028 - .138						•	•	•	•	•	•	•									
 For Medium	TNMG 2.531 MT	.004 - .014	.031 - .138						•	•	•				•									
	2.532 MT	.006 - .018	.039 - .138						•	•	•				•									
	2.533 MT	.008 - .022	.047 - .138						•	•	•				•									
 For Medium	TNMG 2.531 PC	.004 - .012	.016 - .118						•	•	•				•									
	2.532 PC	.006 - .016	.020 - .118						•	•	•				•									
	2.533 PC	.007 - .020	.024 - .118						•	•	•				•									
 For Medium	TNGG 2.531 R/L	.005 - .012	.039 - .118		•																			
	2.532 R/L	.006 - .014	.051 - .118		•																			

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

Negative 80° Trigon Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated												PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	WNMX 331 EM	.004 - .014	.016 - .138									•	•	•			•			•				
	332 EM	.005 - .016	.020 - .138									•	•	•			•			•				
	333 EM	.006 - .016	.028 - .138									•	•	•			•			•				
 For Finishing	WNMX 331 FG	.003 - .012	.008 - .080	•	•				•	•					•		•							
	332 FG	.004 - .014	.008 - .080	•	•				•	•														
 For Finishing	WNMX 331 FM	.003 - .012	.010 - .080		•				•	•					•									
	332 FM	.004 - .014	.012 - .080		•				•	•					•									
	333 FM	.006 - .016	.014 - .080		•				•	•					•									
 For Medium	WNMX 331 MM	.006 - .018	.016 - .138									•	•	•			•			•				
	332 MM	.008 - .020	.020 - .138							•		•	•	•	•		•	•		•				
	333 MM	.009 - .020	.028 - .138									•	•	•			•			•				
 For Medium	WNMX 331 MT	.004 - .014	.032 - .138						•	•		•	•	•	•		•							
	332 MT	.006 - .018	.040 - .138			•	•		•	•		•	•	•	•		•							
	333 MT	.008 - .022	.047 - .138			•	•		•	•					•									
 For Medium	WNMX 331 PC	.004 - .012	.016 - .138						•	•														
	332 PC	.006 - .016	.020 - .138						•	•														
	333 PC	.007 - .020	.024 - .138						•	•										•				

• Insert hole size and shape are different from ANSI standard.
For use with Ingersoll H-Type holders

● Marked: Standard Items

Negative 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing	CNMA	431	.006 - .020	.039 - .197			●	●	○													●	
		432	.006 - .024	.039 - .236			●	●	○													●	○
		433	.006 - .028	.059 - .236			●	●	○	●													
		434	.008 - .031	.079 - .236			●	●	○														
		543	.006 - .028	.079 - .315			●	●	○														
		544	.008 - .031	.079 - .315			●	●															
		641	.006 - .020	.079 - .394																			
		642	.006 - .028	.079 - .394			○	●	○														
		643	.006 - .028	.079 - .394			●	●	○														
		644	.006 - .039	.118 - .394			●	●	○														
Wiper  For Roughing	CNMA	432 WT	.006 - .031	.028 - .197			●																
 For Medium	CNGG	430 ML	.001 - .004	.004 - .039														●				●	
		430.5 ML	.002 - .006	.008 - .047														●				●	
		431 ML	.004 - .012	.031 - .138														●				●	
		432 ML	.005 - .014	.039 - .138														●	●			●	
 For Medium	CNMG	431	.007 - .018	.039 - .197		●	●	●	○	●	●	●				●			●			●	
		432	.009 - .024	.059 - .197		●	●	●	○	●	●	●				●	●	●	●			●	○	●
		433	.010 - .024	.079 - .197			●	●	○	●	●					●							○	
		434	.011 - .024	.098 - .197						○														
		532	.010 - .024	.079 - .256							○													
		541	.008 - .018	.079 - .256							●													
		542	.010 - .024	.079 - .256						●	●					●					●			
		543	.011 - .024	.079 - .256							●													
		544	.011 - .024	.079 - .256																				
		641	.008 - .018	.118 - .315						●	●					●								
		642	.010 - .024	.118 - .315			●	●	○	●	●	●				●								
		643	.012 - .024	.118 - .315			●	●		●	●	●				●	●				●			
		644	.014 - .028	.118 - .315						●	●	●				●								
		646	.014 - .031	.118 - .315																				
 For Finishing	CNMG	431 EA	.002 - .012	.006 - .059		○				●	●		●	●	●	●		●	●		●			
		432 EA	.003 - .016	.006 - .059		●				●	●		●	●	●	●		●	○		●			
New  For Medium	CNMG	431 EM	.004 - .018	.020 - .197									●	●	●			●			●			
		432 EM	.005 - .020	.020 - .197									●	●	●			●			●			
		433 EM	.006 - .022	.020 - .197									●	●	●			●			●			
		434 EM	.007 - .024	.020 - .197									●	●	●			●			●			
		542 EM	.005 - .020	.020 - .256									●	●	●			●						
		543 EM	.006 - .022	.020 - .256									●	●	●			●						
		544 EM	.007 - .024	.020 - .256									●	●	●			●						
		642 EM	.005 - .020	.020 - .315									●	●	●			●						
		643 EM	.006 - .022	.020 - .315									●	●	●			●			●			
		644 EM	.007 - .024	.020 - .315									●	●	●			●						

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																					
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing	CNMG	432 ET	.007 - .022	.047 - .217							●		●	●	●	●		●			●				
		433 ET	.008 - .024	.047 - .217						●			●	●	●	○		●			●				
		542 ET	.008 - .024	.098 - .276									●	●	●			●							
		543 ET	.010 - .024	.098 - .276							●		●	●	●			●			●				
		642 ET	.008 - .024	.118 - .354									●	●	●			●							
		643 ET	.010 - .024	.118 - .354							●		●	●	●	○		●			●				
		644 ET	.012 - .026	.118 - .354										●	●	○		●							
 For Finishing	CNMG	431 FA	.002 - .008	.008 - .079		●				●	●					●									
		432 FA	.002 - .010	.012 - .079	○	●				●	●					●									
 For Finishing	CNMG	431 FC	.002 - .012	.008 - .098	●	●				●	●		●	●	●	●									
		432 FC	.003 - .014	.012 - .098	●	●				●	●		●	●	●	●									
		433 FC	.004 - .016	.012 - .098	○	●				●	●		●	●	●	○									
 For Finishing	CNMG	431 FG	.002 - .012	.008 - .098	●	●	●	●		●	●					●									
		432 FG	.003 - .014	.012 - .098	●	●	●	●		●	●					●									
 For Roughing	CNMG	**432 KT**	.007 - .021	.015 - .276			●	●																	
		433 KT	.010 - .028	.020 - .276			●	●																	
		434 KT	.011 - .033	.030 - .276			●	●																	
		543 KT	.010 - .028	.020 - .276			●	●																	
 For Medium	CNMG	431 MC	.004 - .012	.020 - .138		●				●	●					●			●						
		432 MC	.005 - .014	.028 - .138		●		●	○	●	●					●	●		●		●				
		433 MC	.006 - .016	.028 - .138						●	●					●									
 For Medium	CNMG	431 ML	.004 - .012	.031 - .138		●				●	●		●	●		●		●	●				●		
		432 ML	.005 - .014	.039 - .138		●				●	●		●	●		●		●	●		●		●		
		433 ML	.006 - .014	.051 - .138						●						●		●							
 For Medium	CNMG	431 MP	.004 - .012	.031 - .157						●	●		●	●	●	●		●	●						
		432 MP	.005 - .016	.039 - .157			●	●		●	●	●	●	●	●	●	●	●	●		●				
		433 MP	.006 - .020	.059 - .157							●		●	●	●	●		●	●				○		
		543 MP √	.006 - .020	.098 - .236							●														
 For Medium	CNMG	431 MT	.006 - .016	.039 - .197		●	●	●	○	●	●					●		●	●						
		432 MT	.007 - .022	.047 - .197	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●		●				
		433 MT	.008 - .022	.059 - .197		○	●	●	○	●	●	●	●	●	●	●	●	●	●						
		542 MT √	.008 - .022	.079 - .256			●				●														
		543 MT √	.010 - .022	.079 - .256			●	●	○	●	●	●				●		●	●						
		544 MT √	.012 - .022	.079 - .256						●	●					●									
		642 MT	.009 - .022	.118 - .315			●			●	●		●	●	●	●			●						
		643 MT	.010 - .022	.118 - .315			●			●	●	●		●	●	●		●	●						
		644 MT √	.012 - .022	.118 - .315						●	●														

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	CNMG	431 PC	.004 - .016	.016 - .197						●	●		●	●	●	●								
		432 PC	.006 - .020	.020 - .197						●	●	●	●	●	●	●					●			
		433 PC	.007 - .022	.024 - .197						●	●		●	●	●	●					●			
		434 PC	.008 - .024	.031 - .197						●	●					●		●						
		542 PC	.008 - .022	.079 - .256						●	●													
		543 PC	.010 - .022	.079 - .256						●	●													
		544 PC	.012 - .022	.079 - .256						●	●													
		642 PC	.009 - .022	.118 - .315						●	●													
		643 PC	.010 - .022	.118 - .315						●	●													
		644 PC	.012 - .022	.118 - .315						●	●													
 For Roughing	CNMG	432 RT	.010 - .028	.098 - .236			●	●	○	●	●	●	●	●	●	●	●	●						
		433 RT	.010 - .028	.098 - .236			●	●	○	●	●	●	●	●	●	●	●							
		434 RT	.012 - .028	.098 - .236				●	○	●							○							
		543 RT	.010 - .028	.118 - .276			●	●	○	●	●	●				●	●	●						
		544 RT	.012 - .033	.118 - .276			●	●	○	●	●	●												
		642 RT	.010 - .028	.118 - .354			○			●	●	●				●								
		643 RT	.010 - .028	.118 - .354			●	●	○	●	●	●		●	●	●	●	●						
		644 RT	.012 - .033	.118 - .354			●	●	○	●	●	●				●	●		●					
		866 RT	.018 - .039	.197 - .472						●	●	●				●	●							
 For Finishing	CNMG	431 SF	.003 - .010	.020 - .059		●										●		●	●		●			
		432 SF	.004 - .012	.028 - .059		●				●	●					●		●	●					
Wiper  For Finishing	CNMG	431 WS	.002 - .014	.020 - .079		●				●	●					○								
Wiper  For Medium	CNMG	432 WT	.006 - .024	.039 - .197		●	●	●	○	●	●		●			●		●						
		433 WT	.008 - .031	.039 - .197		○	●			●	●					●								

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Heavy	CNMM	643 HT	.014 - .035	.157 - .354						●	●	●				●	○							
		644 HT	.018 - .039	.157 - .354						●	●	●					○							
		646 HT	.022 - .047	.157 - .354						●	●	●												
		856 HT	.022 - .051	.197 - .472								●		●										
		866 HT	.022 - .051	.197 - .472						●	●	●					●							
		868 HT	.026 - .051	.197 - .512						○	●													
New  For Heavy	CNMM	646 HY	.020 - .043	.157 - .472						●	●													
		866 HY	.022 - .059	.157 - .591						●	●													
New  For Heavy	CNMM	866 HZ	.022 - .059	.157 - .591						●	●													
 RH(N)	CNMM	432 RH	.012 - .028	.098 - .236				●		●	●					●								
		432 RH(N)	.010 - .024	.079 - .197						○	●					●								
		433 RH	.012 - .031	.098 - .236						●	●					●								
		542 RH	.012 - .028	.118 - .315							●										○			
		543 RH	.012 - .031	.118 - .315						●	●					○								
		544 RH	.018 - .039	.157 - .315						○	●					○								
		642 RH *	.012 - .028	.118 - .354							●													
 RH		643 RH	.014 - .031	.157 - .354						●	●	●		●	○	●	○							
		643 RH(N)	.012 - .028	.118 - .315												○								
		644 RH	.018 - .039	.157 - .354						●	●	●		●	●	●								
		644 RH(N)	.018 - .035	.118 - .315						○						○								
For Roughing		646 RH	.022 - .047	.157 - .354						●	●	●		●	●	●								
		856 RH *	.022 - .047	.197 - .472																				
		866 RH *	.022 - .047	.197 - .472							●					●								
New  For Roughing	CNMM	432RX	.008 - .022	.028 - .276						●	●	●												
		433 RX	.010 - .028	.039 - .276						●	●	●												
		543 RX	.010 - .028	.039 - .354						●	●	●												
		544 RX	.012 - .035	.059 - .354						●	●	●												
		546 RX	.014 - .047	.079 - .354						●	●	●												
		642 RX	.008 - .022	.028 - .394						●	●	●												
		643 RX	.010 - .028	.039 - .394						●	●	●												
		644 RX	.012 - .035	.059 - .394						●	●	●												
		646 RX	.014 - .043	.079 - .394						●	●	●												
		856 RX	.014 - .047	.079 - .472						●	●	●												
		866 RX	.014 - .047	.079 - .472						●	●	●												

* Marked: Chipbreaker shape is not the same as shown in the catalogue.

● Marked: Standard Items

Negative 55° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																					
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	DNGG	430 ML	.001 - .004	.039 - .039														●					●	
		430.5 ML	.002 - .006	.008 - .047														●					●	
		431 ML	.004 - .012	.031 - .138														●						
		432 ML	.005 - .014	.039 - .138														●						
 For Roughing	DNMA	431	.006 - .020	.016 - .157																				
		441	.006 - .020	.016 - .157																			○	
		432	.006 - .026	.031 - .157			●	●	○															
		442	.006 - .026	.031 - .157		○	●	●	○	●	●					●								○
		433	.006 - .026	.047 - .157			●	●	○															
		443	.006 - .026	.047 - .157			●	●	○															
 For Medium	DNMG	431	.007 - .018	.039 - .157			●	●		●	●					○								
		441	.007 - .018	.039 - .157		●	●	●		●	●					●								
		432	.007 - .022	.059 - .157			●	●	○	●	●					●				●				
		442	.007 - .022	.059 - .157		●	●	●	○	●	●	●				●								●
		433	.010 - .022	.059 - .157			●			○						○								
		443	.010 - .022	.059 - .157			●	●	○	●	●					●								○
		434	.010 - .026	.098 - .157												●								
		444	.010 - .026	.098 - .157						●														
 For Finishing	DNMG	431 EA	.002 - .008	.004 - .059									●	●	●			●			●			
		432 EA	.004 - .016	.004 - .059									●	●	●			●			●			
		441 EA	.002 - .008	.004 - .059									●	●	●			●			●			
		442 EA	.004 - .016	.004 - .059									●	●	●			●			●			
New  For Medium	DNMG	332 EM *	.005 - .020	.020 - .157									○	○	○			○						
		432 EM	.005 - .020	.020 - .197									●	●	●			●			●			
		442 EM	.005 - .020	.020 - .197									●	●	●			●			●			
		433 EM	.006 - .022	.020 - .197									●	●	●			●						
		443 EM	.006 - .022	.020 - .197									●	●	●			●						
 For Roughing	DNMG	432 ET	.008 - .024	.039 - .236									●	●	●			●			●			
		442 ET	.008 - .024	.039 - .236									●	●	●			●			●			
		433 ET	.010 - .024	.039 - .236									●	●	●			●			●			
		443 ET	.010 - .024	.039 - .236									●	●	●			●			●			
 For Finishing	DNMG	432 FA	.002 - .008	.008 - .079		○				●						●								
		442 FA	.002 - .008	.008 - .079		●				●	●													
 For Finishing	DNMG	331 FC *	.003 - .008	.020 - .079	○	○				○	○													
		332 FC *	.004 - .010	.028 - .079		○				○	○			○										
		431 FC	.002 - .012	.008 - .098		●				●	●			●		●								
		441 FC	.002 - .012	.008 - .098	●	●				●	●		●	●	●									
		432 FC	.003 - .014	.012 - .098		●				●	●		●	●		●								
		442 FC	.003 - .014	.012 - .098	●					●	●		●	●	●	●								
		433 FC	.003 - .014	.020 - .098						●	●													
		443 FC	.003 - .014	.020 - .098						●	●													
OLD  For Finishing	DNMG	331 FG *	.003 - .008	.020 - .079	○	○				○	○					○		○						
		332 FG *	.004 - .010	.028 - .079	○	○				○	○					○		○						
		431 FG	.003 - .008	.020 - .079	●	●	●	●		●	●					●			○					
		441 FG	.003 - .008	.020 - .079	●	●				●	●					●								
		432 FG ✓	.004 - .010	.028 - .079	●	●	●	●		●	●					●								
		433 FG	.005 - .010	.039 - .079						●	●													
		442 FG ✓	.004 - .010	.028 - .079	●	●				●	●					●								

* Marked: Insert with screw hole ✓ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 55° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	DNMG	441 MC	.004 - .012	.020 - .138						●	●					●							
		432 MC	.005 - .014	.028 - .138						●	●					●							
		433 MC	.006 - .014	.039 - .138						●													
		442 MC	.005 - .014	.028 - .138						●	●	●				●	●		●				
		443 MC	.006 - .014	.039 - .138						●						●							
 For Medium	DNMG	431 ML	.004 - .012	.031 - .138						●	●		●	●		●		●					
		441 ML	.004 - .012	.031 - .138						●	●					●		●					
		432 ML	.005 - .014	.039 - .138							●		●	●		●		●	●			●	
		442 ML	.005 - .014	.039 - .138						●	●					●		●	●			●	
 OLD For Medium	DNMG	431 MP	.004 - .012	.031 - .157						●				●		●		●	●				
		441 MP	.004 - .012	.031 - .157						●	●			●	●	●		●					
		432 MP	.005 - .016	.039 - .157						●	●		●	●		●		●	●				
		442 MP	.005 - .016	.039 - .157						●	●		●	●	●	●		●	●		●		
		443 MP √	.006 - .016	.039 - .157									●	●	●	○		○					
 For Medium	DNMG	332 MT *	.007 - .016	.039 - .118		○	○	○	○	○	○					○							
		333 MT *	.008 - .018	.039 - .118						○						○							
		431 MT	.006 - .016	.031 - .157		●		●	○	●	●					●							
		441 MT	.006 - .016	.031 - .157		●	●	●	○	●	●					●		●					
		432 MT	.007 - .020	.039 - .157		●	●	●	○	●	●	●	●	●	●	●			●				
		442 MT	.007 - .020	.039 - .157		●	●	●	○	●	●		●	●	●	●	●	●	●				
		433 MT	.008 - .020	.051 - .157			●			●						●							
		443 MT	.008 - .020	.051 - .157			●	●	○	●	●		●	●	●	●		●	●				
 For Medium	DNMG	332 PC *	.007 - .016	.020 - .118						○	○												
		431 PC	.004 - .016	.016 - .157						●	●		●	●		●							
		441 PC	.004 - .016	.016 - .157						●	●		●	●	●	●							
		432 PC	.006 - .020	.020 - .157						●	●		●	●	●								
		442 PC	.006 - .020	.020 - .157						●	●		●	●	●	●							
		433 PC	.007 - .022	.024 - .157						●	●												
		443 PC	.007 - .022	.024 - .157						●	●			●	●								
 For Roughing	DNMG	432 RT	.010 - .026	.079 - .157			●	●	○	●	●	●				●							
		442 RT	.010 - .026	.079 - .157			●	●	○	●	●	●				●							
		433 RT	.010 - .026	.098 - .157				●	○		●												
		443 RT	.010 - .026	.098 - .157			●	●	○		●												
		444 RT	.010 - .028	.098 - .217						●	●					●							
 Right Hand Shown For Medium	DNMG	431 L-VF	.004 - .014	.028 - .177							●					○							
		431 R-VF	.004 - .014	.028 - .177						●	●					●		●					
		441 L-VF	.004 - .014	.028 - .177		○				●	●					●							
		441 R-VF	.004 - .014	.028 - .177		●				●	●					●	●						
		432 L-VF	.005 - .018	.039 - .177						●								●		●			
		432 R-VF	.005 - .018	.039 - .177						●	●							●		●			
		442 L-VF	.005 - .018	.039 - .177						●	●					●							
		442 R-VF	.005 - .018	.039 - .177		●				●	●												
 For Finishing	DNMG	432 WS	.004 - .012	.031 - .157		●	●	●	○	●	●			●									
		442 WS	.004 - .012	.031 - .157		●				●	●			●									
 For Medium	DNMG	433 WT	.006 - .024	.039 - .197						○						○							
		443 WT	.006 - .024	.039 - .197		○				●	●												

✱ Marked: Insert with screw hole
√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 120° Hexagonal Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	HNMG	432 GU	.006 - .024	.020 - .138			●	●	○		●		●			●		●							
		643 GU	.010 - .028	.039 - .197			●	●	●		●														
 For Medium	HNMG	432 SU	.006 - .020	.020 - .138												●		●							
		643 SU	.010 - .028	.039 - .197												●		●							

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 55° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right Hand Shown For Medium	KNUX	3331 L11	.006 - .014	.059 - .197						●	●	●		●		●									
		3331 R11	.006 - .014	.059 - .197		●	●			●	●	●		●		●	●		●			●			
		3332 L11	.008 - .018	.079 - .197						●	●			●		●									
		3332 R11	.008 - .018	.079 - .197				●		●	●			●		●									
 Right Hand Shown For Roughing	KNUX	3331 L12	.009 - .020	.079 - .197							●														
		3331 R12	.009 - .020	.079 - .197						●	●					●									
		3332 L12	.012 - .024	.098 - .236							●														
		3332 R12	.012 - .024	.098 - .236							●					●									

● Marked: Standard Items

Negative Round Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing	RNMG	43	.012 - .024	.079 - .197						●	●					●									
		54	.014 - .028	.138 - .276																					
		64	.018 - .031	.177 - .354																					
		86	.022 - .047	.157 - .472						○							●								

● Marked: Standard Items

Negative Square Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right Hand Shown For Medium	SNGG	321 L	.005 - .014	.039 - .118		●																	
		322 L	.006 - .016	.039 - .118																			
		322 R	.006 - .014	.039 - .118		○																	
		431 L	.006 - .014	.039 - .157		●																	
		431 R	.005 - .014	.039 - .157		●																	
		432 L	.006 - .016	.039 - .157		○															○		
		432 R	.006 - .014	.039 - .157		●															●		
 For Roughing	SNMA	432	.006 - .028	.039 - .236			●	●	○													●	
		433	.008 - .031	.059 - .236			●	●	○														○
		434	.012 - .039	.079 - .236			●	●	○														
		543	.008 - .031	.079 - .315			●																
		544	.012 - .039	.079 - .315					○														
		643	.008 - .031	.079 - .394			●	●	○													●	
		644	.012 - .039	.079 - .394			●	●	○														
		854	.012 - .039	.118 - .512																			
		856	.016 - .047	.118 - .512				●	○	●													
 For Medium	SNMG	431	.007 - .018	.039 - .197		●	●	●	○	●	●	●				●					○	●	
		432	.009 - .024	.059 - .197		●	●	●	○	●	●	●				●			●		●	○	●
		433	.010 - .024	.079 - .197			●	●	○		●					●							○
		434	.014 - .028	.079 - .197							●					●							
		542	.010 - .024	.059 - .236							●					●							
		543	.010 - .024	.079 - .236							●												
		544	.014 - .028	.079 - .236						●						●							
		641	.007 - .018	.118 - .315							●												
		642	.010 - .024	.118 - .315			●	●	○	●	●	●				●							
		643	.012 - .024	.118 - .315			●	●	○	●	●	●				●	○						
		644	.014 - .028	.118 - .315						●	●	●				●							
		854	.014 - .028	.157 - .472						●	●	●				●							
		856	.020 - .039	.197 - .472						●	●					●							
		866	.020 - .039	.197 - .472							●						●						
 For Finishing	SNMG	431 EA	.002 - .008	.004 - .059									●	●	●			●			●			
		432 EA	.004 - .016	.004 - .059									●	●	●						●		
New  For Medium	SNMG	432 EM	.005 - .020	.031 - .197									●	●	●			●			●		
		433 EM	.006 - .022	.031 - .197									●	●	●			●			●		
		543 EM	.006 - .022	.031 - .256									●	●	●			●					
		544 EM	.007 - .024	.031 - .256									○	○	○			○					
		643 EM	.006 - .022	.031 - .315									●	●	●			●					
		644 EM	.007 - .024	.031 - .315									●	●	●			●					
 For Roughing	SNMG	432 ET	.010 - .028	.079 - .276									●	●	●			●			●		
		433 ET	.012 - .028	.079 - .276									●	●	●			●			●		
		642 ET	.012 - .030	.118 - .354									●	●	●			●			●		
		643 ET	.014 - .030	.118 - .354									●	●	●			●			●		
 For Finishing	SNMG	431 FC	.002 - .012	.008 - .098		●				●	●			●									
		432 FC	.003 - .014	.008 - .098	●	●					●												
		433 FC	.004 - .016	.012 - .098		●				●	●			●									

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative Square Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	SNMG	431 FG √	.003 - .008	.020 - .118	○	●					●					●									
		432 FG √	.004 - .010	.028 - .118	●	●				●	●					●									
 For Medium	SNMG	432 MC	.005 - .014	.028 - .138						●	●					●			●						
		433 MC	.006 - .016	.028 - .138						○	○					○									
 For Medium	SNMG	432 ML	.005 - .014	.039 - .138						●	●					●			●				●		
		433 ML	.006 - .014	.039 - .138						○	●					○									
 For Medium	SNMG	431 MP √	.004 - .012	.031 - .157						○	●					●			○						
		432 MP	.005 - .016	.039 - .157						●	●		●	●	●	●		●	●		●				
		433 MP	.006 - .016	.051 - .157						○	●			●				●							
		542 MP	.010 - .024	.059 - .236						●															
 For Medium	SNMG	431 MT √	.005 - .016	.039 - .197		●				○	●					●									
		432 MT	.007 - .022	.047 - .197		●	●	●	○	●	●	○		●	●	●		●	●		○				
		433 MT √	.008 - .022	.059 - .197			●			●	●		●	●		●		●	●						
		543 MT √	.012 - .026	.079 - .276							●	●													
		642 MT	.007 - .022	.118 - .315							●			●	●						●				
		643 MT	.008 - .022	.118 - .315							●			●	●	●			●						
		644 MT	.012 - .022	.118 - .315															●						
 For Medium	SNMG	431 PC	.005 - .016	.016 - .197						●	●														
		432 PC	.006 - .020	.020 - .197						●	●			●		●					●				
		433 PC	.006 - .020	.024 - .197						●	●			●											
 For Roughing	SNMG	432 RT	.010 - .028	.098 - .236			●	●	○	●	●	●				●			○						
		433 RT	.012 - .028	.098 - .236			●	●	○	●	●		●		●										
		434 RT	.016 - .028	.098 - .236						●	●														
		543 RT	.012 - .028	.118 - .276				●		●	●	●				●									
		643 RT	.012 - .030	.118 - .354			○			●	●	●		●	●	●		●							
		644 RT	.016 - .035	.118 - .354						●	●	●		●	●	●		●	●						
		856 RT	.016 - .039	.197 - .472																					
		866 RT	.016 - .039	.197 - .472							●	●				○									
 For Heavy	SNMM	643 HT	.014 - .035	.157 - .354						●	●	●				●									
		644 HT	.018 - .039	.157 - .354						●	●	●					●								
		646 HT	.022 - .047	.157 - .354						●	●	●					●								
		856 HT	.022 - .051	.197 - .472						●	●	●		●		●	●								
		866 HT	.022 - .051	.197 - .472						●	●	●					●								
		868 HT	.026 - .051	.197 - .512																					

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative Square Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
New  For Heavy	SNMM	646 HY	.020 - .043	.157 - .472						●	●													
		866 HY	.022 - .059	.157 - .591						●	●													
New  For Heavy	SNMM	866 HZ	.022 - .059	.157 - .591						●	●													
 RH(N)	SNMM	432 RH	.012 - .028	.098 - .236						○	●					●								
		432 RH(N)	.010 - .024	.098 - .197												●								
		433 RH	.012 - .031	.098 - .236							●					●								
		433 RH(N)	.012 - .028	.118 - .197																				
		543 RH	.012 - .031	.118 - .276						○	●					●								
		642 RH *	.012 - .028	.118 - .354							●					○								
		643 RH	.012 - .031	.157 - .354							●	●		●	●	●	●							
		643 RH(N)	.012 - .028	.118 - .315																				
 RH For Roughing		644 RH	.018 - .039	.157 - .354						●	●	●		●	●	●			●					
		644 RH(N)	.016 - .035	.118 - .315												○								
		646 RH	.022 - .047	.157 - .354							●	●		●	●	●	○							
		854 RH *	.022 - .039	.197 - .472							●													
		856 RH *	.022 - .047	.197 - .472						●	●	●				●	○							
		866 RH *	.022 - .047	.197 - .472							●					●								
New  For Roughing	SNMM	432 RX	.008 - .022	.028 - .276						●	●	●												
		433 RX	.010 - .028	.039 - .276						●	●	●												
		543 RX	.010 - .028	.039 - .354						●	●	●												
		643 RX	.010 - .028	.039 - .394						●	●	●												
		644 RX	.012 - .035	.059 - .394						●	●	●												
		646 RX	.014 - .043	.079 - .394						●	●	●												
		856 RX	.014 - .047	.079 - .472						●	●	●												
		866 RX	.014 - .047	.079 - .472						●	●	●												

* Marked: Chipbreaker shape is not the same as shown in the catalogue.

● Marked: Standard Items

Negative Triangular Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P10	P20	K10
 Left Hand Shown For Medium	TNGG	331 L	.005 - .012	.039 - .138		●					●											●	
		331 R	.005 - .012	.039 - .138		●					●					●						●	○
		332 L	.006 - .014	.051 - .138		●					●												
		332 R	.006 - .014	.051 - .138		●					●					○						●	
		431 L	.005 - .012	.039 - .197		●																●	
		431 R	.005 - .012	.039 - .197		●					●											●	
		432 L	.006 - .014	.051 - .197		●										○							
		432 R	.006 - .014	.051 - .197		●					●					○						●	

● Marked: Standard Items

Negative Triangular Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing	TNMA	331	.006 - .012	.039 - .157		○	●	●	○													○		
		332	.006 - .016	.039 - .157			●	●	○													○	●	
		333	.008 - .020	.059 - .177			●	●	○															
		334	.008 - .020	.039 - .177			●	●	○															
		431	.006 - .012	.059 - .197																				
		432	.006 - .016	.059 - .197			●	●	○	●												○		
		433	.008 - .020	.059 - .197			●	●	○															
		434	.008 - .024	.079 - .197			●	●																
 For Medium	TNMG	221	.006 - .016	.047 - .118						○	○													
		222	.007 - .016	.059 - .118						○						○								
		331	.007 - .018	.059 - .138		●	●	●	○	●	●					●						●	●	
		332	.007 - .022	.079 - .138			●	●	○	●	●					●			●					
		333	.010 - .022	.079 - .138						●														
		431	.007 - .018	.059 - .197			●			●	●					●								
		432	.007 - .022	.079 - .197			●	●		●	●					●	●							
		433	.010 - .022	.079 - .197			●			●	●													
		434	.012 - .024	.079 - .197				●	○	●	●													
		542	.007 - .022	.079 - .197							●													
		543	.010 - .022	.118 - .276						○	●													
		544	.012 - .024	.118 - .276						○	●													
		654	.014 - .028	.118 - .354							●	●					●							
		666	.016 - .031	.118 - .354								●												
 For Finishing	TNMG	331 EA	.002 - .008	.004 - .059									●	●	●			●			●			
		332 EA	.004 - .016	.004 - .059									●	●	●			●			●			
 For Medium	TNMG	332 EM	.005 - .020	.031 - .177									●	●	●			●			●			
		333 EM	.006 - .022	.031 - .177										●	●			●			●			
		432 EM	.005 - .020	.031 - .236									●	●	●			●						
		433 EM	.006 - .022	.031 - .236									●	●	●			●			●			
 For Roughing	TNMG	332 ET	.010 - .026	.079 - .197										●										
		333 ET	.010 - .026	.079 - .197										●										
		432 ET	.010 - .026	.098 - .276										●										
		433 ET	.010 - .026	.098 - .276										●										
		543 ET	.010 - .028	.098 - .276									●	●	●									
 For Finishing	TNMG	331 FC	.002 - .012	.008 - .098	●	●				●	●			●	●	●								
		332 FC	.003 - .014	.008 - .098	●	●				●	●		●	●	●	●					●			
		333 FC	.004 - .016	.012 - .098	○	○				●	●		●	●	●	○								
 For Finishing	TNMG	221 FG	.003 - .008	.020 - .059		○				○						○								
		331 FG	.003 - .008	.020 - .079	●	●				●	●					●								
		332 FG	.004 - .010	.028 - .079	●	●				●	●					●								
		333 FG	.005 - .012	.028 - .079						○														
		432 FG	.004 - .010	.028 - .079						●	●													
 Right hand shown For Medium	TNMG	331 L-FS	.006 - .012	.031 - .118		●					●					●								
		331 R-FS	.006 - .012	.031 - .118		●					●					●			●					
		332 L-FS	.008 - .016	.039 - .138							●					○								
		332 R-FS	.008 - .016	.039 - .138							●					●								
 For Medium	TNMG	332 MC	.007 - .016	.028 - .138						●	●					●			●					

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative Triangular Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	TNMG	331 ML	.004 - .012	.031 - .138						●	●					●		●	●			●		
		332 ML	.005 - .014	.039 - .138						●	●	●				●		●	●			●		
		333 ML	.006 - .014	.059 - .138						○						○								
		431 ML	.004 - .012	.039 - .157						●	●					●						○		
		432 ML	.005 - .014	.039 - .157						●	●					●						●		
 For Medium	TNMG	331 MP	.004 - .012	.031 - .138						●	●		●	●	●	●		●	●					
		332 MP	.005 - .016	.039 - .138						●	●			●	●	●		●	●		●			
		333 MP	.006 - .016	.059 - .138						●				●	●	●		●						
		431 MP	.005 - .014	.039 - .138							●			●				●						
		432 MP	.005 - .016	.039 - .157						●	●			●		●		●	●					
		433 MP	.006 - .016	.039 - .157						○														
 OLD  For Medium	TNMG	222 MT	.007 - .016	.039 - .118						○	●					○								
		331 MT	.007 - .016	.039 - .138		●	●	●	○	●	●					●		●	●					
		332 MT	.007 - .020	.047 - .138	○	●	●	●	○	●	●			●	●	●		●	●					
		333 MT	.008 - .020	.059 - .138			●			●	●	●		●	●	●								
		431 MT √	.006 - .016	.047 - .197						●	●													
		432 MT √	.007 - .020	.047 - .197			●			●	●					●	○		●					
		433 MT	.008 - .020	.059 - .197						●	●					●			●					
		543 MT √	.008 - .020	.118 - .276							●	●				●		●						
 For Medium	TNMG	331 PC	.006 - .016	.039 - .138						●	●			●							●			
		332 PC	.006 - .020	.020 - .177						●	●		●	●	●	●					●			
		333 PC	.007 - .022	.024 - .177						●	●			●	●	●					●			
		432 PC	.007 - .020	.047 - .197						●	●													
		433 PC	.008 - .020	.059 - .197						●	●													
 For Roughing	TNMG	332 RT	.010 - .026	.079 - .197			●	●	○		●	●												
		333 RT	.010 - .026	.079 - .197			●	●	○		●													
		432 RT	.010 - .026	.079 - .276				●	○	●	●					●								
		433 RT	.010 - .026	.098 - .276			○	●	○		●													
		666 RT	.014 - .028	.118 - .354							●						●							
 For Finishing	TNMG	332 SF	.004 - .012	.028 - .059		●										●		●						
 Right hand shown For Medium	TNMG	331 L-VF	.004 - .012	.028 - .138		●				●	●					●								
		331 R-VF	.004 - .012	.028 - .138	●	●				●	●					●								
		332 L-VF	.005 - .014	.039 - .138						○	●					●								
		332 R-VF	.005 - .014	.039 - .138						●	●					●								
 For Roughing	TNMM	332 RH	.012 - .028	.079 - .276							●													
		432 RH	.012 - .028	.079 - .276						○	●					○								
		433 RH	.012 - .028	.098 - .276						●	●					○								
		434 RH	.016 - .033	.118 - .276																				
		543 RH	.012 - .031	.118 - .315						○														
 For Roughing	TNMM	332 RX	.008 - .022	.028 - .236						●	●	●												
		333 RX	.010 - .028	.039 - .276						●	●	●												
		432 RX	.008 - .022	.028 - .295						●	●	●												
		433 RX	.010 - .028	.039 - .295						●	●	●												
		434 RX	.012 - .035	.059 - .295						●	●	●												

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 35° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	T5100	TT7100	T5080	T8020	T9020	T9080	P20	K10	K20
 For Medium	VNGG	330 ML	.001 - .004	.004 - .039														●					○	
		330.5 ML	.002 - .006	.008 - .047														●					●	
		331 ML	.004 - .011	.031 - .118										●				●					●	
		332 ML	.004 - .012	.031 - .138									●	●				●					●	
 For Medium	VNMG	331	.007 - .016	.039 - .118		●	●	●	○	●	●					●									
		332	.007 - .020	.059 - .118		●	●	●	○	●	●					●									
		333	.008 - .020	.059 - .118			●	●		○	●										●				
		432	.007 - .020	.059 - .118							●														
 For Finishing	VNMG	331 EA	.002 - .008	.004 - .059									●	●	●			●			●				
		332 EA	.003 - .012	.008 - .098									●	●	●			●			●				
 For Medium	VNMG	332 EM	.005 - .020	.031 - .138									●	●	●						●				
 For Finishing	VNMG	332 FA	.002 - .010	.012 - .079	●	○				●	●					●		●							
 For Finishing	VNMG	2.531 FC	.003 - .008	.020 - .059		●				●	●			●											
		2.532 FC	.004 - .009	.020 - .079		●				●	●			●											
		331 FC	.002 - .012	.012 - .098	●	●				●	●			●		●									
		332 FC	.003 - .014	.012 - .098	●	●				●	●		●	●	●	●									
 For Finishing	VNMG	2.531 FG *	.003 - .008	.020 - .059		●				●	●					●		●							
		2.532 FG *	.004 - .009	.020 - .079		●				●	●					○		○							
		331 FG	.003 - .008	.020 - .079	●	●	●	●		●	●			●		●		●	●						
		332 FG	.004 - .009	.020 - .079	●	●	●	●		●	●					●		●							
 For Medium	VNMM	331 ML	.004 - .011	.031 - .118																		●			
		332 ML	.005 - .013	.039 - .118												●						●			
 OLD For Medium	VNMG	2.531 MT *	.006 - .014	.031 - .098			●	●		●						●									
		2.532 MT *	.007 - .014	.039 - .098			●			●	●					●		●							
		331 MT √	.006 - .014	.031 - .118		●				●	●			●		●		●							
		332 MT	.007 - .014	.039 - .098		●	●	●	○	●	●			●	●	●		●	●						
 For Medium	VNMG	331 PC	.006 - .014	.016 - .118						●	●			●											
		332 PC	.007 - .014	.020 - .118						●	●			●											

* Marked: Insert with screw hole
√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 80° Trigon Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing	WNMA	332	.006 - .028	.039 - .157			●	●	●															
		333	.008 - .031	.059 - .157			●																	
		432	.006 - .028	.039 - .197			●	●	○															
		433	.008 - .031	.059 - .197			●	●	○															
		434	.008 - .031	.059 - .197			●	●	○															
	WNMG	431	.007 - .018	.039 - .157			●	●																
		432	.008 - .024	.059 - .157			●	●																
		433	.010 - .028	.079 - .157			●	●																
 For Finishing	WNMG	431 EA	.002 - .008	.004 - .059									●	●	●			●			●			
		432 EA	.004 - .016	.004 - .059									●	●	●			●			●			
New  For Medium	WNMG	332 EM	.005 - .020	.031 - .118									●	●	●			●			●			
		333 EM	.006 - .022	.031 - .118									●	●	●			●			●			
		431 EM	.004 - .018	.031 - .157									●	●	●			●						
		432 EM	.005 - .018	.031 - .157									●	●	●			●			●			
		433 EM	.005 - .018	.031 - .157									●	●	●			●			●			
 For Roughing	WNMG	332 ET	.006 - .020	.031 - .157									●	●	●			●			●			
		333 ET	.006 - .020	.031 - .157									●	●	●			●			●			
		432 ET	.006 - .022	.031 - .177									●	●	●			●			●			
		433 ET	.008 - .020	.031 - .177									●	●	●			●			●			
 For Finishing	WNMG	331 FC	.003 - .008	.020 - .079		●				●	●			●										
		332 FC	.004 - .010	.020 - .079																				
		431 FC	.003 - .008	.020 - .079		●				●	●			●										
		432 FC	.003 - .008	.020 - .079	●	●				●	●		●	●	○	●								
		433 FC	.004 - .010	.020 - .079																				
 For Finishing	WNMG	331 FG	.003 - .008	.020 - .079	●	●				●	●					●		●						
		332 FG	.004 - .010	.028 - .079	●	●				●														
		431 FG	.003 - .008	.020 - .079	●	●				●	●					●		●						
		432 FG	.004 - .010	.028 - .079	●	●	●	●		●	●					●								
 For Medium	WNMG	331 MC	.004 - .012	.020 - .098							○					○								
		332 MC	.005 - .014	.028 - .118						●						●								
		432 MC	.005 - .014	.028 - .138		○				●	●	●				●								
		433 MC	.006 - .016	.028 - .138						●	●													
 For Medium	WNMG	432 ML	.005 - .014	.039 - .138						●	●		●	●		●		●	●				●	
		433 ML	.006 - .014	.051 - .138						●						●		●						
 For Medium	WNMG	332 MP	.005 - .014	.039 - .118						●	●			●	●	●		●						
		333 MP	.006 - .016	.051 - .118						○						○								
		431 MP √	.004 - .014	.039 - .157							●													
OLD		432 MP	.005 - .016	.039 - .157			●	●		●	●		●	●	●	●		●	●		●			
		433 MP	.006 - .016	.051 - .157						●	●		●	●	○	●								

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Negative 80° Trigon Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	T5080	T8020	T9020	T9080	P20	K10	K20
	WNMG	331 MT	.005 - .016	.039 - .118			●	●		●	●			●		●								
		332 MT	.006 - .018	.047 - .118			●			●	●			●	●	●			●					
		333 MT	.009 - .020	.059 - .118			●			●	●					●								
OLD		431 MT √	.005 - .016	.039 - .157		●	●	●	○	●	●			●		●		●	●					
		432 MT	.007 - .022	.047 - .157		●	●	●	○	●	●	●	●	●	●	●	○	●	●		●			
For Medium		433 MT	.010 - .022	.059 - .157			●	●	○	●	●		●	●	●	●		●			●			
	WNMG	332 PC	.006 - .020	.020 - .157						●	●													
		333 PC	.007 - .020	.024 - .157						●	●													
		432 PC	.006 - .020	.020 - .157						●	●		●	●	●	●					●			
		433 PC	.007 - .020	.024 - .157						●	●	●	●	●	○	●					●			
For Medium		434 PC	.008 - .020	.031 - .157						●	●													
	WNMG	432 RT	.010 - .028	.098 - .157			●	●	○	●	●	●	●	●	●	●	●	●						
		433 RT	.010 - .028	.098 - .157			●	●	○	●	●					●	●							
For Roughing		434 RT	.012 - .030	.098 - .157			●			●	●													
Wiper 	WNMG	432 WS	.003 - .014	.020 - .079				●		●	●													
For Finishing																								
Wiper 	WNMG	332 WT	.006 - .024	.028 - .138			●			●	●					●								
		333 WT	.008 - .031	.028 - .138				●	○	●						○								
		432 WT	.006 - .024	.039 - .157		●	●	●	○	●	●					●								
For Medium		433 WT	.008 - .031	.039 - .157				●	○	●	●	●				●								

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right hand shown For Finishing	CCET	21.50 L-GF	.001 - .006	.008 - .059																○			
		21.50 R-GF	.001 - .006	.008 - .059																○			
		21.50.5 L-GF	.001 - .007	.012 - .059																●			
		21.50.5 R-GF	.001 - .007	.012 - .059																●			
		21.51 L-GF	.002 - .008	.012 - .059																●			
		21.51 R-GF	.002 - .008	.012 - .059																●			
		32.50 L-GF	.001 - .006	.008 - .098																●			
		32.50 R-GF	.001 - .006	.008 - .098																●			
		32.50.5 L-GF	.001 - .007	.012 - .098																●			
		32.50.5 R-GF	.001 - .007	.012 - .098																●			
		32.51 L-GF	.002 - .008	.012 - .098																●			
		32.51 R-GF	.002 - .008	.012 - .098																●			
Wiper  Right hand shown For Finishing Can be applied only to toolholders with 95° approach angle	CCET	21.5X0 L-GW	.001 - .006	.004 - .059																○			
		21.5X0 R-GW	.001 - .006	.004 - .059																●			
		32.5X0 L-GW	.001 - .006	.004 - .098																○			
		32.5X0 R-GW	.001 - .006	.004 - .098																●			
New  For Finishing	CCGT	1.10.9X0 R-FF	.001 - .004	.002 - .012		●																	
		1.10.9X0 L-FF	.001 - .004	.002 - .012		●																	
		1.10.90 R-FF	.001 - .005	.003 - .016		●																	
		1.10.90 L-FF	.001 - .005	.003 - .016		●																	
		1.10.90.5 R-FF	.001 - .006	.004 - .016		●																	
		1.10.90.5 L-FF	.001 - .006	.004 - .016		●																	
		1.10.91 R-FF	.002 - .008	.004 - .016		●																	
		1.10.91 L-FF	.002 - .008	.004 - .016		●																	
		1.41.1X0 R-FF	.001 - .004	.002 - .016		●																	
		1.41.1X0 L-FF	.001 - .004	.002 - .016		●																	
		1.41.10 R-FF	.001 - .005	.004 - .020		●																	
		1.41.10 L-FF	.001 - .005	.004 - .020		●																	
		1.41.10.5 R-FF	.001 - .006	.004 - .020		●																	
		1.41.10.5 L-FF	.001 - .006	.004 - .020		●																	
		1.41.11 L-FF	.002 - .008	.004 - .020		●																	
		1.41.11 R-FF	.002 - .008	.004 - .020		●																	
New  For Finishing	CCGT	21.50 SA	.001 - .006	.004 - .059														●		●			
		21.50.5 SA	.001 - .006	.004 - .059														●		●			
		21.51 SA	.001 - .008	.004 - .094														●		●			
		32.50 SA	.001 - .006	.004 - .098														●		●			
		32.50.5 SA	.001 - .006	.004 - .098														●		●			
		32.51 SA	.001 - .008	.004 - .098														●		●			

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance 80° Rhombic Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated												PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	CCMT 21.50.5 FA	.002 - .006	.004 - .059		●										●		●			●				
	21.51 FA	.002 - .006	.004 - .059	●	●					●							●	●						
	32.50.5 FA	.002 - .006	.004 - .079	●	●										●		●							
	32.51 FA	.002 - .008	.004 - .079	●	●					●					●		●	●						
	32.52 FA	.004 - .010	.008 - .079	●	●					●					●		●							
 OLD For Finishing	CCMT 21.51 FG	.002 - .006	.012 - .059	●	●					●			●	●	●		●	●		●				
	32.51 FG	.003 - .008	.016 - .079	●	●				●	●			●	●	●		●	●		●				
	32.52 FG	.004 - .010	.024 - .079	●	●	●			●	●			●	●	●		●	●						
	432 FG √	.004 - .010	.024 - .079	●		●				●					●									
 For Medium	CCMT 21.51 MT	.003 - .008	.020 - .079	●	●	●	●	○	●	●			●	●	●		●	●				●		
	21.52 MT	.005 - .012	.028 - .079		●	●	●	○	●	●					●					●				
	32.51 MT	.004 - .010	.028 - .138	●	●	●	●	○	●	●	●		●	●	●		●	●						
	32.52 MT	.005 - .012	.039 - .138		●	●	●	○	●	●	●		●	●	●		●	●		●				
	431 MT	.004 - .010	.039 - .197		●	●	●	○	●	●					●			●						
	432 MT	.005 - .012	.051 - .197		●	●	●	○	●	●	●		●	●	●		●	●						
	433 MT	.007 - .014	.059 - .197			●			●	●														
 New For Semi Finishing	CCMT 21.51 PC	.002 - .007	.012 - .079	●					●	●			●							●				
	21.52 PC	.003 - .010	.016 - .079		●				●	●			●							●				
	32.51 PC	.003 - .010	.014 - .118		●				●	●			●		●					●				
	32.52 PC	.004 - .011	.020 - .118		●				●	●			●		●					●				
	431 PC	.003 - .010	.016 - .157		●				●	●			●							●				
	432 PC	.004 - .012	.028 - .157		●				●	●			●							●				
	433 PC	.005 - .014	.039 - .157		●				●	●			●							●				
 Wiper For Medium	CCMT 32.52 WT	.004 - .016	.028 - .118			●			●	●					●									

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 11° Clearance 80° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																					
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	T5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	CPGT	2.51.51 C	.002 - .008	.016 - .059		●																				
		321 C	.002 - .008	.016 - .079		●																				
 For Finishing	CPMT	2.51.51 FG	.003 - .008	.016 - .059		●					●					●										
		2.51.52 FG	.004 - .010	.024 - .059		●					●					●										
		321 FG	.003 - .008	.016 - .079		●					●					●										
		322 FG	.004 - .010	.024 - .079						●	●					●										
New  For Semi Finishing	CPMT	21.51 PC	.002 - .007	.012 - .079		●	●	●						●		●		●								
		21.52 PC	.003 - .010	.016 - .079		●	●	●						●		●		●								
		321 PC	.003 - .010	.018 - .118		●					●			●		●		●								
		322 PC	.004 - .012	.024 - .118		●					●			●		●		●								
		32.51 PC	.003 - .010	.018 - .118		●	●	●			●			●		●		●								
		32.52 PC	.004 - .012	.024 - .118		●	●	●			●			●		●		●								

● Marked: Standard Items

Positive 7° Clearance 55° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																					
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	T5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right hand shown For Finishing	DCET	21.50 L-GF	.001 - .006	.008 - .059																●						
		21.50 R-GF	.001 - .006	.008 - .059																●						
		21.50.5 L-GF	.001 - .007	.012 - .059																●						
		21.50.5 R-GF	.001 - .007	.012 - .059																●						
		21.51 L-GF	.002 - .008	.012 - .059																○						
		21.51 R-GF	.002 - .008	.012 - .059																●						
		32.50 L-GF	.001 - .006	.008 - .098																○						
		32.50 R-GF	.001 - .006	.008 - .098																●						
		32.50.5 L-GF	.001 - .007	.012 - .098																●						
		32.50.5 R-GF	.001 - .007	.012 - .098																●						
		32.51 L-GF	.002 - .008	.012 - .098																●						
		32.51 R-GF	.002 - .008	.012 - .098																●						
Wiper  Right hand shown For Finishing Can be applied only to toolhoders with 93° approach angle	DCET	21.5X0 L-GW	.001 - .006	.004 - .059																●						
		21.5X0 R-GW	.001 - .006	.004 - .059																●						
		32.50.1 L-GW	.001 - .006	.004 - .098																●						
		32.50.1 R-GW	.001 - .006	.004 - .059																●						
New  For Finishing	DCGT	21.50 SA	.001 - .006	.004 - .059														●		●						
		21.50.5 SA	.001 - .006	.004 - .059														●		●						
		21.51 SA	.001 - .008	.004 - .059														●		●						
		32.50 SA	.001 - .002	.004 - .098														●		●						
		32.50.5 SA	.001 - .006	.004 - .098														●		●	●					
		32.51 SA	.001 - .008	.004 - .098														●		●	●					

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance 55° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	DCMT	21.50.5 FA	.002 - .006	.004 - .059	●	●										●		●			●				
		32.50.5 FA	.002 - .006	.004 - .059	●	●							●			●		●			●				
 For Finishing	DCMT	21.51 FG	.003 - .008	.016 - .059	●	●				●	●			●	●	●		●	●		●				
		21.52 FG	.003 - .008	.016 - .079	●					●	●			●		●			●		●				
		32.51 FG	.004 - .010	.024 - .059	●	●	●	●		●	●		●	●	●	●		●	●		●				
		32.52 FG	.004 - .010	.024 - .079	●	●	●	●		●	●			●	●	●		●			●				
 For Medium	DCMT	32.51 MT	.004 - .010	.028 - .118	●	●	●	●	○	●	●	●		●	●	●		●	●						
		32.52 MT	.005 - .012	.039 - .118		●	●	●	○	●	●			●	●	●		●	●	●	●			●	
		32.53 MT	.007 - .014	.059 - .118		○	●	●	○	●						●									
New  For Semi Finishing	DCMT	21.51 PC	.002 - .007	.012 - .079		●				●	●			●							●				
		21.52 PC	.003 - .010	.016 - .079		●				●	●			●							●				
		32.51 PC	.003 - .010	.014 - .118		●				●	●			●							●				
		32.52 PC	.004 - .011	.020 - .118		●				●	●			●							●				
		32.53 PC	.005 - .013	.020 - .118		●				●	●			●							●				

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance Round Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																				
					Cermet		CVD Coated												PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	RCMT	10T300 MT	.008 - .020	.039 - .157			●	●		●	●					●									
		120400 MT	.012 - .024	.079 - .197			●	●		●	●														
		160600 MT	.016 - .031	.118 - .276				○	○		●														
New  For Semi Finishing	RCMT	120400 PC	.008 - .024	.051 - .177						●	●			●	●			●							
 For Roughing	RCMX	100300	.010 - .020	.059 - .157			●	●	○	●	●					●									
		120400	.012 - .024	.098 - .197			●	●	○	●	●					●							○		
		160600	.016 - .030	.118 - .276			●	●	○	●	●					●									
		200600	.019 - .035	.138 - .354			●	●	○	●	●					●							●		
		250700	.022 - .047	.157 - .472			●	●	○	●	●														
		320900	.026 - .059	.197 - .591			●	●		●	●														
New  For Roughing	RCMX	100300 RA	.008 - .020	.039 - .157						●	●	●													
		120400 RA	.010 - .024	.079 - .197						●	●	●													
		160600 RA	.014 - .030	.098 - .276						●	●	●													
		200600 RA	.016 - .035	.118 - .354						●	●	●													
		250700 RA	.020 - .047	.138 - .472						●	●	●													
		320900 RA	.024 - .059	.157 - .591						●	●	●													

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance Square Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	SCMT	32.51 FG	.003 - .010	.024 - .079										●										
		32.52 FG	.004 - .010	.024 - .079						●	●			●		●		●	●					
 For Medium	SCMT	32.51 MT	.004 - .010	.028 - .138		●	●	●	○	●	●			●		●			●					
		32.52 MT	.005 - .012	.039 - .138		●	●	●	○	●	●	●		●	●	●	●	●	●					
		431 MT	.004 - .010	.039 - .197		●	●	●		●	●					●								
		432 MT	.005 - .012	.039 - .197		●	●	●	○	●	●			●	●	●		●	●					
		433 MT	.006 - .014	.039 - .197			●	●		●	●	●												
New  For Semi Finishing	SCMT	32.51 PC	.003 - .010	.014 - .118		●				●	●			●							●			
		32.52 PC	.004 - .011	.020 - .118		●				●	●			●							●			
		431 PC	.003 - .010	.016 - .157		●				●	●			●							●			
		432 PC	.004 - .012	.028 - .157		●				●	●			●							●			
		433 PC	.005 - .014	.039 - .157		●				●	●			●							●			

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 11° Clearance Square Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	P20	P30	K10	K20
 For Finishing	SPG	321	.003 - .008	.028 - .138						○												●	○
		322	.004 - .010	.028 - .138						●											○		●	●
		421	.003 - .008	.039 - .197			●														●		●	
		422	.004 - .010	.039 - .197						●	●										●	●	●	●
		423	.006 - .012	.039 - .197																		○	○	
		431	.003 - .008	.039 - .197						○													○	●
		432	.004 - .010	.039 - .197						○														
		433	.006 - .012	.039 - .197																				○
		434	.007 - .013	.039 - .197																			○	
		531	.003 - .008	.059 - .276						●											●		●	○
		532	.004 - .010	.059 - .276																	●			
		533	.006 - .012	.059 - .276																				
		631	.003 - .008	.059 - .354						○														
		632	.004 - .010	.059 - .354																	●		●	
 For Medium	SPMR	321	.004 - .010	.028 - .138						○	●					○								
		322	.005 - .012	.039 - .138						●	●					○								
		421	.004 - .010	.039 - .197						○	●					●								
		422	.005 - .012	.039 - .197						●	●					●								
 For Medium	SPU	321	.004 - .012	.039 - .138		○				○											○			
		322	.006 - .016	.039 - .138						○												○		
		421	.004 - .012	.039 - .197						●	●										●			
		422	.006 - .016	.039 - .197		●				●	●					●					●	●	●	
		423	.008 - .020	.039 - .197																		○	○	
		531	.004 - .012	.059 - .276																				
		633	.008 - .020	.059 - .354							○											○		

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 5° Clearance Triangular Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	TBGT 1.21X0 R-FF	.001 - .004	.002 - .012		●																		
	1.21X0 L-FF	.001 - .004	.002 - .012		●																		
	1.210 R-FF	.001 - .005	.003 - .016		●																		
	1.210 L-FF	.001 - .005	.003 - .016		●																		
	1.210.5 R-FF	.001 - .006	.004 - .016		●																		
	1.210.5 L-FF	.001 - .006	.004 - .016		●																		
	1.211 R-FF	.002 - .008	.004 - .016		●																		
	1.211 L-FF	.002 - .008	.004 - .016		●																		

● Marked: Standard Items

Positive 7° Clearance Triangular Inserts

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																				
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right hand shown For Finishing	TCET 220 R-GF	.001 - .006	.008 - .059																●				
	220.5 R-GF	.001 - .007	.012 - .059																●				
	221 R-GF	.002 - .008	.020 - .059																●				
 For Finishing	TCGT 21.50 SA	.001 - .002	.004 - .098														●		●				
	21.50.5 SA	.001 - .006	.008 - .098														●		●				
	21.51 SA	.001 - .008	.008 - .098														●		●				
 For Finishing	TCMT 1.21.20.5 FA	.001 - .006	.016 - .047		●																		
	21.50.5 FA	.001 - .006	.004 - .059		●						●						●			●			
	21.51 FA	.002 - .006	.004 - .059	●						●					●								
 For Finishing	TCMT 732 FG	.004 - .010	.024 - .059	●	●					●					●								
	21.51 FG	.003 - .008	.016 - .059	●	●					●			●	●	●		●	●		●			
	21.52 FG	.004 - .010	.024 - .059	●	●	●	●		●	●			●	●	●								
	32.51 FG	.003 - .008	.016 - .079	●	●	●	●			●					●			●					
	32.52 FG	.004 - .010	.024 - .079		●	●	●		●	●			●	●	●		●						
 OLD For Medium	TCMT 731 MT √	.004 - .010	.024 - .079	●	●	●	●	○	●	●			●	●	●		●	●					
	732 MT √	.005 - .012	.031 - .079		●	●	●	○	●	●													
	21.51 MT √	.004 - .010	.024 - .118		●	●	●	○	●	●			●	●	●		●	●					
	21.52 MT √	.005 - .012	.031 - .118		●	●	●	○	●	●			●	●	●		●	●		●			
	32.51 MT	.004 - .010	.031 - .197		●	●	●	○	●	●			●	●	●		●						
	32.52 MT	.004 - .012	.039 - .197		●	●	●	○	●	●			●	●	●		●	●					
	32.53 MT	.004 - .012	.059 - .197			●				●													
	432 MT	.004 - .013	.039 - .197			●		●		●													
 For Semi Finishing	TCMT 731 PC	.002 - .007	.012 - .079		●				●	●			●							●			
	732 PC	.003 - .010	.016 - .079		●				●	●			●							●			
	21.51 PC	.002 - .008	.012 - .098		●				●	●			●							●			
	21.52 PC	.004 - .010	.017 - .098		●				●	●			●							●			
	32.51 PC	.003 - .010	.014 - .118		●				●	●			●							●			
	32.52 PC	.004 - .011	.020 - .118		●				●	●			●							●			
	32.53 PC	.005 - .014	.024 - .118		●				●	●			●							●			

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 11° Clearance Triangular Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated			Uncoated			
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	P20	P30	K10	K20
 For Finishing	TPG	221	.003 - .008	.028 - .118		●			○	●	●										●	●	●	○
		222	.004 - .010	.039 - .118						●												○	●	○
		320.5	.002 - .007	.039 - .197																			○	
		321	.003 - .008	.039 - .197		●				●	●										●	●	●	○
		322	.004 - .010	.039 - .197				●		●	●										●	○	●	●
		323	.006 - .012	.039 - .197		○																○	○	○
		431	.003 - .008	.059 - .276																	●	○	●	○
		432	.004 - .010	.059 - .276						○	●										●		●	●
		433	.006 - .012	.059 - .276																	●			
		434	.008 - .014	.059 - .276																	○			
		542	.006 - .010	.118 - .315						●														
 Right hand shown For Finishing	TPGT	731 L-C	.002 - .008	.012 - .059		●																		
		221 L-C	.002 - .008	.020 - .079		●																	●	
		221 R-C	.002 - .008	.020 - .079		●																		
		222 L-C	.003 - .010	.020 - .079		●																		
		331 L-C	.002 - .008	.028 - .118		●																		
		331 R-C	.002 - .008	.028 - .118		●																		
 Left hand shown For Finishing	TPGX	730.5 L	.002 - .006	.016 - .059	●	●																		
		731 L	.003 - .008	.024 - .059		●																	●	●
		220.5 L	.003 - .008	.020 - .059	●	●																		
		220.5 R	.003 - .008	.020 - .059		●																		
		221 L	.003 - .008	.024 - .079		●																	●	
		221 R	.003 - .008	.024 - .079		●																		
 OLD For Medium	TPMR	731	.004 - .010	.020 - .079						●	●													
		732	.005 - .012	.028 - .079		○		●	○	●	●					○								
		221	.004 - .010	.028 - .118	○	●	●	●	○	●	●					●			●					
		222	.005 - .012	.039 - .118	●	●		●		●	●					●								
		321	.004 - .010	.039 - .197		●	●	●	○	●	●	●				●		●	●					
		322	.005 - .012	.039 - .197	○	●	●	●		●	●					●		●	●					
		323	.006 - .014	.039 - .197						○	●													
		431	.004 - .010	.039 - .276							●					●								
		432	.005 - .012	.059 - .276			●				●					●								
		433	.006 - .014	.059 - .276							●													
 For Finishing	TPMT	221 FG	.003 - .008	.016 - .059		●	●				●					●			●					
 New For Semi Finishing	TPMT	731 PC	.002 - .007	.012 - .079		●								●		●		●						
		21.51 PC	.002 - .008	.016 - .098		●	●	●						●		●		●						
		21.52 PC	.004 - .010	.020 - .098		●	●	●						●		●		●						
		221 PC	.002 - .008	.016 - .098		●								●		●		●						
		222 PC	.004 - .010	.020 - .098		●			●		●			●		●		●						
		32.51 PC	.003 - .010	.018 - .118		●					●			●		●		●						
		32.52 PC	.004 - .012	.020 - .118		●					●			●		●		●						

√ Marked: Old type chipbreaker

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 11° Clearance Triangluar Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated												PVD Coated			Uncoated			
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	P20	P30	K10	K20
 For Medium	TPU	221	.004 - .012	.039 - .118						○	●										●	○	○	
		222	.006 - .016	.039 - .118						○	●										●		○	
		321	.004 - .012	.039 - .197		○				●	●										●	●	●	
		322	.006 - .016	.039 - .197		○				●	●								●		●	●	○	
		323	.008 - .020	.059 - .197							●											●		
		324	.010 - .022	.059 - .197																		○		
		431	.004 - .012	.059 - .276							●											●		
		432	.006 - .016	.059 - .276		○					●										●	●	○	
		433	.008 - .020	.059 - .276																	○	●		
		434	.010 - .022	.059 - .276																		○		

● Marked: Standard Items

Positive 5° Clearance 35° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																			
					Cermet		CVD Coated												PVD Coated			Uncoated			
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 Right hand shown For Finishing	VBET	220 L-GF	.001 - .006	.008 - .059																●				
		220 R-GF	.001 - .006	.008 - .059																●				
		220.5 L-GF	.001 - .007	.012 - .059																●				
		220.5 R-GF	.001 - .007	.012 - .059																●				
		221 L-GF	.002 - .008	.012 - .059																○				
		221 R-GF	.002 - .008	.012 - .059																●				
Wiper  Right hand shown For Finishing Can be applied only to toolhoders with 95° approach angle	VBET	22X0 L-GW	.001 - .006	.004 - .059																●				
		22X0 R-GW	.001 - .006	.004 - .059																●				
New  For Finishing	VBGT	220 SA	.001 - .008	.004 - .059														●		●				
		220.5 SA	.001 - .008	.008 - .059														●		●				
		221 SA	.002 - .008	.008 - .059														●		●				
		330 SA	.001 - .008	.004 - .059														●		●				
		330.5 SA	.001 - .008	.008 - .059														●		●				
 For Finishing	VBMT	332 FA	.002 - .010	.012 - .079	●	●				●	●					○		●						
 For Finishing	VBMT	331 FG	.003 - .008	.020 - .059	●	●	●	●		●	●		●	●		●		●	●					
		332 FG	.004 - .010	.028 - .079		●	●	●		●	●		●	●		●		●						

● Marked: Standard Items

Positive 5° Clearance 35° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Medium	VBMT	331 MT	.004 - .010	.024 - .118	●	●	●	●	○	●	●			●		●		●	●					
		332 MT	.005 - .012	.035 - .118	●	●	●	●	○	●	●			●		●		●	●					
		333 MT	.006 - .012	.047 - .118			●			●	●					●		○			●			
New  For Semi Finishing	VBMT	331 PC	.003 - .009	.020 - .110		●				●	●			●							●			
		332 PC	.004 - .011	.020 - .110		●				●	●			●							●			
		333 PC	.004 - .011	.020 - .110		●				●	●			●							●			

● Marked: Standard Items
○ Marked: Semi Standard Items

Positive 7° Clearance 35° Rhombic Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated											PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
New  For Finishing	VCGT	220 SA	.001 - .008	.004 - .059														●		●				
		220.5 SA	.001 - .008	.008 - .059														●		●				
		221 SA	.002 - .008	.008 - .059														●		●				
New  VCMT 08,11	VCMT	1.51.50.5 PC	.001 - .006	.008 - .059		●				●	●			●		●								
		1.51.51 PC	.002 - .008	.008 - .059	●	●				●	●			●										
 VCMT 16		221 PC	.002 - .008	.004 - .067		●				●	●			●						●				
For Semi Finishing		332 PC	.002 - .008	.012 - .079		●				●	●			●						●				

● Marked: Standard Items

Positive 5° Clearance 80° Trigon Inserts

Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated										PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Finishing	WBMT	1.210.5 R-C	.001 - .006	.004 - .016		●																	
		1.210.5 L-C	.001 - .006	.004 - .016		●																	
	WBGT	1.21X0 R-FF	.001 - .004	.002 - .012		●																	
		1.21X0 L-FF	.001 - .004	.002 - .012		●																	
		1.210 R-FF	.001 - .005	.003 - .016		●																	
		1.210 L-FF	.001 - .005	.003 - .016		●																	
		1.210.5 R-FF	.001 - .006	.004 - .016		●																	
		1.210.5 L-FF	.001 - .006	.004 - .016		●																	
		1.211 R-FF	.002 - .008	.004 - .016		●																	
		1.211 L-FF	.002 - .008	.004 - .016		●																	

● Marked: Standard Items

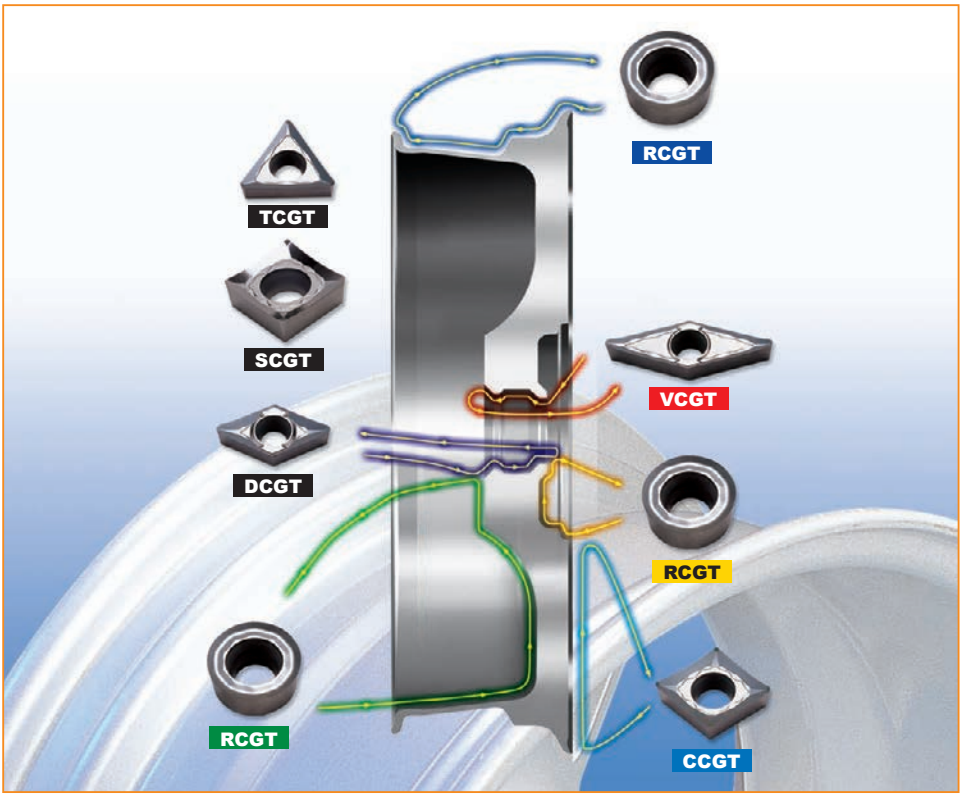
Negative Square Insert for Pipe Skiving

Insert	Designation		Dimension(inch)				Grade Coated
			l	d	t	r	TT5100
 For Pipe Skiving	SNG 452	10R	0.079	0.5	0.313	0.394	●
		16R	0.079	0.5	0.313	0.630	●
		20R	0.079	0.5	0.313	0.787	●
		25R	0.079	0.5	0.313	0.984	●
		30R	0.079	0.5	0.313	1.181	●
		40R	0.079	0.5	0.313	1.575	●
		50R	0.079	0.5	0.313	1.969	●
		60R	0.079	0.5	0.313	2.362	●
		70R	0.079	0.5	0.313	2.756	●

• Toolholders will be produced upon request.

● Marked: Standard Items

Inserts for Aluminum



Features

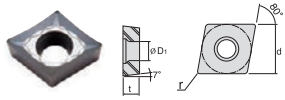
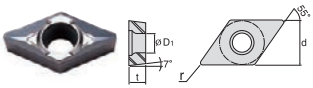
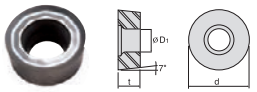
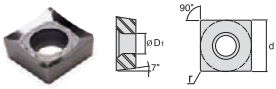
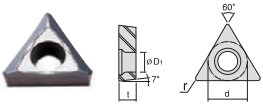
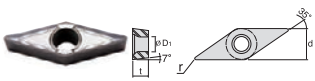
- Wide range of applications for aluminum and other non-ferrous materials
- Very high positive rake geometry to minimize cutting forces and built-up edges

Machining Conditions with K10 Grade

Materials		Hardness Brinell (HB)	Kc (N/mm^2)	Vc (sfm)	f (ipr)
Aluminum Alloys (Forged)	Unhardened	50 - 70	500 - 600	8200 - 3280	.004 - .024
	Hardened	90 - 110	700 - 900	3280 - 980	.004 - .020
Aluminum Alloys (Cast)	Unhardened	70 - 80	700 - 800	3280 - 980	.004 - .020
	Hardened	80 - 100	800 - 950	1970 - 660	.004 - .016
Copper Alloys		90 - 110	700	1970 - 820	.004 - .020
Bronze		100	1700	980 - 490	.004 - .024

Inserts for Aluminum

Positive 7° Clearance Inserts for Aluminum Machining

Insert	Designation		Dimension(inch)				Grade
			d	t	r	ØD1	K10
	CCGT	21.50.5 FL	.250	.094	.008	.110	●
		21.51 FL	.250	.094	.016	.110	●
		32.50.5 FL	.375	.156	.008	.173	●
		32.51 FL	.375	.156	.016	.173	●
		32.52 FL	.375	.156	.031	.173	●
		430.5 FL	.500	.187	.008	.217	●
		431 FL	.500	.187	.016	.217	●
		432 FL	.500	.187	.031	.217	●
	DCGT	21.50.5 FL	.250	.094	.008	.110	●
		21.51 FL	.250	.094	.016	.110	●
		32.50.5 FL	.375	.156	.008	.173	●
		32.51 FL	.375	.156	.016	.173	●
		32.52 FL	.375	.156	.031	.173	●
	RCGT	0803MO FL	.315	.125	-	.110	●
		1003MO FL	.393	.125	-	.173	●
		10T3MO FL	.393	.156	-	.173	●
	SCGT	32.52 FL	.375	.156	.031	.173	●
		430.5 FL	.500	.187	.008	.217	●
		431 FL	.500	.187	.016	.217	●
		432 FL	.500	.187	.031	.217	●
	TCGT	731 FL	.219	.094	.016	.098	●
		21.51 FL	.250	.094	.016	.110	●
		32.51 FL	.375	.156	.016	.173	●
		32.52 FL	.375	.156	.031	.173	●
	VCGT	220.5 FL	.250	.125	.008	.110	●
		221 FL	.250	.125	.016	.110	●
		330.5 FL	.375	.187	.008	.173	●
		331FL	.375	.187	.016	.173	●
		332 FL	.375	.187	.031	.173	●
		333 FL	.375	.187	1.2	.217	●
		43.57.5 FL	.500	.219	3.0	.217	●

● Marked: Standard Items

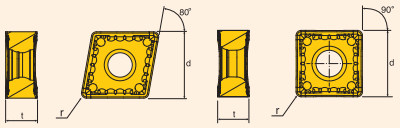

TOFORCE
TOFEED
GOLDDUTY
Member IMC Group
Ingersoll
Cutting Tools

GOLDDUTY™

CNMX HB SNMX HB

(inch)

Designation	d	t	r
CNMX 43.52 HB	.500	.219	.031
CNMX 43.53 HB	.500	.219	.047
CNMX 553 HB	.625	.272	.047
CNMX 554 HB	.625	.272	.063
SNMX 553 HB	.625	.272	.047
SNMX 554 HB	.625	.272	.063



Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated									PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	CNMX	43.52 HB	.010 - .032	.080 - .240					●	●	●												
		43.53 HB	.010 - .032	.080 - .240					●	●	●												
		553 HB	.012 - .031	.059 - .315					●	●	●						●			●			
		554 HB	.012 - .031	.059 - .315					●	●	●												
	SNMX	553 HB	.012 - .031	.059 - .315					●	●													
		554 HB	.012 - .031	.059 - .315					●	●													

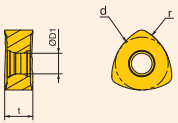
● Marked: Standard Items

TOFEED™

BNMX HF

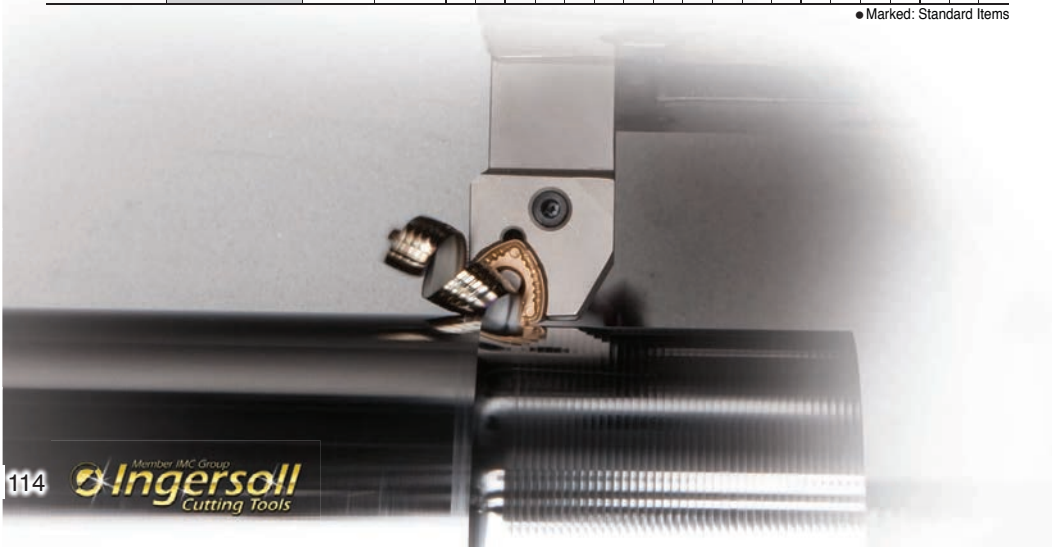
(inch)

Designation	d	t	r	ØD1
BNMX 150720R/L HF	.591	.315	.591	.244



Insert	Designation (ANSI)		Recommended Machining Conditions		Grade																		
					Cermet		CVD Coated									PVD Coated				Uncoated		
			feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	BNMX	150720R/L HF	.020 - .098	.020 - .098					●	●										●			

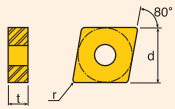
● Marked: Standard Items



CNMD HD HT HY HZ

(inch)

Designation	d	t	r
CNMD 646	.750	.250	.094
CNMD 866	1.0	.375	.094



Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated											PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT7005	TT7015	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
 For Roughing  For Finishing	CNMD 866 HD	.022 - .059	.157 - .591						●	●												
 For Roughing	CNMD 646 HT	.014 - .035	.157 - .354						●	●												
 For Finishing	866 HT	.022 - .051	.197 - .472						●	●												
 For Roughing	CNMD 646 HY	.020 - .043	.157 - .472						●	●												
 For Finishing	866 HY	.022 - .059	.157 - .591						●	●												
 For Roughing  For Finishing	CNMD 866 HZ	.022 - .059	.157 - .591						●	●												

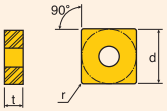
● Marked: Standard Items

TOFORCE™

SNMD HD HT HY HZ

(inch)

Designation	d	t	r
SNMD 646	.750	.250	.094
SNMD 866	1.0	.375	.094
SNMD 1066	1.250	.375	.094



Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated									PVD Coated				Uncoated			
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
For Roughing / For Finishing	SNMD 866 HD	.022 - .059	.157 - .591					●	●													
For Roughing	SNMD 646 HT	.022 - .047	.157 - .354					●	●													
For Finishing	866 HT	.022 - .051	.197 - .472					●	●													
For Roughing	SNMD 646 HY	.020 - .043	.157 - .472					●	●													
For Finishing	866 HT	.022 - .059	.157 - .591					●	●													
For Roughing / For Finishing	SNMD 866 HZ	.022 - .059	.157 - .591					●	●													

● Marked: Standard Items

SNMD 31 HD HT

Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated									PVD Coated				Uncoated			
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
For Heavy / For Finishing	SNMD 1066 HD	.024 - .059	.276 - .984					●	●						●							
For Heavy / For Finishing	SNMD 1066 HT	.020 - .055	.236 - .866					●	●						●							

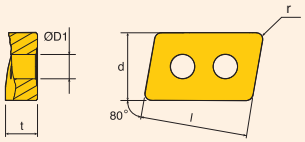
● Marked: Standard Items

Member IMC Group Ingersoll Cutting Tools

LNMM HX

(inch)

Designation	l	d	t	r	ØD1
LNMM 401224R/L-HX	1.575	1.0	.472	.094	.360



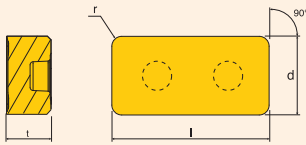
Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated										PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	LNMM 401224R/L-HX	.028 - .059	.236 - 1.260					●	●						●							

● Marked: Standard Items

LNMX HD LNMX HY

(inch)

Designation	l	d	t	r
LNMX 501432 HD	2.0	1.0	.559	.126
LNMX 501432 HY	2.0	1.0	.559	.126



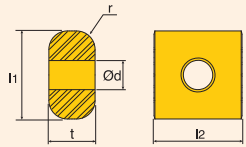
Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated										PVD Coated				Uncoated		
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	LNMX 501432 HD	.028 - .063	.236 - 1.575					●	●						●							
	LNMX 501432 HY	.026 - .059	.197 - 1.575						●			●			●							

● Marked: Standard Items

LNMX TWF TWM TWR

(inch)

Designation	l1	l2	Ød	t	r
LNMX 191940	.750	.750	.250	.394	.157
LNMX 301940	1.181	.750	.250	.472	.157



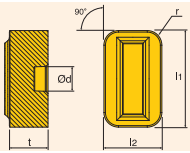
Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated									PVD Coated				Uncoated			
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	LNMX 191940 TWF	.012 - .039	.012 - .197					●	●													
	LNMX 191940 TWM	.018 - .059	.059 - .354					●	●													
	301940 TWM	.020 - .059	.059 - .591					●	●													
	LNMX 301940 TWR	.028 - .071	.079 - .591					●	●													

● Marked: Standard Items

SRR TX

(inch)

Designation	l1	l2	Ød	t	r
SRR-TX	1.250	.750	.311	.50	.189

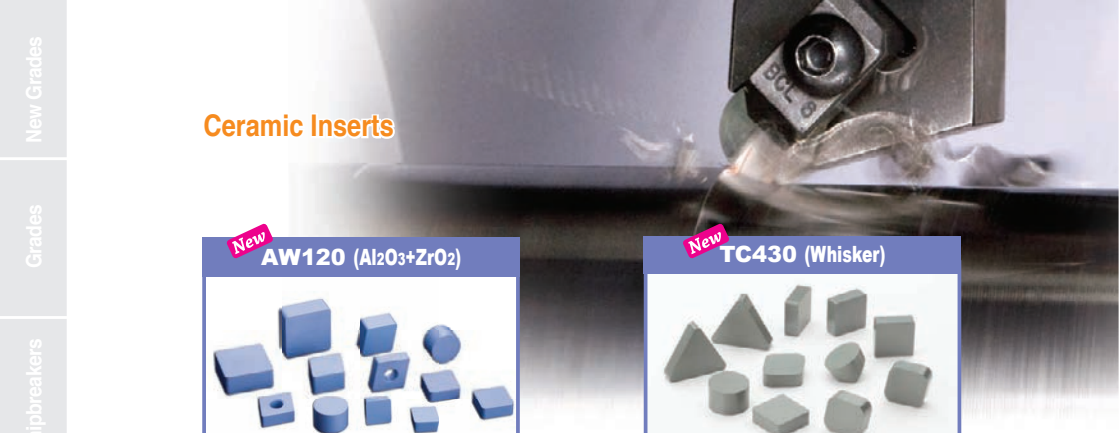


Insert	Designation (ANSI)	Recommended Machining Conditions		Grade																		
				Cermet		CVD Coated									PVD Coated				Uncoated			
		feed (ipr)	ap (Inch)	PV3010	CT3000	TT1300	TT7310	TT8115	TT8125	TT8135	TT9215	TT9225	TT9235	TT5100	TT7100	TT5080	TT8020	TT9020	TT9080	P20	K10	K20
	SRR-TX	.024 - .071	.059 - .787																			

* Insert and holder can be supplied by quotation.


Ceramic Inserts
CBN Inserts
PCD Inserts

Ceramic Inserts



AW120 (Al_2O_3+ZrO_2)

New

TC430 (Whisker)

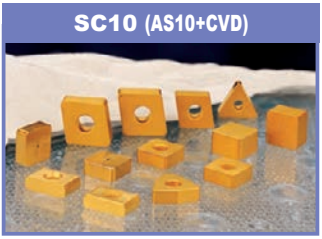
New

AS500 (SiAlON)

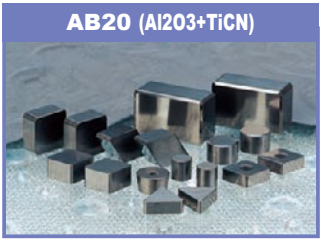
New

AB2010 (AB20+TiN PVD Coated)

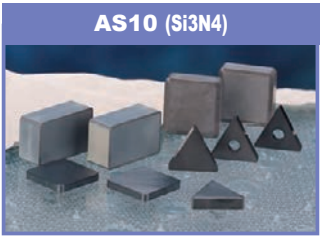
SC10 (AS10+CVD)



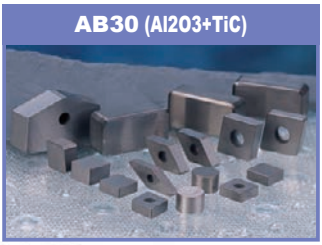
AB20 (Al2O3+TiCN)



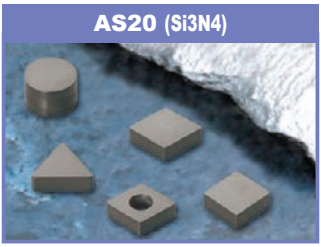
AS10 (Si_3N_4)



AB30 (Al2O3+TiC)



AS20 (Si_3N_4)



Insert	Designation				Grade								
	ANSI		ISO		AW120	AB2010	AB20	AB30	TC430	AS500	SC10	AS10	AS20
	CNGA	431	CNGA	120404		●	●	●					
		432		120408		●	●	●			●	●	
		432 E		120408 E									●
		432 T7		120408 T7						●			
		433		120412		●	●	●			●	●	
		433 E		120412 E									●
		433 T7		120412 T7						●			
		434		120416			●	●			●	●	
		542		160608			●						
		543		160612			●	●				●	
		544		160616			●	●					
		546		160624				●					
		642		190608			●	●					
		643		190612			●	●					
		644		190616				●					
		646		190624				●				●	
	CNG	431	CNGN	120404				●					
		432		120408		●	●	●				●	
		432 T6		120408 T6					●				
		432 E		120408 E									●
		433		120412	●		●	●			●	●	
		433 E		120412 E									●
		433 T6		120412 T6					●				
		434		120416			●					●	
		452		120708		●	●	●					
		452 E		120708 E									●
		452 T6		120708 T6					●				
		453		120712	●			●			●	●	
		453 E		120712 E									●
		453 T6		120712 T6					●				
		454		120716	●			●			●	●	
		454 E		120716 E									●
	CNGX	453 CH	CNGX	120712 CH								●	
		453 T7-CH		120712 T7-CH						●		●	
		454 CH		120716 CH							●	●	
		454 T7-CH		120716 T7-CH						●			
	CNMG	431 CE	CNMG	120404 CE				●					
		432 CE		120408 CE			●	●					
	DNGA	431	DNGA	150404			●	●					
		432		150408		●	●	●					
		433		150412		●	●						
		434		150416			●						
		441		150604		●	●	●					
		442		150608	●	●	●	●					
		443		150612		●	●	●				●	
		444		150616			●	●					

● Marked: Standard Items

Ceramic Inserts

Insert	Designation				Grade								
	ANSI		ISO		AW120	AB2010	AB20	AB30	TC430	AS500	SC10	AS10	AS20
	DNG	432	DNGN	150408			●	●					
		451		150704				●					
		452		150708	●			●					
		453		150712	●								
		454		150716	●		●						
	DNGX	453 CH	DNGX	120712 CH							●	●	
		453 T7-CH		120712 T7-CH						●			
		454 CH		150716 CH							●	●	
	DNMG	442 CE	DNMG	150608 CE				●					
	HNGX	453 CH	HNGX	050712 CH								●	
		453 T7-CH		050712 T7-CH						●			
		454 CH		050716 CH								●	
		454 T7-CH		050716 T7-CH						●			
	RCGX	24 U1	RCGX	060600 U1				●					
		35 T6		090700 T6					●				●
		35 U1		090700 U1			●	●					
		45		120700				●					
		45 T6		120700 T6					●				
		45 U2		120700 U2			●	●					
		57 U2		151000 U2			●	●					
		67 U2		191000 U2			●	●					
		88 U3		251200 U3			●	●					
	RNG	32	RNGN	090300			●	●					
		32 T6		090300 T6					●				
		43		120400		●	●	●					
		43 E		120400 E									●
		43 T6		120400 T6					●				
		45		120700	●	●	●	●					
		45 E		120700 E									●
		45 T6		120700 T6					●				●
		55		150700			●	●					
		65		190700	●		●	●					
		65 T6		190700 T6					●				●
	RPG	43 T6	RPGN	120400 T6					●				
	RPGX	35 T6	RPGX	090700 T6					●				●
		45 T6		120700 T6					●				
	SNGA	431	SNGA	120404	●	●	●	●					
		432		120408		●	●	●				●	
		432 E		120408 E									●
		433		120412		●	●	●			●	●	
		434		120416	●		●				●	●	

● Marked: Standard Items

Insert	Designation				Grade								
	ANSI		ISO		AW120	AB2010	AB20	AB30	TC430	AS500	SC10	AS10	AS20
	SNG	431	SNGN	120404	●	●	●	●					
		432		120408		●	●	●				●	
		432 E		120408 E									●
		432 T6		120408 T6					●				
		433		120412	●	●	●	●		●	●	●	
		433 T6		120412 T6					●				
		433 T7		120412 T7						●			
		434		120416	●	●	●	●			●	●	
		436		120424	●								
		451		120704			●	●					
		452		120708	●	●	●	●			●	●	
		452 T6		120708 T6					●				
		453		120712	●	●	●	●			●	●	
		453 T6		120712 T6				●	●				
		454		120716	●	●	●	●			●	●	
		455		120720	●								
		543		150612			●						
		553		150712	●								
		554		150716	●			●				●	
		654		190716	●			●					
		655		190720	●								
	SNGX	453 CH	SNGX	120712 CH							●	●	
		453 T7-CH		120712 T7-CH						●		●	
		454 CH		120716 CH							●	●	
		454 T7-CH		120716 T7-CH						●		●	
* 	SNGX	453 T7-CHX	SNGX	120712 T7-CHX						●			
		454 T7-CHX		120716 T7-CHX						●			
	SNMG	432 CE	SNMG	120408 CE				●					
	SPG	322	SPGN	090308	●								
		422		120308				●				●	
		423		120312				●					
		433		120412				●			●	●	
	TNGA	321	TNGA	160304				●					
		322		160308				●					
		331		160404		●	●	●					
		332		160408	●	●	●	●			●	●	
		332 E		160408 E									●
		333		160412	●	●	●	●			●	●	
		334		160416			●						
		431		220404			●	●					
		432		220408		●	●	●					
		433		220412			●	●					
		434		220416			●	●					

* Marked: DCL S-4D clamp is applied only to marked insert.

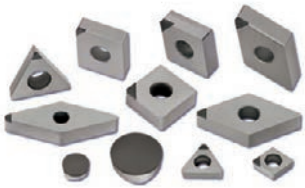
● Marked: Standard Items

Insert	Designation		Grade								
	ANSI	ISO	AW120	AB2010	AB20	AB30	TC430	AS500	SC10	AS10	AS20
	TNG 222	TNGN 110308				●					
	223	110312								●	
	331	160404	●		●	●					
	332	160408	●	●	●	●			●	●	
	332 E	160408 E									●
	333	160412	●		●	●		●	●	●	
	334	160416	●			●					
	335	160420	●								
	351	160704				●					
	352	160708				●					
	353	160712	●			●				●	
	432	220408			●						
	433	220412				●					
	543	270616				●					
	TNMG 332 CE	TNMG 160408 CE				●					
	TPG 220.5	TPGN 110302			●	●					
	221	110304		●	●	●					
	222	110308		●	●	●					
	321	160304	●	●	●	●					
	322	160308	●	●	●	●				●	
	323	160312			●	●					
	431	220404			●						
	432	220408				●					
	433	220412			●	●					
	VNGA 331	VNGA 160404		●	●	●			●		
	332	160408		●	●	●				●	
	334	160412			●	●					
	433	220412				●					
	WNGA 432	WNGA 080408		●	●	●			●	●	
	433	080412		●	●	●			●	●	
	433 T7	080412 T7						●			
	434	080416			●	●			●		
	LNU 6688T	LNU 6688T			●	●					
	T11 - 3219	T11 - 3219			●	●					
	T132 - 32 - R2	T32 - 32 - R2			●					●	

● Marked: Standard Items

New
TB610

New
TB730



TB650

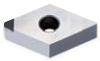
KB90A

New
TB670

CBN Inserts

Insert	Designation				Grade				
	ANSI		ISO		TB610	TB650	TB670	TB730	KB90A
	CCGW	21.50.5 LS2	CCGW	060202 LS2			●	●	
		21.51 LS2		060204 LS2	●		●	●	
		21.52 LS2		060208 LS2	●		●	●	
		32.51 LS2		09T304 LS2	●		●	●	
		32.51 WZ-LS2		09T304 WZ-LS2	●	●	●	●	
		32.52 LS2		09T308 LS2	●		●	●	
		32.52 WZ-LS		09T308 WZ-LS		●			
		32.52 WZ-LS2		09T308 WZ-LS2			●	●	
		431 LS2		120404 LS2				●	
		432 LS2		120408 LS2				●	
	CNGA	431 WZ-LS	CNGA	120404 WZ-LS		●			
		431 WZ-LS2		120404 WZ-LS2	●	●	●		
		431 WZ-LS4		120404 WZ-LS4			●		
		432 WZ-LN		120408 WZ-LN		●			
		432 WZ-LS		120408 WZ-LS		●			
		432 WZ-LS2		120408 WZ-LS2	●	●	●	●	
		432 WZ-LS4		120408 WZ-LS4	●		●		
		433 WZ-LN		120412 WZ-LN		●			
		433 WZ-LS		120412 WZ-LS		●			
		433 WZ-LS2		120412 WZ-LS2		●	●	●	
		433 WZ-LS4		120412 WZ-LS4			●		
	CNMA	431 LN	CNMA	120404 LN	●	●	●		
		431 LN2		120404 LN2				●	
		431 LS		120404 LS		●			
		431 LS2		120404 LS2	●	●	●	●	
		431 LS4		120404 LS4		●	●		
		432 LN		120408 LN	●	●	●	●	
		432 LS		120408 LS		●			
		432 LS2		120408 LS2	●	●	●	●	
		432 LS4		120408 LS4	●	●	●	●	
		433 LN		120412 LN	●	●	●		
		433 LS		120412 LS		●			
		433 LS2		120412 LS2		●	●	●	
		433 LS4		120412 LS4			●	●	
	CNM	322 SD	CNMN	090308 SD					●
		323 SD		090312 SD					●
		324 SD		090316 SD					●
		434 SD		120416 SD					●
	DCGW	21.50.5 LS	DCGW	070202 LS		●			
		21.50.5 LS2		070202 LS2	●		●	●	
		21.51 LS		070204 LS		●			
		21.51 LS2		070204 LS2	●		●	●	
		21.52 LS2		070208 LS2				●	
		32.51 LN		11T304 LN		●			
		32.51 LS		11T304 LS		●			
		32.51 LS2		11T304 LS2	●		●	●	
		32.52 LN		11T308 LN		●			
		32.52 LS		11T308 LS		●			
		32.52 LS2		11T308 LS2	●		●	●	

● Marked: Standard Items

Insert	Designation				Grade				
	ANSI		ISO		TB610	TB650	TB670	TB730	KB90A
	DNMA	431 LN	DNMA	150404 LN	●	●	●		
		431 LS		150404 LS		●			
		431 LS2		150404 LS2	●	●	●	●	
		431 LS4		150404 LS4	●	●	●		
		432 LN		150408 LN	●	●	●		
		432 LS		150408 LS		●			
		432 LS2		150408 LS2	●	●	●	●	
		432 LS4		150408 LS4			●		
		433 LN		150412 LN		●	●		
		433 LS2		150412 LS2			●		
		433 LS4		150412 LS4			●		
		441 LN		150604 LN	●	●	●	●	
		441 LS		150604 LS		●			
		441 LS2		150604 LS2	●	●	●	●	
		442 LN		150608 LN	●	●	●	●	
		442 LS2		150608 LS2	●	●	●	●	
		442 LS4		150608 LS4			●		
		443 LS2		150612 LS2			●		
	RCGX	22 FT	RCGX	060300 FT				●	
		32 FT		090300 FT				●	
		43 FT		120400 FT				●	
	RNM	32 FT	RNMN	090300 FT		●	●	●	
		42 FT		120300 FT				●	
	RNM	32 SD	RNMN	090300 SD					●
		42 SD		120300 SD					●
		43 SD		120400 SD					●
	SCGW	32.51 LS2	SCGW	09T304 LS2				●	
		32.52 LS2		09T308 LS2				●	
	SNMA	431 LN	SNMA	120404 LN		●	●		
		431 LS		120404 LS		●			
		431 LS2		120404 LS2			●	●	
		431 LS4		120404 LS4			●		
		432 LN		120408 LN	●	●	●	●	
		432 LS		120408 LS		●			
		432 LS2		120408 LS2	●		●	●	
		432 LS4		120408 LS4			●		
		432 LS8		120408 LS8			●		
		433 LS		120412 LS		●			
	SNM	322 SD	SNMN	090308 SD					●
		323 SD		090312 SD					●
		324 SD		090316 SD					●
		423 SD		120312 SD					●
		424 SD		120316 SD					●

● Marked: Standard Items

CBN Inserts

Insert	Designation				Grade				
	ANSI		ISO		TB610	TB650	TB670	TB730	KB90A
	TCGW	731 LS3	TCGW	090204 LS3	●			●	
		732 LS3		090208 LS3			●		
		21.51 LS		110204 LS		●			
		21.51 LS3		110204 LS3	●		●	●	
		21.52 LS		110208 LS		●			
		21.52 LS3		110208 LS3			●	●	
		32.51 LS		16T304 LS		●			
		32.51 LS3		16T304 LS3	●		●	●	
		32.52 LS		16T308 LS		●			
		32.52 LS3		16T308 LS	●		●	●	
	TNMA	331 LN	TNMA	160404 LN		●	●		
		331 LS		160404 LS		●			
		331 LS3		160404 LS3	●		●	●	
		331 LS6		160404 LS6		●	●		
		332 LN		160408 LN		●	●		
		332 LS		160408 LS		●			
		332 LS3		160408 LS3	●	●	●	●	
		332 LS6		160408 LS6			●		
		333 LS		160412 LS		●			
		333 LS3		160412 LS3			●	●	
		334 LN		160416 LN		●			
		334 LS		160416 LS		●			
		431 LN		220404 LN		●			
		432 LS		220408 LS		●			
	TNM	222 SD	TNMN	110308 SD					●
	TPG	731 LS3	TPGN	090204 LS3	●				
		220.5 LS3		110302 LS3				●	
		221 LS		110304 LS		●			
		221 LS3		110304 LS3	●		●	●	
		222 LS		110308 LS		●			
		222 LS3		110308 LS3	●		●	●	
		321 LS		160304 LS		●			
		321 LS3		160304 LS3	●		●	●	
		322 LS		160308 LS		●			
		322 LS3		160308 LS3	●		●	●	
		432 LS		220408 LS		●			
	TPGW	080204 LS3	TPGW	080204 LS3			●		
		731 LS3		090204 LS3			●	●	
		732 LS3		090208 LS3			●		
		220.5 LS3		110302 LS3	●			●	
		221 LS		110304 LS		●	●		
		221 LS3		110304 LS3	●			●	
		222 LS3		110308 LS3	●		●	●	
		331 LS3		160404 LS3			●		
		332 LS3		160408 LS3			●		
	VBGW	221 LS2	VBGW	110304 LS2			●		
		222 LS2		110308 LS2			●		
		330.5 LS2		160402 LS2			●		
		331 LN		160404 LN		●	●		
		331 LS		160404 LS		●			
		331 LS2		160404 LS2	●		●	●	
		332 LS		160408 LS		●			
		332 LS2		160408 LS2	●		●	●	

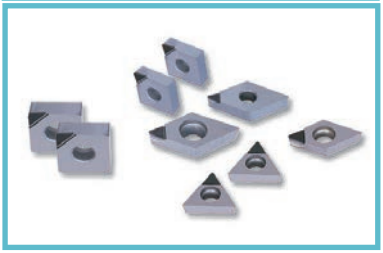
● Marked: Standard Items

Insert	Designation				Grade				
	ANSI		ISO		TB610	TB650	TB670	TB730	KB90A
	VNGA	331 LN	VNGA	160404 LN		●	●		
		331 LS		160404 LS		●			
		331 LS2		160404 LS2	●		●	●	
		332 LN		160408 LN		●	●		
		332 LS		160408 LS		●			
		332 LS2		160408 LS2	●	●	●	●	
		332 LS4		160408 LS4			●		
	WNGA	332 WZ-LS6	WNGA	060408 WZ-LS6			●		
		432 WZ-LS3		080408 WZ-LS3	●	●	●		
		432 WZ-LS6		080408 WZ-LS6			●		
		434 WZ-LS3		080412 WZ-LS3			●		
	WNMA	432 LS3	WNMA	080408 LS3			●		
		432 LS6		080408 LS6			●		

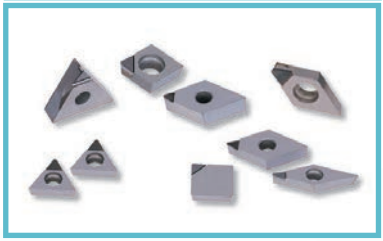
● Marked: Standard Items

PCD Inserts

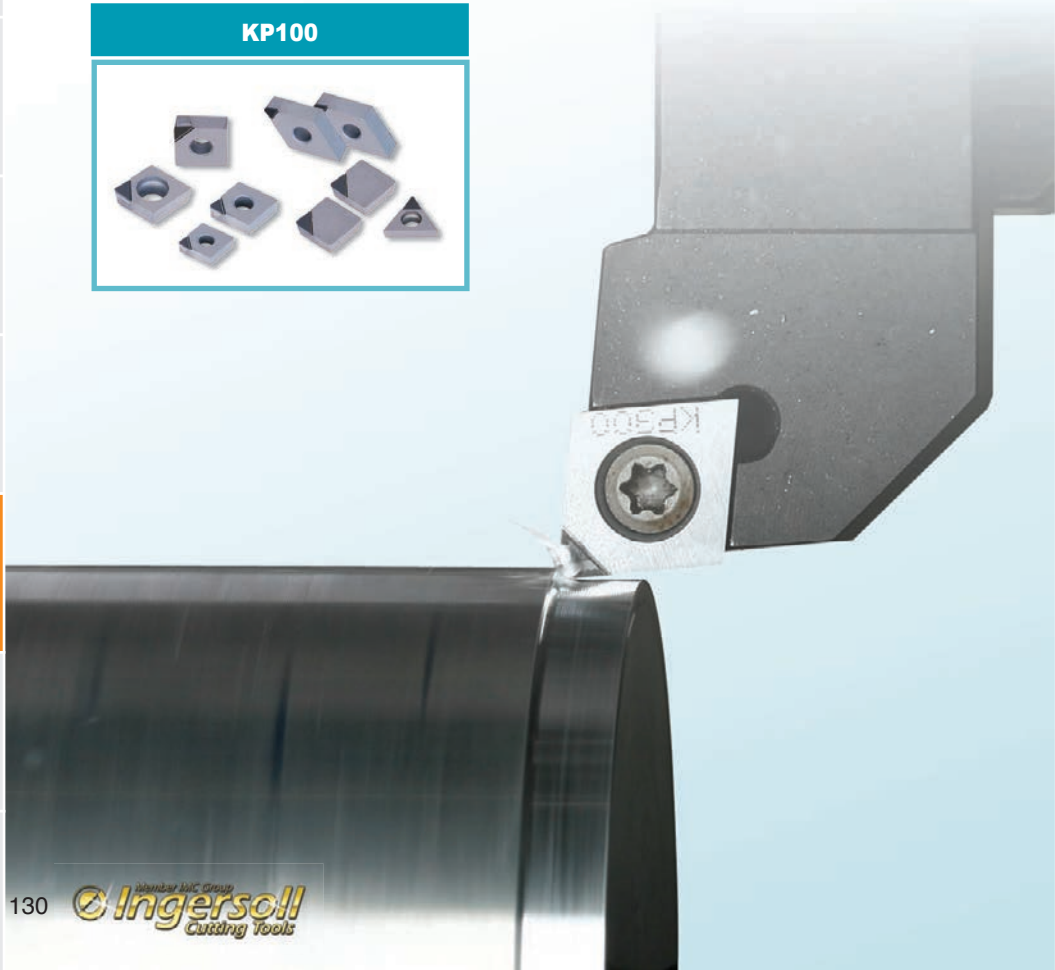
KP500

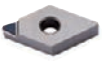


KP300



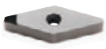
KP100



Insert	Designation				Grade		
	ANSI		ISO		KP100	KP300	KP500
	CCGT	21.51 CB	CCGT	060204 CB		●	
		32.50.5 CB		09T302 CB		●	
		32.51 CB		09T304 CB		●	
		32.52 CB		09T308 CB		●	
		431 CB		120404 CB		●	
		432 CB		120408 CB		●	
	CCGW	21.50.5 LN-7	CCGW	060202 LN-7		●	
		21.51 LN-7		060204 LN-7		●	
		21.52 LN-7		060208 LN-7		●	
		32.51 LN-7		09T304 LN-7		●	
		32.52 LN-7		09T308 LN-7		●	
		431 LN-7		120404 LN-7		●	
		432 LN-7		120408 LN-7		●	
	CNMA	431 LN-10	CNMA	120404 LN-10		●	
		432 LN-10		120408 LN-10		●	●
		434 LN-10		120412 LN-10		●	
	DCGT	21.50.5 CB	DCGT	070202 CB		●	
		21.51 CB		070204 CB		●	
		32.50.5 CB		11T302 CB		●	
		32.51 CB		11T304 CB		●	
		32.52 CB		11T308 CB		●	
	DCGW	21.50.5 LN-7	DCGW	070202 LN-7		●	
		21.51 LN-7		070204 LN-7		●	
		32.50.5 LN-7		11T302 LN-7		●	
		32.51 LN-7		11T304 LN-7		●	
		32.52 LN-7		11T308 LN-7		●	
	DNMA	431 LN-10	DNMA	150404 LN-10		●	
		432 LN-10		150408 LN-10		●	
		433 LN-10		150412 LN-10		●	
		441 LN-10		150604 LN-10		●	
		442 LN-10		150608 LN-10		●	
	SNMA	432 LN-10	SNMA	120408 LN-10		●	●
		433 LN-10		120412 LN-10		●	
	SPG	322 LN-7	SPGN	090308 LN-7		●	
		422 LN-7		120308 LN-7		●	
	TCGT	731 CB	TCGT	090204 CB		●	
		21.51 CB		110204 CB		●	
		32.51 CB		16T304 CB		●	
		32.52 CB		16T308 CB		●	
	TCGW	731 LN-7	TCGW	090204 LN-7		●	
		732 LN-7		090208 LN-7		●	
		21.51 LN-7		110204 LN-7		●	
		21.52 LN-7		110208 LN-7		●	
		32.51 LN-7		16T304 LN-7		●	
		32.52 LN-7		16T308 LN-7		●	
	TNMA	331 LN-10	TNMA	160404 LN-10		●	
		332 LN-10		160408 LN-10		●	

CB: PCD chipbreaker type insert. ● Marked: Standard Items

PCD Inserts

Insert	Designation				Grade		
	ANSI		ISO		KP100	KP300	KP500
	TPG	220.5 LN-7	TPGN	110302 LN-7		●	
		221 LN-7		110304 LN-7		●	
		222 LN-7		110308 LN-7		●	
		320.5 LN-7		160302 LN-7		●	
		321 LN-7		160304 LN-7		●	
		322 LN-7		160308 LN-7		●	
	VBGW	330.5 LN-7	VBGW	160402 LN-7		●	
		331 LN-7		160404 LN-7		●	
		332 LN-7		160408 LN-7		●	
	VCGT	220.5 CB	VCGT	110302 CB		●	
		221 CB		110304 CB		●	
		331 CB		160404 CB		●	
		332 CB		160408 CB		●	
		333 CB		160412 CB		●	
		43.57.5 CB		220530 CB		●	
	VCGW	331 LN-7	VCGW	160404 LN-7		●	
		332 LN-7		160408 LN-7		●	
	VNGA	331 LN-10	VNGA	160404 LN-10		●	
		332 LN-10		160408 LN-10		●	

CB: PCD chipbreaker type insert. ● Marked: Standard Items

Grade Comparison Table

ISO class	Ingersoll	SANDVIK	WALTER	SECO	KENNAMETAL	MMC	SUMITOMO	TUNGALOY	KYOCERA	KORLOY	ISCAR
P	TT8115	GC4205 GC4215	WPP05 WPP10S	TP0500 TP1500	KCP05 KCP10	UE6105 UE6110	AC810P AC1000	T9105 T9115	CA5505 CA5515	NC3010 NC3015	IC8150 IC9150
	TT8125 TT5100	GC4225 GC4025	WPP20S WPP20	TP2500 TP2000	KCP25 KC9125	MC6025 UE6020	AC820P AC2000	T9125	CA5525 CR7025	NC3120 NC3020 CX269	IC8250 IC9250
	TT8135 TT7100	GC4235 GC4035	WPP30S WPP30	TP3500 TP3000	KCP30 KCP40 KC9040	UE6135 UH6400	AC830P AC3000	T9135 T9035	CA5535 CR9025	NC3030 NC500H	IC8350 IC9350
M	TT9215	GC2015	WAM10	TM2000 TP200	KCM15	MC7015 US7020	AC610M EH10Z		CA6515	PC8110 NC9020	IC6015 IC807
	TT9225	GC2025	WAM20	CP500	KCM25	MC7025 US735	AC630M AC304	T6020	CA6525	NC9025	IC6025 IC9300
	TT9235 TT8020	GC2035 GC30	WAM30	TM4000 TP400	KCM35	UH6400 MP7035	AC3000	T6030	PR630	NC5330 PC9030	IC3028
K	TT7005	GC3205	WAK10	TK1001 TK1000	KCK05 KC9315	UC5105	AC405K AC410K	T5105 T5010	CA4505 CA4010	NC6205 NC6105	IC5010 IC4028
	TT7015 TT7310	GC3210	WAK20	TK2001 TK2000	KCK15 KC9325	UC5115	AC415K	T5115 T5020	CA4515 CA4115 CA4120	NC6210 NC6110	IC5005
		GC3215	WAK30		KCK20		AC420K	T5125		NC315K	
S H	TT5080	GCS05F GC1105 GC1115	WSM10	TH1000 TH1500 TS2000 TS2500	KC5510	VP05RT VP10RT	AC510U	AH110	PR1005 PR930	PC8110	IC807 IC907
	TT9080	GC15 GC1125	WSM20 WSM30	CP500	KC5525	VP15TF VP20RT	AC520U	AH120	PR1025 PR1125 PR1225 PR1425	PC5300 PC9530	IC808 IC908

Grade Comparison Table

Cermet Grade

ISO class	Ingersoll	SANDVIK	KENNAMETAL	SUMITOMO	KYOCERA	TUNGALOY	MITSUBISHI	HITACHI	KORLOY	SECO	NTK	DIJET	CERAMTEC	WALTER	CERATIZIT
P01	PV3030 PV3010		KT315	T110A T1000A T1500Z	PV30 TN30 PV7010	GT720 NS710	AP25N NX2525		CC105 CC115 CN1000		T3N	LN10	SC35		TCM407 TCC410
P10	CT3000	CT5005 CT5015 CT525 GC1525	KT5020 KT125 KT150	T1500A T1200A T2000Z	PV7020 PV7025 PV60 TN6010 TN6020 TN60	GT730 GT530 NS520 NS720	MP3025 UP35N	CZ25	CN2000 CC125	TP1030 CMP CM	T15 C30 Q50	CX50 CX75	SC15 SC8015 SC7035 SC40	WCE10	TCM10
P20	CT7000	CT530	KT1120 KT175	T3000Z T130Z	TN100M TC60M PV90	NS730 NS530	VP45N NX99 NX3035	CH550 CH7030 MZ1000 MZ2000	CN20 CN30	TP1020 C15M	N20 Z15 C50 C7X	CX90	SC7015 SC60		
P30				T250A T130A		NS740	NX4545	MZ3000 CH7035			Q50 N40	CX99			
M01	PV3010 PV3030		KT315	T110A	PV30 TN30 PV7010	GT720 NS710	AP25N NX2525		CC105 CC115 CN1000		T3N	LN10	SC35		TCM407 TCC410
M10	CT3000	CT5005 CT5015 CT525 GC1525	KT5020 KT125 KT150	T1500A T1200A T2000Z	PV7020 PV60 TN6010 TN6020 TN60	GT730 GT530 NS520 NS720	MP3025 UP35N	CZ25	CN2000 CC125	TP1030 CMP CM	T15 C30 Q50	CX50 CX75	SC15 SC8015 SC7035 SC40	WCE10	TCM10
M20	CT7000	CT530	KT1120 KT175	T3000Z T130Z	TN100M TC60M PV90	NS730 NS530	VP45N NX99 NX3035	CH550 CH7030 MZ1000 MZ2000	CN20 CN30	TP1020 C15M	N20 Z15 C50 C7X	CX90	SC7015 SC60		
M30				T250A T130A		NS740	NX4545	MZ3000 CH7035			Q50 N40	CX99			
K01	PV3030		KT315	T110A T1000A T1500Z	PV30 PV7005 PV7020 PV60	NS710 GT720 NS720 NS520	AP25N NX2525	CH350	CN1000	CM	T3N Q15	LN10	SC8015		TCM407 TCC410
K10	CT3000	CT5015	KT125	T1200A T2000Z	TN60 TN6020	GT730 NS730 NS530		CH550 MZ1000	CN2000	C15M	T15 Z15 C7Z	CX75	SC7015	WCE10	TCM10
K20				T3000Z				MZ2000							

Ceramic Grade

Application	Composition	ISO Code	Ingersoll	SANDVIK	KENNAMETAL	CERAMTEC	NTK	KYOCERA	SUMITOMO	SSANG-YONG
Cast Iron	Al_2O_3	K01-K10	AW120	CC620		SN60 SN80	HC1 HW2	KA30		SZ200 SZ300
	Al_2O_3+TiC	K05-K15	AB30	CC650	KY1615	SH2 SH4	HC2 HC5 HC6	A65	NB90S NB90M	ST100 SD200 TC100(PVD)
	SiAlON	K10-K20	AS500		KY300 KY1310 KYK10	SL506 SL508 SL606 SL608			SN200K SN2100K	
	Si_3N_4	K15-K25	AS10	CC6090 CC6091	KY1320 KY3500	SL500 SL808	SX1 SX2 SX6	KS500 KS6000 KS6050	NS260	SN26 SN300 SN400 SN500 SN600
	Si_3N_4+CVD	K15-K25	SC10	CC1690	KY3400 KYK25	SL550C SL554C SL654C SL658C SL854C SL858C	SP2 SP9	CS7050	NS260C	
Hardened Steel	Al_2O_3+TiCN	H01-H10	AB20			SH2 SH4	HC2 HC5 HC7			ST300 ST500 ST700
	Al_2O_3+TiCN + PVD	H01-H10	AB2010	CC6050	KY4400		ZC4 ZC7	A66N PT600M	NB100C	TC300
Super Alloy	Al_2O_3+SiCw	S01-S15	TC430	CC670	KY4300		WA1		WX2000	SW500 SW800
	Si_3N_4+TiN	S10-S20	AS20							
	SiAlON	S05-S20		CC6060 CC6065	KY2100 KY1540 KYS30 KYS25		SX5 SX7 SX9	KS6040		SN800 SN900

CBN Grade

Application		Ingersoll	TUNGALOY	SANDVIK	KENNAMETAL	CERAMTEC	SECO	SUMITOMO
Hardened Steel	Continuous	TB610	BX310	CB7015	KB1610 KB5610 KB9610	WBN575	CBN10 CBN050C	BNX10 BNC100
	General	TB650	BX530 BX330 BXM20	CB7025	KB1625 KB5625	WBN570 WBN560	CBN100 CBN160C	BN250 BNX20 BNC160 BNC200
		TB670	BX360 BX380 BXC50		KB1630 KB5630	WBN555	CBN150 CBN100P	BN350 BNX25 BN500 BNC300
Cast Iron	General	TB730(KB90)	BX930 BX850 BX950 BX470 BX480	CB7050	KB1345 KB9640	WBN735 WBN750	CBN200 CBN400C	BN100 BN700
	Solid CBN	KB90A	BX90S BXC90			WBN100 WBN100C	CBN300 CBN350	BNS800

PCD Grade

Grade	Ingersoll	TUNGALOY	SANDVIK	KENNAMETAL	SECO	SUMITOMO	NTK	KYOCERA
Fine	KP100	DX110 DX120		KD1415	PCD05	DA2200 DA1000		KPD001 KPD002
Medium	KP300/TD810	DX140	CD10	KD1410	PD20	DA150	PD1	KPD010
Coarse	KP500	DX160 DX180		KD100	PCD20 PCD20	DA90		KPD025

Comparison of Chipbreaker

Description			Ingersoll	SANDVIK	KENNAMETAL	SECO	WALTER	VALENITE	MITSUBISHI	SUMITOMO	KYOCERA	TUNGALOY	KORLOY	ISCAR
Negative Insert	For Steel	Double sided	WS	WF, WL	FW	W-MF2	NF	W3	SW	LUW, SEW	WP	AFW	LW	
			WT	WMX,WM	MW	W-M3	NM	W6	MW	GUW	WQ	ASW	VW,HW	WG
			FA		FF FS	FF1		F2	FH	FL,FA	GP, DP, XF XP	TF	HU	SF
			FG	QF	FP FN	MF2	NF3 FP5 NFT		SH	SU SE	HQ	ZF ZM,TS, NS,NM TSF	VG,HF,GF VF VQ	NF
			FC	PF, LC XF			NS6		FY,SA	LU	CJ CQ		VL, VB, HC	
			VF	K		95			ES	GX,HM		S		
			ML	GP-	GP-K,MS- MS GP		G-NMT, NS4 NS5,G1		FJ,SY MJ	UP	XQ A3, AH XS	CB,17	HA VP2	12 PP
			MP	XM QM	P	MF3	NM4	M2					HS,GS, VP3	TF VL
			MC	SM	MN	MR3	MP3 NM4				GS	AS	HC	
			PC	PM XMR		M3	NM6 MP5		MP, MV	GE,GU	PS	TM	VM	
			MT		MP RP		NS8	M3	MA	UX,UG	HS CS		HM,GM	GN
			MG-		UN	M4	MG-		MG-	UZ	MG- C	38 DM,MG- 33,37	B20,B25	MG-
			RT	PR HM	UM RN MG-	M5 MR7	NM5,NM7 NRT, RP5 NM6,NM9	R3	MH,GJ GH HAS,HDS	ME MU, MX	GT,PT PH,HT	TH	HR, GR	NR
		Single sided	RX	PR	RM		NRF				PX			
			RH	QR MR	RP	R6,RR9 R5,R4,37 RR6	NR6 NR5,NR8 NR7	R6	HZ HA HH	MP HG HP	HX	TRS 57	GH	RP NM
			HT, HD	HR, 31	RH	R8,56,57 R7	NRR		HC5 HX,HBS	HF HU		65 TU	VT,HH	
			HY, HZ						HV,HDS, HXD	HW			VH,B40	
	Stainless Steel	Double sided	EA,SF	MF	FP	MF1	NF4	F5	FS	SU	MQ,GU		HA	
			EM	MM	MU1, MS1 UP	MF4	NM4		MS	EX	MU MS	SS	VP3 HS	
			ET	MR MM-MR	RP	MR6, MF5 MM-RR6	NR4	M5		GU	HU	SM	GS	TNM
			SU	SF, SGF MX-SM, 23, SM SR, SMR	FH, FX MS, MH, MX							HMM, SA		
	Cast Iron	Double sided	MT	KF,KM	FN	M5			MA	UZ	MG-	CF CM		
			MG-		RP		NM5		MG-		C		B25	
			RT	KR	UN	MR7			GH	GZ	ZS, GC	CH	GR	
Positive Insert	for Steel		WT	WM	MW	W-F2	PF		MW					WG
			FA	PF,UF	UF,11,GM	FF1	PF4 PF5		FV	LU FP	XP GK, GP, DP	01,PF,PSF	HFP	38, PF
			SA						SMG	FC	CF, GF GQ GR	JS		
			FG	UM XF	FP LF	F1	PS4 PS5	PM3 PM4	SQ,SV	FK SU SC,SK	XQ HQ		VF HMP,C05	SM 16, GT-
			PC	PM	MP		PF2					PSS PS		
			MT	XM PR,UR XR	MF	F2	PM5 E47, MT-	PM5	MQ,MV MT- G	SF,MU	MT-	PM	C25	14, 17 19, MT-
			PMR-	PMR-	PMR-		PMR-		PMR-	UJ	GP,HQ G,PMR-	23		
	for Aluminum		FL	AL	HP	AL	PM2	IL	AZ	AG	AH	AL	AR	AF, AS

Material Properties

Recommeded cutting condition-According to DIN / ISO 513 and VDI 3323 Standard

ISO	Material		Condition	Tensile Strength [N/mm²]	Kc(1) [N/mm²]	mc(2)	Hardness (HB)	Material Group
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C	Annealed	420	1350	0.21	125	1
		>= 0.25 %C	Annealed	650	1500	0.22	190	2
		< 0.55 %C	Quenched and tempered	850	1675	0.24	250	3
		>= 0.55 %C	Annealed	750	1700	0.24	220	4
			Quenched and tempered	1000	1900	0.24	300	5
	Low alloy steel and cast steel (less than 5% all elements)		Annealed	600	1775	0.24	200	6
			Quenched and tempered	930	1675	0.24	275	7
			Quenched and tempered	1000	1725	0.24	300	8
			Quenched and tempered	1200	1800	0.24	350	9
	High alloy steel, cast steel, and tool steel		Annealed	680	2450	0.23	200	10
			Quenched and tempered	1100	2500	0.23	325	11
M	Stainless steel and cast steel		Ferritic/martensitic	680	1875	0.21	200	12
			Martensitic	820	1875	0.21	240	13
			Austenitic	600	2150	0.20	180	14
K	Grey cast iron (GG)		Ferritic	-	1150	0.20	180	15
			Pearlitic	-	1350	0.28	260	16
	Cast iron nodular (GGG)		Ferritic	-	1225	0.25	160	17
			Pearlitic	-	1350	0.28	250	18
	Malleable cast iron		Ferritic	-	1225	0.25	130	19
			Pearlitic	-	1420	0.3	230	20
N	Aluminum-wrought alloy		Not curable	-	700	0.25	60	21
			Cured	-	800	0.25	100	22
	Aluminum-cast, alloyed	< = 12% Si	Not curable	-	700	0.25	75	23
			Cured	-	700	0.25	90	24
		> 12% Si	High temperature	-	750	0.25	130	25
	Copper alloys	> 1% Pb	Free cutting	-	700	0.27	110	26
			Brass	-	700	0.27	90	27
			Electrolitic copper	-	700	0.27	100	28
	No-metallic		Duroplastics, fiber plastics	-			-	29
			Hard rubber	-			-	30
S	High temp, alloys	Fe based	Annealed	-	2600	0.24	200	31
			Cured	-	3100	0.24	280	32
		Ni or Co based	Annealed	-	3300	0.24	250	33
			Cured	-	3300	0.24	350	34
			Cast	-	3300	0.24	320	35
	Titanium and Ti alloys			RM 400	1700	0.23	-	36
			Alpha+beta alloys cured	RM 1050	2110	0.22	-	37
H	Hardened steel		Hardened	-	4600		55 HRc	38
			Hardened	-	4700		60 HRc	39
	Chilled cast iron		Cast	-	4600		400	40
	Cast iron nodular(GGG)		Hardened	-	4500		55 HRc	41

Steel **Stainess Steel** **Cast Iron** **Nonferrous** **High Temp. Alloys** **Hardened Steel**

(1)Specific cutting force for 1 mm² chip section.

(2)Chip thickness factor.

Hardness Conversion Table

VICKERS 50kg HV	BRINELL HB10mm BALL LOAD 3000kgf STANDARD BALL	BRINELL HB10mm BALL LOAD 3000kgf TUNGSTEN CARBIDE BALL	ROCKWELL A SCALE 60kgf Diamond brale HRA	ROCKWELL B SCALE 100kgf 1/16in BALL HRB	ROCKWELL C SCALE 150kgf Diamond brale HRC	ROCKWELL D SCALE 100kgf Diamond brale HRD	SHORE'S HS	TENSILE STRENGTH N/mm² (kgf/mm²)
1900			93.1		80.5			
1800			92.6		79.2			
1700			91.9		77.9			
1600			91.3		76.6			
1500			90.5		75.3			
1450			90.1		74.6			
1400			89.6		74.0			
1350			89.1		73.4			
1300			88.7		72.7			
1250			88.3		72.1			
1200			87.9		71.5			
1150			87.5		70.9			
1100			87.1		70.3			
1050			86.6		69.6			
1000			86.2		68.9			
940			85.6		68.0	76.9	97	
920			85.3		67.5	76.5	96	
900			85.0		67.0	76.1	95	
880		(767)	84.7		66.4	75.7	93	
860		(757)	84.4		65.9	75.3	92	
840		(745)	84.1		65.3	74.8	91	
820		(733)	83.8		64.7	74.3	90	
800		(722)	83.4		64.0	74.8	88	
780		(710)	83.0		63.3	73.3	87	
760		(698)	82.6		62.5	72.6	86	
740		(684)	82.2		61.8	72.1	84	
720		(670)	81.8		61.0	71.5	83	
700		(656)	81.3		60.1	70.8	81	
690		(647)	81.1		59.7	70.5		
680		(638)	80.8		59.2	70.1	80	
670		630	80.6		58.8	69.8		
660		620	80.3		58.3	69.4	79	
650		611	80.0		57.8	69.0		
640		601	79.8		57.3	68.7	77	2205(210)
630		591	79.5		56.8	68.3		2020(206)
620		582	79.2		56.3	67.9	75	1985(202)
610		573	78.9		55.7	67.5		1950(199)
600		564	78.6		55.2	67.0	74	1905(194)
590		554	78.4		54.7	66.7		1860(190)
580		515	78.0		54.1	66.2	72	1825(186)
570		535	77.8		53.6	65.8		1795(183)
560		525	77.4		53.0	65.4	71	1750(179)
550	(505)	517	77.0		52.3	64.8		1750(174)
540	(496)	507	76.7		51.7	64.4	69	1660(169)
530	(488)	497	76.4		51.1	66.2		1620(165)
520	(480)	488	76.1		50.5	63.5	67	1570(160)
510	(473)	479	75.7		49.8	62.9		1530(156)
500	(465)	471	75.3		49.1	62.2	66	1459(153)
490	(456)	460	74.9		48.4	61.6		1460(149)
480	488	452	74.5		47.7	61.3	64	1410(144)

VICKERS 50kg HV	BRINELL HB10mm BALL LOAD 3000kgf STANDARD BALL	BRINELL HB10mm BALL LOAD 3000kgf TUNGSTEN CARBIDE BALL	ROCKWELL A SCALE 60kgf Diamond brale HRA	ROCKWELL B SCALE 100kgf 1/16in BALL HRB	ROCKWELL C SCALE 150kgf Diamond brale HRC	ROCKWELL D SCALE 100kgf Diamond brale HRD	SHORE'S HS	TENSILE STRENGTH N/mm² (kgf/mm²)
470	441	442	74.1		46.9	60.7		1570(160)
460	433	433	73.6		46.1	60.1	62	1530(156)
450	425	425	73.3		45.3	59.4		1459(153)
440	415	415	72.8		44.5	58.8	59	1460(149)
430	405	405	72.3		43.6	58.2		1410(144)
420	397	397	71.8		42.7	57.5	57	1370(140)
410	388	388	71.4		41.8	56.8		1330(136)
400	379	379	70.8		40.8	56.0	55	1290(131)
390	369	369	70.3		39.8	55.2		1240(127)
380	360	360	69.8	(110.0)	38.8	54.4	52	1250(123)
370	350	350	69.2		37.7	53.6		1170(120)
360	341	341	68.7	(109.0)	36.6	52.8	50	1130(115)
350	331	331	68.1		35.5	51.9		1095(112)
340	322	322	67.6	(108.0)	34.4	51.1	47	1070(109)
330	313	313	67.0		33.3	50.2		1035(105)
320	303	303	66.4	(107.0)	32.2	49.4	45	1005(103)
310	294	294	65.8		31.0	48.4		980(100)
300	284	284	65.2	(105.5)	29.8	47.5	42	950(97)
295	280	280	64.8		29.2	47.1		935(96)
290	275	275	64.5	(104.5)	28.5	46.5	41	915(94)
285	270	270	64.2		27.8	46.0		905(92)
280	265	265	63.8	(103.5)	27.1	45.3	40	890(91)
275	261	261	63.5		26.4	44.9		875(89)
270	256	256	63.1	(102.0)	25.6	44.3	38	855(87)
265	252	252	62.7		24.8	43.7		840(86)
260	247	247	62.4	(101.0)	24.0	43.1	37	825(84)
255	243	243	62.0		23.1	42.2		805(82)
250	238	238	61.6	99.5	22.2	41.7	36	795(81)
245	233	233	61.2		21.3	41.1		780(79)
240	228	228	60.7	98.1	20.3	40.3	34	765(78)
230	219	219		96.7	(18.0)		33	730(75)
220	209	209		95.0	(15.7)		32	695(71)
210	200	200		93.4	(13.4)		30	670(68)
200	190	190		91.5	(11.0)		29	635(65)
190	181	181		89.5	(8.5)		28	605(62)
180	171	171		87.1	(6.0)		26	580(59)
170	162	162		85.0	(3.0)		25	545(56)
160	152	152		81.7	(0.0)		24	515(53)
150	143	143		78.7			22	490(50)
140	133	133		75.0			21	455(45)
130	124	124		71.2			20	425(44)
127	121			69.8			19	(42)
122	116			67.6			18	(41)
117	111			65.7			15	(39)

• Note: Gothic figures come from ASTM E 140 table(Calculated by SAE-ASM-ASTM together)

Material Conversion Table

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
1	A 366 (1012) 1008	0.0030	C10	040 A 10 045 M 10 1449 10 CS	AF 34 C 10 XC 10		C 10 1 C 10	F.1511 F.151A	S 10C	SM 10C	10
1		1.0028	Ust 34-2 (S250G1T)		A 34-2		Fe 330,Fe 330 B FU		SS 330	SS 330	
1		1.0034	RSt 34-2 (S250G2T)	1449 34/20 HR, HS,CR,CS	A 34-2 NE		Fe 330 B FU				St2sp
1		1.0035	St185 (Fe 310-0) St 33	Fe 310-0 1449 15 HR,HS	A 33	1300	Fe 320	Fe 310-0			St0
1	A 570 Gr. 33,36	1.0036	S235JRG1 (Fe 360 B) Ust 37-2	Fe 360 B 4360-40 B		1311 1312	FE37BFU	AE 235 B Fe 360 B			16D, 18Kp St3Kp
1		1.0037	S235JR (Fe 360 B) St 37-2	Fe 360 B 4360-40 B	E 24-2	1311	Fe 360 B 1449 37/23 HR	AE 235 B Fe 360 B	STKM 12A;C	STKM 12A;C	
1	1115	1.0038	GS-CK16	030A04 1A		1325	Fe 330,Fe 330 B FU		SS 330	SS 330	
1	A 570 Gr. 40	1.0044	S275JR (Fe 430 B) St44-2	Fe 430 B FN 1449 43/25 HR, HS 4360-43 B	E 28-2	1412	Fe 430 B Fe 430 B FN	AE 275 B Fe 430 B FN	SM 400 A;B;C	SM 400 A;B;C	St4ps; sp
1		1.0045	S355JR	4360-50 B	E 36-2	2172	Fe 510 B	AE 355 B			
1	A 570 Gr.50 A 572 Gr.50	1.0050	E295 (Fe 490-2) St 50-2	Fe 490-2 FN 4360-50 B	A 50-2	1550 2172	Fe 490	a 490-2 Fe 490-2 FN	SS 490	SS 490	ST5ps; sp
1	A 572 Gr. 65	1.0060	E335 (Fe 590-2) St 60-2	Fe 60-2 4360-55 E; 55 C	A 60-2	1650	Fe 60-2 Fe 590	A 590-2 Fe 590-2 FN	SM 570	SM 570	St6ps; sp
1		1.0060	St 60-2				Fe 60-2				
1		1.0070	E360 (Fe 690-2) St 70-2	Fe 690-2 FN	A 70-2	1655	Fe 70-2 Fe 690	A 690-2 Fe 690-2 FN			
1		1.0112	P235S	1501-164-360B LT20	A37AP		Fe 360 C	AE 235 C			
1		1.0114	S235JU;St 37-3 U	4360-40C	E 24-3		Fe 360 C	AE 235 C			
1	A 284 Gr.D A 573 Gr.58 A 570 Gr 36;C A 611 Gr. C	1.0116	S235J2G3 (Fe 360 D 1) St 37-3	Fe 360 D1 FF 1449 37/23 CR 4360-40 D	E 24-3 E 24-4	1312 1313	Fe 360 D1 FF Fe 360 C FN Fe 360 D FF Fe 37-2	AE 235 D Fe 360 D1 FF			St3kp; ps; sp 16D
1		1.0130	P265S	1501-164-400B LT 20	A 42 AP			SPH 265			
1		1.0143	S275J0; St 44-3 U	4360-43C	E 28-3	1414-01	Fe 430 D	AE 275 D			
1	A 573 Gr. 70 A 611 Gr.D	1.0144	S275J2G3 (Fe 430 D 1) St 44-3	Fe 430 D1 FF 4360-43 C; 43 D	E 28-3 E 28-4	1411, 1412 1414	Fe 430 B, Fe 430 C (FN) Fe 430 D (FF)	AE 275 D Fe 430 D1 FF	SM 400 A;B;C	SM 400 A;B;C	St4kp> ps; sp
1		1.0149	S275JOH; RoSt 44-2	4360-43C		1412-04	Fe 430 C	Fe 430 C			
1		1.0226	DX51D; St 02 Z	Z2	GC	1151 10	FeP 02 G	FeP 02 G			
1	M 1010	1.0301	C10	040 A 10 045 M 10 1449 10 CS	AF 34 C 10 XC 10		C 10 1 C 10	F.1511 F.151.A	S 10C	SM 10C	10
1	A 621 (1008)	1.0330	DC 01 St 2; St 12	1449 4 CR 1449 3 CS	TE	1142	FeP 00 FeP 01	AP 11	SPHD	SPHD	15kp
1	A 619 (1008)	1.0333	Ust 3 (DC03G1) Ust 13	1449 2 CR;3 CR	E		FeP 02	AP 02	SPCD	SPCD	
1	A 621 (1008)	1.0334	UStW 23 (DD12G1)		SC		FeP 12	AP 12	SPHE	SPHE	10kp
1	A 622 (1008)	1.0335	DD13; StW 24	1449 1 HR	3C		FeP 13	AP 13	SPHE	SPHE	08kp
1	A 620 (1008)	1.0338	DC04 St4; St 14	1449 1 CR;2 CR	ES	1147	FeP 04	AP 04	SPCE	SPCE	08jU; JUA
1	A 516 Gr. 65; 55 A 515 Gr. 65;55 A 414 Gr. C A 442 Gr.55	1.0345	P235GH HI	1501 Gr. 141-360 1501 Gr. 161-360; 151-360 1501 Gr. 161-400; 154-360 1501 Gr. 164-360; 161-360	A 37 CP;AP	1331 1330	FeE235, Fe 360 1 KW;KG Fe 360 2 KW;KG	A 37 RC I RA II	SGV 410, SGV 450, SGV 48, SPV 450;SPV 480	SGV 410, SGV 450, SGV 480, SPPV 450;SPPV 480	
1	(M) 1020 M 1023	1.0402	C22	055 M 15, 070 M 20 2C/2D 1499 22 HS, CS	AF 42 C 20; XC 25;1 C 22	1450	C 20 C 21, C 25	1 C 22 F.112	S20C	SM 20C	20
1	1020	1.0402	C22	050A20 2C/2D	CC20	1450	C20, C21	F.112	S22C	SM 22C	20
1	1020;1023	1.0402	C22	055 M 15, 070 M 20 2C	AF 42 C 20; XC 25;1 C 22	1450	C 20; C 21;C 25	1 C 22F.112	S 20 C;S 22 C	SM 20 C;SM 22C	
1		1.0425	P265GH H II	1501 Gr. 161-400;151-400 1501 Gr. 164-360; 161-400 1501 Gr. 164-400;154-400	A 42 CP; AP	1431 1430 1432	Fe 410 1 KW; KG; KT Fe 410 2 KW; KG	A 42 RC I A 42 RC II	SPV 315; SPV 355 SG 295; SGV 410 SGV 450; SGV 480	SPPV 315; SPPV 355 SG 295; SGV 410 SGV 450; SGV 480	16K 20K
1	A27 65-35	1.0443	GS-45	A1	E 23-45 M	1305					
1		1.0539	S355NH;StE 335		TSE 355-4	2134-04	Fe 510 B	Fe 355 KGN			
1		1.0545	S355N; StE 355	4360-50E	E 355 R	2334-01	FeE 355 KG	AE 355 KG			
1		1.0546	S355NL;TStE 355	4360-50EE	E 355 FP	2135-01	FeE 355 KT	AE 355 KT			
1		1.0547	S355JOH	4360-50C	TSE 355-3	2172-04	Fe 510 C	Fe 510 C			
1		1.0549	S355 NLH;TStE 355			2135	Fe 510 D	FeE 355 KTM			
1		1.0553	S355JO;St 52-3U	4360-50C	E 36-3		Fe 510 C				

Material Conversion Table

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
1	A 633 Gr.C A 588	1.0562	P355N StE 355	1501 Gr.225-490A LT 20	FeE 355 KG N E 355 R/FP; A 510 AP	2106	FeE 355 KG;KW	AEE 355 KG;DD	SM 490 A;B;C; YA;YB	SM 490 A;B;C; YA;YB	15GF
1		1.0565	P355NH; WStE 355	1501-225-490B LT 20	A 510 AP	2106	FeE 355-2				
1		1.0566	P355NL1; TStE 355	1501-225-490A LT 50	A 510 FP	2107-01	FeE 355-3				
1	1	1.0570	S355J2G3 St 52-3	Fe 510 D1 FF 1449 50/35 HR>HS 4360-50 D	E 36-3 E 36-4	2132, 2133 2134, 2174	17GS 17G1S	AE 355 D Fe 510, D1 FF	SM 490 A;B;C; YA;YB	SM 490 A;B;C; YA;YB	17GS 17G1S
1	1213	1.0715	9 SMn 28 (1SMn30)	230 M 07	S 250	1912	CF SMn 28	F.2111 - 11 SMn 28	SUM 22	SUM 22	
1	1213	1.0715	9 SMn 28	230 M 07	S 250	1912	CF 9 SMn 28	11 SMn 28	SUM 22	SUM 22	
1	12 L 13	1.0718	9 SMnPb 28 (11SMnPb30)		S 250 Pb	1914	CF 9 SMnPb 28	F.2112-11 SMnPb 28	SUM 22 L SUM 23 L, SUM 24 L	SUM 22 L SUM 23 L, SUM 24 L	
1	1108 1109	1.0721	10 S 20	(210 M 15)	10S20 10F 2		CF 10 S 20	F. 2121 - 10 S 20			
1	11 L 08	1.0722	10 SPb 20		10PbF 2		CF 10 SPb 20	F.2122-10 SPb 20			
1	11 L 08	1.0722	10 SPb 20		10PbF 2		CF 10 SPb 20	10 SPb 20			
1	1215	1.0736	9 SMn 36 11SMn37)		S 300		CF 9 Mn 36	F.2113 - 12 SMn 35	SUM25	SUM25	
1	12 L 14	1.0737	9 SMnPb 36 (11SMnPb37)								
1		1.0972	S315MC; QStE 300 TM	1501-40F30	E 315 D						
1		1.0976	S355MC; QStE 360 TM	1501-43F35	E 355 D	2642	FeE 355TM				
1		1.0982	S460MC; QStE 460 TM	1501-50F45							
1		1.0984	S500MC; QStE 500 TM		E 490 D	2662	FeE 490 TM				
1		1.0986	S500MC; QStE 500 TM	1501 - 60F55	E 560 D		FeE 560 TM				
1	1010	1.1121	CK 10 (C10E)	040 A 10	XC 10	1265	C 10, 2 C 10 2 C 15	F-1510-C 10 K	S 9 CK S 10 C	S 9 CK S 10 C	08;10
1		1.1121	St 37-1	4360 40 A		1300					
1	1015	1.1141	CK 15 (C15E)	040 A 15 32C 080 M 15	XC 12 XC 15 XC 18	1370	C 15 C 16	F.1110-C 15 F.1511-C 16 K	S 15 S 15 CK	SM 15C SM 15CK	15
1	1020 1023	1.1151	C22E CK 22	055 M 15 (070 M 20)	2 C 22 XC 18 XC 25	1450	C 20 C 25	F.1120-C 25 K	S 20 C, S 20 CK S 22 C	SM 20 C, SM20 CK SM22 C	20
1	D 3	1.2080	X 210 Cr 12	BD 3	Z 200 C 12	2642					
1	A36		St 44-2	4360 43 A	NFA 35-501 E 28	1411					
1			StE 320-3Z	1 501 160		1421					
1	A572-60	1.8900	StE 380	4360 55 E		2145	FeE390KG		S 25C	SM 25C	
2	(M) 1025	1.0406	C 25	070 M 26	1 C 25		C 25 1 C 25				
2		1.0416	GS-38		20-400 M	1306					
2	A 537 Cl.1 A 414 Gr. G A 612	1.0473	P355GH	19 Mn 6	A 52 CP	2101 2102	Fe E 355-2	A 52 RC I RA II	SGV 410 SGV 450 SGV 480	SGV 410 SGV 450 SGV 480	
2	1035	1.0501	C 35	080 A 32, 080 A 35 080 M 36, 1449 40 CS	1 C 35 AF 55 C 35 XC 38	1572 1550	C 35 1 C 35	F.113	S35C	SM35C	35
2	1045	1.0503	CF 45 (C45G)	060 A 47 080 M 46	XC 42 H 1 TS	1672	C 43 C 46		S 45 C	SM 45 C	45
2	1040	1.0511	C 40	080 M 40	1 C 40 AF 60 C 40		C 40	1 C 40	S 40 C	SM 40 C	
2		1.0540	C 50			1674	C 50	1 C 50			
2	A27 70-36	1.0551	GS-52	A2	280-480 M	1505					
2	A148 80-40	1.0553	GS-60	A3	320-560 M	1606					
2	A738	1.0577	S355J2G4 (Fe 510 D 2)	Fe 510 D2 FF 1501 Gr.224-460 1501 Gr. 224-490	A 52 FP	2107		A 52 RB II AE 355 D			
2	1140	1.0726	35 S 20	212 M 36 8M	35MF 6	1957		F.210.G			
2	1146	1.0727	45 S 20 (46S20)		45 MF 4	1973					
2	1035 1041	1.1157	40Mn4	150 M 36 15	35 M 5 40 M 5				S 09CK	SMn 433	
2	1025	1.1158	C25E CK 25	(070 M 25)	2 C 25 XC 25	C 25	F.1120 - C 25 K	S 25 C S 28 C	S 25 C	SM 25 C	
2	1536	1.1166	34Mn5				TO.B	SMn 433 H			
2	1330	1.1170	28Mn6	(150 M 28), (150 M 18)	20 M 5, 28 Mn 6	1421	C 28 Mn	28 Mn 6	SCMn 1	SCMn 1	30G
2	1330	1.1170	28Mn6	150 M 5	20 M 5	2145					
2	1330	1.1170	28Mn6	14A	20 M 5		C 28 Mn		SCMn 1	SCMn 1	
2		1.1178	C30E; CK 30	080M30	XC 32		C 30	2 C 30			

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No.	DIN	BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
2	1035	1.1180	C35R Cm 35	080 A 35	3 C 35 XC 32	1572		F.1130-C 35 K-1			
2	1035 1038	1.1181	C35E CK 35	080 A 35 (080 M 36)	2 C 35, XC 32 XC 38 H 1	1550 1572	C35	F.1130-C 35 K	S 35 C	SM 35 C	35
2	1035	1.1181	C35E CK 35	080 A 35 (080 M 36)		1572	C36		S 35 C	SM 35 C	
2	1042	1.1191	GS- Ck 45	080 A 46	XC 45	1660	C45	F-1140			
2	1049 1050	1.1206	C50E CK 50	080 M 50	2 C 50 XC 48 H 1; XC 50 H 1	1674	C 50				50
2	1050 1055	1.1213	Cf 53 (C53G)	070 M 55	XC 48 H TS	1674	C 53		S 50 C	SM 50 C	50
2	4520	1.5423	22Mo4	1503-245-420			16 Mo 5 KG; KW	F.2602- 16 Mo 5	SB 450 M	SB 450 M	SB 480 M
3		1.0050	St50-2				FE50				
3	A 516 Gr.70 A 515 Gr. 70 A 414 Gr.F; G	1.0481	P295GH 17 Mn 4	1501 Gr. 224	a 48 Cp;AP		Fe 510 KG;KT;KW Fe 510-2 KG;KT;KW FeE 295	A 47 RC I RA II	SG 365, SGV 410 SGV 450 SGV 480	SG 365, SGV 410 SGV 450 SGV 480	14G2
3	1043	1.0503	C35	060 A 47 080 M 46 1449 50 HS, CS	1 C 45 AF 65 C 45	1672 1650	C 45 1 C 45	F.114	S 45 C	SM 45 C	45
3	1074	1.0614	C 76 D; D 75-2		XC 75						
3	1086	1.0616	C 86 D; D 85-2		XC 80	C 85					
3	1095	1.0618	C 92 D;D 95-2		XC 90						
3	1036 1330	1.1165	30Mn5	120 M 36 (150 M 28)	35 M 5			F.8211-30 Mn 5 f.8311-AM 30 Mn 5	SMn 433 H SCMn 2	SMn 433 H SCMn 2	27ChGSNMDTL 30GSL
3	1335	1.1167	30Mn5	150 M 36	40 M 5	2120		F. 1203-36 Mn 6 F. 8212-36 Mn 5	SMn 438 (H) SCMn 3	SMn 438 (H) SCMn 3	35G2 35GL
3	1040	1.1186	C40E CK 40	060 A 40, 080 A 40 080 M 40	2 C 40 XC 42 H 1		C 40		S 40 C	SM 40 C	
3	1045	1.1191	C45E CK 45	080 M 46 060 A 47	2 C 45 XC 42 H 1 XC 45 XC 48 H 1	1672	C 45 C 46	F.1140-C 45 K F.1142-C48 K	S 45 C S 48 C	S 45 C S 48 C	45
3	1049	1.1201	C45R Cm 45	080 M 46	3 C 45 XC 42 H 1 XC 48 H 1	1660	C 45	F.1145-C 45K-1 F.1147C 48 K-1	S 50 C	SM 50 C	
3		1.7242	18 CrMo 4			18 CrMo 4					
3	A 387 Gr. 12 Cl	1.7337	16 CrMo 4 4				A 18 CrMo 4 5 KW				
3	A 387 Gr. 12 Cl	1.7337	16 CrMo 4 4				A 18 CrMo 4 5 KW				
3		1.7362	12 CrMo 19 5	3606-625	Z 10 CD 5.05		16 CrMo 20 5				
3	A572-60		17 MnV 6	436055 E	NFA 35-501 E 36	2142					
4	1055	1.0535	C55	070 M 55	1 C 55 AF 70 C 55	1655	C 55 1 C 55		S 55 C	SM 55 C	55
4	1060	1.0601	C60	060 A 62 43D 1449 HS,CS	1 C 60 AF 70 C 55		C 60 1 C 60		S 58 C	SM 58 C	60(G)
4	1070	1.0603	C67	080 A 67 1449 70HS	XC65		C 67				
4	1074 1075	1.0605	C75	1449 80 HS			C 75				75
4	1055	1.1203	C55E CK 55	060 A 57 070 M 55	2 C 5 XC 55 H 1	1655	C 55	F.1150-C 55 K	S 55 C	SM 55 C	55
4	1055	1.1209	C55R Cm 55	070 M 55	3 C 55 XC 55 H 1		C 55	F.1155-C 55 K-1			
4	1060 1064	1.1221	C60E CK 60	060 A 62 43D	2 C 60 XC 60 H 1	1655 1678	C 60		S 58 C	SM 58 C	60 60G, 60GA
4	1070	1.1231	CK 67 (C67E)	060 A 67	XC 68	1770	C 70				65GA 68GA , 70
4	1074 1075 1078	1.1248	CK 75 (C75E)	060 A 78	XC 75	774	C 75				75(A)
4	1086	1.1269	CK 85 (C85E)		XC 90		C 90				85(A)
4	1095	1.1274	Ck 101 (C101E)		XC 100		C 100	F-5117	SUP 4	SPS 4	
4	W 112	1.1663	C 125 W		Y2 120	1870					
4						2223					
5		1.0070	St70-2				FE70-2				
5		1.7238	49 CrMo 4								
5		1.7701	51 CrMoV 4				51 CrMoV 4				

Material Conversion Table

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN	BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
6	A573-81 65	1.0116 St 37-3	4360 40 B	E 24-U	1312	Fe37-3				
6	A515 65	1.0345 H1	1 501 161	A 37 CP	1330					
6	5120	1.0841 St 52-3	150 M 19	20 MC 5	2172	Fe 52	F-431			
6	9255	1.0904 55 Si 7	250A53 45	55S7	2085	55Si8	56Si7			
6	9254	1.0904 55 Si 7	250 A 53	55 S 7	2090		F-431			
6	9262	1.0961 60SiCr7	1 501 161	60SC6	60SiCr8	60SiCr8				
6	L3	1.2067 100Cr6	BL3	Y100C6		100Cr6				
6	L1	1.2108 90 CrSi 5			2092	105WCR 5				
6	L2	1.2210 115CrV3		100C3		107CrV3KU				
6		1.2241 51CrV4								
6		1.2311 40 CrMnMo 7				35 cRmO 8 KU				
6	4135	1.2330 35 CrMo 4	708 A 37	34 CD 4	2234	35CrMo4	34CrMo4	SCM435TK	SCM435TK	
6		1.2419 105WCr6	BO1	105WC13	2140	10WCr6	105WCr5			
6	0 1	1.2510 100 MnCrW 4	BS1	8 MO 8	2140	10WCr6	105WCr5	SKS 31	STS 31	
6	S1	1.2542 45 WCrV7			2710	45 WCrV8 KU	45WCrSi8			
6	S1	1.255 60WCrV7		55WC20	2710	58WCr9KU				
6	L6	1.2713 55NiCrMoV6		55NCDV7			F.520.S	SKT 4	STF 4	
6	L6	1.2721 50NiCr13		55 NCV 6	2550		f-528			
6	O2	1.2842 90MnCrV8	BO2	90 MV8						
6	E 50100	1.3501 100 Cr 2		55WC20						
6	52100	1.3505 100Cr6	2 S 135 31 535 A 99	100 C 6	2258	100Cr6	F.1310 - 100 Cr 6	SUJ2	STB 2	SchCh 15
6		1.5024 46Si7		45 S 7; Y 46 7;46 SI 7			F. 1451 - 46 SI 7			
6	9255	1.5025 51Si7		51 S 7 51 Si 7	2090	48 Si 7 50 Si 7	F.1450-50 Si 7			
6	9255	1.5026 55Si7	251 a 58	55 S 7	2085 2090	55 Si 7	F.1440 - 56 Si 7			55S2
6	9260	1.5027 60Si7	251 A 60 251 H 60	60 S 7		60 Si 7	F. 1441 - 60 Si 7			60S2
6	9260 H	1.5028 65Si7		60 S 7				50 P 7 SUP 6	SPS 6	
6		1.5120 38 MnSi 4								
6	A 204 Gr.A 4017	1.5415 16Mo3 15 Mo 3	1503-243 B	15 D 3	2912	16Mo3(KG;KW)	F. 2601 - 16 Mo 3			
6	4419	1.5419 20Mo4	1503-243-430		-2512	G 20 Mo 5 G 22 Mo5		SCPH 11	SCPH 11	
6	A 350-LF 5	1.5622 14Ni6		16N6	14 Ni 6 KG;KT	F.2641 - 15 Ni 6				
6	3415	1.5732 1 NiICr10		14 NC 11	16NiCr11	15NiCr11	SNC415(H)			
6	3310; 3314	1.5752 14NiICr14	655M13 36A	12NC15			SNC815(H)			
6		1.6587 17CrNiMo6	820A16	18NCD6		14NiCrMo13				
6		1.6657 14NiCrMo134				14NiCrMo131				
6	5515	1.7015 15 Cr 3	523 M 15	12 C 3				SCr415(H)	SCr415(H)	
6	5132	1.7033 34Cr4	530A32 18B	32C4		34Cr4(KB)	35Cr4	SCr430(H)	SCr430(H)	
6	5140	1.7035 41C r4	530M40 18	42C4		41Cr4	42Cr4	SCr440(H)	SCr440(H)	
6	5140	1.7045 42Cr41	530 A 40	42 C 4 TS	2245	41Cr4	42Cr4	SCr440	SCr440	
6	5115	1.7131 16MnCr5	527 M 17	16 MC 5	2511	16MnCr5	16MnCr5			
6		1.7139 16MnCr5			2127					
6	5515	1.7176 55Cr3	527 A 60 48	55 C 3	2253			SUP9(A)	SPS 9(A)	
6	4135; 4137	1.7220 34CrMo4	708 Aa 37	35 CD 4	2234					
6	4142	1.7223 41CrMo4				41CrMo4	42CrMo4	SNB 22-1	SNB 22-1	
6	4140	1.7225 42CrMo4	708 M 0	42 CD 4	2244					
6		1.7228 55NiCrMoV6G	823M30 33		2512	653M31				
6		1.7262 15CrMo5		12 CD 4	2216		12CrMo4			
6		1.7321 20 mOcR 4			2625					
6	ASTM A182 F-12	1.7335 13CrMo4 4	1501-620Gr27			14CrMo4 5	14CrMo45			
6	A 182-F11;12	1.7335 13 CrMo 4 4	1 501 620 Gr. 27	15 CD 4.5	2216		12CrMo4	SCM415(H)	SCM415(H)	
6	ASTM A 182 F22	1.7380 10CrMo9 10	1501-622gR31; 45							
6	A182 F-22	1.7380 10 CrMo 9 10	1501-622	12 CD 9.10	2218	12CrMo9,10	TU.H			
6		1.7715 14MoV6 3	1503-660-440				13MoCrV6			
6	A355A	1.8509 41CrAlMo 7	905 M 39 41B	40 CAD 6.12	2940	41CrAlMo7	41CrAlMo7			
7	A570.36	1.0038 S235JRG2 (Fe 360 B) RSt 37-2	Fe 360 B FU 1449 27/23 CR 4360-40 B	E 24-2NE	1312	Fe 360 B FN	AE 235 B FN;FU Fe 360 B FN; FU			St3ps; sp
7	3135	1.5710 36NiCr6	640A35	35NC6						

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN	BS	EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
7		1.5755 31 NiCr 14	653 M 31		18 NC 13						
7	8620	1.6523 2 NiCrMo2	805M20	362	20 NCD 2	2506	20NiCrMo2	20NiCrMo2	SNCM220(H)	SNCM220(H)	
7	8740	1.6546 40 NiCrMo 22	311-Tyre 7				40NiCrMo2(KB)	40NiCrMo2	SNCM240	SNCM240	
7	4130	1.7218 25CrMo4	CDS 110		25 CD 4	2225	25CrMo4(KB)	55Cr3	SCM420/430	SCM420/430	
7		1.7733 24 CrMoV 5 5			20 CDV 6		21 CrMoV 5 11				
7		1.7755 GS-45 CrMOV 10 4									
7		1.8070 21 CrMoV 5 11					35 NiCr 9				
8	4142	1.2332 47 CrMo 4	708 M 40	19A	42 CD 4	2244	42CrMo4	42CrMo4	SCM (440)	SCM (440)	
8	A128 (A)	1.3401 G-X120 Mn 12			Z 120 M 12	2183	GX120Mn12	F.8251-AM-X120Mn12	SCMnH 1, SCMn H 11	SCMnH 1, SCMn H 11	110G13L
8	3435	1.5736 36 NiCr 10			30 NC 11						
8	9840	1.6511 36CrNiMo4	816M40	110	40NCD3		36nlcRmO4(KB)	35NiCrMo4	SUP 10	SPS 10	
8	4340	1.6582 35CrNiM 6	817 M 40	24	35 NCD 6	2541	35NiCrMo6(KB)		SNCM 447	SNCM 447	
8		1.7361 32 CeMo12	722 M 24	40B	30 CD 12	2240	30CrMo12	F.124.A			
8	6150	1.8159 50 CrV 4	735 A 50	47	50CrV4	2230	50CrV4	51CrV4			
8		1.8161 58 CrV 4									
8		1.8515 32 CrMo 12	722 M 24	40B	30 CD 12	2240	32CrMo12	F.124.A			
8		1.8523 39CrMoV13 9	897M39	40C			36CrMoV12				
9		1.4882 X 50 CrMnNiNbN 21 9			Z 50 CMNNb 21.09						
9	3135	1.5710 36NiCr6	640A35	111A	35NC6				SNC236	SNC236	
9		1.5864 35 niCr 18									
9		31 NiCrMo 13 4	830 m 31			2534		f-1270			
10	A573-81	1.0144 ST 44-3	4360 43 C		E 28-3	1412			SM 400A;B;C	SM 400A;B;C	
10	A 619	1.0347 DCO3 RSt;RRSt 13	1449 3 CR 1449 2 CR		E		Fep 02	AP 02			08JU
10	M 1015 M 1016 M 1017	1.0401 C15	080 M 15 080 M 15 1449 17 CS		AF 37 C12 XC 18	1350	C15 C16 1 C 15	F.111	S 15 C	SM 15 C	
10		1.0570 ST 52-3	4360 50 B		E 36-3	2132	Fe52BFN/Fe52CFN		SM490A;B;C;YA;YB	SM490A;B;C;YA;YB	
10	12L13	1.0718 9SMnPb28			S250Pb	1914	CF9SMnPb28	11SMnPb28			
10	(12L13)	1.0718 9 SMnPb 28			S 250 Pb	1914	CF 9 SMnPb 28	11 SMnPb 28	SUM 22L	SUM 22L	
10		1.0723 15 S 22 15 S 20	210 A 15 210 M 15			1922		F.210.F	SUM 32	SUM 32	
10		1.2083				2314					
10	H 11	1.2343 x 38 CrMoV 5 1	BH 11		Z 38 CDV 5		X 37 CrMoV 5 1 KU				
10	H 13	1.2344 X 40 CrMoV 5 1	BH 13		Z 40 CDV 5	2242	X40CrMoV511KU	F-5318	SKD61	STD61	
10	A 2	1.2363 X100 CrMoV 5 1	BA 2		Z 100 CDV 5	2260	X100CrMoV51KU	F-5227	SKD12	STD12	
10	D 2	1.2379 X 155 CrVMo 12 1	BD2		Z 160 CDV 12	2310	X165CrMoW12KU	X160CrMoW12KU			
10	HNV3	1.2379 X210Cr12G	BD2		Z160CDV12	2736					
10	D 4 (D 6)	1.2436 X 210 CrW 12	BD6		Z 200 CD 12	2312	X215CrW 12 1 KU	F-5213			
10	H 21	1.2581 X 30 WCrV 9 3	BH 21		Z 30 WCV 9		X30WCrV 9 3 KU	F-526	SKD5	STD5	
10		1.2601 X 165 CrMoV 12				2310					
10	H 12	1.2606 X 37 CrMoW 5 1	BH 12		Z 35 CWDV 5		X 35 CrMoW 05 KU	F.537			
10	D3	1.3343 S 6-5-2	BM2		Z200C12	2715	X210Cr13KU	X210Cr12	SUH3	STR3	
10	N08028	1.4563			Z1NCDU31-27-03	2584					
10	ASTM A353	1.5662 X8Ni9	1501-509;510				14 Ni 6 KG;KT	XBNiO9			
10	ASM A353	1.5662 X8Ni9	502-650		9 Ni		X10Ni9	F-2645	SL9N60(53)	SL9N590(520)	
10	2517	1.5680 12Ni19	12Ni19		Z18N5						
10	2515	1.5680 12 Ni 19			Z 18 N 5						
11		1.3202 S 12-1-4-5	BT 15				HS 12-1-5-5	12-1-5-5			
11		1.3207 S 10-4-3-10	BT 42		Z130WKCDV						
11	T15	1.3243 S 6-5-2-5			KCV 06-05-05-04-02	2723	HS 6-5-2-5	6-5-2-5	SKH55	SKH55	
11		1.3246 S 7-4-2-5			Z110 WKCDV 07-05-04	7-4-2-5	HS 7-4-2-5	M 35			
11		1.3247 S 2-10-1-8	BM 42		Z110 DKCWV 09-08-04	2-10-1-8	HS 2-9-1-8 2-9-2-8	M 41			
11	M 42	1.3249 S 2-9-2-8	BM 34								
11	T 4	1.3255 S 18-1-2-5	BT 4		Z 80 WKCV 18-05-04-0						
11	M 2	1.3343 S6-5-2	BM2		Z 85 WDCV	2722	HS 652	F-5604	SKH 51	SKH 51	
11	M 7	1.3348 S2-9-2			Z 100 DCWV 09-04-02-	2782	HS 292	F-5607			

Material Conversion Table

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS	EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
11	T 1	1.3355	S 18-0-1	BT 1		Z 80 WCV 18-4-01						
11	630	1.4548				Z7CNU17-04						
11	HNV 3	1.4718	X45CrSi 9 3	401S45	52	Z45CS9		X45CrSi8	F322	SUH1	STR1	
11	422	1.4935	x20 CrMoWV 12 1									
12	403	1.4000	X6Cr13	403 S 17		Z 6 C 13	2301	X6Cr13	F.3110	SUS403	STS 403	
12		1.4001	X6Cr14						F8401			
12	(410S)	1.4001	X7 Cr 13	(403 S 7)		Z 8 C 13	2301					
12	405	1.4002	X6CrA12	405S17		Z8CA12		X6CrAl13				
12	405	1.4002	X6 CrAl 13	405 S 17		Z6CA13	2302	X6CrAl13				
12	416	1.4005	X12CrS 13	416 S 21		Z11 CF 13	2380	X12 CrSC13	F-3411	SUS 416	SUS 416	
12	410; CA-15	1.4006	(G-)X10 Cr 13	410S21	56A	Z10 C 13	2302	X12Cr13	F.3401	SUS 410	SUS 410	
12	430	1.4016	X8Cr17	Z8C17		430S15	2320	X8Cr17	F.3113			
12	430	1.4016	X6 Cr 17	430 S 15	60	Z 8 C 17	2320	X8Cr17	F.3113	SUS 430	SUS 430	
12		1.4027	G-X20Cr14	420 C 29		Z20 C 13M						
12		1.4027	G-X 20 Cr 14	420 C 29		Z 20 C 13M						
12	420	1.4028	X30 Cr 13	420 S 45		Z 30 C 13	2304					
12		1.4086	G-X120Cr29	452C11								
12	430 F	1.4104	X12CrMoS17	420 S 37		Z 10 CF 17	2383	X10CrS17	F.3117	SUS430F	STS 430F	
12	440B	1.4112	X90 CrMoV 18									
12	434	1.4113	X6CrMo 17	434 S 17		Z 8 CD 17.01	2325	X8CrMo17		SUS434	STS 434	
12		1.4340	G-X40CrNi27 4									
12	S31500	1.4417	X2CrNiM0Si19 5				2376					
12	S31500	1.4417	X2 CrNoMoSi 18 5 3				2376					
12		1.4418	X4 CrNiMo16 5			Z6CND16-04-01	2387					
12	XM 8 430 Ti 439	1.4510				Z 4 CT 17		X 6 CrTi 17	F.3115-X 5 CrTi 17	SUS 430 LK	STS 430 LX	08 Ch17T
12	430tl	1.4510	X6 CrTi 17			Z 4 CT 17						
12		1.4511	X 6 CrNb 17(X 6 CrNb 17			Z 4 CNb 17		X 6 CrNb 17	F.3122-X 5 CrNb 17	SUS 430 LK	STS 430 LX	
12	409	1.4512	X 6 CrTi 12 (X2CrTi12)	LW 19 409 S 19		Z 3 CT 12		X 6 CrTi 17		SUH 409	STR 409	
12		1.4720	X20CrMo13									
12	405	1.4724	X10CrA113	403S17		Z10C13		X10CrA112	F.311			
12	430	1.4742	X10CrA118	439S15	60	Z10CAS18		X8Cr17	F.3113	SUS430	STS430	
12	HNV6	1.4747	X80CrNiSi20	443S65	59	Z80CSN20.02		X80CrSiNi20	F.320B	SUH4	STR4	
12	446	1.4749	x18 cRn 28									
12	446	1.4762	X10CrA124			Z10CAS24	2322	X16Cr26		SUH446	STR446	
12	EV 8	1.4871	X 53 CrMnNiN 21 9	349 S 54		Z 52 CMN 21.09		X53CrMnNiN21 9		SUH35,SUH36	STR35,STR36	
12	302		x12 CrNi 18 9	302 S 31		Z 10 CN 18-09	2330					
12	429		X10 CrNi 15									
13	420	1.4021	X20Cr13	420S37		Z 20 C 13	2303	14210				
13	420	1.4031	X40 Cr 13			Z 40 C 14	-2304					
13		1.4034	X46Cr13	420 S 45		Z40 C 14		X40Cr14	F.3405	SUS420J2	STS420J2	
13	431	1.4057	X20CrNi172	431 S 29	57	Z 15 CN 16.02	2321	X16CrNi16	F.3427	SUS431	STS431	
13		1.4125	X 105 CrMo 17			Z 100 CD 17		X 105 CrMo 17				
13	CA6-NM	1.4313	G-X4 CrNi 13 4	425 C 11		Z 4 CND 13-04 M	2385	(G)X6CrNi304		SCS5	SSC5	
13	630	1.4542	X 5 CrNiCuNb 17 4 (X5CrNiCuNb 16-4)									
13		1.4544		S. 524 S. 526				X 6 CrNiTi 18 11				08Ch 18N12T
13	348	1.4546	X5CrNiNb 18-10	347 S 31 2 S. 130 2 S. 143/144/145 S.525/527				X 6 CrNiNb 18 11				
13		1.4922	x20cRmV12-1				2317	x20cRmOnl 12 01				
13		1.4923	X22 CrMoV12 1									
14	304	1.4301	X 5 CrNi 18 9	304 S 15		Z 5 CN 18.09	2332;2333					
14	303	1.4305	X10 CrNiS 18 9	303 S 21	58M	Z 8 CNF 18-09	2346	X10CrNiS18.09	F.3508	SUS303	STS303	
14	304L	1.4306	X2CrNi18 9	304S12		Z2CrNi18 10	2352	x2cRnl18 11	F.3503	SCS19	SSC19	
14	304L	1.4306	X2 CrNi 18 10	304 S 11		Z 3 CN 19-11	2352	X2CrNi18 11				
14	CF-8	1.4308	X6 CrNi 18 9	304 C 15	58E	Z 6 CN 18-10 M	2333			SUS304L	STS304L	
14	301	1.4310	X12CrN i17 7	301 S 21		Z 12 CN 17.07	2331	X2CrNi18 07	F.3517			

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
14	304 LN	1.4311	X2 CrNiN 18 10	304 S 62	Z 2 CN18.10	2371	X2CrNiN18 10		SUS304LN	STS304LN	
14		1.4312	G-X10CrNi18 8	302C25	Z10CN18.9M						
14	305	1.4312	X8 CrNi 18 12	305 s 19							
14		1.4332	X2 CrNi 18-8								
14	304	1.4350	X5CrNi18 9	304S15 58E	Z6CN18.09	2332	X5CrNi18 10	F.3551	SUS304	STS304	
14	S32304	1.4362	X2 CrNiN 23 4		Z 2 CN 23-04 AZ						
14	202	1.4371	X3 CrMnNiN 188 7	284 S 16	Z 8 CMN 18- 08-05						
14	316	1.4401	X 5 CrNiMo 17 12 2 (X4 CrNiMo 17 -12-2)	316 S 13 316 S 17 316 S 19 316 S 31 316 S 33	Z 3 CND 17 -11-01 Z 6 CND 17-11 Z 6 CND 17-11-02 Z 7 CND 17-11-02 Z 7 CND 17-12-02	2347	X 5 CrNiMo 17 12	F.3534-X 5 CrNiMo 17 12 2	SUS 316	STS 316	
14	316L	1.4404	X2 CrNiMo 17 13 2 (X2 CrNiMo 17-12-2) GX 2 CrNiMoN 18-10	316 S 11, 316 S 13 316 S 14, 316 S 31; 316 S 42, S.537;316 C 12, T.75, S. 161	Z 2 CND 17-12 Z 2 CND 18-13 Z 3 CND 17-11-02 Z 3 CND 17-12-02 FF Z 3 CND 18-12-03 Z 3 CND 19.10 M	2348	X 2 CrNiMo 17 12 G-X 2 CrNiMo 19 11	F.3533 - X 2 CrNiMo 17 13 2 F.3537 - X 2 CrNiMo 17 13 3	SUS 316 L	STS 316 L	
14	316LN	1.4406	X2 CrNiMoN 17 12 2 (X2CrNiMoN 18-10)	316 S 61 316 S 63	Z2 CND 17-12 AZ		X 2 CrNiMoN 17 12	F.3542-X 2 CrNiMoN 17 12 2	SUS316LN	STS316LN	
14	CF-8M	1.4408	GX 5 CrNiMoN 7 12 2 G-X 6 CrNiMo 18 10	316 C 16 (LT 196) ANC 4 B		2343		F.8414-AM-X 7 CrNiMo 20 10	SCS 14	SSC 14	07 Ch 18N10G2S2MSL
14		1.4410	G-X10CrNiMo18 9		Z5CNaD20.12M	2328					
14	316 Ln	1.4429	X2 CrNiMo 17 -13-3	316 S 62	Z 2 CND 17-13 Az	2375	X 2 CrNiMoN 17 13	F.3543-X 2 CrNiMoN 17 13 3	SUS 316 LN	STS 316 LN	
14	316L	1.4435	X2 CrNiMo18 14 3	316 S 11;316 S 13 316 S 14;316 S 31 LW 22 LWCF 22	Z 3 CND 17-12-03 Z 3 CND 18-14-03	2375	X 2 CrNiMoN 17 13	F.3533-X 2 CrNiMo 17 13 2	SUS 316 L	STS 316 L	O3 Ch 17N14M3
14	316	1.4436	X 5 CrNiMo 17 13 3 (X4CRNIMO 17-13-3	316 S 19; 316 S 31 316 S 33 LW 23 LWCF 23	Z 6 CND 18-12-03 Z 7 CND 18-12-03	2343	X 5 CrNiMo 117 13 X 8 cRnImO 17 13	F.3543-X 5 CrNiMo 17 12 2 F.3538-X 5 CrNiMo 17 13	SUS 316	STS 316	
14	317L	1.4438	X2 CrNiMo 18 16 4 (X2CrNiMo 18-15-4)	317 S 12	Z 2 CND 19-15-04 z 3 cnd 19-15-04	2367	X2CrNiMo18 16	f.3539-x 2 cRnImO 18 16 4	SUS317L	STS317L	
14	(s31726)	1.4439	X2 CrNiMoN 17 13 5		Z 3 CND 18-14-06 AZ						
14		1.4440	X 2 CrNiMo 18 13								
14	317	1.4449	X5 CrNiMo 17 13 3	317 S 16			X 5 CrNiMo 18 15		SUS 317	STS 317	
14	329	1.4449 1.4460	X 4 CrNiMo 27 5 2 (X3CrNiMo27-5-2)		(Z 3 CND 25-07 Az) Z 5 CND 27-05 Az	2324		F.3309-X 8 CrNiMo 17 12 2 F.3552-X 8 CrNiMo 18 16 4	SUS 329 J 1	STS 329 J 1	
14	329	1.4460	X8CrNiMo27 5								
14		1.4462	X2CrNiMoN22 5 3	318 S 13	Z 3 CND 22-05 Az (Z 2 CND 24 -08 Az) (Z 3 CND 25-06-03 Az)	2377			SUS 329 J3L	STS 329 J3L	
14		1.4500	G-X7NiCrMoCuNb25 20		23NCDU25.20M		Z8CNA17-07	X2CrNiMo1712			
14	17-7PH	1.4504		316S111							
14	443 444	1.4521	X2CrMoTi18-2	317 S 16		2326		F.3123-X 2 CrMoTiNb 18 2	SUS 444	STS 444	
14	UNS N 08904	1.4539	X1NiCrMoCuN25-20-5		Z 2 NCDU 25-20	2562					
14	CN-7M	1.4539	(G-)X1 NiCrMoCu 25 20 5		Z1 NCDU 25-02 M	2564					
14	321	1.4541	Z 6 CrNiTi 18-10	321 S 31 321 S 51 (1010;1105) LW 24 LWCF 24	Z 6 CNT 18-10	2337	X 6 CrNiTi 18 11	F.3523 - X 6 CrNiTi 18 10	SUS 321	STS 321	06Ch18N10T 08Ch18N10T 09Ch18N10T 12Ch18N10T
14	630	1.4542	X5 CrNiCuNb 17 4 (X5 CrNiCNb 16-4)		Z 7 CNU 15-05 Z 7 CNU 17-04				SCS 24 SUS 630	SSC 24 STS 630	
14	17-4PH	1.4542			Z7CNU17-04						
14	S31254	1.4547	X1 CrNiMoN 20 18 7			2378					
14	17-4PH	1.4548			Z7CNU17-04						
14	347	1.4550	X6 CrNiNb 18 10	347 S 17 58F	Z 6 CNNb 18.10	2338	X6CrNiNb18 11	F.3552	SUS347	STS347	
14		1.4552	G-X7CrNiNb18 9		Z4CNNb19.10M						
14	17-7PH	1.4568		316S111			Z8CNA17-07	X2CrNiMo1712			
14	316TiTi	1.4571	X6 CrNiMoTi 17 12 2	320 S 31	Z 6 CNDT 17-12002	2350					
14		1.4581	G-X 5 CrNiMoNb	318 C 17	Z 4 CNDNb 18.12 M						
14	318	1.4583	X 10CrNiMoNb 18 12	303 S 21	Z15CNS20.12		x15cRnIsl2 12				

Material Conversion Table

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS	EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
14		1.4585	G-X7CrNiMoCuNb18 18					X6CrNiMoTi17 12				
14		1.4821	X20CrNiSi25 4			Z20CNS25.04						
14		1.4823	G-X40CrNiSi27 4									
14	309	1.4828	X15CrNiSi20 12	309 S 24	58C	Z15CNS20.12			F.8414	SCS17	SSC17	
14	309S	1.4833	X6 CrNi 22 13	309 S 13		Z 15 CN 24-13						
14	310 S	1.4845	X12 CrNi 25 21	310S24		Z 12 CN 25-20	2361	X6CrNi25 20	F.331	SUH310	STR310	
14	321	1.4878	X6 CrNiTi 18 9	32 1 S 20	58B	Z 6 CNT 18-12 (B)	2337	X6CrNiTi18 11	F.3553	SUS321	STS321	
14	Ss30415	1.4891	X5 CrNiNb 18 10			Z20CNS25.04	2372					
14	S30815	1.4893	X8 CrNiNb 11				2368					
14	304H	1.4948	X6 CrNi 18 11	304 S 51		Z 5 CN 18-09	2333					
14	660	1.498	X5 NiCrTi 25 15			Zz 8 nctv 25-15 b ff	2570					
14			X5 NiCrN 35 25									
14	S31753		X2 CrNiMoN 18 13 4									
14			X2 CrNiMoN 25 22 7									
15	CLASS20	0.6010	GG10			Ft10D	110	G 10				
15	A48-20B	0.6010	GG-10			Ft 10 D	0110-00					
15	NO 25 B	0.6015	GG 15	Grade 150		Ft 15 D	0115-00	G 15	FG 15	FC150	GC150	
15	CLASS25	0.6015	GG 15	Grade 150		Ft 15D	115	G 15	FG 15			
15	A48 25 B	0.6015	GG 15	Grade 150		Ft 15 D	01 15-00	G 14	FG 15			
15	A48-30B	0.6020	GG-20	Grade 220		Ft 20 D	0120-00					
15	NO 30 B	0.6020	GG 20	Grade 220		Ft 20 D	120	G 20		FC200	GC200	
15	A436 Type 2	0.6660	GGL-NiCr202	L-NiCuCr202		L-NC 202	0523-00					
15	60-40-18	0.7040	GGG 40	SNG 420/12		FCS 400-12	0717-02	GS 370-17	FGE 38-17	FCD400	GCD400-18,15	
15	No 20 B		GG 10			Ft 10 D	110			FC100	GC100	
16	CLASS30	0.6020	GG 20	Grade 220		Ft 20D	120	G 20	FG 20			
16	CLASS45	0.6030	GG 30	Grade 300		Ft 30D	130	G 30	FG 30	FC300	GC300	
16	A48-45 B	0.6030		Grade 350		Ft 30D	01 30-00					
16	A48-50	0.6035	GG-35	Grade 350		Ft 35 D	135	G 35	FG 35	FC350	GC350	
16	A48-60 B	0.6040	GG40	Grade 400		Ft 40 D	140					
16	100/70/03	0.7070	GGG-70	SNG700/2		FGS 700-2	07 37-01	GGG 70	GGG 70	FCD700	GCD700-2	
16		1.4829	X 12 CrNi 22 12									
17		0.7033	GGG35.3				0717-15					
17		0.7033	GGG-35.3	350/22 L 40		FGS 370/17	0717-15					
17	60-40-18	0.7040	GGG-40	SNG 420/12		FGS 400-12	0717-02					
17	60/40/18	0.7043	GGG-40.3	370/7		FGS 370/17	0717-15					
17	80-55-06	0.7050	GGG50	SNG500/7		FGS 500/7	0727-02	GGG 50				
17	65-45-12	0.7050	GGG-50	SNG 500/7		FGS 500-7		0727-02		FCD 500	GCD 500-7	
17		0.7652	GGG-NiMn 13 7	S-NiMn 137		S-Mn 137						
17	A43D2	0.7660	GGG-NiCr 20 2	Grade S6		S-NC 202	0772-00					
17			GGG 40.3	SNG 370/17		FGS 370-17	0776-00					
18	A48-40 B	0.6025	GG25	Grade260		Ft 25 D	0717-12					
18		0.7060	GGG60	SNG600/3		FGS600-3	125	G 25	FG 25	FC250	GC250	
18	80/55/06	0.7060	GGG-60	600/3		FGS 600/3	07 32-03	GGG 60	GGG 60			
18	A48 40 B						0727-03			FCD600	GCD600-3	
19		0.8055	GTW55									
19	32510	0.8135	GTS-35-10	B 340/12		MN35-10			GTW 55			
19	A47-32510	0.8135	GTS-35-10	B 340/2		Mn 35-10	810		GTS 35			
19	A220-40010	0.8145	GTS-45-06	P 440/7		Mn 450-6	0815-00					
19			GTS-35	B 340/12				0852-00	GMN 45			FCMW370
19				8 290/6		MN 32-8						
19	32510		GTS-35	B340/12		MN 35-10	0810-00					
20		0.8035	GTM-35	W340/3		MB35-7	814			AC4A	AC4A	
20		0.8040	GTW-40	W410/4		MB40-10	08 15			FCMW330	FCMW330	
20		0.8045					852		GTM 35			
20		0.8065	GTMW-65					GTB40	GTM 40			
20	A220-50005	0.8155	GTS-55-04	P 510/4		Mn 550-4		GMB45	GTM 45			
20	50005	0.8155	GTS-55-04	P 510/4		MP 50-5			GTM 65			
20	70003	0.8165	GTS-65-02	P 570/3		Mn 650-3	0854-00					
20	90001	0.8170	GTS-70-02	P 690/2		Mn 700-2	0854-00	GMN 55		FCMP490	PMC 490	
20	A220-90001	0.8170	GTS-70-02			Mn 700-2	0856-00	GMN 65		FCMP590	PMC 590	

According to VDI 3323 Standard

Material Group	AIS/SAE	Material No. DIN		BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
20		0.8170	GTS-70-02	IP 70-2		0862-00	GMN 70		FCMP690	PMC 690	
20	1022 1518	1.1133	20Mn5	120 M 19	20 M 5	0864-00					
20	1035	1.1183	Cf 35 (C35G)	080 A 35	XC 38 H 1 TS	2132	G 22 Mn 3				
20	400 10		GTS-45	P440/7			20 Mn 7	F.1515-20 Mn 6	SMnC 420	SMnC 420	
20	70003		GTS-65	P 570/3	MP 60-3	1572	C 36; C 38		S 35 C	SM 35 C	35
21	Al99	3.0205				08 52					
21	1000	3.0255	Al99.5	L31/34/36	A59050C	858			FCMP540	PMC 540	
21		3.3315	AlMg1								
22		3.1325	AlCuMg 1								
22		3.1655	AlCuSiPb								
22		3.2315	AlMgSi1								
21	7050	3.4345	AlZnMgCuO,5	L 86	AZ 4 GU/9051						
23		3.2381	G-AlSi 10 Mg								
23		3.2382	GD-AlSi10Mg			811-04					
23		3.2581	G-AlSi12								
23		3.3561	G-AlMg 5								
23	ZE 41	3.5101	G-MgZn4sE1Zr1	MAG 5							
23	EZ 33	3.5103	MgSE3Zn27r1	MAG 6	G-TR3Z2						
23	AZ 81	3.5812	G-MgAl8Zn1	NMAG 1							
23	AZ 91	3.5912	G-MgAl9Zn1	MAG 7							
24		2.1871	G-AlCu 4 TiMg								
24		3.1754	G-AlCu5Ni1,5								
24		3.2163	G-AlSi9Cu3								
24	4218 B	3.2371	G-AlSi 7 Mg								
24	SC64D	3.2373	G-AlSi9MGWA		A-S7G	4231			C4BS	C4BS	
24		3.2373	G-AlSi 9 Mg								
24	QE 22	3.5106	G-MgAg3SE2Zr1	mag 12							
24	GD-AlSi12		G-ALMG5	LM5	A-SU12	4252					
23-24	A360.2	3.2383	G-AlSi0Mg(Cu)	LM9		4253					
23-24	A356-72			2789;1973	NF A32-201						
23-24	356.1			LM25		4244			A5052	A5052P	
23-24	A413.2		G-AlSi12	LM6		4261					
23-24	A413.1		G-AlSi 12 (Cu)	LM20		4260			ADC12	ALDC12	
23-24	A413.0		GD-AlSi12			4247			A6061	A6061P	
23-24	A380.1		GD-AlSi8Cu3	LM24		4250			A7075	A7075P	
26	C93200	2.1090	G-CuSn 7 5 pb		U-E 7 Z 5 pb 4						
26	C83600	2.1096	G-CuSn5ZnPb	LG 2							
26	C83600	2.1098	G-CuSn 2 Znpb								
26	C23000	2.1182	G-CuPb15Sn	LB1	U-pb 15 E 8						
26	C93800	2.1182	G-CuPb15Sn		Uu-PB 15e 8						
27		2.0240	CuZn 15								
27	C27200	2.0321	CuZn 37	cz 108	CuZn 36, CuZn 37		C 2700				
27	C27700	2.0321	CuZn 37	cz 108	CuZn 36, CuZn 37		C 2720				
27		2.0590	G-CuZn40Fe								
27	C 86500	2.0592	G-CuZn 35 Al 1	U-Z 36 N 3	HTB 1						
27	C 86200	2.0596	G-CuZn 34 Al 2	HTB 1	U-Z 36 N 3						
27	C 18200	2.1293	CuCrZr	CC 102	U-Cr 0.8 Zr						
28		2.0060	E-Cu57								
28		2.0375	CuZn36Pb3								
28	C 94100	2.0596	G-CuZn 34 Al 2	HTB 1	U-Z 36 N 3						
28	C 63000	2.0966	CuAl 10 Ni 5 Fe 4	Ca 104	U-A 10 N						
28	B-148-52	2.0975	G-CuAl 10 Ni								
28	C 90700	2.105	G-CuSn 10	CT1							
28	C 90800	2.1052	G-CuSn 12	pb 2	UE 12 P						
28	C 81500	2.1292	G-CuCrF 35	CC1-FF							
28		2.4764	CoCr20W15Ni								
31	N 08800	1.4558	X 2 NiCrAlTi 32 20	NA 15							
31	N 08031	1.4562	X 1 NiCrMoCu 32 28 7								

According to VDI 3323 Standard

Material Group	AISI/SAE	Material No.	DIN	BS EN	AFNOR	SS	UNI	UNE	JIS	KS	GOST
31	N 08028	1.4563	X 1 NiCrMoCuN 32 27 4			2584					
31	N 08330	1.4564	X 12 NiCrSi 36 16	NA 17	Z 12 NCS 35.16						
31	330	1.4564	X12 NiCrSi 36 16	NA 17	Z 12 NCS 37.18				SUH330	STR 330	
31		1.4865	G-X40NiCrSi38 18	330 C 40			XG50NiCr39 19		SCH15	HRSC 15	
31		1.4958	X 5 NiCrAlTi 31 20								
31	AMS 5544	LW2.4668	NiCr19NbMo		NC20K14						
32		1.4977	X 40 CoCrNi 20 20		Z 42 CNKDWNb						
33	Monel 400	2.4360	NiCu30Fe	NA 13	NU 30						
33	5390A	2.4603			NC22FeD						
33	Hastelloy C-4	2.4610	NiMo16cR16Ti								
33	Nimonic 75	2.4630	NiCr20Ti	HR 5,203-4	NC 20 T						
33		2.4630	NiCr20Ti	HR5,203-4	NC20T						
33	Inconel 690	2.4642	NiC29Fe		Nnc 30 Fe						
33	Inconel 625	2.4856	NiCr22Mo9Nb	NA 21	NC 22 FeDNb						
33	5666	2.4856	NiCr22Mo9Nb		Inconel 625						
33	Incoloy 825	2.4858	NiCr21Mo	NA 16	NC 21 Fe DU						
34	Monel k-500	2.4375	NiCu30 Al	NA 18	NU 30 AT						
34	4676	2.4375	NiCu30Al	3072-76							
34		2.4631	NiCr20TiAl	Hr40;601	NC20TA						
34	Inconel 718	2.4668	NiCr19FeNbMo		NC 19 Fe Nb						
34	Inconel	2.4694	NiCr16fE7TiAl								
34		2.4955	NiFe25Cr20NbTi								
34	5383	LM2.4668	NiCr19Fe19NbMo	HR8	NC19eNB						
34	5391	LW2.4670	S-NiCr13A16MoNb	3146-3	NC12AD						
34	5660	LW2.4662	NiFe35Cr14MoTi		ZSNCDT42						
34	5537C	LW2.4964	CoCr20W15Ni		KC20WN						
34	AMS 5772		C0Cr22W14Ni		KC22WN						
35	Inconel X-750	2.4669	NiCr15Fe7TiAl		NC 15 TNb A						
35	Hastelloy B	2.4685	G-NiMo28								
35	Hastelloy C	2.4810	G-NiMo30								
35	AMS 5399	2.4973	NiCr19Co11MoTi		NC19KDT						
35		3.7115	TiAl5Sn2								
36	R 50250	3.7025	Ti 1	2 TA 1							
36	R 52250	3.7225	Ti 1 pd	TP 1							
36	AMS 5397	LW2 4674	NiCo15Cr10MoAlTi								
37		3.7124	TiCu2	2 TA 21-24							
37	R 54620	3.7145	TiAl6Sn2Zr4Mo2Si								
37		3.7165	TiAl6V4	TA 10-13;TA 28	T-A 6 V						
37		3.7185	TiAl4Mo4Sn2	TA 45-51; TA 57							
37		3.7195	TiAl 3 V 2.5								
37			TiAl4Mo4Sn4Si0.5								
37	AMS R54520		TiAl5Sn2.5	TA14/17	T-A5E						
37	AMS R56400		TiAl6V4	TA10-13/TA28	T-A6V						
37	AMS R56401		TiAl6V4ELI	TA11							
38	W 1	1.1545	C105W1	BW 1A	Y1105	1880	C100KU	F-5118	SK3	STC 105(STC3)	
38	W210	1.1545	C105W1	BW2	Y120	2900	C120KU	CF.515	SUP4	SPS 4	
38		1.2762	75 CrMoNiW 6 7								
38	440C	1.4125	X105 CrMo 17		Z 100 CD 17						
38		1.6746	32 nlcRmO 14 5	832 M 31	35 NCD 14						
40	Ni- Hard 2	0.9620	G-X 260 NiCr 4 2	Grade 2 A			0512-00				
40	Ni- Hard 1	0.9625	G-X 330 Ni Cr 4 2	Grade 2 B							
40	Ni- Hard 4	0.9630	G-X 300 CrNiSi 9 5 2				0513-00				
40		0.9640	G-X 300 CrMoNi 15 2 1								
40	A 532 III A 25% Cr	0.9650	G-X 260 Cr 27	Grade 3 D							
40	A 532 III A 25% Cr	0.9655	G-X 300 CrNMo 27 1	Grade 3 E							
40		1.2419	105 WCr 6	105WC 13			0466-00				
40	310	1.4841	X15 CrNiSi 25 20	314 S31	Z 15 CNS 25-20						
41		0.9635	G-X 300 CrMo 15 3								
41		0.9645	G-X 260 CrMoNi 20 2 1					107 WCr 5 KU			
41		0.9655	G-X 300 CrNMo 27 1								

Test Reports

Customer / Address :

Contact / Position :

Phone / Fax / E-Mail

Part / Material / Hardness:

Machine Type / Model / Power :

	Existing Method	TaeguTec	
		Test 1	Test 2
Holder			
Insert			
Surface Speed Vc (sfm)			
Feed rate f (ipr)			
Depth of Cut ap (inch)			
RPM n			
Dia of Part D (inch)			
Operation			
Coolant			
Indexing Criteria			
No of Parts/ Edge			
Cutting Time/ Part(min)			
Total Cut Time/ Edge(min)			
Insert Cost/ Piece			
Cost/ Part			
Tool Cost Saving(%)			
Productivity Improvement(%)			

Remarks

Date:

Member IMC Group

Ingersoll Cutting Tools

Ingersoll Cutting Tools For Americas

Marketing & Technology Center
845 S. Lyford Road
Rockford, IL 61108-2749 U.S.A.
Tel: 815.387.6600
Fax: 815.387.6968
Email: info@ingersoll-imc.com
Internet: www.ingersoll-imc.com

Ingersoll Mexico
Blvd. Cuauhtemoc Num 2411 Locales 6 y 7
Esquina Calle Manuel Perez Trevino
Fracc. Residencial Los Pinos
CP 25198
Saltillo, Coahuila, Mexico
Tel: 52-844-4-85-32-20
Fax: 52-844-4-85-32-23
Email: info@ingersoll-imc.com

Ingersoll Cutting Tools For Europe

Marketing & Technology Center
Ingersoll Werkzeuge GmbH
Kalteiche-Ring 21-25
35708 Haiger, Germany
Tel: 02773.742 0
Fax: 02773.742 812/814
Email: info@ingersoll-imc.de
Internet: www.ingersoll-imc.de

Ingersoll France s.a.r.l.
21, rue Galilée
F-77420 CHAMPS-sur-MARNE
Tel: +33 (0)1 64 68 45 36
Fax: +33 (0)1 64 68 45 24
Email: info@ingersoll-imc.fr

Ingersoll Italien
Via Monte Grappa, 78
20020 Arese (Milano)
Telefon: +39 02 99 76 67 00
Telefax: +39 02 99 76 67 10
Email: crespi@taegutec.it

Ingersoll Cutting Tools For Asia

Ingersoll Japan Ltd.
Senri Asahi Hankyu Bldg. 15F
1-5-3 Shinsenri-Higashimachi
Toyonaka-shi Osaka 560-0082
Tel: 81-6-6835-7731
Fax: 81-6-6835-7732

Ingersoll China
7B21,
Hanwei Plaza,
GuangHua Road,
Chaoyang District,
Beijing, P.R.C.,100004.
Tel: +86 10 656 10261/2/3
Fax: +86 10 656 10264

MAN-009 7806036 (02/14)