

**SECO
STEEL &
CAST IRON
TURNING**



DURATOMIC®





EDGE INTELLIGENCE

Our approach to used edge detection makes it very easy to identify wear with the naked eye, with absolutely no decline in performance.

**NEVER WASTE
ANOTHER INSERT**

THE INDUSTRY'S BEST GRADES FOR STEEL & CAST IRON TURNING

TP3501 / TP2501 / TP1501 / TP0501 (steel) & TK1501 / TK0501 (cast iron)

Steel turning remains one of the most common industrial processes in the world. Through the incorporation of Duratomic® technology in our revolutionary TP2500 grade in 2007, Seco has built a reputation as a leader in this application area. We are continuing to live up to that reputation with a dramatic new introduction.

Over the past 10 years, we have continued extensive research into the technology that produces our Duratomic® based coatings. We have now incorporated all of that knowledge into six new grades: TP3501, TP2501, TP1501 and TP0501 for steel turning and TK1501 and TK0501 developed for cast iron turning.

By keeping the same characteristics and strengths as their predecessors, these six grades represent a substantial improvement to both toughness and wear resistance. This will boost your productivity and greatly enhance the value from Seco's turning grades.

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LEARN MORE AT: DURATOMIC.COM

FOR APPLICATION VIDEOS VISIT:
YOUTUBE.COM/SECOTOOLSUS



STEEL



POSITIONING THE STEEL GRADES

Our latest addition TP3501, has now completed the full grade offering for steel turning. The TP2501, TP1501 and TP0501 Duratomic® grades have already received tremendous respect in regards to improving performance and productivity. From our first developments in 2007, we were able to maintain all the characteristics of each grade, while applying the vast knowledge we have learned from the technology itself and how it affects properties such as toughness and wear resistance.

TP3501: SECURED PRODUCTIVITY

- 1st choice for secured productivity in steels
- Intended for tough demanding applications
- Intermittent machining and/or speed limitations
- **Roughing to finishing**, especially smaller components
- Highly capable in stainless steels applications

CASE STUDY	
Part	FORGED FLANGE
Work piece material	A105
SMG	SMG P2
Operation	OD and Facing
Cutting mode	Roughing
Coolant	Yes

Competing against a single sided insert with our double sided in a roughing operation.

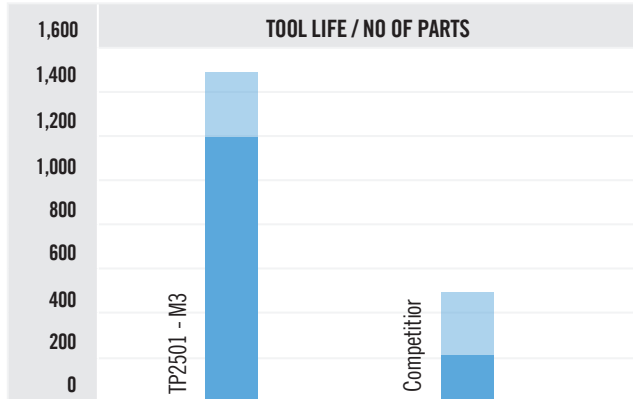
Grade	TP3501	Competitor
Insert	CNMG433-M5	CNMM433
	4 useable edges	2 useable edges
Vc (sfm)	722 (220 m/min)	722 (220 m/min)
f (in/rev)	0.020" (0.5 mm)	0.020" (0.5 mm)
APMX (in)	0.079" (2.0 mm)	0.079" (2.0 mm)



ROUGHING OF IRREGULAR FORGINGS

TP2501: VERSATILE PRODUCTIVITY

- 1st choice grade in steels
- When **reliability** is required
- Versatility and more intermittent machining
- **Roughing to finishing**
- Capable in cast irons and stainless steel



CASE STUDY		Customer expectations exceeded to improve process stability in small demanding components with interruptions. 25% productivity increase.
Part	DRIVER GEAR	
Work piece material	SCM415	
SMG	SMG P3	
Cutting mode	Internal interrupted cut	
Coolant	Emulsion	

Grade	TP2501	Competitor
Insert	WNMG332-M3	WNMG332
Vc (sfm)	492 (150 mm/min)	394 (120 mm/min)
f (in/rev)	0.010" (0.25 mm)	0.010" (0.25 mm)
APMX (in)	0.060" (1.5 mm)	0.060" (1.5 mm)
Tool life	1,200 - 1,500 parts	200 - 500 parts

TP1501: BALANCED PRODUCTIVITY

- 1st choice in low-alloyed steels
- When **optimizing** is required
- Versatile productivity and some intermittent machining
- **Finishing** and lower heat applications than TP0501
- Capable of intermittent machining of ductile cast iron

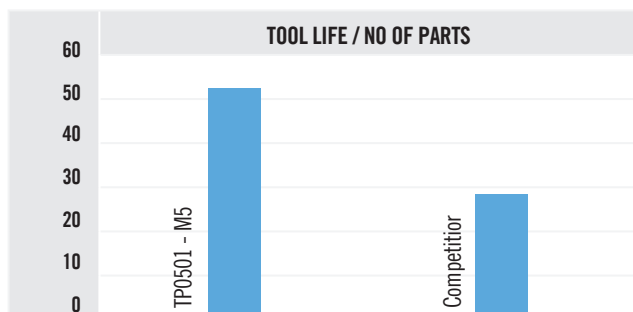


CASE STUDY		In many ordinary steel applications TP1501 provides major tool life or productivity gains keeping reliability.
Part	PISTON	
Work piece material	C60	
SMG	SMG P3	
Cutting mode	Continuous	
Coolant	Emulsion	

Grade	TP1501	Competitor
Insert	TNMG332-M3	TNMG332
Vc (sfm)	853 (260 mm/min)	787 (240 mm/min)
f (in/rev)	0.008" (0.2 mm)	0.006" (0.15 mm)
APMX (in)	0.060" (1.5 mm)	0.060" (1.5 mm)
Tool life	20 parts	5 parts

TP0501: HIGH-SPEED PRODUCTIVITY

- 1st choice in high-carbon steels
- When highest **productivity** is required
- Continuous cuts and limited intermittent machining
- **Roughing** and higher speeds than TP1501
- Dry machining and effective for gray cast iron



CASE STUDY		Demonstrator of the capability of TP0501 in roller bearing steel materials.
Part	BEARING	
Work piece material	100Cr6	
SMG	SMG P7	
Cutting mode	Continuous	
Coolant	Emulsion	

Grade	TP0501	Competitor
Insert	TNMG433-M5	TNMG433
Vc (sfm)	984 (300 mm/min)	984 (300 mm/min)
f (in/rev)	0.014"-0.016" (0.35-0.40 mm)	0.014"-0.016" (0.35-0.40 mm)
APMX (in)	0.079"-0.160" (2-4 mm)	0.079"-0.160" (2-4 mm)
Tool life	> 50 parts	< 30 parts

CAST IRON



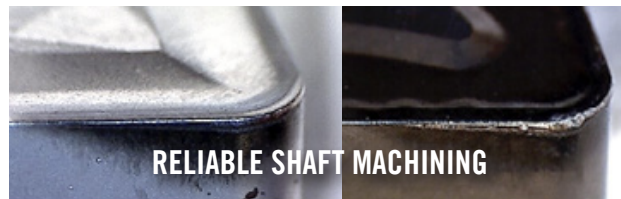
POSITIONING THE CAST IRON GRADES

Since the launch of our first Duratomic® grades TK2001 and TK1001 for cast iron in 2013, we have gained further knowledge about our Duratomic® technology and how it relates to cast iron applications. What we now see is an opportunity to further improve performance and reliable productivity by pulling the grades apart slightly in its properties. Giving a wider application range and more opportunities to outperform current tooling in both grey and nodular ductile cast iron.

TK1501: BALANCED CAST IRON PRODUCTIVITY

- 1st choice in ductile cast iron
- When **optimizing** is required
- Versatile productivity and intermittent machining in most cast irons
- Limited speed and high reliability in demanding applications
- Using MR9 creates the most secure productivity solution available
- When general performance is needed in steel as well

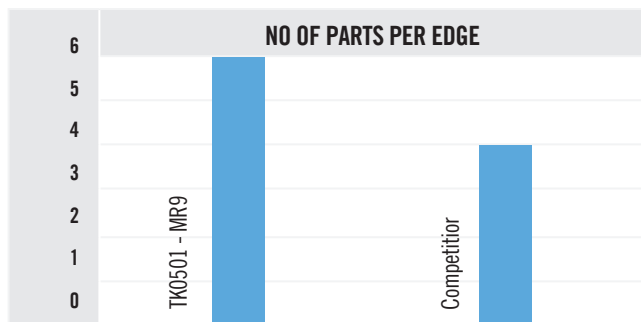
CASE STUDY		
Part	SHAFT	<p>Higher wear resistance but slightly lower speed capability compared to competitor.</p> <p>Keep a moderate cutting speed to get the reliable upper hand. In this case the competitor insert is more prone to chipping.</p>
Work piece material	Ductile	
SMG	SMG K4	
Coolant	Emulsion	
Vc (sfm)	722 (220 mm/min)	
f (in/rev)	0.010" (0.25 mm)	
APMX (in)	0.079" (2 mm)	
Grade	TK1501	Competitor
Insert	CNMG432-M4	CNMG432
Tool life	45 parts	45 parts





TK0501: SECURED PRODUCTIVITY

- 1st choice in grey cast iron
- When the highest **productivity** is required
- Highest wear resistance in continuous cuts of all cast irons
- Higher speed and easier cast iron applications than TK1501
- Using MR9 creates a very secure, high productivity solution
- Highest performance even in hardened steels

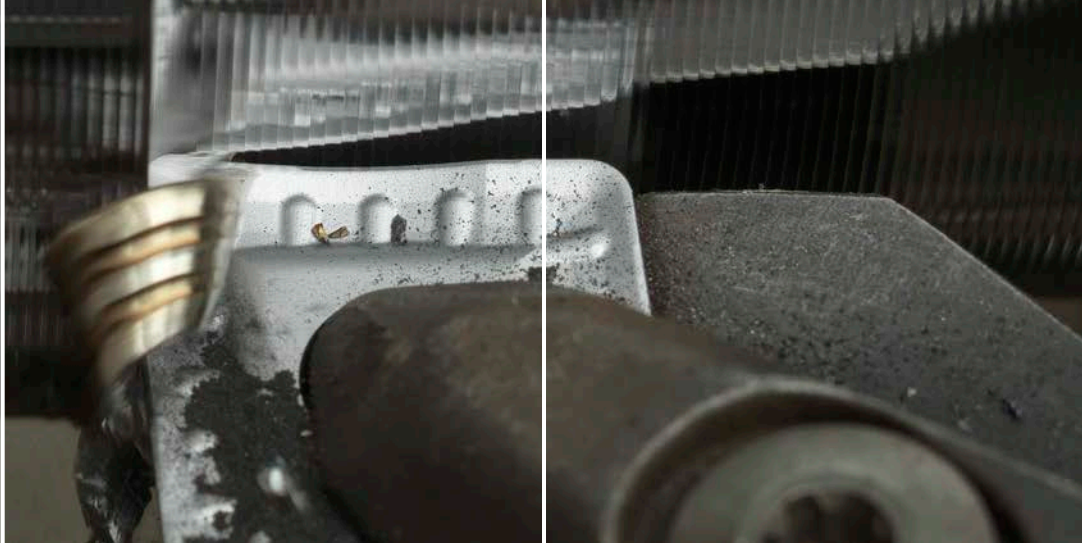


CASE STUDY		Outperforming the competitor achieving at least 50% more parts using the winning team TK0501-MR9 .
Part	CYLINDER BLOCK, PARTLY INTERRUPTIONS	
Operations	Rough-Boring	
Workpiece material	EN-GJS-600, Ductile iron	
SMG	SMG K4	
Coolant	Yes, flood	

Grade	TK0501	Competitor
Insert	CNMA433-MR9	CNMA433
Vc (sfm)	492 (150 mm/min)	492 (150 mm/min)
f (in/rev)	0.012" (0.30 mm)	0.012" (0.30 mm)
APMX (in)	0.079" - 0.157" (2-4 mm)	0.079" - 0.157" (2-4 mm)
Tool life	6 parts per edge	4 parts per edge

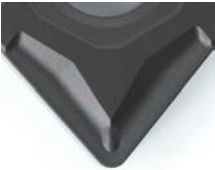
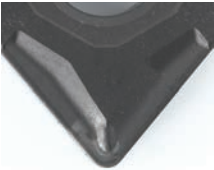
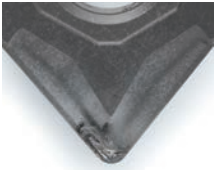
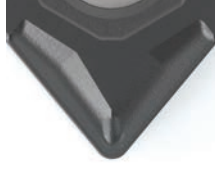

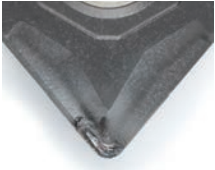
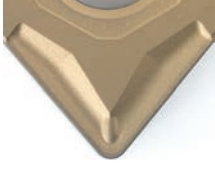




USED EDGE DETECTION



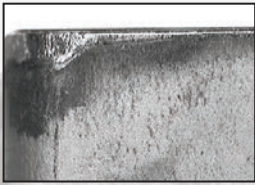
The used edge detection was selected to give the highest possible contrast and excel in real-life working conditions in all new Duratomic® Technology grades.

With the new grades, Seco took into account the users' need to reduce waste. A unique approach to used edge detection makes it very easy to identify unused edges with the naked eye. A key feature being that there is absolutely no loss in performance with the presence of the chrome layer.

USED EDGE DETECTION	New edge	10 seconds in cut	15 minutes in cut
All Black			
Black/TiN-flank Black/TiC-flank			
Classic TiN or TiN-top			

Conclusion: With careful observation a wear scar can be seen on gold TiN coated inserts. However, the presence of this coating on top of aluminum oxide usually results in a significant reduction in performance. The situation is even worse for black inserts, where it is very difficult to tell which cutting edges are used and which ones are not. These wasteful problems are not an issue with the chrome coating and you can easily tell which corners have been used. As a result there is no loss in the remarkable performance associated with the coatings produced with Duratomic® technology.

TROUBLE-SHOOTING COMMON WEAR MODES



Flank Wear

CORRECTIVE ACTIONS (TO RAPID FLANK WEAR)

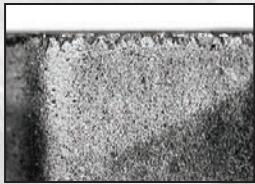
- Select a harder, more wear resistant grade.
- Apply coolant correctly
- Reduce the cutting speed (RPM or SFPM)



Crater Wear

CORRECTIVE ACTIONS (TO RAPID CRATER WEAR)

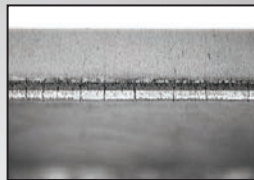
- Use a coated grade, coatings containing relatively thick layers of aluminum oxide are best
- Apply coolant
- Use a freer cutting geometry to reduce heat
- Reduce the cutting speed (RPM or SFPM)
- Reduce feed rate
- Increasing the lead angle will have a small, but positive, effect



Edge Chipping

CORRECTIVE ACTIONS

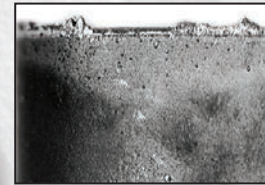
- Ensure proper (rigid) machine tool setup
- Minimize deflection
- Select a stronger cutting edge geometry
- Select a tougher insert grade
- Reduce the feed rate (especially at the entrance or exit of the cut)
- See also corrective actions for built-up edge as built-up edge is a frequent cause of chipping



Thermal Mechanical Fracturing

CORRECTIVE ACTIONS

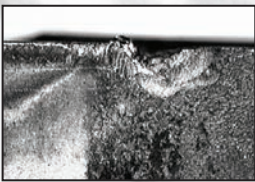
- Apply coolant correctly or remove completely
- Select a tougher insert grade (higher cobalt content)
- Reduce the cutting speed (RPM or SFPM)
- Reduce the feed rate



Built-up Edge

CORRECTIVE ACTIONS

- Increase the cutting speed (RPM or SFPM)
- Any coating, but especially a nitride coating, will reduce built-up edge
- Select an insert with a sharper, freer cutting edge geometry
- Apply coolant correctly. Increasing the concentration usually helps
- Use an insert with a smoother (polished) surface



Notch Wear

CORRECTIVE ACTIONS

- Vary the depth of cut when using multiple passes
- Use taper machining techniques when possible
- Use a tool with a larger lead angle
- Increase cutting speed if machining a high temp alloy – NOTE: This will generate more flank wear
- Use a chipbreaker designed for high feed rates
- Select a tougher insert grade
- Reduce the feed rate



Insert Fracture

CORRECTIVE ACTIONS

- Correct for all other failure mechanisms besides normal flank wear
- Verify set-up rigidity
- Select a tougher insert grade (higher content of cobalt)
- Select a thicker insert
- Select an insert with a tougher cutting edge
- Select an insert with a chipbreaker geometry designed for higher feed rates
- Reduce the depth of cut
- Reduce the feed rate
- Check the workpiece for hard inclusions or difficult entry



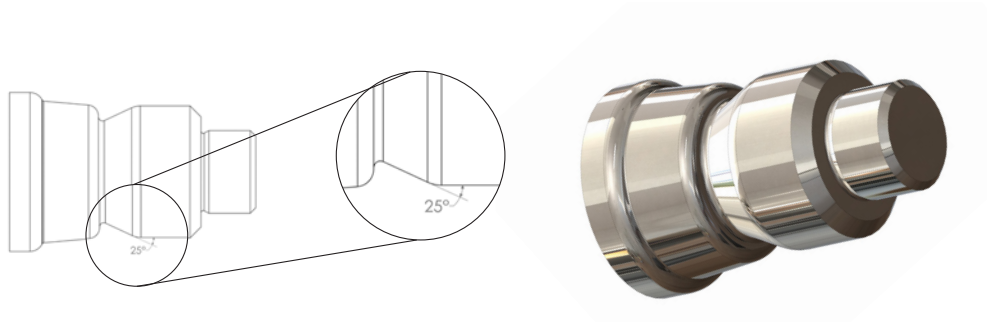
Plastic Deformation

CORRECTIVE ACTIONS

- Apply coolant correctly
- Use a harder, more wear resistant grade with a lower cobalt content
- Using a freer cutting insert geometry will have a small but positive effect
- Reduce the cutting speed (RPM or SFPM)
- Reduce the feed rate
- Select an insert with a larger nose radius

TOOL SELECTION MADE EASY: THE RECOMMENDED PROCESS FOR SELECTING THE RIGHT TOOL

As an illustration of the tool selection process, consider a part that is made of 4140 steel. There is a feature showing an undercut at 25° and the finish requirement is 128 R_a. **APPLICATION EXAMPLE:**

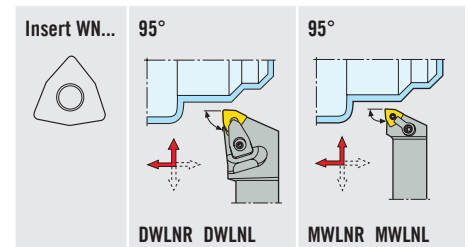
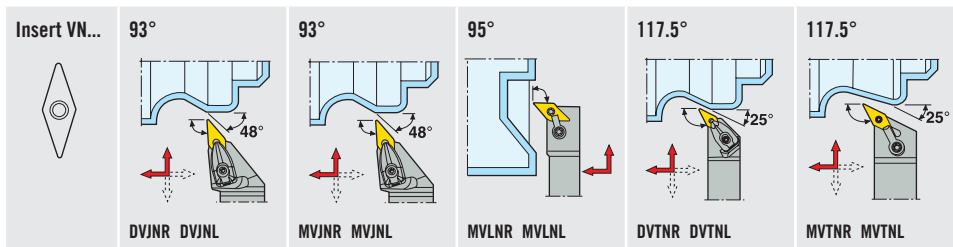
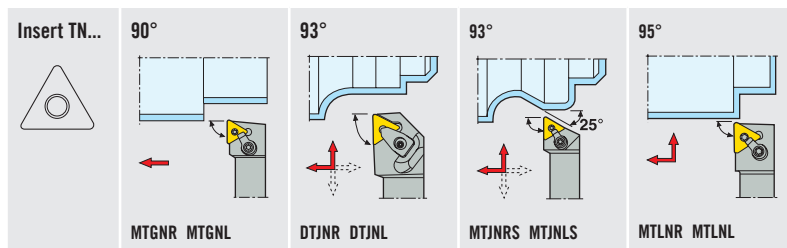
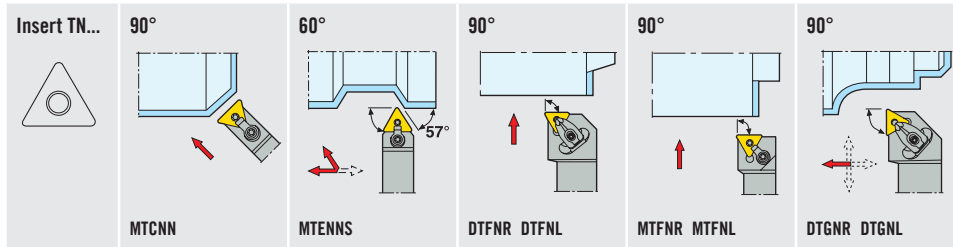
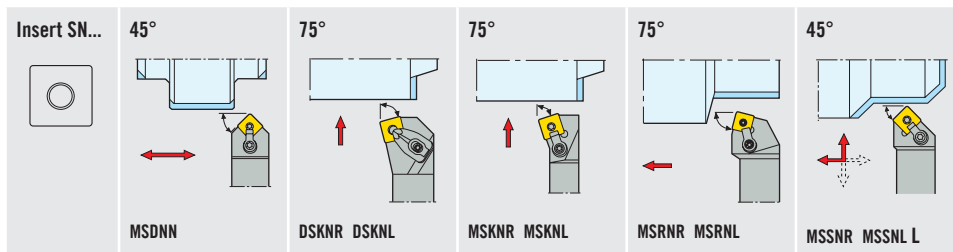


STEP 1: TOOL STYLE

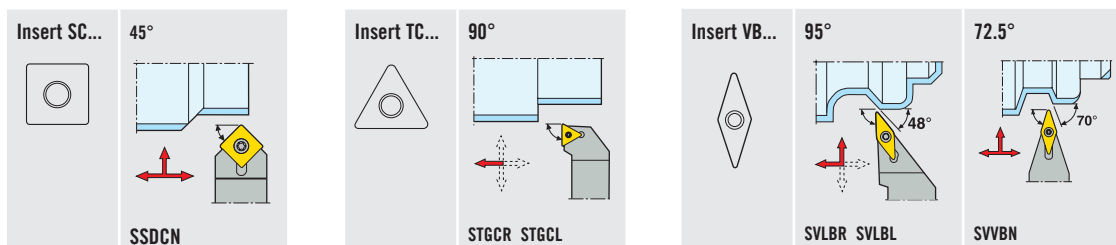
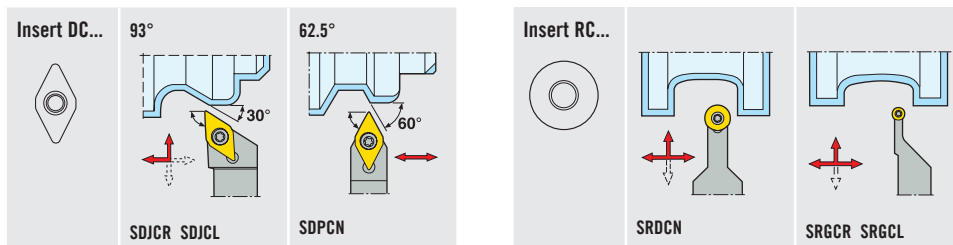
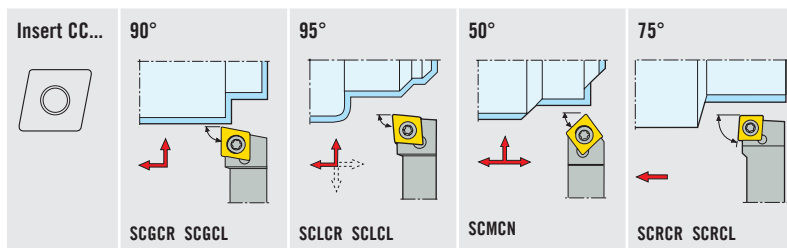
Match the shape of the part to be machined with the sketches shown below. Select toolholder and insert style to suit the machining operation to be carried out.

EXTERNAL TURNING, -D STYLE, ANSI -M STYLE AND -P STYLE (M STYLE WITHOUT TOP CLAMP)

Insert CN... 	75° DCKNR DCKNL	75° MCKNR MCKNL	95° DCLNR DCLNL	95° MCLNR MCLNL	40° MCMNN	75° MCRNR MCRNL		
Insert DN... 	93° DDHNR DDHNL	93° DDJNR DDJNL	93° MDJNR MDJNL	62.5° DDPNN	Insert R... 	 DRGNR DRGNL	 MRGNR MRGNL	 MRGOR MRGOL



EXTERNAL TURNING, ANSI -S C-LOCK (S TOOLHOLDER)



STEP 2: WORKPIECE MATERIAL (STEEL & CAST IRON)

Find the name of the materials being machined and identify the Seco Material Group that is appropriate for your material of interest.

STEELS, FERRITIC AND MARTENSITIC STAINLESS STEELS

SMG	DESCRIPTION	PROPERTIES UTS = Ultimate tensile strength (ksi)	REFERENCE MATERIAL (ANSI)
P1	Free-cutting steels	50 < UTS < 75	1213 UTS = 55 ksi
P2	Low alloy ferritic steels, C < 0.25%wt Low alloy weldable general structural steels	45 < UTS < 85	A 573 Gr. 58 UTS = 60 ksi
P3	Ferritic & ferritic/pearlitic steels, C < 0.25%wt Weldable general structural steels Case hardening steels	60 < UTS < 90	5115 UTS = 80 ksi
P4	Low alloy general structural steels, 0.25% < C < 0.67%wt Low alloy Quench & Temper steels	75 < UTS < 175	1045 UTS = 95 ksi
P5	Structural steels, 0.25% < C < 0.67%wt Quench & Temper steels	80 < UTS < 175	4140 UTS = 100 ksi
P6	Low alloy through hardening steels, C > 0.67%wt Low alloy spring and bearing steels	75 < UTS < 170	1095 UTS = 85 ksi
P7	Through hardening steels, C > 0.67%wt Spring and bearing steels	85 < UTS < 170	52100 UTS = 95 ksi
P8	Tool steels High Speed Steels (HSS)	85 < UTS < 170	H13 UTS = 100 ksi
P11	Ferritic & martensitic stainless steels	60 < UTS < 170	420 UTS = 95 ksi

CAST IRONS

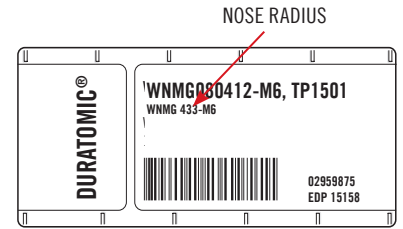
SMG	DESCRIPTION	PROPERTIES	REFERENCE MATERIAL (ANSI)
K1	Grey cast irons (GCI)	20 < UTS < 40	A48 35 B
K2	Compacted graphite irons (CGI)	50 < UTS < 73	Grade 400-15
K3	Malleable cast irons (MCI)	60 < UTS < 70	A220 60004
K4	Nodular cast irons (SGI)	80 < UTS < 120	80-55-06
K5	Austempered ductile irons (ADI)	130 < UTS < 230	1050/700/7
K6	Austenitic lamellar cast irons	24 < UTS < 29	A436 Type 1 (Ni-Resist 1)
K7	Austenitic nodular cast irons	54 < UTS < 60	A439 Type D-2M (Ni-Resist D-2M)

STEP 3: NOSE RADIUS & FEED RATE

NOSE RADIUS

The choice of nose radius is dependent on the workpiece design and the machining operation. The nose radius influences cutting data choice and the surface finish achieved. The maximum feed rate that can be used depends on a number of factors including machine power, stability, workpiece material, insert shape and size, nose radius, chipbreaker, grade and setting angle.

Small nose radius = universal machining, low cutting forces (less vibration risk).
 Large nose radius = strong, suitable for high cutting data, good surface finish.



Surface finish Ra value (μ inch)	Nose radius, r_E (inch)					
	.008	.016	.032	.047	.062	.094
	Feed rate, f (inch/rev)					
24	.002	.003	.004	.005	.006	.007
64	.003	.005	.006	.008	.009	.011
128	.005	.006	.009	.011	.013	.016
250	—	.009	.013	.016	.018	.022
320	—	—	.016	.019	.022	.027

Find the feed recommendations for a chosen chipbreaker. Then look in the surface finish table below to be sure that the required surface finish can be achieved. The maximum feed rate should always be considerably smaller than the nose radius. A feed rate that is too low can result in poor chipbreaking and tool life.

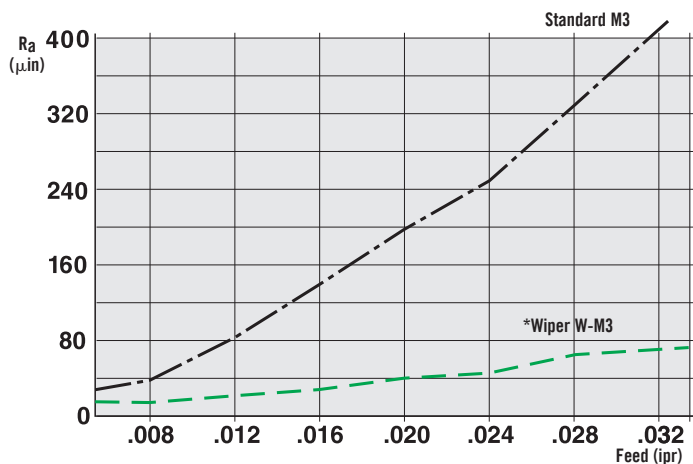
HIGH FEED INSERTS

The Seco High Feed inserts offer

- Excellent surface finish at high feed rates
- Superior surface finish at normal feed rates

The use of High Feed inserts often eliminates the need for finish grinding. High Feed inserts are designed for small cutting depths.

CNMG 432W-M3, TP2501, $R = 95^\circ$, APMX = .040", cutting speed adjusted for feed, workpiece material: steel, Seco material group 4.

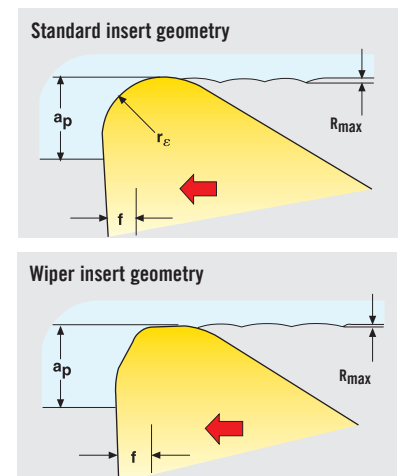


WIPER INSERT OPERATION GUIDELINES

Favorable surface finish results are lost, if the cutting edge angle diverges from:
 95° (C & W style inserts)
 93° (D & T style inserts)

Maximum diversion angle allowed $\pm 2^\circ$, Back turning is not recommended

For more info, see page 50 of the Turning Navigator Catalog.



STEP 4: CHIPGROOVES

Select the proper chip groove by understanding both feed rate and depth of cut, in which you will be machining for your component.

CHIPBREAKER OVERVIEW

The chipbreakers are designed to control the chips when turning long chipping materials. The numerical designations describe the application area as follows:

Numerals 1 - 9:

- 1 = For low feed rates and easy conditions
- 9 = For high feed rates and rough conditions

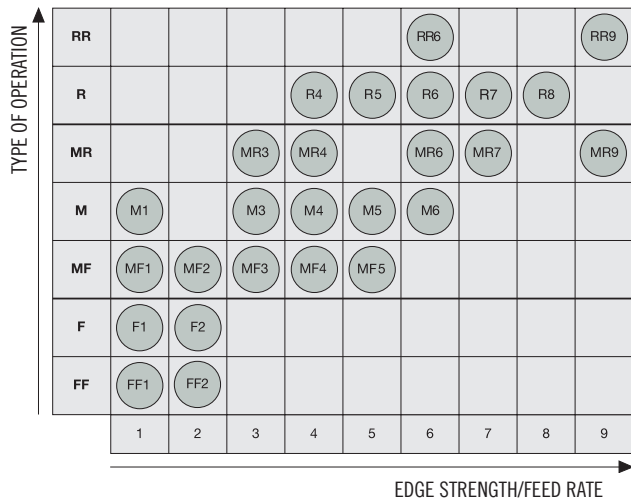
NEGATIVE INSERT CHIPGROOVE RECOMMENDATIONS

Steel (ISO-P)	FF2	M3	M6
Stainless Steel (ISO-M)	MF1	MF4	M5
Cast Iron (ISO-K)	M3	M5	MR9
Hardened Steels (ISO-H)	MF1	M3	-

FINISHING
at low depth of cut. Typical APMX = .008-.032" and f = .008 in/rev.

MEDIUM-ROUGH MACHINING
Typical one pass machining at APMX = .032-.120" and f = .012 in/rev.

ROUGH MACHINING
at higher depth of cut and feed rate in most cases with difficult surface conditions such as scale, irregularities and other conditions leading to interruptions and edge damage. Typically APMX = .12-.28" and f = .02 in/rev.




POSITIVE INSERT CHIPGROOVE RECOMMENDATIONS

F1	MF2	M5
F1	MF2	M5
F1	M3	M5
F1	-	-

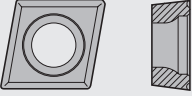


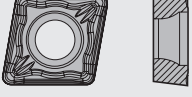
NEGATIVE INSERT CHIPBREAKERS

	-FF1	Chipbreaker for negative inserts. Used to achieve a very fine finish when turning steel and stainless steel. Machining range: f = .003-.012 ipr, APMX = .008-.120"
	-FF2	Chipbreaker for high feed finishing and medium-roughing machining of steel and cast iron. Ensures safe and well directed chip flow and good surface finish. Machining range: f = .003-.012 ipr, APMX = .008-.060"
	-MF1	Chipbreaker intended for machining stainless steel, superalloys and titanium alloys. Type ..GG insert has a sharp, precision ground edge. Type ..MG insert has a lightly honed cutting edge for increased strength. MF1 is intended for use in semi-finishing and finishing applications. Machining range: f = .003-.012 ipr, APMX = .008-.140"
	-MF2	First choice for finishing with negative inserts. Suitable for chip control at depths of cut down to .010", provided that the feed rate is in excess of .010"/rev. Good capacity for medium-rough machining. Machining range: f = .004-.016 ipr, APMX = .008-.120"

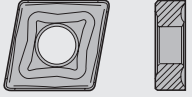
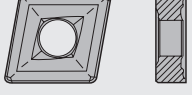
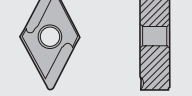
NEGATIVE INSERT CHIPBREAKERS

		-MF3	Chipbreaker with positive cutting rake angle intended for moderately difficult stainless steel. The MF3 is also intended for light roughing in relatively soft, “tacky” steel and difficult to machine stainless steel if the depth of cut is limited. MF3 can also be used for finishing of cast iron. Machining range: $f = .006-.016$ ipr, $APMX = .040-.200$ ”
		-MF4	Chipbreaker intended for medium/finishing of stainless steel, very open and highly positive geometry. Machining range: $f = .006-.020$ ipr, $APMX = .020-.160$ ”
		-MF5	Chipbreaker intended for medium finishing of steel and stainless steel at high feeds. Very easy cutting and open geometry. Machining range: $f = .008-.031$ ipr, $APMX = .008-.100$ ”
		-M3	First choice for medium-rough machining and also the most versatile Seco chipbreaker. In most cases, it is the only chipbreaker needed. Offers the best useful life and best chipbreaking in a wide range of cutting data and workpiece materials. Suitable for precision forged and cast workpieces (Near Net Shape workpieces or NNS) as regards both chip control and edge strength. Machining range: $f = .006-.020$ ipr, $APMX = .020-.200$ ”
		-M4	Chipbreaker intended for cast iron. Positive rake angle with a narrow T-land gives low cutting forces. First choice for cast iron machining at high speeds. Machining range: $f = .004-.028$ ipr, $APMX = .008-.276$ ”
		-M5	First choice for roughing by means of double-sided inserts. Intended for demanding operations at high feed rates in steel, stainless steel and cast iron. Combines high edge strength with comparatively low cutting forces. Machining range: $f = .010-.028$ ipr, $APMX = .060-.275$ ”
		-M6	Strong double-sided chipbreaker, intended for semi-roughing and roughing of steel. A well-balanced design combining excellent chip control and relatively low cutting forces which provides reliable cutting action in both continuous as well as interrupted cuts. Well suited also for machining of ferritic and martensitic stainless steels. Machining range: $f = 0.008-0.031$ in/rev, $APMX = 0.040-0.275$ inch
		-MR4	The MR4 has a negative T-land, which gives extremely high edge strength. The chipbreaker is intended for more difficult machining applications on superalloys and titanium alloys, such as intermittent cuts and the machining of parts with raw surface. Machining range: $f = .006-.022$ ipr, $APMX = .060-.275$ ”
		-MR7	The strongest chipbreaker for double-sided inserts. The MR7 is suitable for high feed rates and depths of cut that normally require a single-sided insert. The chipbreaker has a wide negative T-land, which gives high edge strength. Machining range: $f = .010-.032$ ipr, $APMX = .060-.275$ ”
		-MR9	Chipbreaker for double sided inserts in our cast iron grade range. Large support surfaces improve strength and heat transport from the cutting zone through the insert is more efficient. Primarily designed for high feed rates and depth of cut, interruptions and forging skins. Machining range: $f = .010-.032$ ipr, $APMX = .060-.275$ ”
		-R4	Chipbreaker for single-sided inserts. It has a positive cutting edge which gives low cutting forces. Machining range: $f = .008-.024$, $APMX = .080-.400$ ”
		-R5	Chipbreaker for single-sided inserts. Recommended for medium-roughing of steel. Machining range: $f = .012-.040$ ipr, $APMX = .080-.480$ ”
		-R6	Chipbreaker for single-sided inserts. Recommended for medium-roughing of stainless steel. Machining range: $f = .010-.025$ ipr, $APMX = .080-.400$ ”
		-RR6	A very easy-cutting chipbreaker for single-sided inserts. Recommended for roughing of stainless steel and steel. Machining range: $f = .012-.040$, $APMX = .080-.480$ ”
		-R7	A strong but easy-cutting chipbreaker for single sided inserts. The R7 is well suited for intermittent machining of both stainless and ordinary carbon steel. Machining range: $f = .016-.040$, $APMX = .070-.500$ ”

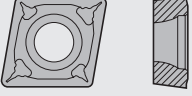


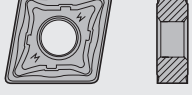

POSITIVE INSERT CHIPBREAKERS

	-FF1	Chipbreaker for positive inserts. Used to achieve a very fine finish when turning steel and stainless steel. Machining range: $f = .002-.012$ ipr, $APMX = .008-.080$ "
	-F1	A versatile chipbreaker for positive inserts. Positive geometry with sharp cutting edge gives easy-cutting properties. Suitable for high feed rates at fine depths of cut on precision forgings and castings. Machining range: $f = .004-.012$, $APMX = .020-.100$ " Machining in bar automatics, for instance: $f = .003-.010$ ipr, $APMX = .040-.120$ "
	-F2/M3	Chipbreaker for positive inserts. Ensures safe chip flow on finishing and medium roughing in steel and stainless steel. Machining range: $f = .006-.016$ ipr, $APMX = .030-.200$ "
	-M5	Rigid chipbreaker for positive inserts. Intended for medium-rough and rough machining of steels, stainless steels and cast iron. Combines high edge strength with comparatively low cutting forces. Safe action in interruptions and rough skin on parts. Machining range: $f = .006-.024$ ipr, $APMX = .039-.200$ "

SUPPLEMENTARY CHIPBREAKER PROGRAM

	-R8	A very strong chipbreaker for single-sided inserts. The R8 is intended for high feed rates when machining castings and forgings of austenitic stainless steel. Machining range: $f = .014-.031$ ipr, $APMX = .070-.500$ "
	-RR9	Extremely strong chipbreaker for single-sided negative inserts, for use at high feed rates. Suitable for difficult castings and forgings and for austenitic stainless steel. Machining range: $f = .020-.048$ ipr, $APMX = .100-.600$ "
	-UX	Chipbreaker for negative inserts. Positive cutting rake with sharp edge. Low cutting force. Suitable for slim components. Machining range: $f = .008-.016$ ipr, $APMX = .040-.240$ "

CHIPBREAKER PROGRAM, HIGH FEED INSERTS (WITH WIPER RADIUS)

	W-F1	A versatile chipbreaker for positive inserts. For finishing machining of steel, stainless steel and cast iron giving good surface finish. Suitable for high feed rates at small depth of cut. Machining range: $f = .002-.020$, $APMX = .010-.120$ "
	W-MF2	First choice for finishing with negative inserts. Chipbreaker suitable for finishing machining of steel, stainless steel and cast iron at high feed rates giving good surface finish. Machining range: $f = .002-.024$ ipr, $APMX = .010-.160$ "
	W-MF5	Chipbreaker intended for medium finishing of steel at high feed. The geometry is very open and highly positive. Machining range: $f = .008-.031$ ipr, $APMX = .008-.105$ "
	W-M3	Versatile chipbreaker for high feed finishing and medium-roughing machining of steel, stainless steel and cast iron. Operates in a wide application area. Gives a good surface finish even at high feeds. Machining range: $f = .008-.035$ ipr, $APMX = .020-.240$ "
	W-R7	A strong easy cutting chipbreaker for single sided inserts. Intended for the highest feeds when medium-roughing and rough machining of steel, stainless steel and cast iron. Gives a good surface finish even at the higher feeds. Machining range: $f = .016-.048$ ipr, $APMX = .080-.375$ "

STEP 5: CUTTING DATA & APPLYING SMG V2

STEEL

SMG	Description	TP0501		TP1501		TP2501		TP3501	
		f (in/rev)		f (in/rev)		f (in/rev)		f (in/rev)	
		0.008	0.016	0.008	0.016	0.008	0.016	0.008	0.016
P1	Free-cutting steels	2560	2002	2264	1674	1936	1476	1674	1100
P2	Low-alloy ferritic steels, C < 0.25%wt	2494	1936	2230	1624	1838	1510	1624	1082
P3	Case-hardening steels, C < 0.25%wt	2034	1674	1640	1312	1870	1526	1182	820
P4	Low-alloy Quench & Temper steels, 0.25% < C < 0.67%wt	1902	1476	1674	1230	1428	1082	1246	820
P5	Quench & Temper steels, 0.25% < C < 0.67%wt	1706	1428	1378	1100	1328	1082	984	722
P6	Low-alloy bearing steels, C > 0.67%wt	2034	1574	1804	1328	1526	1164	1346	886
P7	Bearing steels, C > 0.67%wt	1804	1510	1460	1164	1280	1148	936	688
P8	Tool steels	1706	1428	1378	1100	1328	1082	886	590
P11	Ferritic & martensitic stainless steels	1772	1460	1428	1132	1378	1116	820	426
P12	Maraging and precipitation-hardening stainless steels	1034	870	836	672	574	524	492	246

This cutting data for CNMG432 can be used as an example for referencing the SMG steel classification. It comes from the same single source cutting data service that is used for box label data, data in My Pages and catalogs for consistency.

CAST IRON

SMG	Description	TK0501		TK1501		TP1501	
		f (in/rev)		f (in/rev)		f (in/rev)	
		0.008	0.016	0.008	0.016	0.008	0.016
K1	Grey Cast Iron (GCI)	1968	1706	1738	1444	1492	1510
K2	Compacted graphite irons (CGI)	1526	1362	1492	1312	1296	1312
K3	Malleable cast irons (MCI)	1296	1148	1264	1116	1100	1116
K4	Nodular cast irons (SGI)	1230	1100	1198	1066	1050	1066
K5	Austempered ductile irons (ADI)	738	656	722	624	624	640
K6	Austentic lamellar cast irons	1230	1050	1066	886	918	936
K7	Austentic nodular cast irons	936	836	918	804	804	804

This cutting data for CCMT32.52-M5 can be used as an example for referencing the SMG cast iron classification for 15 minutes tool life and 0.04 in D.O.C. including a reference to TP1501 from the TP grade chain.

SMG	Description	TK0501		TK1501		TP1501	
		f (in/rev)		f (in/rev)		f (in/rev)	
		0.008	0.016	0.008	0.016	0.008	0.016
K1	Grey Cast Iron (GCI)	1870	1492	1574	1164	1476	1328
K2	Compacted graphite irons (CGI)	1378	1164	1378	1132	1280	1148
K3	Malleable cast irons (MCI)	1164	984	1164	952	1082	968
K4	Nodular cast irons (SGI)	1116	936	1116	918	1034	918
K5	Austempered ductile irons (ADI)	672	558	656	542	606	558
K6	Austentic lamellar cast irons	1148	918	968	722	902	820
K7	Austentic nodular cast irons	854	706	854	688	788	706

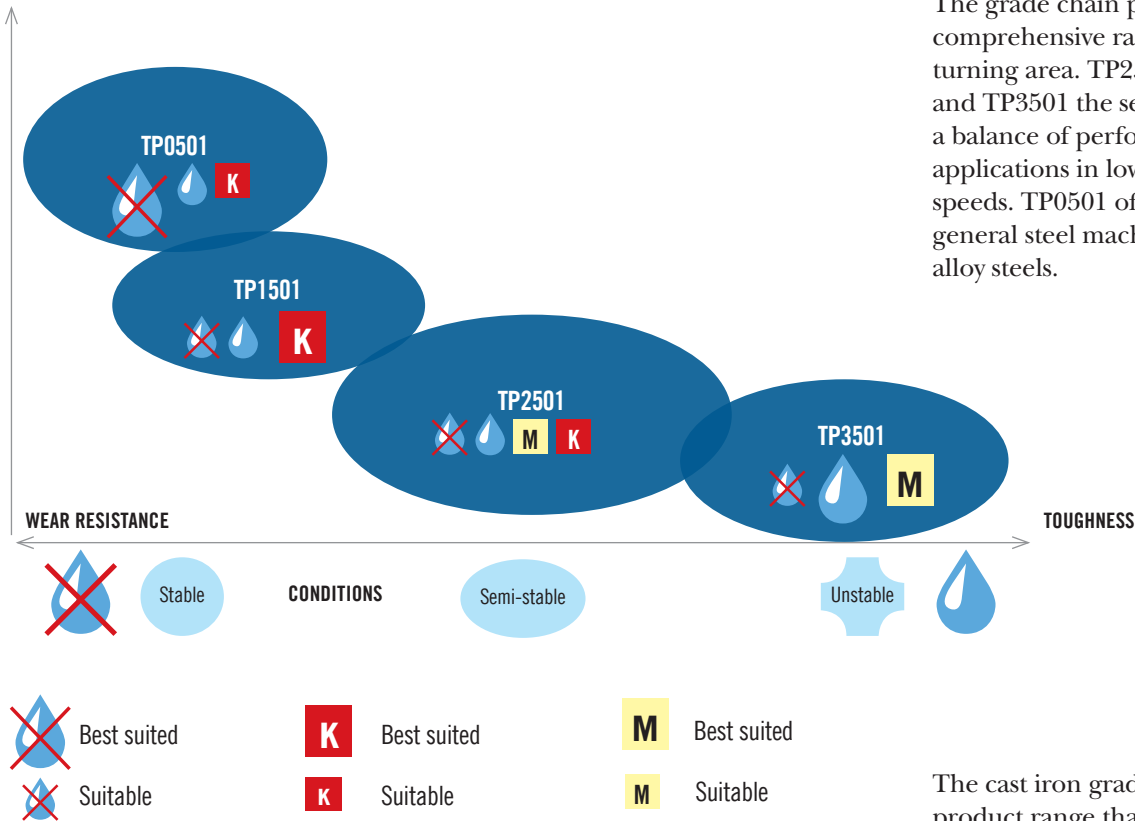
This cutting data for CNMG433-MR7 can be used as an example for referencing the SMG cast iron classification. for 15 minutes tool life and 0.12 in D.O.C including a reference to TP1501 from the TP grade chain.

STEP 6: GRADE, SPEED & FEED - GENERAL MACHINING RECOMMENDATIONS

The following chart illustrates the indicative positioning and application area for the following grades in steel and cast iron applications.

APPLICATION AREA IN STEEL

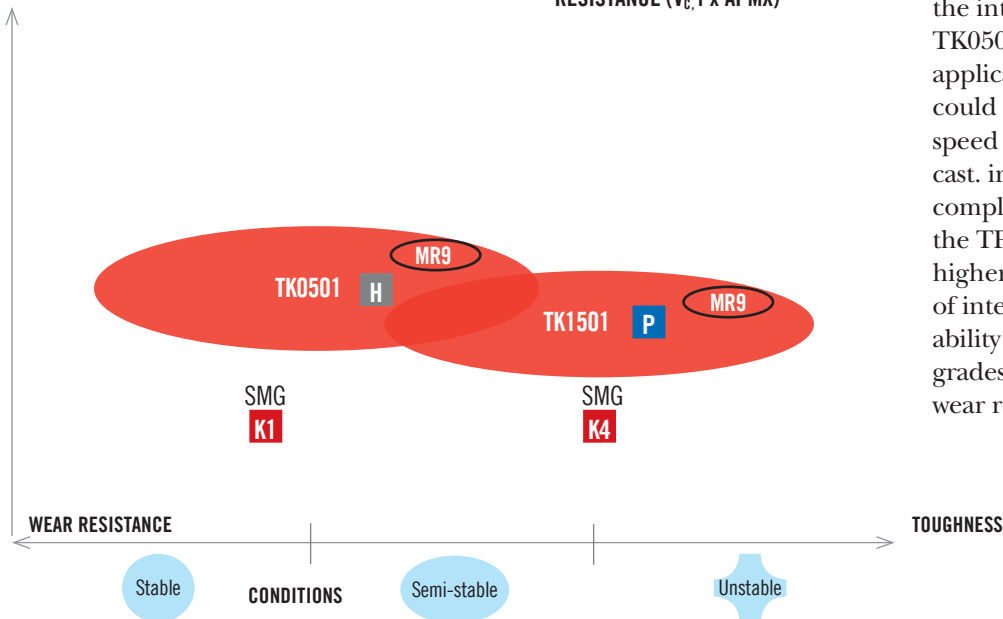
WEAR RESISTANCE, HEAT RESISTANCE ($V_c, f \times APMX$)



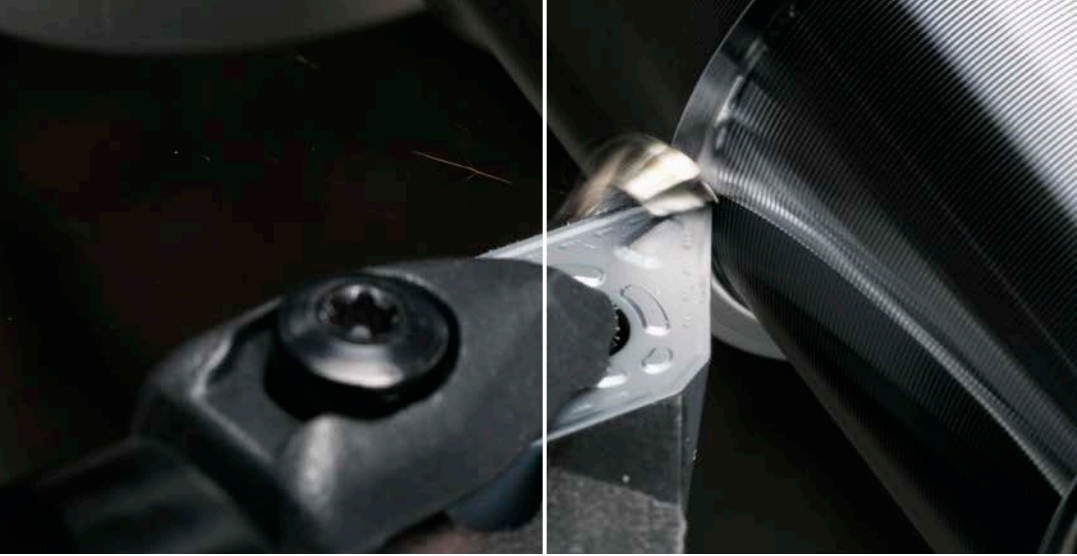
The grade chain provides a very versatile and comprehensive range to cover the whole steel turning area. TP2501 is the “king” of versatility and TP3501 the secure choice. TP1501 provides a balance of performance and productivity for applications in low-alloy steels or using lower speeds. TP0501 offers a high-heat profile in general steel machining, particularly in high alloy steels.

APPLICATION AREA IN CAST IRON

WEAR RESISTANCE, HEAT RESISTANCE ($V_c, f \times APMX$)



The cast iron grade chain provides a versatile product range that has an even wider coverage of the cast iron application area. TK1501 is the first choice in ductile cast iron and TK0501 is the first choice in grey cast iron material, but the interchange capability of the grades i.e. TK0501 works amazingly well in continuous application in ductile casts as well as TK1501 could be a better choice at more limited speed in more toughness demanding grey cast. iron applications. Worth noting is the complementary capability of TP1501 from the TP grade chain in cast irons especially at higher speed in ductile irons with some level of interrupted cuts. Always remember the ability of MR9 to drastically shift both the grades to higher toughness keeping the highest wear resistance.



DURATOMIC® INSERT PROGRAM

INSERT SIZE

For equal sided inserts I.C. in 1/8ths of an inch.

Examples:

- 1/8" = 1
- 5/32" = 1.2
- 3/16" = 1.5
- 7/32" = 1.8
- 1/4" = 2
- 5/16" = 2.5
- 3/8" = 3
- 1/2" = 4
- 5/8" = 5
- 3/4" = 6
- 7/8" = 7
- 1" = 8
- 1 1/4" = 10

Rectangle and parallelogram inserts require two digits: 1st Digit-Number of 1/8ths in width. 2nd Digit-Number of 1/4ths in length.

INSERT THICKNESS

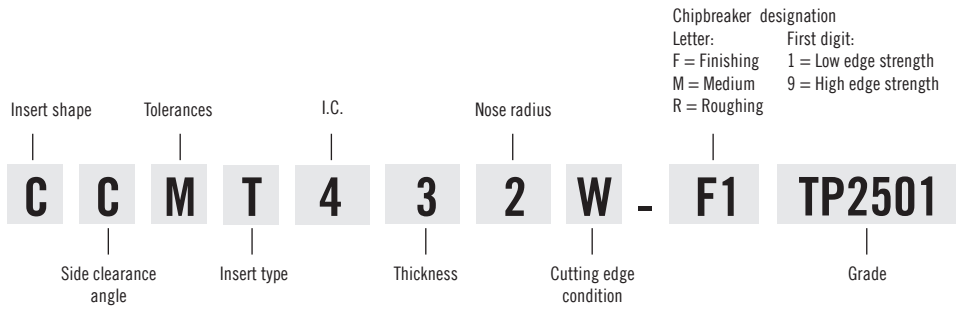
Number of 1/32nds on inserts less than 1/4"

I.C.Number of 1/16ths on inserts 1/4" I.C. and over.

INSERT NOSE RADIUS

- 0.0 = Sharp to .002"
- 0 = Sharp to .004"
- 0.5 = .008"
- 1 = .016"
- 2 = .031"
- 3 = .047"
- 4 = .062"
- 6 = .094"
- 8 = .125"

CODE KEY



DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
CNMM433W-R4	-	16653	16690	-	-	-
CNMM434-R4	-	16911	16908	16863	-	-
CNMM543-R4	49399	17062	16954	16932	-	-
CNMM543-R6	49402	-	-	-	-	-
CNMM543-R7	49403	-	-	-	-	-
CNMM543-RR6	-	17270	-	-	-	-
CNMM544-R4	49405	16982	17045	16948	-	-
CNMM544-R5	-	-	17347	17444	-	-
CNMM544-R7	49406	17137	-	17136	-	-
CNMM544-RR6	-	17155	17323	-	-	-
CNMM546-R7	-	-	-	17440	-	-
CNMM643-R4	49408	17028	16925	16889	-	-
CNMM643-R6	49409	-	-	-	-	-
CNMM643-R7	49411	17165	-	-	-	-
CNMM643-RR6	-	17172	-	-	-	-
CNMM644-MR6	-	-	18015	-	-	-
CNMM644-R4	48990	16997	17081	16930	-	-
CNMM644-R5	-	-	-	17175	-	-
CNMM644-R7	49413	17334	17181	-	-	-
CNMM644-R8	49414	-	-	-	-	-
CNMM644-RR6	49415	17350	-	-	-	-
CNMM644W-R7	-	16693	16669	-	-	-
CNMM646-R4	49416	16966	16952	16903	-	-
CNMM646-R5	-	-	-	17277	-	-
CNMM646-R7	49417	17447	-	17192	-	-
CNMM646-RR6	-	17437	-	17206	-	-
CNMM646W-R7	-	16766	16658	16657	-	-
DCMT21.50.5-F1	49419	19787	-	-	-	-
DCMT21.50.5-M3	-	20284	20236	-	-	-
DCMT21.51-F1	49420	19974	19919	-	-	-
DCMT21.51-M3	49421	20296	20285	-	-	-
DCMT21.51-MF2	49422	14255	14963	-	-	-
DCMT21.52-F1	49425	-	19789	-	-	-
DCMT21.52-M3	49426	20291	20265	-	-	-
DCMT21.52-MF2	49428	-	-	-	-	-
DCMT32.50.5-F1	49429	19971	-	-	-	-
DCMT32.50.5-FF1	-	19684	-	-	-	-
DCMT32.50.5-M3	-	20288	20237	-	-	-
DCMT32.50.5-MF2	49759	14256	14964	-	-	-
DCMT32.51-F1	49430	20179	19983	15860	46651	46493
DCMT32.51-FF1	-	19955	-	-	-	-
DCMT32.51-M3	48956	20298	20293	15904	46558	-
DCMT32.51-MF2	49431	14257	14970	14966	-	-
DCMT32.52-F1	49432	20220	20182	15862	46652	46494
DCMT32.52-FF1	-	19957	-	-	-	-
DCMT32.52-M3	49433	20299	20289	-	46559	-
DCMT32.52-M5	49434	14278	14975	14971	-	-
DCMT32.52-MF2	49435	14258	14977	14976	-	-
DCMT32.53-F1	-	19939	19920	-	-	-
DCMT32.53-M5	61340	14283	-	-	-	-
DCMT32.53-MF2	-	14259	-	-	-	-
DCMT431-M3	49437	20292	20266	-	-	-
DCMT432-M3	49438	20294	20282	-	-	-
DCMT433-M3	49439	20286	20283	-	-	-
DCMX32.51W-F1	-	19307	19130	-	-	-
DCMX32.52W-F1	-	19224	19308	-	-	-
DNMA432	-	-	-	-	-	46697
DNMA433-MR9	-	-	-	-	46301	46300
DNMA442	-	-	-	-	-	46698
DNMA443	-	-	-	-	-	46699
DNMA443-MR9	-	-	-	-	46304	46302
DNMG431-FF2	-	15594	15593	-	-	-
DNMG431-M3	-	15407	15406	-	46571	-
DNMG431-M5	49440	-	-	-	-	-
DNMG431-MF2	-	15064	15028	15023	-	-
DNMG431-MF3	49441	-	-	-	-	-
DNMG432-FF2	49443	14296	15600	15599	-	-
DNMG432-M3	48958	15419	15417	15411	46572	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
DNMG432-M5	49001	16238	16237	16223	46573	-
DNMG432-M6	49444	15182	15180	-	-	-
DNMG432-MF2	49446	15065	15031	15029	-	-
DNMG432-MF3	49447	-	-	-	-	-
DNMG432-MF5	-	18251	18100	-	-	46473
DNMG433-M3	49449	15450	15445	15427	46574	-
DNMG433-M5	49002	16596	16595	-	-	-
DNMG433-M6	49451	15184	15183	-	-	-
DNMG433-MF2	-	15066	-	-	-	-
DNMG433-MF5	-	18235	18025	-	-	-
DNMG434-M3	61351	-	-	-	-	-
DNMG434-M6	61350	15188	-	-	-	-
DNMG441-FF2	-	15606	15605	-	-	-
DNMG441L-UX	-	17578	17510	-	-	-
DNMG441-M3	48959	15455	15454	-	46575	-
DNMG441-M5	49458	16251	-	-	-	-
DNMG441-MF2	49038	15067	15729	-	-	-
DNMG441-MF3	49767	-	-	-	-	-
DNMG441R-UX	-	17597	17541	-	-	-
DNMG442-FF2	-	14297	15612	15611	-	-
DNMG442L-UX	-	17585	17559	-	-	-
DNMG442-M3	48960	15463	15461	15458	46576	-
DNMG442-M5	49003	16267	16266	16258	46783	46732
DNMG442-M6	49790	15190	15189	-	46524	-
DNMG442-MF2	49052	15068	15733	15732	46673	46474
DNMG442-MF3	49053	-	-	-	-	-
DNMG442-MF4	-	18104	-	-	-	-
DNMG442-MF5	-	18238	18225	18222	-	46475
DNMG442-MR7	-	-	16597	-	-	-
DNMG442R-UX	-	17596	17566	-	-	-
DNMG443-M3	-	15466	15734	15464	46577	-
DNMG443-M5	49004	16606	16605	16604	46785	46734
DNMG443-M6	49462	15204	15192	15191	46525	-
DNMG443-MF2	-	15069	15737	15736	46578	-
DNMG443-MF3	48962	-	-	-	-	-
DNMG443-MF5	-	18164	18230	18046	-	-
DNMG443-MR7	49465	-	16412	16408	46579	-
DNMG444-M3	-	15475	15738	-	-	-
DNMG444-M5	49005	16610	16608	16607	-	-
DNMG444-M6	49466	15211	15206	-	-	-
DNMG444-MF5	-	18181	-	-	-	-
DNMG542-M5	61598	-	-	-	-	-
DNMG543-M6	61599	-	-	-	-	-
DNMM442-R4	49467	16801	16797	-	-	-
DNMM443-R4	49468	16832	16833	16802	-	-
DNMM444-R4	-	16831	16819	-	-	-
DNMP431-M3	48957	-	-	-	-	-
DNMP431-MF2	49036	-	-	-	-	-
DNMU330.5-M3	61352	15483	15479	-	-	-
DNMU331-FF2	49470	14298	15619	-	-	-
DNMU331-M3	48963	15485	15739	-	46580	-
DNMU331-MF2	49054	15070	15034	15033	-	46477
DNMU331-MF5	-	18182	-	-	-	-
DNMU332-FF2	49475	14299	15621	15620	-	-
DNMU332-M3	48964	15504	15500	15496	46581	-
DNMU332-M5	-	-	16277	-	46582	-
DNMU332-M6	49479	49037	49028	-	46516	-
DNMU332-MF2	49055	15071	15743	15741	46674	46478
DNMU332-MF5	-	18231	-	-	-	-
DNMU333-M3	-	-	15510	15509	46583	-
DNMU333-M5	-	-	16280	-	-	-
DNMU333-M6	49484	49070	49063	-	46517	-
DNMU333-MF2	-	15072	-	-	-	-
DNMU333-MF5	-	18114	-	-	-	-
DNMX331W-MF2	-	15695	15694	-	-	-
DNMX332W-MF2	49485	15697	15696	-	-	-
DNMX432W-M3	-	-	15563	-	-	-
DNMX433W-M3	-	-	15565	-	-	-
DNMX443W-M3	-	-	15570	15569	-	-

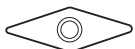
DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
KNUX160405L-11	49336	18923	18868	-	-	-
KNUX160405R-11	49338	18948	18869	-	-	-
KNUX160410L-11	-	18870	-	-	-	-
KNUX160410R-11	-	18871	-	-	-	-
LNMX191940-MF	-	18828	18889	-	-	-
LNMX191940-MR	-	18846	18829	-	-	-
LNMX191940-R2	-	-	18872	18848	46616	-
LNMX191940-RR94	-	-	18894	18849	46617	-
LNMX301940-MF	-	18873	18850	-	-	-
LNMX301940-MR	-	18854	18852	-	-	-
LNMX301940-R2	-	-	18856	18855	46618	-
LNMX301940-RR94	-	-	18857	18875	-	-
LNMX301940-RR97	-	-	18860	18859	-	-
LNMX401432-RR93	-	-	18862	18882	-	-
LNMX401432-RR96	-	18864	18863	-	-	-
LNMX501432-RR96	-	18867	18866	-	-	-
RCMT0602M0-F1	49487	15863	-	-	-	-
RCMT0602M0-M3	61341	15906	-	-	-	-
RCMT0803M0-F1	61342	15864	-	-	-	-
RCMT0803M0-M3	49488	15908	15907	-	46560	-
RCMT10T3M0-F1	49489	15865	-	-	-	-
RCMT10T3M0-M3	49490	15911	15909	-	46561	-
RCMT1204M0-F1	49491	15867	15866	-	46544	-
RCMT1204M0-M3	49493	15913	15912	-	46662	46508
RCMT1204M0-R2	61343	-	-	-	-	-
RCMT1606M0-F1	49495	15870	15869	15868	-	-
RCMT1606M0-M3	49497	15916	15915	15914	-	-
RCMX100300-RR94	48965	-	-	-	-	-
RCMX120400-RR94	48966	20318	-	-	-	-
RCMX160600-RR94	49498	20315	20313	-	-	-
RCMX200600-R2	-	20310	-	20309	-	-
RCMX200600-RR94	49328	20314	20317	20316	-	-
RCMX200600-RR97	-	20312	-	20311	-	46614
RCMX250700-R2	-	20334	-	20333	-	-
RCMX250700-RR94	48967	20341	20345	20349	46621	-
RCMX250700-RR97	-	20335	-	20342	-	46615
RCMX320900-R2	-	20325	-	20321	-	-
RCMX320900-RR94	49329	20336	20340	20347	46622	-
RCMX320900-RR97	-	20330	-	20328	-	-
RNMA43	-	-	-	-	46627	-
RNMG43-M3	49499	15528	15527	-	-	-
SCMT09T308-F1	-	-	-	-	46545	-
SCMT09T308-M3	-	-	-	-	46663	46509
SCMT1268-RR97	-	-	-	20339	-	-
SCMT2.522-M3	49646	15918	-	-	-	-
SCMT21.51-M3	49645	15917	-	-	-	-
SCMT32.51-F1	49649	15871	-	-	-	-
SCMT32.51-M3	49650	15919	-	-	-	-
SCMT32.51-MF2	-	14260	-	-	-	-
SCMT32.52-F1	49652	15880	-	-	-	-
SCMT32.52-M3	49661	15927	15921	-	-	-
SCMT32.52-MF2	49662	14261	-	-	-	-
SCMT32.53-F1	49663	-	-	-	-	-
SCMT432-F1	49666	15884	-	-	-	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
SCMT432-M3	49668	15946	15929	-	46664	46510
SCMT432-M5	49669	14285	-	14978	46562	-
SCMT432-MF2	49672	14262	-	-	-	-
SCMT433-F1	-	-	15886	-	-	-
SCMT433-M3	-	-	-	-	46563	-
SCMT866-RR97	-	-	-	20337	-	-
SCMT866T-RR97	-	20338	-	-	-	-
SNMA322	-	-	-	-	-	46495
SNMA432	-	-	-	-	46813	46700
SNMA433	-	-	-	-	-	46701
SNMA433-MR9	-	-	-	-	46306	46305
SNMA434	-	-	-	-	-	46496
SNMA434-MR9	-	-	-	-	46308	46307
SNMA543	-	-	-	-	46628	46497
SNMA544-MR9	-	-	-	-	46312	46309
SNMA643	-	-	-	-	-	46705
SNMA644	-	-	-	-	46814	46706
SNMG321-MF2	-	18499	-	-	-	-
SNMG322-M5	49006	18259	-	-	-	-
SNMG322-MF2	-	18258	-	-	-	-
SNMG431-M3	49500	15529	-	-	-	-
SNMG432-M3	48968	15531	15530	-	46584	-
SNMG432-M5	49008	16611	-	-	46786	46735
SNMG432-M6	49514	15280	15272	-	-	-
SNMG432-MF2	49071	15073	15744	-	-	-
SNMG432-MR7	49516	16420	16414	-	-	-
SNMG433-M3	48969	15534	15533	-	-	-
SNMG433-M5	49011	16303	16299	-	46787	-
SNMG433-M6	49517	15307	15297	-	-	-
SNMG433-MF2	-	15074	15035	-	-	-
SNMG433-MR7	49058	16446	-	-	46789	-
SNMG434-M3	61354	15536	15535	-	-	-
SNMG434-M5	49519	16312	16304	-	-	-
SNMG434-MR7	-	16470	-	-	-	-
SNMG542-M5	-	16316	-	-	-	-
SNMG543-M3	61355	15538	15537	-	-	-
SNMG543-M5	49523	16345	16320	-	-	-
SNMG543-M6	49524	15313	15312	-	-	-
SNMG543-MR6	-	18210	-	-	-	-
SNMG543-MR7	49525	16475	-	-	46585	-
SNMG544-M5	49526	16368	16360	16346	-	-
SNMG544-M6	49527	15319	15316	15314	-	-
SNMG544-MR7	-	16476	-	-	46586	-
SNMG643-M3	49528	15539	-	-	-	-
SNMG643-M5	49012	16612	-	-	46790	-
SNMG643-M6	49530	49109	49080	49073	-	-
SNMG643-MR7	49533	16489	-	-	-	-
SNMG644-M3	-	15540	-	-	-	-
SNMG644-M5	49013	16622	16614	16407	-	-
SNMG644-M6	49536	49147	49143	49126	46526	-
SNMG644-MR7	49059	16637	16636	16490	-	-
SNMG646-M6	61359	49158	49156	49155	46527	-
SNMG646-MR7	-	16491	-	-	-	-
SNMG866-MR7	49060	18827	-	18617	-	-
SNMM432-R4	49540	-	-	-	-	-
SNMM433-R4	49541	16775	-	-	-	-
SNMM543-R4	48970	18475	-	-	-	-
SNMM544-R4	48971	18507	-	18271	-	-
SNMM546-R7	-	17340	-	-	-	-
SNMM643-R4	49544	16792	-	-	-	-
SNMM643-R6	49545	-	-	-	-	-
SNMM643-R7	-	17286	-	-	-	-
SNMM643-R8	49550	-	-	-	-	-
SNMM643-RR6	49551	-	-	-	-	-
SNMM644-R4	49784	16793	16784	16770	-	-
SNMM644-R5	-	17207	-	-	-	-
SNMM644-R6	49786	-	-	-	-	-
SNMM644-R56	61360	-	-	-	-	-
SNMM644-R57	-	17291	17408	-	-	-
SNMM644-RR6	-	17213	-	-	-	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
SNMM644W-R7	-	16694	-	-	-	-
SNMM646-57	48976	-	-	-	-	-
SNMM646-R4	49555	16790	-	16771	-	-
SNMM646-R5	-	17215	-	-	-	-
SNMM646-R57	61361	-	-	17229	-	-
SNMM646-R7	-	17346	-	17235	-	-
SNMM646-RR6	-	17315	-	-	-	-
SNMM646W-R7	-	16663	-	-	-	-
SNMM856-56	49341	-	-	-	-	-
SNMM856-57	49342	-	-	-	-	-
SNMM856-R56	-	18567	-	-	-	-
SNMM856-R57	-	18621	-	-	-	-
SNMM856-R7	49343	18813	-	18627	-	-
SNMM856-RR6	-	18676	-	-	-	-
SNMM856-RR9	49344	-	-	-	-	-
SNMM866-R68	-	18633	-	18629	-	-
SNMM866-R7	49345	18821	-	18634	-	-
SNU433	-	-	-	-	46629	-
SPMR321-F1	-	18283	-	-	-	-
SPMR322-F1	-	18481	-	-	-	-
SPMR421-F1	-	18484	-	-	-	-
SPMR422-F1	-	17626	-	-	-	-
SPMR422-M3	-	17735	-	-	-	-
SPMR423-F1	-	18448	-	-	-	-
SPU421	-	17900	-	-	-	-
SPU422	-	17997	-	-	-	-
SPU633	-	17870	-	-	-	-
SPU634T	-	17835	-	-	-	-
TCGX32.50.5WL-F1	-	15887	-	-	-	-
TCGX32.50.5WR-F1	-	15888	-	-	-	-
TCMT16T312-M5	-	-	-	-	46547	-
TCMT21.50.5-F1	49676	-	-	-	-	-
TCMT21.51-F1	49680	15890	15889	-	-	-
TCMT21.51-MF2	49681	14263	-	-	-	-
TCMT21.52-F1	49682	15892	15891	-	-	-
TCMT21.52-MF2	49683	14264	-	-	-	-
TCMT32.50.5-F1	49684	-	-	-	-	-
TCMT32.51-F1	49685	15894	15893	-	-	-
TCMT32.51-M3	49686	15948	15947	-	46564	-
TCMT32.51-MF2	49694	14265	-	-	-	-
TCMT32.52-F1	49699	15896	15895	-	-	-
TCMT32.52-M3	49701	15951	15949	-	46665	46513
TCMT32.52-M5	61344	14286	-	14979	46546	-
TCMT32.52-MF2	49702	14266	-	-	-	-
TCMT32.53-F1	49703	-	15897	-	-	-
TCMT32.53-M5	49704	14288	-	-	-	-
TCMT432-M3	49711	15953	15952	-	-	-
TCMX32.52W-F1	-	15903	15902	-	-	-
TNMA331	-	-	-	-	-	46707
TNMA332	-	-	-	-	46815	46708
TNMA333	-	-	-	-	46816	46710
TNMA333-MR9	-	-	-	-	46315	46314
TNMA334	-	-	-	-	-	46498
TNMA334-MR9	-	-	-	-	46317	46316
TNMA432	-	-	-	-	-	46711
TNMA433	-	-	-	-	46817	46712
TNMA434	-	-	-	-	-	46713
TNMA434-MR9	-	-	-	-	46319	46318
TNMG221-MF2	-	15746	-	-	-	-
TNMG322-M5	49014	-	-	-	-	-
TNMG322-MF3	49556	-	-	-	-	-
TNMG331-FF2	-	15658	15623	-	-	-
TNMG331L-UX	-	17592	-	-	-	-
TNMG331-M3	48977	15541	15747	-	46791	-
TNMG331-M5	49558	15957	-	-	-	-
TNMG331-MF2	49061	15076	15748	-	-	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501
TNMG331-MF3	49062	-	-	-	-	-
TNMG331R-UX	-	17602	-	-	-	-
TNMG332-FF2	-	15659	15749	-	-	-
TNMG332L-UX	-	17591	-	-	-	-
TNMG332-M3	48978	15546	15751	15750	-	-
TNMG332-M4	-	-	-	-	46588	-
TNMG332-M5	49015	15966	15964	15960	46792	46740
TNMG332-M6	49560	15323	15320	-	-	-
TNMG332-MF2	49064	15077	15038	15037	-	-
TNMG332-MF3	49065	-	-	-	-	-
TNMG332-MF5	-	18253	18240	-	-	-
TNMG332-MR7	49568	-	-	-	-	-
TNMG332R-UX	-	17594	-	-	-	-
TNMG333-M3	48979	15548	15752	-	-	-
TNMG333-M5	49016	16640	16639	16638	46793	-
TNMG333-M6	49569	15326	15324	-	-	-
TNMG333-MF2	-	15078	15755	-	-	-
TNMG333-MF5	-	18136	18211	-	-	-
TNMG333-MR7	49066	-	16646	-	-	-
TNMG334-M5	-	-	-	-	46589	-
TNMG431-M5	49574	15967	-	-	-	-
TNMG431-MF2	-	15079	-	-	-	-
TNMG431-MF3	49067	-	-	-	-	-
TNMG432-M3	48991	15549	15757	-	-	-
TNMG432-M5	49017	16649	16648	15968	46794	-
TNMG432-M6	49575	49161	49160	49159	46528	-
TNMG432-MF2	-	15080	15041	-	-	-
TNMG432-MF3	49576	-	-	-	-	-
TNMG432-MR7	49579	-	-	-	-	-
TNMG433-M3	49580	15553	15550	-	-	-
TNMG433-M5	49019	15971	15970	15969	-	-
TNMG433-M6	49581	49164	49163	49162	46529	-
TNMG433-MR7	49584	-	-	-	-	-
TNMG434-M5	49585	15974	15973	15972	-	-
TNMG434-M6	49586	49175	49166	49165	-	-
TNMG542-M5	49347	-	-	-	-	-
TNMG543-M3	49348	18792	-	-	-	-
TNMG543-M5	49349	18826	18677	-	-	-
TNMG543-M6	49588	49177	49176	-	-	-
TNMG543-MR7	49354	18684	-	-	-	-
TNMG544-M5	49355	18669	18824	-	-	-
TNMG544-M6	49589	49179	49178	-	-	-
TNMG544-MR7	49357	18825	-	-	-	-
TNMG666-MR7	49358	18690	-	-	-	-
TNMM331-R6	49590	-	-	-	-	-
TNMM332-R4	49592	16795	-	-	-	-
TNMM333-R4	-	18493	-	-	-	-
TNMM432-R4	49594	16796	-	-	-	-
TNMM433-R4	49595	16794	16791	-	-	-
TNMM434-R4	49598	16789	16800	-	-	-
TNMM434-R6	49359	-	-	-	-	-
TNMX332W-M3	-	15572	15571	-	-	-
TNMX333W-M3	-	-	15573	-	-	-
TPMR221-F1	-	17643	-	-	-	-
TPMR222-F1	-	18503	-	-	-	-
TPMR321-F1	-	17644	17605	-	-	-
TPMR321-M3	-	17750	-	-	-	-
TPMR322-F1	-	17611	17617	-	-	-
TPMR322-M3	-	17757	-	-	-	-
TPMR432-M3	-	17771	-	-	-	-
TPMR433-M3	-	17694	-	-	-	-
TPU221	-	-	-	-	46822	-
TPU222	-	-	-	-	46823	-
TPU321	49714	17915	-	-	46633	-
TPU322	49716	18013	-	-	46634	-
TPU323	-	-	-	-	46635	-
TPU431	-	17885	-	-	-	-
TPU432	-	17925	-	-	46636	-
TPU433	-	18487	-	-	-	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501



VBMT221-F1	49720	19952	-	-	-	-
VBMT222-F1	-	19673	-	-	-	-
VBMT330.5-F1	49721	19953	-	-	-	-
VBMT330.5-MF2	49722	-	-	-	-	-
VBMT331-F1	48980	20223	19973	-	-	-
VBMT331-M3	49723	20300	20290	-	46667	46514
VBMT331-MF2	49724	14268	14983	14981	-	-
VBMT332-F1	49725	20235	20227	-	46654	46500
VBMT332-M3	49727	20308	20295	20287	46565	-
VBMT332-M5	49736	14291	14986	14985	46549	-
VBMT332-MF2	49737	14269	14989	14988	-	-
VBMT333-F1	49738	19862	20126	-	-	-
VBMT333-M3	48981	20297	20267	-	-	-
VBMT333-MF2	-	14270	14994	14993	-	-
VNMA332	-	-	-	-	46619	-
VNMG330.5-FF2	-	14302	15669	-	-	-
VNMG331-FF1	-	-	17571	-	-	-
VNMG331-FF2	49622	14303	15670	-	-	-
VNMG331-M3	48988	15512	15511	-	46595	-
VNMG331-MF2	49624	15090	15046	-	-	-
VNMG331-MF3	49625	-	-	-	-	-
VNMG332-FF2	49630	14304	15671	-	-	-
VNMG332-M3	48989	15515	15770	15514	46596	-
VNMG332-MF2	49631	15092	15049	15048	-	-
VNMG332-MF3	49637	-	-	-	-	-
VNMG333-MF2	-	15100	15050	-	-	-
VNNU130408-MF2	-	-	-	-	46609	-
VNNU2.531-M3	49641	15520	15516	-	-	-
VNNU2.531-MF2	49642	47502	47501	-	-	-
VNNU2.532-M3	49643	15526	15524	15522	-	-
VNNU2.532-M6	61365	49181	49180	-	-	-
VNNU2.532-MF2	49644	47505	47504	-	-	-



WCMT32.52-F1	49755	19956	-	-	-	-
WCMT32.52W-F1	-	18970	-	-	-	-
WNMA332	-	-	-	-	46818	46714
WNMA333	-	-	-	-	46819	-
WNMA432	-	-	-	-	46820	46715
WNMA432-MR9	-	-	-	-	46336	46331
WNMA433	-	-	-	-	46821	46716
WNMA433-MR9	-	-	-	-	46338	46337
WNMA434	-	-	-	-	46630	46717
WNMA434-MR9	-	-	-	-	46340	46339
VNMG330.5-M3	-	15373	-	-	-	-
VNMG331-FF2	-	15661	15660	-	-	-
VNMG331-M3	48982	15374	15759	-	-	-
VNMG331-MF2	49068	15082	15760	-	-	-
VNMG331-MF5	-	18140	-	-	-	-
VNMG331W-FF2	-	15662	-	-	-	-
VNMG331W-MF2	-	15704	15703	-	-	-
VNMG332-FF2	-	15665	15664	-	-	-
VNMG332-M3	48983	15376	15763	15761	46795	-
VNMG332-M5	49020	16555	16550	16546	46798	46741
VNMG332-MF2	49069	15083	15043	-	-	-
VNMG332-MF3	49072	-	-	-	-	-
VNMG332-MF4	-	18191	-	-	-	-
VNMG332-MF5	-	18256	-	-	-	-
VNMG332W-FF2	-	15666	-	-	-	-
VNMG332W-M3	61362	15575	15574	-	46590	-
VNMG332W-MF2	-	15708	15706	-	-	-
VNMG332W-MF5	-	16696	16683	-	-	-
VNMG333-M3	48984	15386	15382	15378	-	-

DESCRIPTION	GRADES (PRODUCT NUMBER)					
	TP3501	TP2501	TP1501	TP0501	TK1501	TK0501

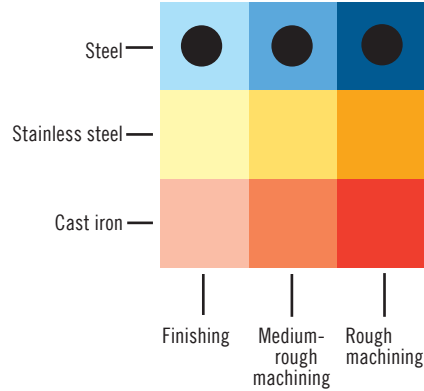
WNMG333-MF2	-	15084	-	-	-	-
WNMG333-MF5	-	18087	18212	-	-	-
WNMG333W-M3	-	15577	15576	-	-	-
WNMG431-FF2	-	14300	15667	-	-	-
WNMG431-M3	48985	15395	15764	-	46801	-
WNMG431-MF2	-	15085	15765	-	-	-
WNMG431W-MF2	-	15709	-	-	-	-
WNMG432-FF2	-	14301	15668	-	-	-
WNMG432-M3	48986	15397	15767	15766	46802	-
WNMG432-M4	-	-	-	-	46591	-
WNMG432-M5	49022	16589	16567	16560	46803	46742
WNMG432-M6	49603	15151	15149	15145	46530	-
WNMG432-MF2	-	15089	15044	-	-	46479
WNMG432-MF3	49074	-	-	-	-	-
WNMG432-MF4	-	18232	-	-	-	-
WNMG432-MF5	-	18257	18239	18144	-	46480
WNMG432-MR6	-	18213	18202	-	-	-
WNMG432-MR7	49075	16090	-	-	46804	46747
WNMG432W-M3	-	15582	15580	15578	46592	-
WNMG432W-M6	61364	15155	15152	-	-	-
WNMG432W-MF2	-	15716	15712	-	-	-
WNMG432W-MF5	-	16688	16687	-	-	-
WNMG433-M3	48987	15402	15769	15768	46805	-
WNMG433-M4	-	-	-	-	46593	-
WNMG433-M5	49023	16592	16591	16590	46806	46749
WNMG433-M6	49607	15159	15158	15156	46532	-
WNMG433-MF2	-	-	15045	-	-	46482
WNMG433-MF4	-	18203	-	-	-	-
WNMG433-MF5	-	18234	18161	18207	-	-
WNMG433-MR6	-	-	18215	-	-	-
WNMG433-MR7	49076	16594	16593	-	46807	46750
WNMG433W-M3	-	15586	15585	15584	46594	-
WNMG433W-M6	61389	15163	15160	-	-	-
WNMG434-M3	-	15403	-	-	-	-
WNMG434-M5	49611	16205	16189	16185	-	-
WNMG434-M6	49614	15172	15165	15164	46533	-
WNMG434-MF5	-	18250	-	-	-	-
WNMG434-MR7	49615	16094	16093	-	-	-
WNMG442-M5	49616	-	-	-	-	-
WNMG443-M5	49617	16210	16207	-	-	-
WNMG443-M6	49620	15177	15175	15173	46534	-
WNMG444-M5	49621	16221	16216	-	-	-
WNMG444-M6	-	-	15178	-	46536	-
WNMM432-R6	49640	-	-	-	-	-

TECHNICAL INFORMATION

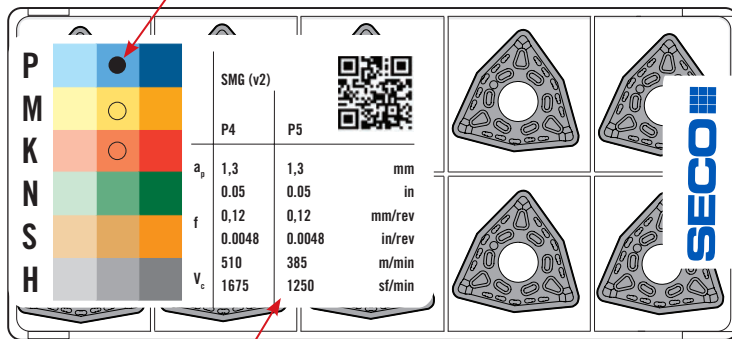
INDIVIDUAL CUTTING DATA ON THE INSERT BOX

The box features cutting data specific to the parts within:

- This cutting data for WNMG433-M6 can be used as an example for referencing the SMG v2 steel classification. It comes from the same one-source cutting data service that is used for box label data, data in My Pages and catalogs.
- The new SMG v2-based box label incorporates a QR code to provide a direct link to a product-specific cutting data page in My Pages. Cutting data comes from a single source and is populated across all Seco platforms for consistency.

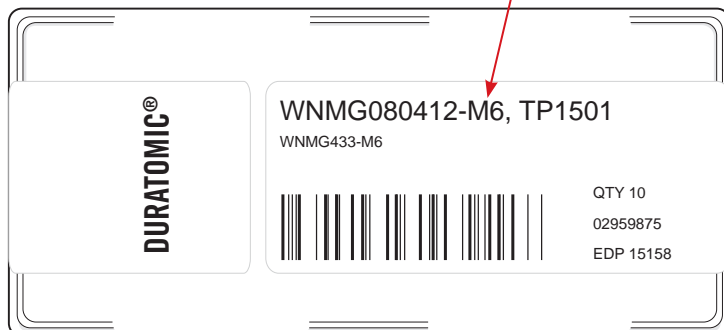


Marking for main application area (open circle for secondary application)



Recommended depth of cut, feed rate and cutting speed for Seco Material Group v2

Chipbreaker

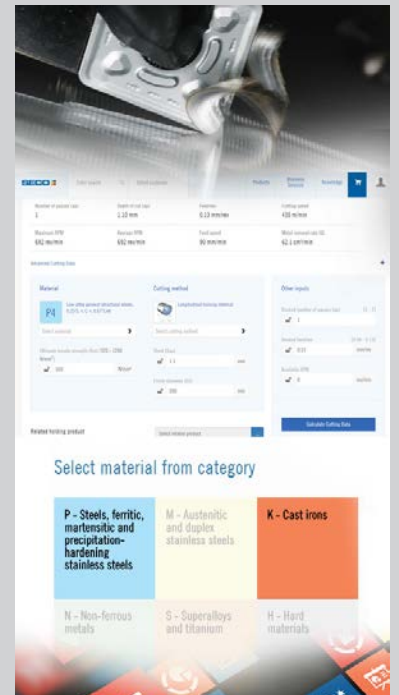


CUTTING DATA ONLINE

Now cutting data is just a few clicks away. Gain quick and easy access to this useful information through our website where standard products are easily searchable by description, grade, trademark or order number. Simply enter your query in the search box at the top of the screen and upon selection of a product the cutting data is provided with the other product details. Initially the data is populated based on default values but you can modify different criteria to fit your requirements.

- Gain instant access to advanced cutting data
- Easily adjust cutting data by material and cutting method
- Or modify based on a variety of other options like desired number of passes, feed/tooth, RPM, machine power or torque

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