



Hybrid Cermet for Steel Machining

General Use

High Speed / Continuous

TN620/PV720

TN610/PV710



New Cermet for High Quality Surface Finish Machining

3 Advantages to the Hybrid Coating Technology

NEW

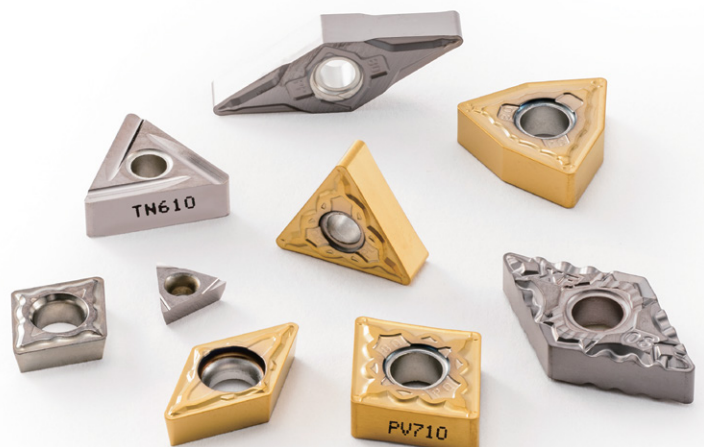
Negative Wiper Insert

Finishing WF Chipbreaker
Finishing-Medium WE Chipbreaker

NEW

Positive Wiper Insert

Finishing WP Chipbreaker
Corner R (r_ε) Line-up Expansion



Uncoated CERMET

TN610/TN620

MEGACOAT NANO CERMET

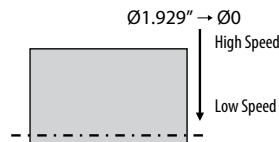
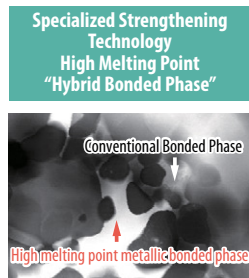
PV710/PV720

3 HybridTechnology Attributes Maintain Superior Surface Finish and Machining Stability

1 Excellent Surface Finish

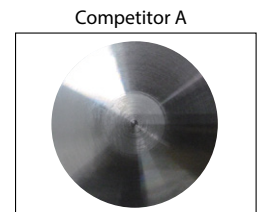
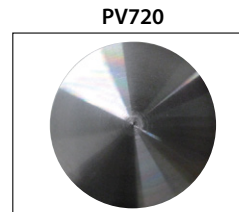
Combining the conventional cermet bonded phase (nickel, cobalt) and the special high melting point metallic bonded phase.

Provides high adhesion resistance to eliminate galling of the work piece.



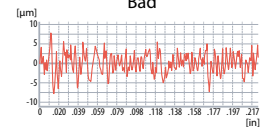
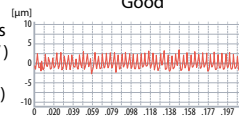
Surface Finish Comparison
(In-house Evaluation)

Cutting Conditions: $V_c = 590 \sim 0 \text{ sfm}$ (Constant Rate), D.O.C. = 0.020"
 $f = 0.004 \text{ ipr}$, Wet, CNMG431 type Workpiece: 1010



Surface Finish

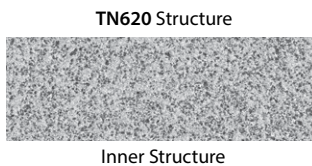
Surface Roughness
($\text{Ø}0.158" \sim \text{Ø}0.591"$)
($V_c = 50 \sim 180 \text{ sfm}$)



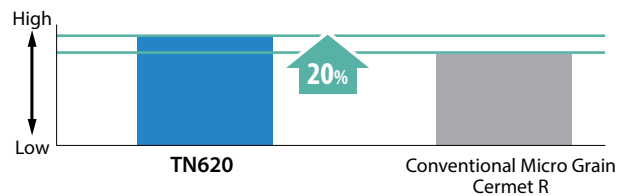
2 Excellent Fracture Resistance

Improved strength with uniform micro grain hard phase and superior compressive stress with high melting point bonded phase. This combination yields greater fracture resistance.

Specialized Strengthening Technology Grain "Hybrid Hard Phase"



Compressive Residual Stress in Hard Phase (In-house Evaluation)



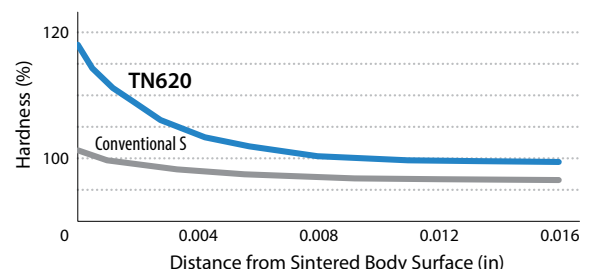
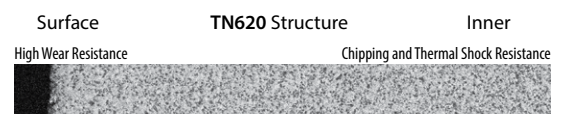
3 Excellent Wear Resistance

Excellent fracture resistance with surface-hardened layer using gradient composition technology.

Continuously-varied hardness provides wear and fracture resistance.

TN620's inner structure has high toughness and chipping resistance along with thermal and greater wear resistance than that of the conventional micro grain cermet. (See Right Chart) (In-house Evaluation)

Specialized Strengthening Technology
Special Surface-Hardened "Hybrid Structure"



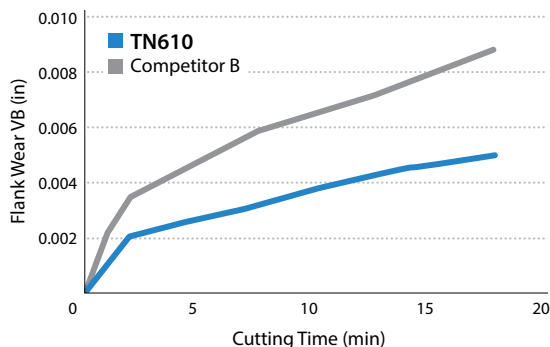
Uncoated CERMET

TN610 / TN620

High Speed / Continuous

TN610 Higher wear resistance during continuous and finish machining High quality / High precision machining

Wear Resistance Comparison (In-house Evaluation)



After Machining 17.9 min.

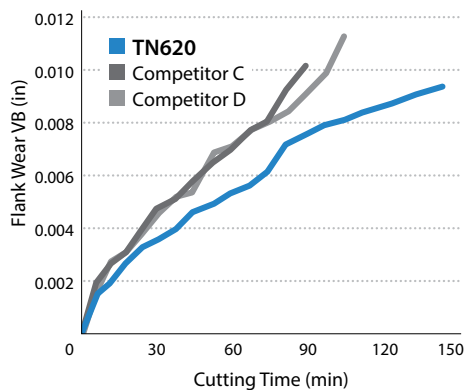


Cutting Conditions: $V_c = 980$ sfm, D.O.C. = 0.039", $f = 0.008$ ipr
Wet, CNMG432 type Workpiece: 4137

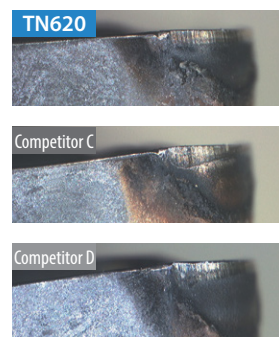
General Use

TN620 General use for quality surface finishes with balanced wear and fracture resistance

Wear Resistance Comparison (In-house Evaluation)

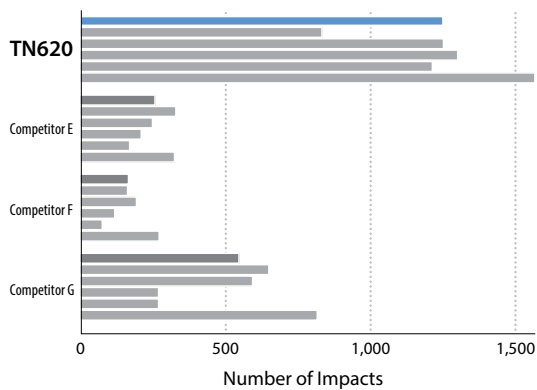


After Machining 89 min.



Cutting Conditions: $V_c = 660$ sfm, $f = 0.008$ ipr, D.O.C. = 0.039"
Wet, CNMG432 type Workpiece: 4137

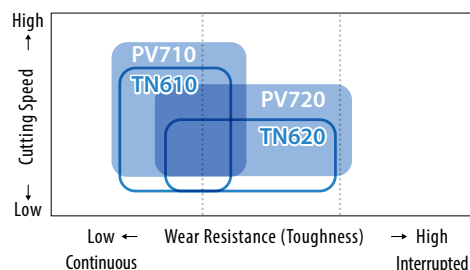
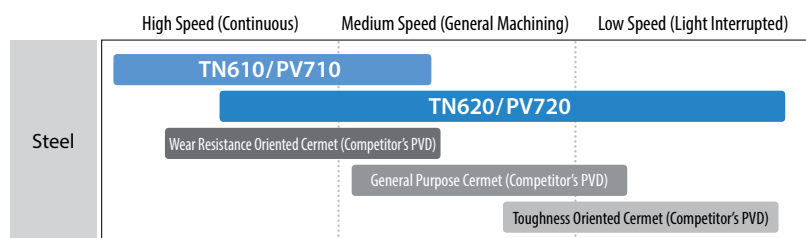
Fracture Resistance Comparison (In-house Evaluation)



Average Values Shown Above

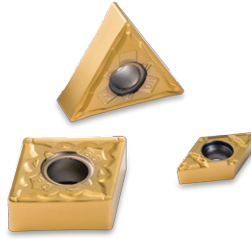
Cutting Conditions: $V_c = 820$ sfm, $f = 0.008$ ipr, D.O.C. = 0.039"
Wet, CNMG432 type Workpiece: 1045 (4 Grooves in Workpiece)

Steel Application Range



PV710 / PV720

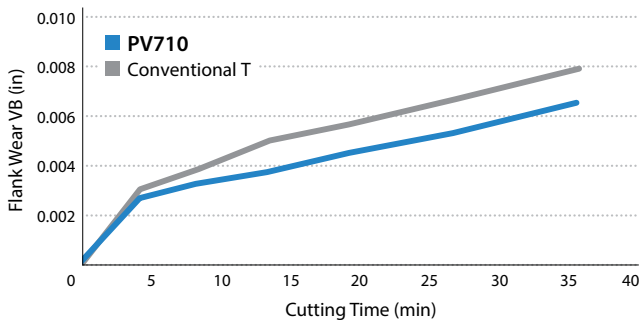
Grades PV710 / PV720 improve performance by composite lamination of MEGACOAT NANO and special TiN coating to combine high adhesion resistance and great visibility of the used cutting edge even in dim light



High Speed / Continuous

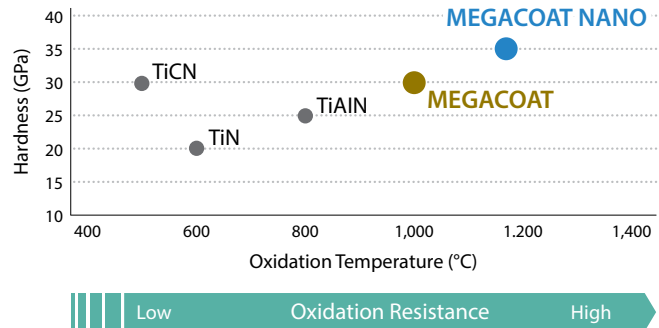
PV710 Long tool life during high speed and continuous machining

Wear Resistance Comparison (In-house Evaluation)



Cutting Conditions: $V_c = 1150$ sfm, D.O.C. = 0.039° , $f = 0.008$ ipr
Wet, CNMG432 type Workpiece: 4137

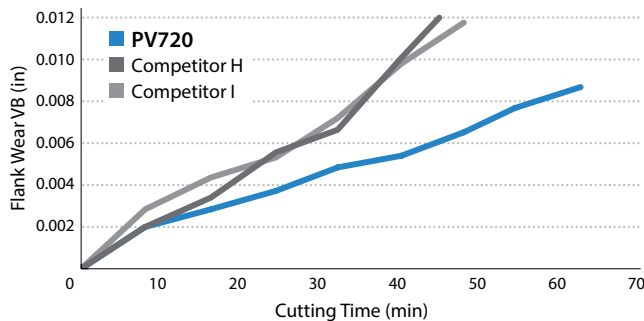
Coating Properties



General Use

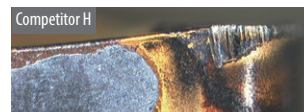
PV720 High efficiency machining and superior surface finish

Wear Resistance Comparison (In-house Evaluation)

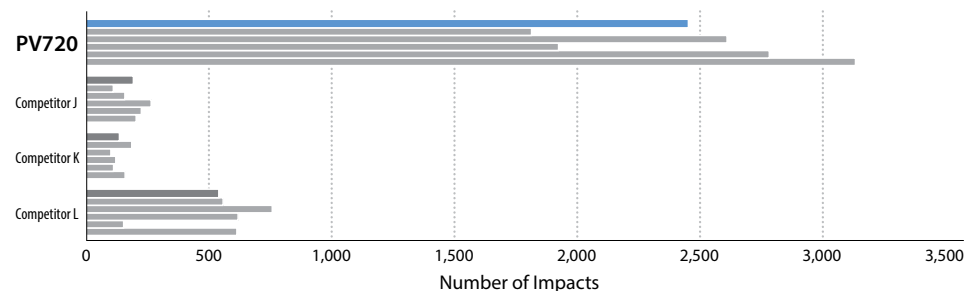


Cutting Conditions: $V = 820$ sfm, D.O.C. = 0.039° , $f = 0.008$ ipr, Wet, CNMG432 type Workpiece: 4137

Flank wear condition after machining 48 min



Fracture Resistance Comparison (In-house Evaluation)



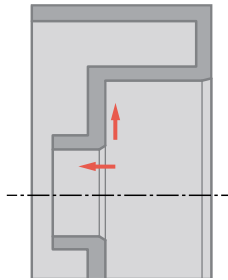
Cutting Conditions: $V = 820$ sfm, D.O.C. = 0.039° , $f = 0.008$ ipr, Wet, CNMG432 type Workpiece: 1045 (4 Grooves in Workpiece)

Average Values Shown Above

Case Studies

Drum - 1030

Vc = 980 sfm
D.O.C. = 0.002"
f = 0.008 ~ 0.012 ipr
Wet
CNMG332HQ



Tool Life

TN620

800 pcs/edge

x 1.1
~ 1.4
Tool Life

Competitor M
(Cermat)

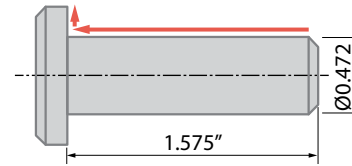
550 ~ 750 pcs/edge

TN620 shows 1.1 to 1.4 times longer tool life compared to Competitor M (Cermat).

(User Evaluation)

Yoke Pin - 1035

Vc = 250 sfm
D.O.C. = 0.006"
f = 0.005 ipr
Wet
TNGG331R-S



Tool Life

TN620

450 pcs/edge

x 1.5
Tool Life

Competitor N
(Cermat)

300 pcs/edge

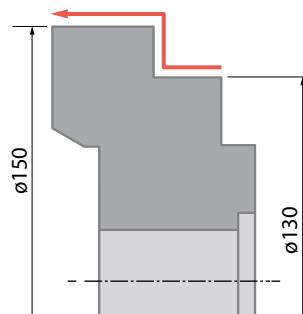
TN620 shows 1.5 times longer tool life compared to Competitor N (Cermat).

Stable surface roughness and shiny surface finish. No chipping and stable machining.

(User Evaluation)

Piston - 1045 Normalized

Vc = 1480 sfm
D.O.C. = 0.006" ~ 0.008"
f = 0.002 ipr
Wet (Water Soluble)
CNMG431PP



Tool Life

PV710

200 pcs/edge

x 2.2
Tool Life

Conventional U
(PVD Coated Cermat)

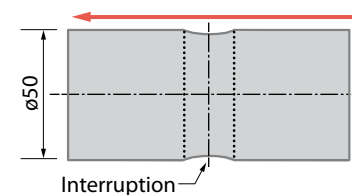
90 pcs/edge

PV710 shows 2.2 times longer tool life compared to Conventional U (PVD Coated Cermat).

(User Evaluation)

Piston - 4115

Vc = 820 sfm
D.O.C. = 0.004" ~ 0.008"
f = 0.003 ipr
Wet (Water Soluble)
CNMG431PP



Tool Life

PV710

250 pcs/edge

x 1.3
Tool Life

Competitor O
(PVD Coated Cermat)

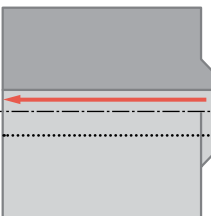
180 pcs/edge

PV710 shows 1.3 times longer tool life compared to Competitor O (PVD Coated Cermat).

(User Evaluation)

Oil Pump - Sintered Steel

Vc = 530 sfm
D.O.C. = 0.008"
f = 0.004 ipr
Wet
TPGH18151L



Tool Life

PV720

Avg. 800 pcs/edge

x 2.7
Tool Life

Competitor P
(PVD Coated Cermat)

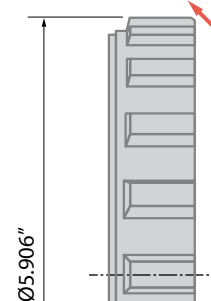
300 pcs/edge

PV720 shows 2.7 times longer tool life compared to Competitor P (PVD Coated Cermat).

(User Evaluation)

Ring Gear - Special Alloy Steel

Vc = 980 sfm
D.O.C. = 0.008"
f = 0.008 ~ 0.016 ipr
Wet
WNMG431PP



Tool Life

PV720

Avg. 10,000 pcs/edge

x 3.3
Tool Life

Competitor Q
(PVD Coated Cermat)

3,000 pcs/edge

PV720 shows 3.3 times longer tool life compared to Competitor Q (PVD Coated Cermat).

(User Evaluation)

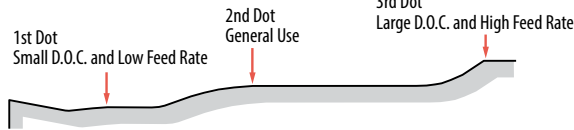
Finishing**PP Chipbreaker**

Negative

Features

3-Step Smart Dot structure for a wide range of steel finishing feed rates
 Smooth taper cutting edge reduces cutting forces
 Corner-R(ϵ) 0.008" - 3/64" are available

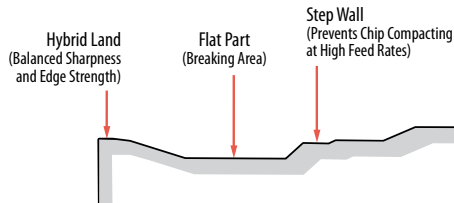
Each Dot Functions According to the Cutting Conditions

**Medium - Roughing****PG Chipbreaker**

Negative

Features

Stable machining with good balance of edge sharpness and strength
 Prevents chip compacting at high feed rates with good chip control at low feed rates

**Finishing - Medium****PQ Chipbreaker**

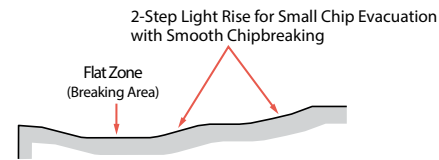
Negative

Features

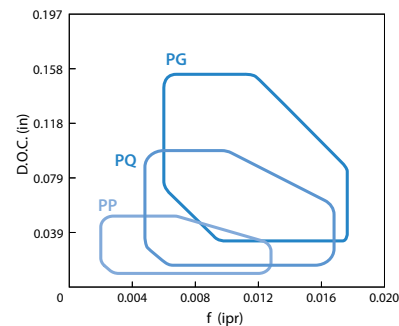
Stable chip control in a wide range of medium-finishing applications with the newly developed "Flat Zone" (Breaking Area) and rising 2-step Smart Wall effect

Twin dots on the edge tip provide smooth chip control at smaller D.O.C. during high feed turning and facing

Continuous Variable Land (CVL) with well-balanced edge sharpness and toughness



Steel C-type Edge Length = 1/2" I.C.

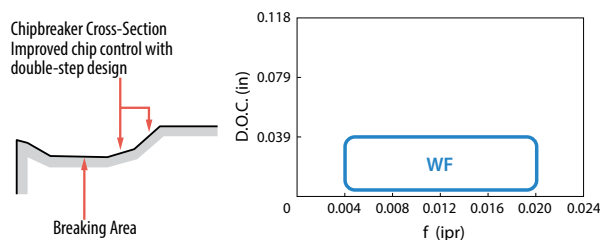
**Finishing****WF Chipbreaker (Wiper)**

Negative

Features

Unique wiper-edge design prevents peeling and provides superior surface finish

Provides excellent chip control with primary & secondary dots and improves cutting performance during finishing operations

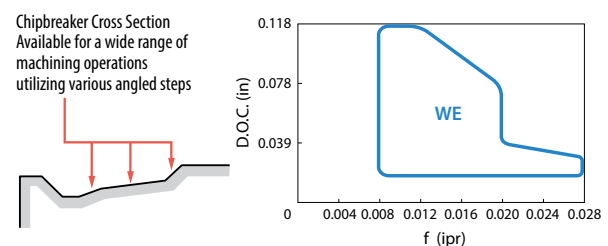
**Finishing - Medium****WE Chipbreaker (Wiper)**

Negative

Features

High-quality surface roughness even at high feed rates with unique wiper-edge design

Wide application range is available with improved chip control at low depths of cut preventing chip crunching and running over chipbreaker dots at high feed rates

**Finishing****WP Chipbreaker (Wiper Insert)**

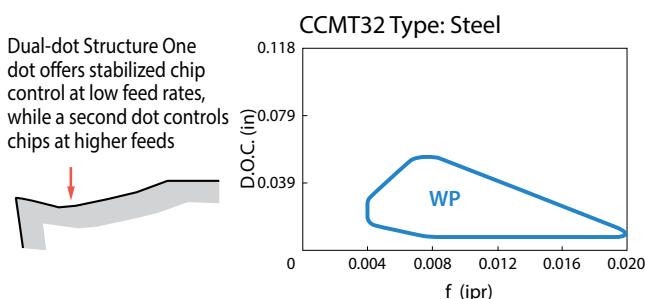
Positive

Features

Excellent surface roughness and smooth chip control at high feed rates

High grade surface finish with no tear

High machining accuracy with low cutting forces

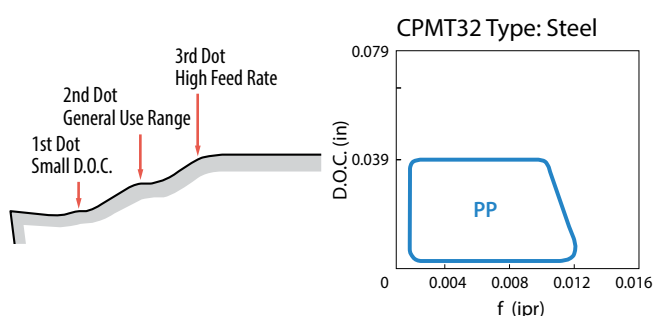
**Finishing****PP Chipbreaker**

Positive

Features

Stable chip control when finishing steel

Special edge designed for sharpness and improved strength for stable tool life during high feed machining operations

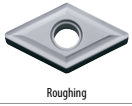
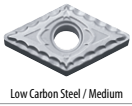
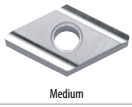


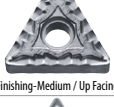
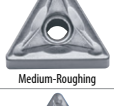
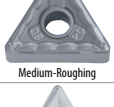
Inserts (Negative)

Shape Right-hand Shown	Description	Dimensions (in)				I.C.	Thickness	Hole	Corner-R (re)	TN610	TN620	PV710	PV720
	CNMG 431WF	1/2	3/16	0.203	1/64								
	432WF				1/32								
	CNMG 431WP	1/2	3/16	0.203	1/64								
	432WP				1/32								
	CNMG 431WE	1/2	3/16	0.203	1/64								
	432WE				1/32								
	433WE				3/64								
	CNMG 431WQ	1/2	3/16	0.203	1/64								
	432WQ				1/32								
	433WQ				3/64								
	CNMG 4305PP	1/2	3/16	0.203	0.008								
	431PP				1/64								
	432PP				1/32								
	433PP				3/64								
	CNMG 331GP	3/8	3/16	0.150	1/64								
	332GP				1/32								
	CNMG 4305GP	1/2	3/16	0.203	0.008								
	431GP				1/64								
	432GP				1/32								
	CNMG 431PQ	1/2	3/16	0.203	1/64								
	432PQ				1/32								
	433PQ				3/64								
	CNMG 331HQ	3/8	3/16	0.150	1/64								
	332HQ				1/32								
	CNMG 431HQ	1/2	3/16	0.203	1/64								
	432HQ				1/32								
	CNMG 431CQ	1/2	3/16	0.203	1/64								
	432CQ				1/32								
	CNMG 331GS	3/8	3/16	0.150	1/64								
	332GS				1/32								
	CNMG 431PG	1/2	3/16	0.203	1/64								
	432PG				1/32								
	433PG				3/64								
	CNMG 431	1/2	3/16	0.203	1/64								
	432				1/32								
	CNMG 431XF	1/2	3/16	0.203	1/64								
	432XF				1/32								
	CNMG 431XP	1/2	3/16	0.203	1/64								
	432XP				1/32								
	CNMG 431XQ	1/2	3/16	0.203	1/64								
	432XQ				1/32								

Shape Right-hand Shown	Description	Dimensions (in)				TN610	TN620	PV710	PV720	
		I.C.	Thickness	Hole	Corner-R (rε)					
 Low Carbon Steel / Roughing	CNMG 432XS	1/2	3/16	0.203	1/32	○	○	○	○	
 Finishing / Surface Roughness Oriented	CNGG 3305%L-S	1/2	3/16	0.150	0.008	○		○		
	331%L-S				1/64	○		○		
	332%L-S				1/32	○		○		
 Medium	CNGG 431%L	1/2	3/16	0.203	1/64	○	○	○	○	
	432%L				1/32	○		○		
 Medium-Roughing / Low Cutting Resistance	CNGG 431%L-25R	1/2	3/16	0.203	1/64	○		○		
	432%L-25R				1/32	○		○		
 Finishing / with Wiper Edge	DNMX 431WF	1/2	3/16	0.203	1/64	○	○	●	●	
	432WF				1/32	○	○	●	●	
	433WF				3/64	○	○	●	●	
	DNMX 441WF	1/2	1/4	0.203	1/64	○	○	●	●	
	442WF				1/32	○	○	●	●	
	443WF				3/64	○	○	●	●	
 Finishing	DNMG 4305PP	1/2	3/16	0.203	0.008	●	●	●	●	
	431PP				1/64	●	●	●	●	
	432PP				1/32	●	●	●	●	
	433PP				3/64	●	●	●	●	
	DNMG 4405PP	1/2	1/4	0.203	0.008	○	○	●	○	
	441PP				1/64	●	○	●	○	
	442PP				1/32	●	○	●	○	
	443PP				3/64	●	○	●	○	
	 Finishing	DNMG 331GP	3/8	3/16	0.150	1/64		○		○
		332GP				1/32		○		○
DNMG 4305GP		1/2	3/16	0.203	0.008	○	○	○	○	
431GP					1/64	○	○	○	○	
432GP		1/32	○	○	○	○				
DNMG 4405GP		1/2	1/4	0.203	0.008	○		○		
441GP					1/64	○		○		
442GP		1/32	○		○					
 Finishing-Medium	DNMG 431PQ	1/2	3/16	0.203	1/64	●	●	●	●	
	432PQ				1/32	●	●	●	●	
	433PQ				3/64	●	●	●	●	
	DNMG 441PQ	1/2	1/4	0.203	1/64	●	○	●	○	
	442PQ				1/32	●	○	●	○	
	443PQ				3/64	●	○	●	○	
 Finishing-Medium	DNMG 3305HQ	3/8	3/16	0.150	0.008		○			
	331HQ				1/64		○		○	
	DNMG 431HQ	1/2	3/16	0.203	1/64	○	○	●	○	
	432HQ				1/32	○	○	○	○	
	433HQ				3/64	○		○		
	DNMG 441HQ	1/2	1/4	0.203	1/64	○		○		
	442HQ				1/32	○		○		
	443HQ				3/64	○		○		
 Finishing-Medium / Up Facing	DNMG 431CQ	1/2	3/16	0.203	1/64	●	●	●	●	
	432CQ				1/32	●	●	●	●	
	433CQ				3/64	●		●		
	DNMG 441CQ	1/2	1/4	0.203	1/64	●		●		
 Medium-Roughing	DNMG 331GS	3/8	3/16	0.150	1/64		○		○	
	332GS				1/32		○		○	
 Medium-Roughing	DNMG 431PG	1/2	3/16	0.203	1/64	●	●	●	●	
	432PG				1/32	●	●	●	●	
	433PG				3/64		●		●	
	DNMG 441PG	1/2	1/4	0.203	1/64	●	○	●	○	
	442PG				1/32	●	○	●	○	
443PG	3/64		○		○					

Inserts (Negative)

Shape Right-hand Shown	Description	Dimensions (in)				TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (r)				
 Roughing	DNMG 431	1/2	3/16	0.203	1/64	○	○	○	○
	432				1/32	○	○	○	○
 Low Carbon Steel / Finishing / Small D.O.C.	DNMG 431XF	1/2	3/16	0.203	1/64	●	○	●	○
	432XF				1/32	●	○	●	○
 Low Carbon Steel / Finishing	DNMG 431XP	1/2	3/16	0.203	1/64	●	●	●	●
	432XP				1/32	●	●	●	●
	DNMG 441XP	1/2	1/4	0.203	1/64	●	●	●	●
	442XP				1/32	●	●	●	●
 Low Carbon Steel / Medium	DNMG 431XQ	1/2	3/16	0.203	1/64	●	●	●	●
	432XQ				1/32	●	●	●	●
 Low Carbon Steel / Roughing	DNMG 432XS	1/2	3/16	0.203	1/32	○	○	○	○
 Medium	DNMG 431%L	1/2	3/16	0.203	1/64	○	○	○	○
	432%L				1/32	○	○	○	○
 Finishing-Medium	SNMG 431PQ	1/2	3/16	0.203	1/64	●	●	●	●
	432PQ				1/32	●	●	●	●
 Finishing-Medium	SNMG 431HQ	1/2	3/16	0.203	1/64	○	○	○	○
	432HQ				1/32	○	○	○	○
	433HQ				3/64	○	○	○	○
 Medium-Roughing	SNMG 432PG	1/2	3/16	0.203	1/32	●	●	●	●
	433PG				3/64	●	●	●	●
	434PG				0.063	●	●	●	●
 Roughing	SNMG 321	3/8	1/8	0.150	1/64	○	○	○	○
	322				1/32	○	○	○	○
	SNMG 431	1/2	3/16	0.203	1/64	○	○	○	○
	432				1/32	○	○	○	○
 Low Carbon Steel / Finishing	SNMG 432XP	1/2	3/16	0.203	1/32	○	●	●	●
 Low Carbon Steel / Medium	SNMG 432XQ	1/2	3/16	0.203	1/32	○	○	○	○
 Low Carbon Steel / Roughing	SNMG 432XS	1/2	3/16	0.203	1/32	○	○	○	○
 B: Finishing-Medium C: Medium-Roughing	SNGG 321%L-B	3/8	1/8	0.150	1/64	○	○	○	○
	322%L-B				1/32	○	○	○	○
	SNGG 431%L-C	1/2	3/16	0.203	1/64	○	○	○	○
	432%L-C				1/32	○	○	○	○
	SNMG 431%L-C	1/2	3/16	0.203	1/64	○	○	○	○
	432%L-C				1/32	○	○	○	○

Shape Right-hand Shown	Description	Dimensions (in)				TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (r)				
 Medium-Roughing / Low Cutting Resistance	SNGG 431%L-25R	1/2	3/16	0.203	1/64	○	○	○	○
	432%L-25R				1/32	○	○	○	○
 NEW Finishing / with Wiper Edge	TNMX 331WF	3/8	3/16	0.150	1/64	○	○	●	●
	332WF				1/32	○	○	●	●
	333WF				3/64	○	○	●	●
 Finishing	TNMG 330SPP	3/8	3/16	0.150	0.008	●	●	●	●
	331PP				1/64	●	●	●	●
	332PP				1/32	●	●	●	●
	333PP				3/64	●	●	●	●
 Finishing	TNMG 231GP	1/4	3/16	0.089	1/64	○	○	○	○
	232GP				1/32	○	○	○	○
	TNMG 330SGP	3/8	3/16	0.150	0.008	○	○	○	○
	331GP				1/64	○	○	○	○
	332GP				1/32	○	○	○	○
 Finishing-Medium	TNMG 331PQ	3/8	3/16	0.150	1/64	●	●	●	●
	332PQ				1/32	●	●	●	●
	333PQ				3/64	●	●	●	●
 Finishing-Medium	TNMG 231HQ	1/4	3/16	0.089	1/64	○	○	○	○
	232HQ				1/32	○	○	○	○
	TNMG 331HQ	3/8	3/16	0.150	1/64	○	○	○	○
	332HQ				1/32	○	○	○	○
 Finishing-Medium / Up Facing	TNMG 331CQ	3/8	3/16	0.150	1/64	○	○	○	○
	332CQ				1/32	○	○	○	○
	333CQ				3/64	○	○	○	○
 Medium-Roughing	TNMG 231GS	1/4	3/16	0.089	1/64	○	○	○	○
 Medium-Roughing	TNMG 331PG	3/8	3/16	0.150	1/64	●	●	●	●
	332PG				1/32	●	●	●	●
	333PG				3/64	●	●	●	●
 Roughing	TNMG 331	3/8	3/16	0.150	1/64	○	○	○	○
	332				1/32	○	○	○	○
 Low Carbon Steel / Finishing / Small D.O.C.	TNMG 331XF	3/8	3/16	0.150	1/64	●	●	●	●
	332XF				1/32	●	●	●	●
 Low Carbon Steel / Finishing	TNMG 331XP	3/8	3/16	0.150	1/64	●	●	●	●
	332XP				1/32	●	●	●	●
 Low Carbon Steel / Medium	TNMG 331XQ	3/8	3/16	0.150	1/64	●	●	●	●
	332XQ				1/32	●	●	●	●
 Low Carbon Steel / Roughing	TNMG 332XS	3/8	3/16	0.150	1/32	○	○	○	○
 Medium-Roughing	TNMG 331%L-ST	3/8	3/16	0.150	1/64	○	○	○	○

● : U.S. Stock ○ : World Express (Shipping: 7-10 Business Days)

Inserts (Negative)

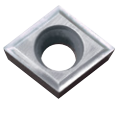
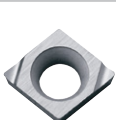
Shape Right-hand Shown	Description	Dimensions (in)				TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (re)				
 Finishing	TNGG 3302%L-S	3/8	3/16	0.150	0.004	○	○	○	○
	3305%L-S				0.008	○	○	○	○
	331%L-S				1/64	○	○	○	○
	332%L-S				1/32	○	○	○	○
 Super Fine Finishing / Sharp Edge / Surface Roughness Oriented	TNEG 3305%L-SSF	3/8	3/16	0.150	0.008	○	○	○	○
	331%L-SSF				1/64	○	○	○	○
 B: Finishing-Medium C: Medium-Roughing	TNGG 2205%L-B	1/4	1/8	0.089	0.008	○	○	○	○
	221%L-B				1/64	○	○	○	○
	TNGG 3305%L-B	3/8	3/16	0.150	0.008	○	○	○	○
	331%L-B				1/64	○	○	Ⓡ	○
	332%L-B				1/32	○	○	○	○
	TNGG 3305%L-C	3/8	3/16	0.150	0.008	○	○	○	○
	331%L-C				1/64	○	○	○	○
	332%L-C				1/32	○	○	○	○
	333%L-C				3/64	○	○	○	○
	TNGG 431%L-C	1/2	3/16	0.203	1/64	○	○	○	○
	432%L-C				1/32	○	○	○	○
	TNMG 331%L-C	3/8	3/16	0.150	1/64	○	○	○	○
	332%L-C				1/32	○	○	○	○
 Medium-Roughing / Low Cutting Resistance	TNGG 331%L-25R	3/8	3/16	0.150	1/64	○	○	○	○
	332%L-25R				1/32	○	○	○	○
 Finishing	VNMG 3305PP	3/8	3/16	0.150	0.008	●	●	●	●
	331PP				1/64	●	●	●	●
	332PP				1/32	●	●	●	●
	333PP				3/64	●	●	●	●
 Finishing	VNMG 3305GP	3/8	3/16	0.150	0.008	○	○	○	○
	331GP				1/64	○	○	○	○
	332GP				1/32	○	○	○	○
 Finishing-Medium	VNMG 331%L-VC	3/8	3/16	0.150	1/64	○	○	○	●
	332%L-VC				1/32	○	○	○	○
	333%L-VC				3/64	○	○	○	○
 Finishing-Medium	VNMG 331VF	3/8	3/16	0.150	1/64	●	●	●	●
	332VF				1/32	●	●	●	●
	333VF				3/64	●	●	●	●
 Finishing-Medium	VNMG 331PQ	3/8	3/16	0.150	1/64	●	●	●	●
	332PQ				1/32	●	●	●	●
	333PQ				3/64	●	●	●	●
 Finishing-Medium	VNMG 331HQ	3/8	3/16	0.150	1/64	○	○	○	○
	332HQ				1/32	○	○	○	○
	333HQ				3/64	○	○	○	○
 Roughing	VNMG 331	3/8	3/16	0.150	1/64	○	○	○	○
	332				1/32	○	○	○	○
 Finishing-Medium	VNGG 3305M-SK	3/8	3/16	0.150	<0.008	○	○	○	○
	331M-SK				<1/64	○	○	○	○
 Medium	VNGG 3305%L	3/8	3/16	0.150	0.008	○	○	○	○
	331%L				1/64	○	○	○	○
	332%L				1/32	○	○	○	Ⓡ
 NEW Finishing / with Wiper Edge	WNMG 431WF	1/2	3/16	0.203	1/64	○	○	●	●
	432WF				1/32	○	○	●	●

Shape Right-hand Shown	Description	Dimensions (in)				TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (re)				
 Finishing / with Wiper Edge	WNMG 431WP	1/2	3/16	0.203	1/64	●	●	●	●
	432WP				1/32	●	●	●	●
 NEW Finishing-Medium / with Wiper Edge	WNMG 431WQ	1/2	3/16	0.203	1/64	●	●	●	●
	432WQ				1/32	●	●	●	●
	433WQ				3/64	●	●	●	●
 Finishing-Medium / with Wiper Edge	WNMG 431WQ	1/2	3/16	0.203	1/64	●	●	●	●
	432WQ				1/32	●	●	●	●
	433WQ				3/64	●	●	●	●
 Finishing	WNMG 4305PP	1/2	3/16	0.203	0.008	●	●	●	●
	431PP				1/64	●	●	●	●
	432PP				1/32	●	●	●	●
	433PP				3/64	●	●	●	●
 Finishing	WNMG 331GP	3/8	3/16	0.150	1/64	○	○	○	○
	332GP				1/32	○	○	○	○
 Finishing	WNMG 431GP	1/2	3/16	0.203	1/64	○	○	○	○
	432GP				1/32	○	○	○	○
 Finishing-Medium	WNMG 431PQ	1/2	3/16	0.203	1/64	●	●	●	●
	432PQ				1/32	●	●	●	●
 Finishing-Medium	WNMG 331HQ	3/8	3/16	0.150	1/64	○	○	○	○
	332HQ				1/32	○	○	○	○
 Finishing-Medium	WNMG 431HQ	1/2	3/16	0.203	1/64	○	○	○	○
	432HQ				1/32	○	○	○	○
	433HQ				3/64	○	○	○	○
 Finishing-Medium / Up Facing	WNMG 431CQ	1/2	3/16	0.203	1/64	○	○	○	○
	432CQ				1/32	○	○	○	○
	433CQ				3/64	○	○	○	○
 Medium-Roughing	WNMG 331GS	3/8	3/16	0.150	1/64	○	○	○	○
	332GS				1/32	○	○	○	○
 Medium-Roughing	WNMG 431PG	1/2	3/16	0.203	1/64	●	●	●	●
	432PG				1/32	●	●	●	●
 Roughing	WNMG 431	1/2	3/16	0.203	1/64	○	○	○	○
	432				1/32	○	○	○	○
 Low Carbon Steel / Finishing	WNMG 431XP	1/2	3/16	0.203	1/64	●	●	●	●
	432XP				1/32	●	●	●	●
 Low Carbon Steel / Medium	WNMG 431XQ	1/2	3/16	0.203	1/64	●	○	●	○
	432XQ				1/32	●	○	●	○
 Low Carbon Steel / Roughing	WNMG 432XS	1/2	3/16	0.203	1/32	○	○	○	○

Insert that has corner R(re) dimension expressed with "less than" sign
(ex. <0.004, <0.008, etc.) indicates models with minus tolerance for corner R(re)

● : U.S. Stock Ⓡ : U.S. Stock (R-hand Only)
○ : World Express (Shipping: 7-10 Business Days)

Inserts (Positive)

Shape Right-hand Shown	Description	Dimensions (in)					TN610	TN620	PV710	PV720	
		I.C.	Thickness	Hole	Corner-R (re)	Relief Angle					
	CCMT 21505WP	1/4	3/32	0.110	0.008	7°	○	○	○	○	
	2151WP				1/64		○	○	○	○	
	CCMT 3251WP	3/8	5/32	0.173	1/64	7°	○	○	●	○	
	3252WP				1/32		○	○	○	○	
	CCMT 21505PP	1/4	3/32	0.110	0.008	7°	●	●	●	●	
	2151PP				1/64		●	●	●	●	
	CCMT 32505PP	3/8	5/32	0.173	0.008	7°	●	●	●	●	
	3251PP				1/64		●	●	●	●	
	CCMT 21505GK	1/4	3/32	0.110	0.008	7°	●	●	●	●	
	2151GK				1/64		●	●	●	●	
	CCMT 32505GK	3/8	5/32	0.173	0.008	7°	●	●	●	●	
	3251GK				1/64		●	●	●	●	
	CCMT 431GK	1/2	3/16	0.217	1/64	7°	●	●	●	●	
	432GK				1/32		●	●	●	●	
		CCMT 21505HQ	1/4	3/32	0.110	0.008	7°	●	○	○	○
		2151HQ				1/64		●	○	○	○
CCMT 32505HQ		3/8	5/32	0.173	0.008	7°	●	●	●	●	
3251HQ					1/64		●	●	●	●	
	CCGT 21502	1/4	3/32	0.110	0.004	7°	○	○	○	○	
	21505				0.008		○	○	○	○	
	2151	1/64	○	○	○	○					
	CCGT 32502	3/8	5/32	0.173	0.004	7°	○	○	○	○	
32505	0.008				○		○	○	○		
	3251	3/8	5/32	0.173	1/64	7°	○	○	○	○	
	CCMT 3252				1/32		○	○	○	○	
		CCET 110902M%L-F	0.138	0.055	0.075	<0.004	7°	○	○	○	○
		110905M%L-F				<0.008		○	Ⓛ	○	Ⓛ
11091M%L-F		<1/64	○	Ⓛ	○	Ⓛ					
CCET 141102M%L-F		0.169	0.071	0.091	<0.004	7°	○	○	○	○	
141105M%L-F	<0.008				○		Ⓛ	○	Ⓛ		
	14111M%L-F	<1/64	○	Ⓛ	○	Ⓛ					
	CCET 21502MF%L-U	1/4	3/32	0.110	<0.004	7°	○	○	○	○	
	21505MF%L-U				<0.008		○	○	○	○	
	CCET 32502MF%L-U	3/8	5/32	0.173	<0.004	7°	○	Ⓡ	○	Ⓡ	
32505MF%L-U	<0.008				○		Ⓡ	○	Ⓡ		
	CCGT 21502E%L-U	1/4	3/32	0.110	0.004	7°	○	○	○	○	
	21505E%L-U				0.008		○	○	○	○	
	2151E%L-U	1/64	○	○	○	○					
	CCGT 32502E%L-U	3/8	5/32	0.173	0.004	7°	○	○	○	○	
32505E%L-U	0.008				○		Ⓡ	○	Ⓡ		
	CPMT 215105PP	5/16	3/32	0.130	0.008	11°	●	●	○	●	
	21511PP				1/64		●	●	○	●	
	CPMT 3205PP	3/8	1/8	0.173	0.008	11°	●	●	○	●	
	321PP				1/64		●	●	○	●	
	322PP	3/8	1/8	0.173	1/32	11°	●	●	○	●	
	CPMT 21511GP				1/64		○	○	○	○	
	CPMT 321GP	3/8	1/8	0.173	1/64	11°	○	○	○	○	
	322GP				1/32		○	○	○	○	
	CPMH 21511HQ	5/16	3/32	0.138	1/64	11°	●	●	○	●	
	21512HQ				1/32		●	●	○	●	
	CPMH 321HQ	3/8	1/8	0.177	1/64	11°	●	●	○	●	
	322HQ				1/32		●	●	○	●	
	CPMH 21511	5/16	3/32	0.138	1/64	11°	○	○	○	○	
	21512				1/32		○	○	○	○	
	CPMH 321	3/8	1/8	0.177	1/64	11°	○	○	○	○	
	322				1/32		○	○	○	○	
	CPMT 21511XP	5/16	3/32	0.130	1/64	11°	●	●	○	●	
	CPMT 321XP				1/64		●	●	○	●	
	322XP	3/8	1/8	0.173	1/32	11°	●	●	○	●	
							●	●	○	●	

Shape Right-hand Shown	Description	Dimensions (in)					TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (r _e)	Relief Angle				
 Low Carbon Steel / Finishing-Medium	CPMT 321XQ 322XQ	3/8	1/8	0.173	1/64	11°	●	○	○	○
					1/32		●	○	○	○
 Finishing-Medium	CPMH 25151%L-Y CPMH 321%L-Y	5/16 3/8	3/32 1/8	0.138 0.177	1/64 1/64	11° 11°	○ ○	 ○	 ○	
 Finishing / with Wiper Edge	DCMX 2151WP DCMX 3251WP	1/4 3/8	3/32 5/32	0.110 0.173	1/64 1/64	7° 7°	○ ○	○ ○	○ ○	○ ○
 Finishing	DCMT 21505PP 2151PP DCMT 32505PP 3251PP 3252PP	1/4 3/8	3/32 5/32	0.110 0.173	0.008 1/64 0.008 1/64 1/32	7° 7°	○ ● ● ● ○	○ ● ● ● ○	○ ○ ● ● ○	○ ● ● ● ○
 Finishing	DCMT 21505GP 2151GP DCMT 3251GP 3252GP	1/4 3/8	3/32 5/32	0.110 0.016	0.008 1/64 1/32	7° 7°	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○
 Finishing-Medium	DCMT 21505GK 2151GK 2152GK DCMT 32505GK 3251GK 3252GK	1/4 3/8	3/32 5/32	0.110 0.173	0.008 1/64 1/32 0.008 1/64 1/32	7° 7°	● ● ● ● ● ○	● ● ● ● ● ○	● ● ● ● ● ○	● ● ● ● ● ○
 Finishing-Medium	DCMT 21505HQ 2151HQ 2152HQ DCMT 32505HQ 3251HQ 3252HQ	1/4 3/8	3/32 5/32	0.110 0.173	0.008 1/64 1/32 0.008 1/64 1/32	7° 7°	○ ● ● ● ● ○	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○
 Medium	DCGT 21502 21505 2151 DCGT 32502 32505 3251 DCMT 3252	1/4 3/8	3/32 5/32	0.110 0.173	0.004 0.008 1/64 0.004 0.008 1/64 1/32	7° 7°	○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○
 Low Carbon Steel / Finishing	DCMT 2151XP DCMT 32505XP 3251XP 3252XP	1/4 3/8	3/32 5/32	0.110 0.173	1/64 0.008 1/64 1/32	7° 7°	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Low Carbon Steel / Finishing-Medium	DCMT 3251XQ 3252XQ	3/8	5/32	0.173	1/64	7°	●	○	●	○
					1/32		●	○	●	○
 Finishing / Sharp Edge	DCET 21502M%L-F 21505M%L-F 2151M%L-F DCET 32502M%L-F 32505M%L-F 3251M%L-F	1/4 3/8	3/32 5/32	0.110 0.173	0.004 0.008 1/64 ≤0.004 ≤0.008 ≤1/64	7° 7°	○ ○ ○ ○ ○ ○	 ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○	 ○ ○ ○ ○ ○ ○
 Low Feed / Sharp Edge	DCET 21502MF%L-U 21505MF%L-U DCET 32502MF%L-U 32505MF%L-U	1/4 3/8	3/32 5/32	0.110 0.173	≤0.004 ≤0.008 ≤0.004 ≤0.008	7° 7°	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○	○ ○ ○ ○
 Low Feed / Honed Edge	DCGT 21502E%L-U 21505E%L-U 2151E%L-U DCGT 32502E%L-U 32505E%L-U 3251E%L-U	1/4 3/8	3/32 5/32	0.110 0.173	0.004 0.008 1/64 0.004 0.008 1/64	7° 7°	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○

Inserts (Positive)

Shape Right-hand Shown	Description	Dimensions (in)							
		I.C.	Thickness	Hole	Corner-R (re)	Relief Angle	TN610	TN620	PV710
	DCET 32502MF% -J	3/8	5/32	0.173	<0.004	7°	○	○	
	32505MF% -J				<0.008		○	○	
	DCGT 32502E% -J	3/8	5/32	0.173	0.004	7°	○	○	
	32505E% -J				0.008		○	○	
	3251E% -J				1/64		○	○	
	RCMX 1003M0	0.394	1/8	0.142	0.039	7°	○	○	○
	RCMX 1204M0	0.472	3/16	0.165	0.039	7°	○	○	○
	SCMT 3251HQ	3/8	5/32	0.173	1/64	7°	○	○	
	3252HQ				1/32		○	○	
	SPGR 321% 322%	3/8	1/8	-	1/64 1/32	11°	○ ○	○ ○	
	SPGR 421% 422%				1/64 1/32		○ ○	○ ○	
	SPM 422 423	1/2	1/8	-	1/32 3/64	11°	○ ○	○ ○	
	SPM 422 423	1/2	1/8	-	1/32 3/64	11°	○ ○	○ ○	
	TBMT 12105DP 1211DP	5/32	1/16	0.091	0.008 1/64	5°	○ ○	○ ○	○ ●
	TBGT 12105% 1211%	5/32	1/16	0.091	0.008 1/64	5°	○ ○	○ ○	○ ○
	TCMX 18151WP TCMX 221WP	7/32 1/4	3/32 3/32	0.098 0.110	1/64 1/64	7° 7°	○ ○	○ ○	○ ○
	TCMT 181505HQ 18151HQ	7/32	3/32	0.098	0.008 1/64	7°	○ ○	○ ○	○ ○
	TCMT 21505HQ 2151HQ 2152HQ				0.008 1/64 1/32		○ ○ ○	○ ○ ○	○ ○ ○
	TCMT 3251HQ 3252HQ	3/8	5/32	0.173	1/64 1/32	7°	○ ○	○ ○	○ ○
	TPMX 18151WP TPMX 2151WP	7/32 1/4	3/32 1/8	0.110 0.130	1/64 1/64	11° 11°	○ ○	○ ○	○ ○
	TPMT 181505PP 18151PP	7/32	3/32	0.110	0.008 1/64	11°	● ●	● ●	● ●
	TPMT 2205PP 221PP 222PP				0.008 1/64 1/32		● ● ●	● ● ●	● ● ●
	TPMT 181505GP 18151GP	7/32	3/32	0.110	0.008 1/64	11°	○ ○	○ ○	○ ○
	TPMT 221GP 222GP				1/64 1/32		○ ○	○ ○	○ ○
	TPMT 321GP	3/8	1/8	0.173	1/64	11°	○	○	○

Shape Right-hand Shown	Description	Dimensions (in)							
		I.C.	Thickness	Hole	Corner-R (re)	Relief Angle	TN610	TN620	PV710
	TPMT 181505HQ 18151HQ	7/32	3/32	0.110	0.008 1/64	11°	●	○	○
	TPMT 2205HQ 221HQ 222HQ	1/4	1/8	0.130	0.008 1/64 1/32		●	○	○
	TPMT 3205HQ 321HQ 322HQ				0.008 1/64 1/32		●	○	○
	TPMT 18151XP TPMT 221XP 222XP	7/32	3/32	0.110	1/64 1/64 1/32		●	○	○
	TPMT 321XP 322XP	3/8	1/8	0.173	1/64 1/32		●	○	○
	TPMT 221XQ 222XQ	7/32	3/32	0.110	1/64 1/32	11°	●	○	○
	TPMT 321XQ 322XQ	3/8	1/8	0.173	1/64 1/32		●	○	○
	TPMT 221XQ 222XQ	1/4	1/8	0.130	1/64 1/32		●	○	○
	TPMT 321XQ 322XQ	3/8	1/8	0.173	1/64 1/32		●	○	○
	TPGH 151505% 15151%	3/16	3/32	0.091	0.008 1/64	11°	○	○	○
	TPGH 181505% 18151%				0.008 1/64		○	○	○
	TPGH 21505% 2151%	1/4	3/32	0.138	0.008 1/64	11°	○	○	○
	TPGH 2205% 221% 222%				0.008 1/64 1/32		○	○	○
	TPGH 3205% 321% 322%	3/8	1/8	0.177	0.008 1/64 1/32	11°	○	○	○
	TPGH 2205%-H 221%-H 222%-H				0.008 1/64 1/32		○	○	○
	TPGH 321%-H TPGT 3305%-H 331%-H				0.008 1/64 1/64		○	○	○
	TPGB 15151 TPGB 18151 TPGB 2151	3/16 7/32 1/4	3/32 3/32 3/32	0.091 0.118 0.138	1/64 1/64 1/64	11° 11° 11°	○	○	○
	TPGB 2205 221 222	1/4	1/8	0.130	0.008 1/64 1/32	11°	○	○	○
	TPGB 321 322				1/64 1/32		○	○	○
	TPMR 221GP TPMR 321GP	1/4 3/8	1/8 1/8	- -	1/64 1/64	11° 11°	○	○	○
	TPMR 221HQ 222HQ	1/4	1/8	-	1/64 1/32	11°	○	○	○
	TPMR 321HQ 322HQ	3/8	1/8	-	1/64 1/32	11°	○	○	○
	TPMR 221 222	1/4	1/8	-	1/64 1/32	11°	○	○	○
	TPMR 321 322	3/8	1/8	-	1/64 1/32	11°	○	○	○
	TPGR 2205%-A 221%-A 221%-B 222%-B	1/4 1/4	1/8 1/8	- -	0.008 1/64 1/64 1/32	11° 11°	○	○	○
	TPGR 3205%-B 321%-B 322%-B	3/8	1/8	-	0.008 1/64 1/32	11°	○	○	○
	TPGR 321%-C 322%-C				1/64 1/32		○	○	○
	TPG 221 222	1/4	1/8	-	1/64 1/32	11°	○	○	○
	TPG 321 322	3/8	1/8	-	1/64 1/32	11°	○	○	○

Insert that has corner R(re) dimension expressed with "less than" sign
(ex. <0.004, <0.008, etc.) indicates models with minus tolerance for corner R(re)

● : U.S. Stock ○ : U.S. Stock (L-hand Only)
○ : World Express (Shipping: 7-10 Business Days) ® : World Express (R-hand Only) ℒ : World Express (L-hand Only)

Inserts (Positive) NEW

Shape Right-hand Shown	Description	Dimensions (in)					TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (R)	Relief Angle				
 Finishing	VBMT 2205PP	1/4	1/8	0.110	0.008	5°	●	●	●	●
	221PP				1/64		●	●	●	●
	222PP				1/32		●	●	●	●
	VBMT 331PP	3/8	3/16	0.173	1/64	5°	●	●	●	●
	332PP				1/32	●	●	●	●	
333PP	3/64				●	●	●	●		
 Finishing	VBMT 221GP	1/4	1/8	0.110	1/64	5°	○	○	○	○
	VBMT 331GP	3/8	3/16	0.173	1/64	5°	○	○	○	○
	332GP				1/32		○	○	○	○
 Finishing	VBMT 2205VF	1/4	1/8	0.110	0.008	5°	●	●	●	●
	221VF				1/64		●	●	●	●
	222VF				1/32		●	●	●	●
	VBMT 3305VF	3/8	3/16	0.173	0.008	5°	●	●	●	●
	331VF				1/64		●	●	●	●
	332VF				1/32		●	●	●	●
	333VF				3/64		●	●	●	●
 Finishing-Medium	VBMT 221HQ	1/4	1/8	0.110	1/64	5°	●	●	●	●
	222HQ	1/32	●	●	●		●			
	VBMT 331HQ	3/8	3/16	0.173	1/64	5°	●	●	●	●
	332HQ				1/32		●	●	●	●
	333HQ				3/64		●	●	●	●
 Finishing / Sharp Edge	VBET 2202M $\frac{R}{L}$ -F	1/4	1/8	0.110	<0.004	5°	○	○	○	○
	2205M $\frac{R}{L}$ -F				<0.008		○	○	○	○
 Finishing-Medium / Sharp Edge	VBET 2205M $\frac{R}{L}$ -Y	1/4	1/8	0.110	<0.008	5°	○	○	○	○
	221M $\frac{R}{L}$ -Y				<1/64		○	○	○	○
 Finishing-Medium	VBGT 3305 $\frac{R}{L}$ -Y	3/8	3/16	0.173	0.008	5°	○	○	○	○
	331 $\frac{R}{L}$ -Y				1/64		○	○	○	○

Insert that has corner R(re) dimension expressed with "less than" sign
(ex. <0.004, <0.008, etc.) indicates models with minus tolerance for corner R(re)

Shape Right-hand Shown	Description	Dimensions (in)					TN610	TN620	PV710	PV720
		I.C.	Thickness	Hole	Corner-R (re)	Relief Angle				
 Finishing	VCMT 151505PP	3/16	3/32	0.091	0.008	7°	●	●	●	●
	15151PP				1/64		●	●	●	●
	VCMT 331PP	3/8	3/16	0.173	1/64	7°	●	●	●	●
	332PP				1/32		●	●	●	●
 Finishing	VCMT 151505VF	3/16	3/32	0.091	0.008	7°	○	○	○	○
	15151VF				1/64		○	○	○	○
 Finishing-Medium	VCMT 151505HQ	3/16	3/32	0.091	0.008	7°	○	○	○	○
	15151HQ				1/64		○	○	○	○
 Finishing	WBMT 12105 $\frac{R}{L}$ -DP	5/32	1/16	0.091	0.008	5°	Ⓕ	Ⓕ	Ⓕ	Ⓕ
	1211 $\frac{R}{L}$ -DP				1/64		Ⓕ	Ⓕ	Ⓕ	Ⓕ
	WBMT 151505 $\frac{R}{L}$ -DP	3/16	3/32	0.091	0.008	5°	Ⓕ	Ⓕ	Ⓕ	Ⓕ
	15151 $\frac{R}{L}$ -DP				1/64		Ⓕ	Ⓕ	Ⓕ	Ⓕ
 Finishing / Sharp Edge	WBET 12105M $\frac{R}{L}$ -F	5/32	1/16	0.091	<0.008	5°	○	Ⓕ	○	Ⓕ
	1211M $\frac{R}{L}$ -F				<1/64		○	Ⓕ	○	Ⓕ
	WBET 151502M $\frac{R}{L}$ -F	3/16	3/32	0.091	<0.004	5°	○	○	○	○
	151505M $\frac{R}{L}$ -F				<0.008		○	Ⓕ	○	Ⓕ
	15151M $\frac{R}{L}$ -F				<1/64		○	Ⓕ	○	Ⓕ
 Finishing-Medium	WPMT 2151GP	1/4	3/32	0.110	1/64	11°		○		○
	WPMT 321GP	3/8	1/8	0.173	1/64	11°		○		○
 Finishing-Medium	WPMT 21505HQ	1/4	3/32	0.110	0.008	11°		○		○
	2151HQ				1/64		○	○	○	○
	WPMT 321HQ	3/8	1/8	0.173	1/64	11°	○	○	○	○
	322HQ				1/32		○	○	○	○

● : U.S. Stock ○ : World Express (Shipping: 7-10 Business Days) Ⓛ : World Express (L-hand Only)

Recommended Cutting Conditions

Vc (sfm)

Grade	Low Carbon Steel Low Carbon Alloy Steel	Medium Carbon Steel Medium Carbon Alloy Steel	High Carbon Alloy Steel
TN610	490 - 820 - 1,150		490 - 760 - 980
TN620	330 - 660 - 980		330 - 590 - 820

Vc (sfm)

Grade	Low Carbon Steel Low Carbon Alloy Steel	Medium Carbon Steel Medium Carbon Alloy Steel	High Carbon Alloy Steel
PV710	490 - 980 - 1,310		490 - 820 - 1,080
PV720	330 - 820 - 1,150		330 - 660 - 920



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