



CCX

CVD Coated Cermet for Finishing



Greater Productivity and High-Speed Machining with CVD Coated Cermet

Newly Developed Unique Cermet Base Material with Thick CVD Coating

Greater Productivity with High-Speed Finishing

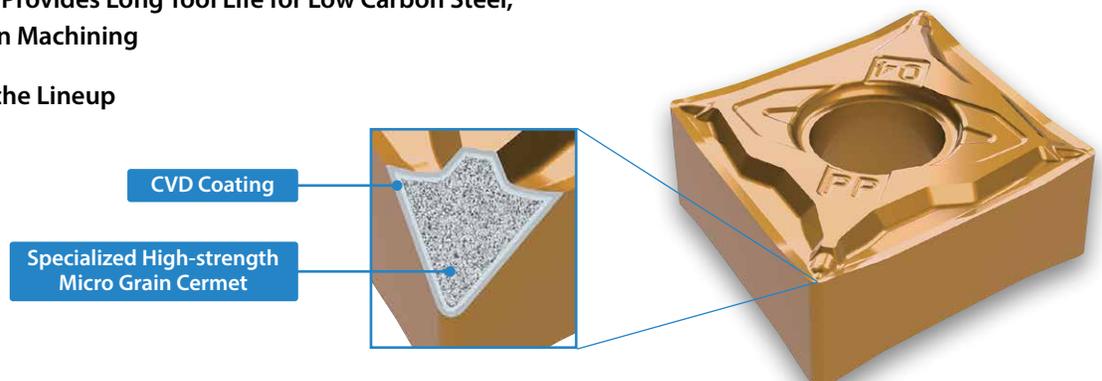
(Recommended Cutting Conditions for Low Carbon Steel: Max. 2,620 sfm)

Wide Range of Cutting Speeds Available from General to High-Speed Machining

**Excellent Wear Resistance Provides Long Tool Life for Low Carbon Steel,
General Steel and Cast Iron Machining**

NEW

Positive Inserts Added to the Lineup



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CVD Coated Cermet for Finishing



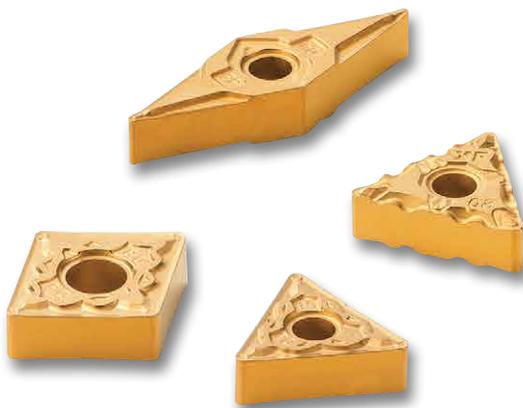
- Combination of cermet with a CVD coating provides high-speed machining for better productivity
- Applicable to a wide range of cutting conditions from general to high-speed applications
- Maintains long tool life in soft steel, general steel and cast iron machining

1 Excellent High-Speed Finishing Leads to Greater Productivity

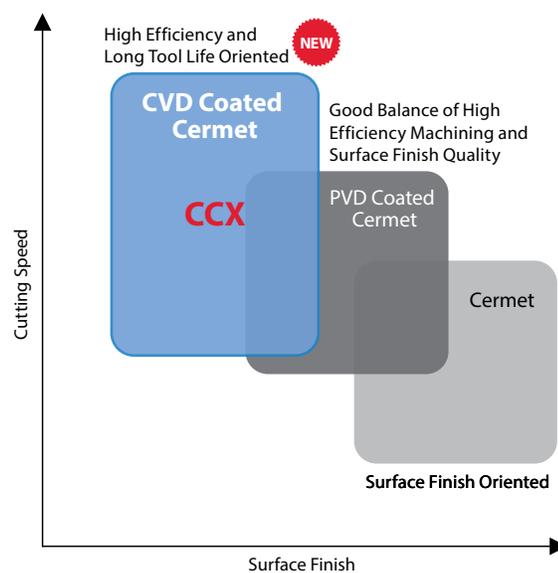
Superior wear resistance with unique cermet grade and thickened CVD coating

Finishing available at a higher speed range

Wide range of cutting speeds from general to high-speed provides long tool life in finishing applications



CVD Cermet Application Map



CCX Application Examples

Great performance in continuous to light interruption finishing applications

Cutting with coolant is recommended

Recommended D.O.C. is 0.039" or less

Long tool life in high speed machining of soft steel and general steel

Long tool life for cast iron finishing



Recommended Cutting Conditions Vc : 980-1,970-2,620 (sfm)



Recommended Cutting Conditions Vc : 650-980-1,310 (sfm)



Recommended Cutting Conditions Vc : 490-820-980 (sfm)

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Combination of Cermet and a CVD Coating Provides High-Speed Machining

Newly developed unique cermet grade with thick CVD coating which is difficult to accomplish using conventional technology
High speed machining and long tool life with superior wear and chipping resistance

Thickened CVD Coated Cermet

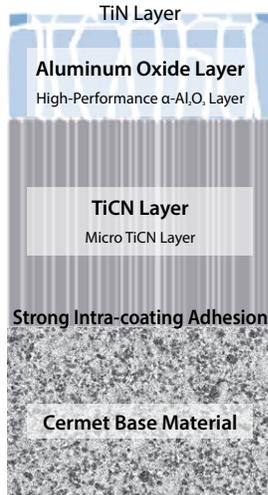
Improved wear resistance with thicker coating than PVD

Al₂O₃ layer provides excellent crater wear resistance

Newly Developed Unique Cermet Grade

Specialized high-strength micro grain cermet including a high metal content binder phase

High wear and fracture resistance



CCX Image

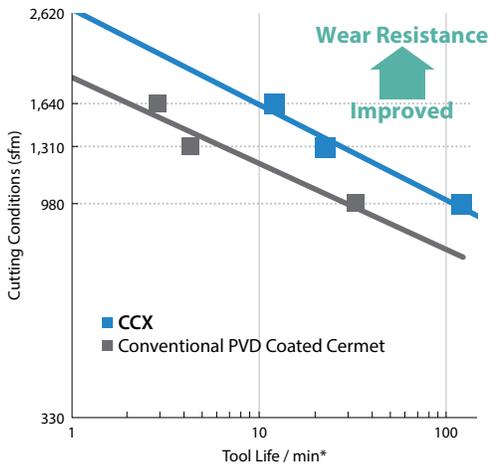


Wear Resistance

Shows greater strength and wear resistance in a wide range of cutting speeds from general to high-speed machining

V-T Diagram (Internal Evaluation)

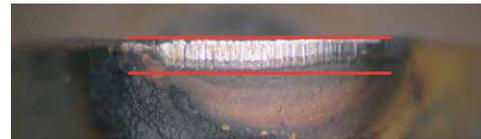
*Tool life (min) : Edge wear amount 0.004" (Logarithmic chart)



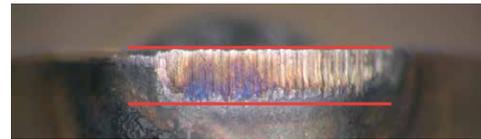
Cutting Conditions : Vc = 980/1,310/1,640 sfm, D.O.C. = 0.020", f = 0.008 ipr, Wet CNMG432 Type Workpiece : 4137

Cutting Edge (Vc = 1,640 sfm : After Machining 12.4 min)

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Conventional PVD Coated Cermet A



Chipping Resistance

Great chipping resistance with specialized high-strength micro grain base material and the compressive residual stress of a CVD coating layer

Surface Condition after the CVD Coating (Internal Evaluation)

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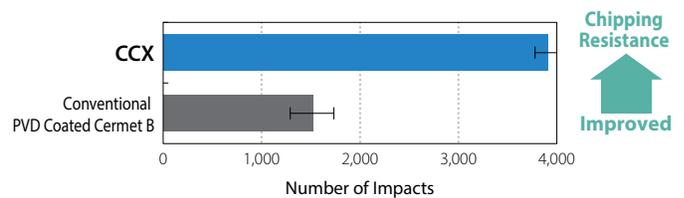


CVD Coated Carbide



Strong compressive residual stress prevents cracks from occurring

Chipping Resistance Comparison (Internal Evaluation)



Cutting Conditions : Vc = 980 sfm, D.O.C. = 0.020", f = 0.012 ipr, n = 3, Wet CNMG432 Type Workpiece : 1045 (with 4 Slots)

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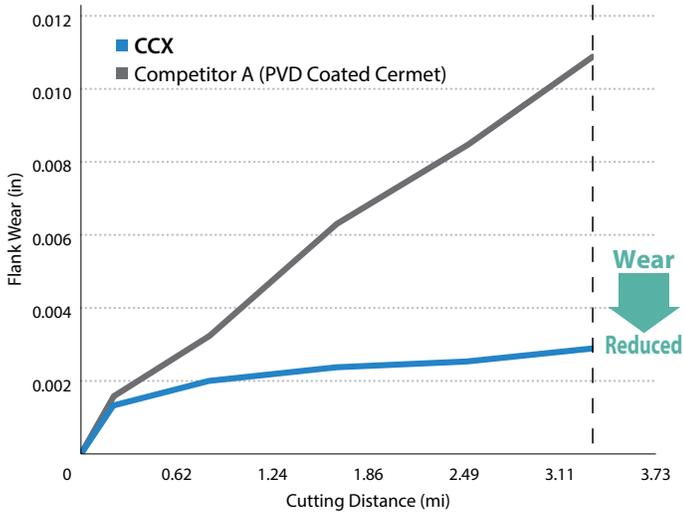
Superior Wear Resistance to PVD Coated Cermets

Low Carbon Steel

High-Speed Comparison : $V_c = 3,280 \text{ sfm}$ *Outside recommended conditions (Acceleration test result)

CCX shows better wear resistance when compared to competitors even in high-speed cutting conditions

Wear Resistance Comparison (Internal Evaluation)



Cutting Conditions : $V_c = 3,280 \text{ sfm}$, D.O.C. = $0.010''$, $f = 0.006 \text{ ipr}$, Wet
CNMG432 Type Facing

Cutting Edge (As of 3.29 mi of machining)

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Competitor A (PVD Coated Cermet)

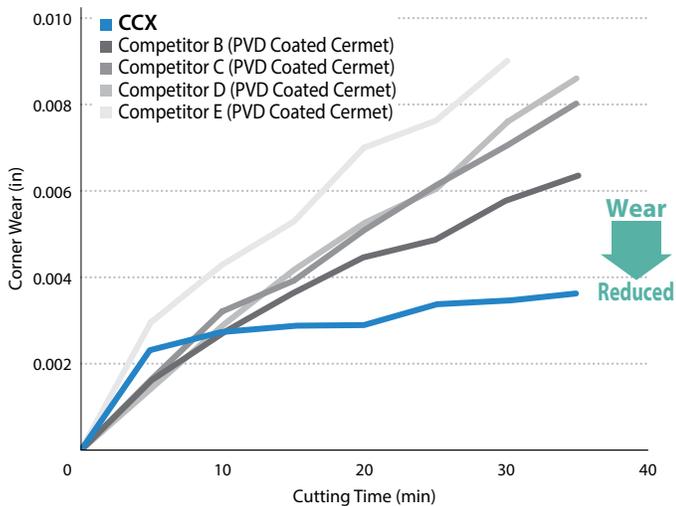


Alloy Steel

High-Speed Comparison : $V_c = 1,310 \text{ sfm}$

CCX provided better tool life than competitor's CVD cermets by greatly reducing the amount of wear

Wear Resistance Comparison (Internal Evaluation)



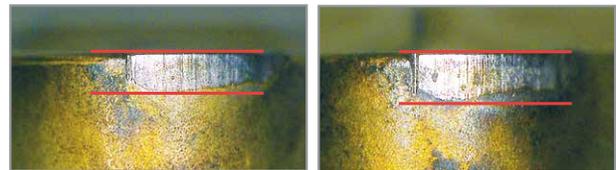
Cutting Conditions : $V_c = 1,310 \text{ sfm}$, D.O.C. = $0.012''$, $f = 0.005 \text{ ipr}$, Wet
CNMG432 Type External Turning

Cutting Edge (After Machining 35 min)

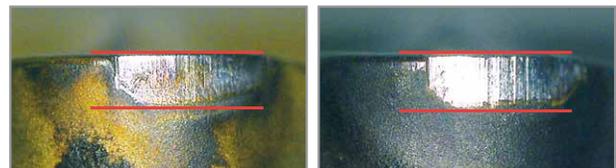
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Competitor B (PVD Coated Cermet) Competitor C (PVD Coated Cermet)



Competitor D (PVD Coated Cermet) Competitor E (PVD Coated Cermet)



*Picture shows 30 min after machining due to a large amount of wear.

Negative Inserts

Shape Right-hand Shown	Part Number	Dimensions (in)				CVD Coated Cermet
		IC	Thickness	Hole Diameter	Corner-R (RE)	
 Finishing	CNMG 4305PP 431PP 432PP 433PP	1/2	3/16	0.203	0.008	●
					1/64	●
					1/32	●
					3/64	●
 Finishing-Medium	CNMG 431PQ 432PQ 433PQ	1/2	3/16	0.203	1/64	●
					1/32	●
					3/64	●
 Finishing-Medium	CNMG 331HQ 332HQ	3/8	3/16	0.150	1/64	●
					1/32	●
	CNMG 431HQ 432HQ 433HQ	1/2	3/16	0.203	1/64	●
					1/32	●
 Finishing / Small D.O.C.	CNMG 431XF 432XF	1/2	3/16	0.203	1/64	●
					1/32	●
 Low Carbon Steel / Finishing	CNMG 431XP 432XP	1/2	3/16	0.203	1/64	●
					1/32	●
 Low Carbon Steel / Medium	CNMG 431XQ 432XQ	1/2	3/16	0.203	1/64	●
					1/32	●
 Cast Iron	CNMG 431 432 433	1/2	3/16	0.203	1/64	●
					1/32	●
					3/64	●
 Cast Iron (Without Chipbreaker)	CNMA 431 432	1/2	3/16	0.203	1/64	●
					1/32	●
 Finishing	DNMG 4305PP 431PP 432PP 433PP	1/2	3/16	0.203	0.008	●
					1/64	●
					1/32	●
					3/64	●
	DNMG 4405PP 441PP 442PP 443PP	1/2	1/4	0.203	0.008	●
					1/64	●
					1/32	●
 Finishing-Medium	DNMG 431PQ 432PQ 433PQ	1/2	3/16	0.203	1/64	●
					1/32	●
					3/64	●
	DNMG 441PQ 442PQ 443PQ	1/2	1/4	0.203	1/64	●
					1/32	●
3/64	●					

Shape Right-hand Shown	Part Number	Dimensions (in)				CVD Coated Cermet
		IC	Thickness	Hole Diameter	Corner-R (RE)	
 Finishing-Medium	DNMG 3305HQ 331HQ	3/8	3/16	0.150	0.008	●
					1/64	●
	DNMG 431HQ 432HQ 433HQ	1/2	3/16	0.203	1/64	●
					1/32	●
					3/64	●
	DNMG 441HQ 442HQ 443HQ	1/2	1/4	0.203	1/64	●
					1/32	●
3/64	●					
 Finishing / Small D.O.C.	DNMG 431XF 432XF	1/2	3/16	0.203	1/64	●
					1/32	●
 Low Carbon Steel / Finishing	DNMG 431XP 432XP	1/2	3/16	0.203	1/64	●
					1/32	●
DNMG 441XP 442XP	1/2	1/4	0.203	1/64	●	
				1/32	●	
 Low Carbon Steel / Medium	DNMG 431XQ 432XQ	1/2	3/16	0.203	1/64	●
					1/32	●
 Cast Iron	DNMG 432	1/2	3/16	0.203	1/32	●
 Cast Iron (Without Chipbreaker)	DNMA 432	1/2	3/16	0.203	1/32	●
 Finishing-Medium	SNMG 431PQ 432PQ	1/2	3/16	0.203	1/64	●
					1/32	●
 Finishing-Medium	SNMG 431HQ 432HQ 433HQ	1/2	3/16	0.203	1/64	●
					1/32	●
					3/64	●
 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	●
					1/32	●
 Low Carbon Steel / Roughing	SNMG 432XS	1/2	3/16	0.203	1/32	●

● : Standard Item

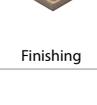
Negative Inserts

Shape Right-hand Shown	Part Number	Dimensions (in)				CVD Coated Cermets	
		IC	Thickness	Hole Diameter	Corner-R (RE)	CCX	
 Cast Iron	SNMG 432	1/2	3/16	0.203	1/32	●	
 Finishing	TNMG 3305PP	3/8	3/16	0.150	0.008	●	
	331PP				1/64	●	
	332PP				1/32	●	
	333PP				3/64	●	
 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	●	
333HQ	3/64	●					
 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	●	
 Cast Iron	TNMG 331	3/8	3/16	0.150	1/64	●	
	332				1/32	●	
 Cast Iron (Without Chipbreaker)	TNMA 331	3/8	3/16	0.150	1/64	●	
	332				1/32	●	
 Finishing	VNMG 3305PP	3/8	3/16	0.150	0.008	●	
	331PP				1/64	●	
	332PP				1/32	●	
	333PP				3/64	●	
 Finishing-Medium	VNMG 331^{FL}-VC	3/8	3/16	0.150	1/64	●	
	332^{FL}-VC				1/32	●	
	333^{FL}-VC				3/64	●	

Shape Right-hand Shown	Part Number	Dimensions (in)				CVD Coated Cermets	
		IC	Thickness	Hole Diameter	Corner-R (RE)	CCX	
 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	●	
	VNMG 331VF				3/8	3/16	0.150
332VF	1/32	●					
 Cast Iron	VNMG 332	3/8	3/16	0.150	1/32	●	
 Finishing	WNMG 4305PP	1/2	3/16	0.203	0.008	●	
	431PP				1/64	●	
	432PP				1/32	●	
	433PP				3/64	●	
 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	●	
	WNMG 431HQ	1/2	3/16	0.203	1/64	●	
	432HQ				1/32	●	
433HQ	3/64	●					
 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	●	
 Cast Iron	WNMG 432	1/2	3/16	0.203	1/32	●	
	WNMA 432				1/32	●	
 Cast Iron (Without Chipbreaker)	WNMA 432	1/2	3/16	0.203	1/32	●	

● : Standard Item

Positive Inserts

Shape Right-hand Shown	Part Number	Dimensions (in)					CVD Coated Cermet	CCX
		IC	Thickness	Hole Diameter	Corner-R (RE)	Relief Angle		
 Finishing	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			
	3252PP				1/32			
 Finishing-Medium	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	4.76	0.217	1/64	7°	●	
432GK	1/32							
 Finishing-Medium	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			
	3252HQ				1/32			
 Medium	CCMT 3252	3/8	5/32	0.173	1/32	7°	●	
 Finishing	CPMT 251505PP	5/16	3/32	0.130	0.008	11°	●	
	25151PP				1/64			
	CPMT 3205PP	3/8	7/32	0.173	0.008	11°	●	
	321PP				1/64			
322PP	1/32							
 Finishing-Medium	CPMH 25151HQ	5/16	3/32	0.138	1/64	11°	●	
	25152HQ				1/32			
	CPMH 321HQ	3/8	1/8	0.177	1/64	11°	●	
	322HQ				1/32			
 Medium	CPMH 25151	5/16	3/32	0.138	1/64	11°	●	
	25152				1/32			
	CPMH 321	3/8	1/8	0.177	1/64	11°	●	
	322				1/32			
 Low Carbon Steel / Finishing	CPMT 25151XP	5/16	3/32	0.130	1/64	11°	●	
	CPMT 321XP	3/8	1/8	0.173	1/64	11°	●	
	322XP				1/32			
 Low Carbon Steel / Medium	CPMT 321XQ	3/8	1/8	0.173	1/64	11°	●	
	322XQ				1/32			
	 Finishing	DCMT 21505PP	1/4	3/32	0.110	0.008	7°	●
2151PP		1/64						
DCMT 32505PP		3/8	5/32	0.173	0.008	7°	●	
3251PP					1/64			
3252PP					1/32			
 Finishing-Medium	DCMT 21505GK	1/4	3/32	0.110	0.008	7°	●	
	2151GK				1/64			
	2152GK				1/32			
	DCMT 32505GK	3/8	5/32	0.173	0.008	7°	●	
	3251GK				1/64			
	3252GK				1/32			
 Finishing-Medium	DCMT 21505HQ	1/4	3/32	0.110	0.008	7°	●	
	2151HQ				1/64			
	2152HQ				1/32			
	DCMT 32505HQ	3/8	5/32	0.173	0.008	7°	●	
	3251HQ				1/64			
3252HQ	1/32							
 Medium	DCMT 3252	3/8	5/32	0.173	1/32	7°	●	
 Low Carbon Steel / Finishing	DCMT 2151XP	1/4	3/32	0.110	1/64	7°	●	
	DCMT 32505XP	3/8	5/32	0.173	0.008	7°	●	
	3251XP				1/64			
3252XP	1/32							
 Low Carbon Steel / Finishing	DCMT 3251XQ	3/8	5/32	0.173	1/64	7°	●	
	3252XQ				1/32			
 No Chipbreaker	SPM 423	3/64	1/8	-	3/64	11°	●	
 Finishing	TBMT 12105DP	5/32	1.59	0.091	0.008	5°	●	
	1211DP				1/64			
 Finishing-Medium	TCMT 181505HQ	7/32	3/32	0.098	0.008	7°	●	
	18151HQ				1/64			
	TCMT 21505HQ	1/4	3/32	0.110	0.008	7°	●	
	2151HQ				1/64			
2152HQ	1/32							
TCMT 3251HQ	3/8	5/32	0.173	1/64	7°	●		
3252HQ				1/32				
3253HQ				3/64				
 Finishing	TPMT 181505PP	5.56	3/32	0.110	0.008	11°	●	
	18151PP				1/64			
	TPMT 2205PP	1/4	1/8	0.130	0.008	11°	●	
	221PP				1/64			
222PP	1/32							
 Finishing-Medium	TPMT 181505HQ	5.56	3/32	0.110	0.008	11°	●	
	18151HQ				1/64			
	TPMT 2205HQ	1/4	1/8	0.130	0.008	11°	●	
	221HQ				1/64			
	222HQ	1/32						
TPMT 3205HQ	3/8	1/8	0.173	0.008	11°	●		
321HQ				1/64				
322HQ	1/32							
 Low Carbon Steel / Finishing	TPMT 221XP	1/4	1/8	0.130	1/64	11°	●	
	222XP				1/32			
	TPMT 321XP	3/8	1/8	0.173	1/64	11°	●	
	322XP				1/32			

● : Standard Item

Recommended Cutting Conditions

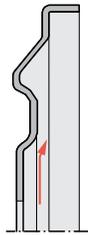
Workpiece	Recommended Cutting Conditions (Vc : sfm)
	Min. - Recommendation - Max.
Low Carbon Steel	980 ~ 1,970 ~ 2,620
Carbon Steel	660 ~ 980 ~ 1,480
Alloy Steel	660 ~ 980 ~ 1,310
Gray Cast Iron	980 ~ 1,150 ~ 1,310
Nodular Cast Iron	490 ~ 820 ~ 980

- **Machining with coolant is recommended.** Dry machining is not recommended.
- Great for soft steel materials during low to high-speed finishing (continuous~light interruption)
- Not recommended for roughing (scale removal) and heavy interrupted machining (D.O.C. should be $\leq 0.039''$)

Case Studies

Cover 1513

Vc = 1,770 sfm
D.O.C. = 0.016"
f = 0.010 ipr
Wet
TNMG332PQ CCX



Tool Life

CCX
(CVD Coated Cermet) **210 pcs/edge (Stable)**

Competitor F
(CVD Coated Carbide) **200 pcs/edge (Unstable)**

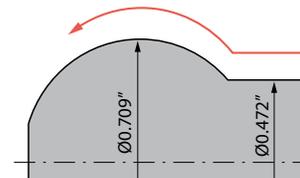
Shortened cutting time with 1.3x faster cutting speed
Stable machining of 210 pcs per edge with improved tool life



(User Evaluation)

Pin 1048 etc.

Vc = 410~590 sfm
D.O.C. = ~0.039"
f = 0.007 ipr
Wet
VNMG332VF CCX



Tool Life

CCX
(CVD Coated Cermet) **1,200 pcs/edge (Stable)**

Conventional C
(PVD Coated Cermet) **500 pcs/edge (Unstable)**

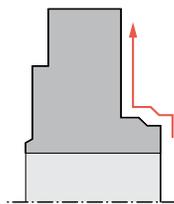
Increased the number of parts produced to 2.4 times that of conventional PVD cermet
Stable part production



(User Evaluation)

Hubs 1045

Vc = 950 sfm
D.O.C. = 0.006"
f = 0.011 ipr
Wet
VNMG331PQ CCX



Reduced amount of wear by about 50% of conventional PVD cermet in the same conditions

Cutting Edge (After Machining 320 pcs)

CCX
(CVD Coated Cermet)



Wear : 0.0042"



Conventional D
(PVD Coated Cermet)



Wear : 0.0091"

(User Evaluation)



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Technical Support | 800.823.7284 - Option 2



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