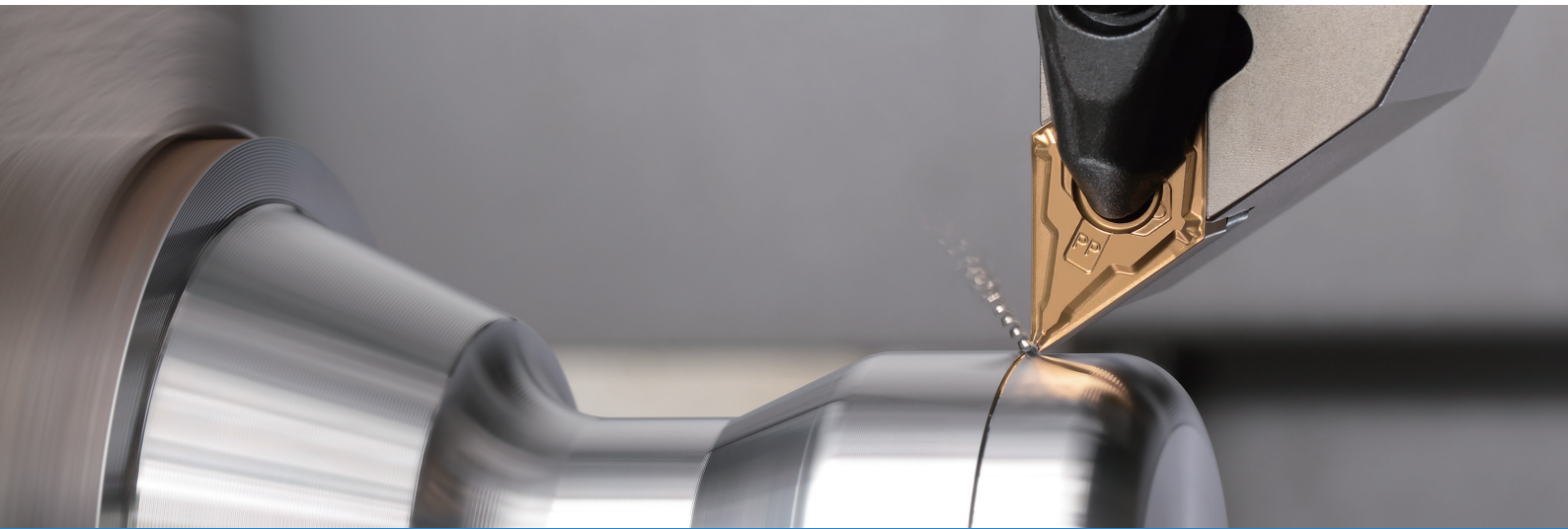


New Grade for Finishing

**CCX** 



Kyocera's New Insert Grade Technology for High-Speed Finishing and Remarkably Long Tool Life

Newly Developed Unique Cermet Base Material with Thin CVD Coating

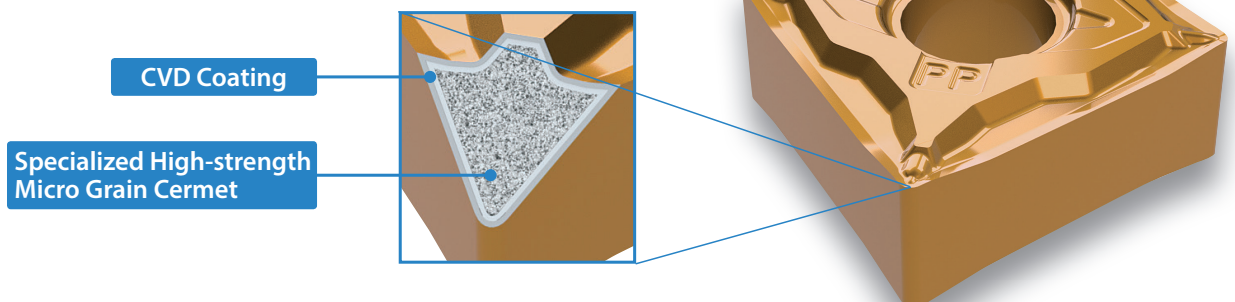
Greater Productivity with High Speed Finishing

(Recommended Cutting Conditions for Low Carbon Steel : Max. 800m/min)

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

Positive Inserts Added to the Lineup



New Grade for Finishing

# CCX

Kyocera's New Insert Grade Technology. Applicable to a Wide Range of Cutting Conditions from General to High Speed Machining. Maintains Long Tool Life in Soft Steel, General Steel and Cast Iron Machining

## 1 Excellent High Speed Finishing Leads to Greater Productivity

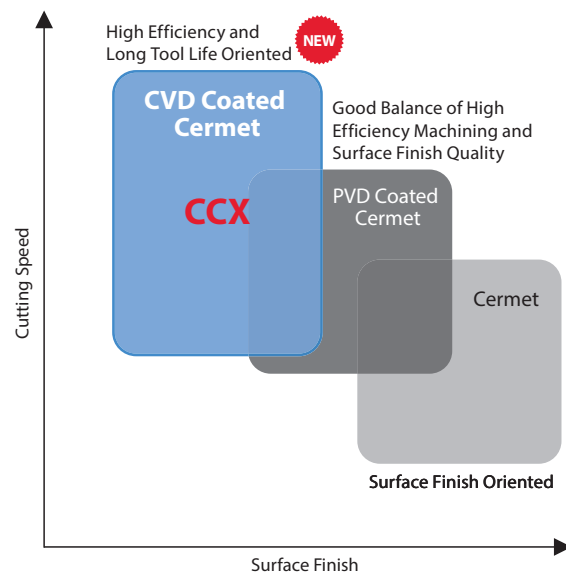
Superior wear resistance with unique cermet grade and thickened CVD coating

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 (image)



## CCX Application Examples

Great performance in continuous to light interruption finishing applications

Cutting with coolant is recommended

Recommended ap is 1.0 mm or less

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

Long tool life for cast iron finishing



Cover (SAPH)

Recommended Cutting Conditions Vc : 300-600-800 (m/min)



Shaft (SCM435)

Recommended Cutting Conditions Vc : 200-300-400 (m/min)



Differential Gear Case (FCD450)

Recommended Cutting Conditions Vc : 150-250-300 (m/min)

## 2 Combination of Cermet and a CVD Coating Provides High Speed Machining for Better Productivity

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

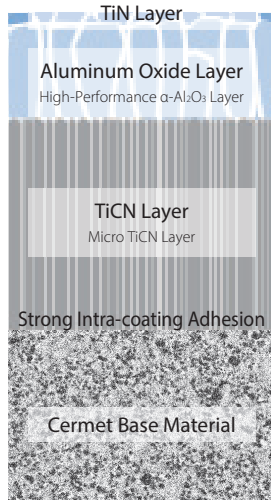
Improved wear resistance with thicker coating than PVD

Al<sub>2</sub>O<sub>3</sub> layer provides excellent crater wear resistance

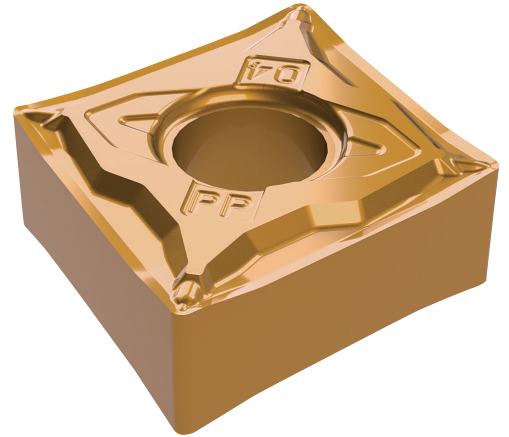
### Newly Developed Unique Cermet Grade

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

High wear and fracture resistance



CCX Image

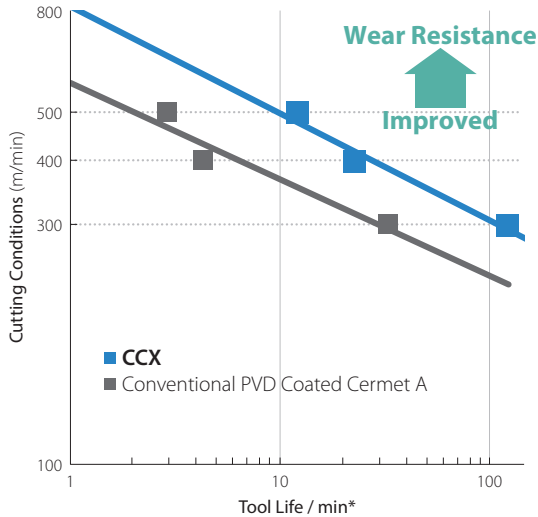


## Wear Resistance

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

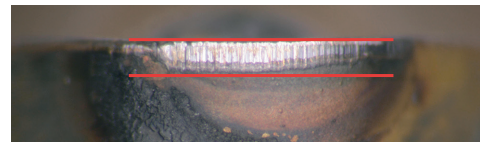
V-T Diagram (Internal Evaluation)

\*Tool life (min) : Edge wear amount 0.1mm (Logarithmic chart)

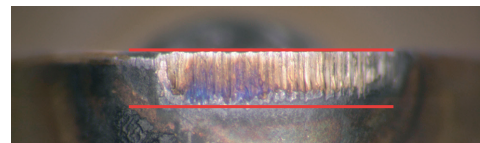


Cutting Edge (Vc=500m/min : After Machining 12.4 min)

CCX



Conventional PVD Coated Cermet A



Cutting Conditions : Vc = 300 / 400 / 500 m/min, ap = 0.5 mm, f = 0.2 mm/rev, Wet CNMG120408 Type Workpiece : SCM435

## Chipping Resistance

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

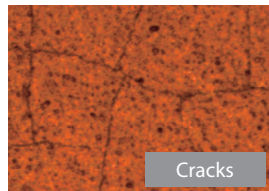
Surface Condition after the CVD Coating (Internal Evaluation)

CCX



No crack

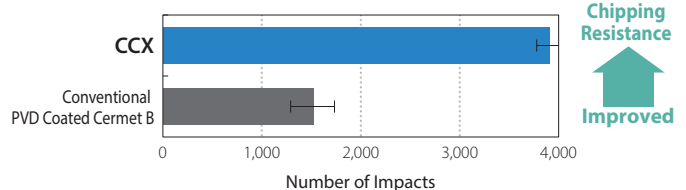
CVD Coated Carbide



Cracks

Strong compressive residual stress prevents cracks from occurring

Chipping Resistance Comparison (Internal Evaluation)



Cutting Conditions : Vc = 300 m/min, ap = 0.5 mm, f = 0.3 mm/rev, n = 3, Wet CNMG120408 Type Workpiece : S45C (with 4 Slots)

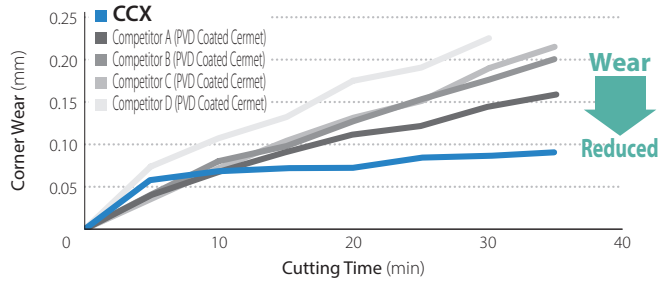
# 3

## Superior Wear Resistance to PVD Coated Cermet

**Alloy Steel (SCM435) High Speed Comparison : Vc = 400 m/min**

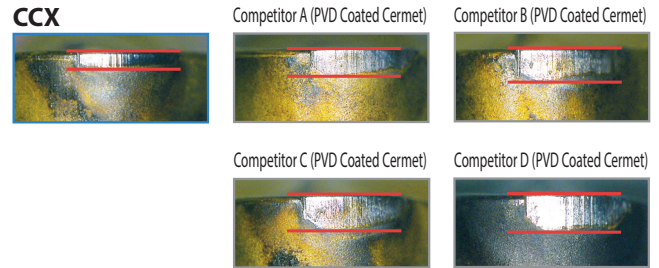
**CCX provided better tool life than competitor's CVD cermet by greatly reducing the amount of wear**

Wear Resistance Comparison (Internal Evaluation)



Cutting Conditions : Vc = 400 m/min, ap = 0.3 mm, f = 0.12 mm/rev, Wet CNMG120408 Type External Turning

Cutting Edge (After Machining 35 min)

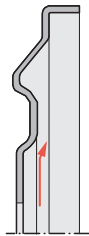


\*Picture shows 30 min after machining due to a large amount of wear.

### Case Studies

#### Cover SAPH440

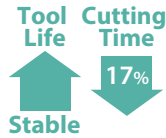
Vc = 540 m/min  
ap = 0.4 mm  
f = 0.25 mm/rev  
Wet  
TNMG160408PQ CCX



Tool Life

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

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

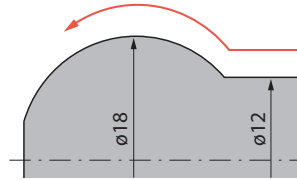


Shortened cutting time with 1.3x faster cutting speed  
Stable machining of 210 pcs per edge with improved tool life

(User evaluation)

#### Pin S48C etc.

Vc = 125~180 m/min  
ap = ~1.0 mm  
f = 0.18 mm/rev  
Wet  
VNMG160408VF CCX



Tool Life

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

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

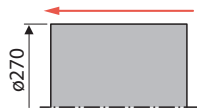


Increased the number of parts produced by 2.4 times than the conventional PVD cermet  
Stable part production

(User evaluation)

#### Cylinder S35C

Vc = 270 m/min  
ap = 0.2 mm  
f = 0.18mm/rev  
Wet  
TNMG160404PP CCX



Efficiency

**CCX (CVD Coated Cermet) Vc=270m/min**

**Competitor F (PVD Coated Cermet) Vc=160m/min**

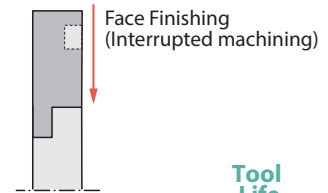


1.6x Shortened cutting time with faster cutting speed  
Longer tool life by 5.0 times than the competitor F

(User evaluation)

#### Wheel FC250

Vc = 450 m/min  
ap = 0.2 mm  
f = 0.18 mm/rev  
Wet  
WNMG080412HQ CCX



Tool Life

**CCX (CVD Coated Cermet) 270 pcs/edge**

**Competitor G (Ceramic) 110 pcs/edge**

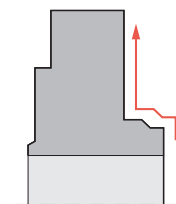


Longer tool life in cast iron machining by 2.5 times than the competitor ceramic insert G  
Ensures lower tooling cost

(User evaluation)

#### Hubs S45C

Vc = 290 m/min  
ap = 0.15 mm  
f = 0.27 mm/rev  
Wet  
VNMG160404PQ CCX



Cutting Edge (After Machining 320 pcs)

**CCX (CVD Coated Cermet)**









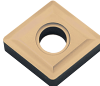



**Conventional D (PVD Coated Cermet)**













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

(User evaluation)














## Stock Items (Negative)








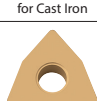
Shape	Description	Dimensions (mm)				CVD Coated Cermet	
		I.C.	Thickness	Hole Diameter	Corner R(RE)	CCX	
	CNMG 120402PP	12.70	4.76	5.16	0.2	●	
	120404PP				0.4	●	
	120408PP				0.8	●	
	120412PP				1.2	●	
	CNMG 120404PQ	12.70	4.76	5.16	0.4	●	
	120408PQ				0.8	●	
	120412PQ				1.2	●	
	CNMG 090404HQ	9.525	4.76	3.81	0.4	●	
	090408HQ				0.8	●	
	CNMG 120404HQ	12.70	4.76	5.16	0.4	●	
	120408HQ				0.8	●	
	120412HQ				1.2	●	
	CNMG 120404XF	12.70	4.76	5.16	0.4	●	
	120408XF				0.8	●	
	CNMG 120404XP	12.70	4.76	5.16	0.4	●	
	120408XP				0.8	●	
	CNMG 120404XQ	12.70	4.76	5.16	0.4	●	
	120408XQ				0.8	●	
	CNMG 120404	12.70	4.76	5.16	0.4	●	
	120408				0.8	●	
	120412				1.2	●	
	CNMA 120404	12.70	4.76	5.16	0.4	●	
	120408				0.8	●	
	DNMG 150402PP	12.70	4.76	5.16	0.2	●	
	150404PP				0.4	●	
	150408PP				0.8	●	
	150412PP				1.2	●	
	DNMG 150602PP	12.70	6.35	5.16	0.2	●	
	150604PP				0.4	●	
	150608PP				0.8	●	
	150612PP				1.2	●	
	DNMG 150404PQ	12.70	4.76	5.16	0.4	●	
	150408PQ				0.8	●	
	150412PQ				1.2	●	
	DNMG 150604PQ	12.70	6.35	5.16	0.4	●	
	150608PQ				0.8	●	
	150612PQ				1.2	●	

Shape	Description	Dimensions (mm)				CVD Coated Cermet	
		I.C.	Thickness	Hole Diameter	Corner R(RE)	CCX	
	DNMG 110402HQ	9.525	4.76	3.81	0.2	●	
	110404HQ				0.4	●	
	DNMG 150404HQ	12.70	4.76	5.16	0.4	●	
	150408HQ				0.8	●	
	150412HQ				1.2	●	
		DNMG 150604HQ	12.70	6.35	5.16	0.4	●
150608HQ		0.8				●	
150612HQ		1.2				●	
	DNMG 150404XF	12.70	4.76	5.16	0.4	●	
	150408XF				0.8	●	
	DNMG 150404XP	12.70	4.76	5.16	0.4	●	
	150408XP				0.8	●	
	DNMG 150604XP	12.70	6.35	5.16	0.4	●	
	DNMG 150404XQ	12.70	4.76	5.16	0.4	●	
	150408XQ				0.8	●	
	DNMG 150408	12.70	4.76	5.16	0.8	●	
	DNMA 150408	12.70	4.76	5.16	0.8	●	
	SNMG 120404PQ	12.70	4.76	5.16	0.4	●	
	120408PQ				0.8	●	
	SNMG 120404HQ	12.70	4.76	5.16	0.4	●	
	120408HQ				0.8	●	
	120412HQ				1.2	●	
	SNMG 120408XP	12.70	4.76	5.16	0.8	●	
	SNMG 120408XQ	12.70	4.76	5.16	0.8	●	
	SNMG 120408XS	12.70	4.76	5.16	0.8	●	
	SNMG 120408	12.70	4.76	5.16	0.8	●	

● : Standard Stock












## Stock Items (Negative)

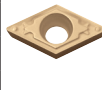









Shape Handed Insert shows Right-hand	Description	Dimensions (mm)				CVD Coated Cermet	
		I.C.	Thickness	Hole Diameter	Corner R(RE)	CCX	
 Finishing	TNMG 160402PP	9.525	4.76	3.81	0.2	●	
	160404PP				0.4	●	
	160408PP				0.8	●	
	160412PP				1.2	●	
 Finishing-Medium	TNMG 160404PQ	9.525	4.76	3.81	0.4	●	
	160408PQ				0.8	●	
	160412PQ				1.2	●	
 Finishing-Medium	TNMG 110404HQ	6.35	4.76	2.26	0.4	●	
	110408HQ				0.8	●	
	TNMG 160404HQ	9.525	4.76	3.81	0.4	●	
	160408HQ				0.8	●	
	160412HQ				1.2	●	
 Finishing / Small ap	TNMG 160404XF	9.525	4.76	3.81	0.4	●	
	160408XF				0.8	●	
 Low Carbon Steel / Finishing	TNMG 160404XP	9.525	4.76	3.81	0.4	●	
	160408XP				0.8	●	
 Low Carbon Steel / Medium cutting	TNMG 160404XQ	9.525	4.76	3.81	0.4	●	
	160408XQ				0.8	●	
 for Cast Iron	TNMG 160404	9.525	4.76	3.81	0.4	●	
	160408				0.8	●	
 for Cast Iron (Without Chipbreaker)	TNMA 160404	9.525	4.76	3.81	0.4	●	
	160408				0.8	●	
 Finishing	VNMG 160402PP	9.525	4.76	3.81	0.2	●	
	160404PP				0.4	●	
	160408PP				0.8	●	
	160412PP				1.2	●	
 Finishing-Medium	VNMG 160404 R/L-VC	9.525	4.76	3.81	0.4	●	
	160408 R/L-VC				0.8	●	
	160412 R/L-VC				1.2	●	
 Finishing-Medium	VNMG 160404PQ	9.525	4.76	3.81	0.4	●	
	160408PQ				0.8	●	
	160412PQ				1.2	●	
 Finishing-Medium	VNMG 160404HQ	9.525	4.76	3.81	0.4	●	
	160408HQ				0.8	●	
	160412HQ				1.2	●	
 Finishing-Medium	VNMG 160404VF	9.525	4.76	3.81	0.4	●	
	160408VF				0.8	●	

Shape	Description	Dimensions (mm)				CVD Coated Cermet	
		I.C.	Thickness	Hole Diameter	Corner R(RE)	CCX	
 for Cast Iron	VNMG 160408	9.525	4.76	3.81	0.8	●	
 Finishing	WNMG 080402PP	12.70	4.76	5.16	0.2	●	
	080404PP				0.4	●	
	080408PP				0.8	●	
	080412PP				1.2	●	
 Finishing-Medium	WNMG 080404PQ	12.70	4.76	5.16	0.4	●	
	080408PQ				0.8	●	
 Finishing-Medium	WNMG 060404HQ	9.525	4.76	3.81	0.4	●	
	060408HQ				0.8	●	
	WNMG 080404HQ	12.70	4.76	5.16	0.4	●	
	080408HQ				0.8	●	
	080412HQ				1.2	●	
 Low Carbon Steel / Finishing	WNMG 080404XP	12.70	4.76	5.16	0.4	●	
	080408XP				0.8	●	
 Low Carbon Steel / Medium cutting	WNMG 080404XQ	12.70	4.76	5.16	0.4	●	
	080408XQ				0.8	●	
 for Cast Iron	WNMG 080408	12.70	4.76	5.16	0.8	●	
 for Cast Iron (Without Chipbreaker)	WNMA 080408	12.70	4.76	5.16	0.8	●	

● : Standard Stock












Shape <small>Handed Insert shows Right-hand</small>	Description	Dimensions (mm)					CVD Coated Cermets
		I.C.	Thickness	Hole Diameter	Corner R(RE)	Relief Angle	
 Finishing	CCMT 060202PP	6.35	2.38	2.8	0.2	7°	●
	060204PP				0.4		●
	CCMT 09T302PP	9.525	3.97	4.4	0.2	7°	●
	09T304PP				0.4		●
	09T308PP				0.8		●
 Finishing-Medium	CCMT 060202GK	6.35	2.38	2.8	0.2	7°	●
	060204GK				0.4		●
	CCMT 09T302GK	9.525	3.97	4.4	0.2	7°	●
	09T304GK				0.4		●
	CCMT 120404GK	12.70	4.76	5.5	0.4	7°	●
	120408GK				0.8		●
 Finishing-Medium	CCMT 060202HQ	6.35	2.38	2.8	0.2	7°	●
	060204HQ				0.4		●
	CCMT 09T302HQ	9.525	3.97	4.4	0.2	7°	●
	09T304HQ				0.4		●
09T308HQ	0.8				●		
 Medium Cutting	CCMT 09T308	9.525	3.97	4.4	0.8	7°	●
 Finishing	CPMT 080202PP	7.94	2.38	3.3	0.2	11°	●
	080204PP				0.4		●
	CPMT 090302PP	9.525	3.18	4.4	0.2	11°	●
	090304PP				0.4		●
090308PP	0.8				●		
 Finishing-Medium	CPMH 080204HQ	7.94	2.38	3.5	0.4	11°	●
	080208HQ				0.8		●
	CPMH 090304HQ	9.525	3.18	4.5	0.4	11°	●
090308HQ	0.8				●		
 Medium Cutting	CPMH 080204	7.94	2.38	3.5	0.4	11°	●
	080208				0.8		●
	CPMH 090304	9.525	3.18	4.5	0.4	11°	●
	090308				0.8		●
 Low Carbon Steel / Finishing	CPMT 080204XP	7.94	2.38	3.3	0.4	11°	●
	CPMT 090304XP	9.525	3.18	4.4	0.4	11°	●
	090308XP				0.8		●
 Low Carbon Steel / Medium cutting	CPMT 090304XQ	9.525	3.18	4.4	0.4	11°	●
	090308XQ				0.8		●
 Finishing	DCMT 070202PP	6.35	2.38	2.8	0.2	7°	●
	070204PP				0.4		●
	DCMT 11T302PP	9.525	3.97	4.4	0.2	7°	●
	11T304PP				0.4		●
	11T308PP				0.8		●
 Finishing-Medium	DCMT 070202GK	6.35	2.38	2.8	0.2	7°	●
	070204GK				0.4		●
	070208GK				0.8		●
	DCMT 11T302GK	9.525	3.97	4.4	0.2	7°	●
	11T304GK				0.4		●
	11T308GK				0.8		●

Shape <small>Handed Insert shows Right-hand</small>	Description	Dimensions (mm)					CVD Coated Cermets
		I.C.	Thickness	Hole Diameter	Corner R(RE)	Relief Angle	
 Finishing-Medium	DCMT 070202HQ	6.35	2.38	2.8	0.2	7°	●
	070204HQ				0.4		●
	070208HQ				0.8		●
	DCMT 11T302HQ	9.525	3.97	4.4	0.2	7°	●
	11T304HQ				0.4		●
	11T308HQ				0.8		●
 Medium Cutting	DCMT 11T308	9.525	3.97	4.4	0.8	7°	●
 Low Carbon Steel / Finishing	DCMT 070204XP	6.35	2.38	2.8	0.4	7°	●
	DCMT 11T302XP	9.525	3.97	4.4	0.2	7°	●
	11T304XP				0.4		●
 Low Carbon Steel / Medium cutting	DCMT 11T304XQ	9.525	3.97	4.4	0.4	7°	●
	11T308XQ				0.8		●
 Without Chipbreaker	SPMN 120312	12.7	3.18	-	1.2	11°	●
 Finishing	TBMT 060102DP	3.97	1.59	2.3	0.2	5°	●
	060104DP				0.4		●
 Finishing-Medium	TCMT 090202HQ	5.56	2.38	2.5	0.2	7°	●
	090204HQ				0.4		●
	TCMT 110202HQ	6.35	2.38	2.8	0.2	7°	●
	110204HQ				0.4		●
	110208HQ				0.8		●
	TCMT 16T304HQ	9.525	3.97	4.4	0.4	7°	●
16T308HQ	0.8				●		
16T312HQ	1.2				●		
 Finishing	TPMT 090202PP	5.56	2.38	2.8	0.2	11°	●
	090204PP				0.4		●
	TPMT 110302PP	6.35	3.18	3.3	0.2	11°	●
	110304PP				0.4		●
110308PP	0.8				●		
 Finishing-Medium	TPMT 090202HQ	5.56	2.38	2.8	0.2	11°	●
	090204HQ				0.4		●
	TPMT 110302HQ	6.35	3.18	3.3	0.2	11°	●
	110304HQ				0.4		●
	110308HQ				0.8		●
	TPMT 160302HQ	9.525	3.18	4.4	0.2	11°	●
160304HQ	0.4				●		
160308HQ	0.8				●		
 Low Carbon Steel / Finishing	TPMT 110304XP	6.35	3.18	3.3	0.4	11°	●
	110308XP				0.8		●
	TPMT 160304XP	9.525	3.18	4.4	0.4	11°	●
	160308XP				0.8		●

● : Standard Stock



Shape Handed Insert shows Right-hand	Description	Dimensions (mm)					CVD Coated Cermet
		I.C.	Thickness	Hole Diameter	Corner R(RE)	Relief Angle	
 Low Carbon Steel / Medium cutting	TPMT 110304XQ	6.35	3.18	3.3	0.4	11°	●
	110308XQ				0.8		●
	TPMT 160304XQ	9.525	3.18	4.4	0.4	11°	●
	160308XQ				0.8		●
 Finishing	VBMT 110302PP	6.35	3.18	2.8	0.2	5°	●
	110304PP				0.4		●
	110308PP				0.8		●
	VBMT 160404PP	9.525	4.76	4.4	0.4	5°	●
	160408PP				0.8		●
	160412PP				1.2		●
 Finishing	VBMT 110302VF	6.35	3.18	2.8	0.2	5°	●
	110304VF				0.4		●
	110308VF				0.8		●
	VBMT 160402VF	9.525	4.76	4.4	0.2	5°	●
	160404VF				0.4		●
	160408VF				0.8		●
	160412VF				1.2		●
	 Finishing-Medium	VBMT 110304HQ	6.35	3.18	2.8	0.4	5°
110308HQ		0.8				●	
VBMT 160404HQ		9.525	4.76	4.4	0.4	5°	●
160408HQ					0.8		●
160412HQ					1.2		●

Shape Handed Insert shows Right-hand	Description	Dimensions (mm)					CVD Coated Cermet
		I.C.	Thickness	Hole Diameter	Corner R(RE)	Relief Angle	
 Finishing	VCMT 080202PP	4.76	2.38	2.3	0.2	7°	●
	080204PP				0.4		●
	VCMT 160404PP	9.525	4.76	4.4	0.4	7°	●
	160408PP				0.8		●
 Finishing	VCMT 080202VF	4.76	2.38	2.3	0.2	7°	●
	080204VF				0.4		●
 Finishing-Medium	VCMT 080202HQ	4.76	2.38	2.3	0.2	7°	●
	080204HQ				0.4		●
 Finishing	WBMT 060102 <sup>R/L</sup> -DP	3.97	1.59	2.3	0.2	5°	●
	060104 <sup>R/L</sup> -DP				0.4		●
	WBMT 080202 <sup>R/L</sup> -DP	4.76	2.38	2.3	0.2	5°	●
	080204 <sup>R/L</sup> -DP				0.4		●
 Finishing-Medium	WPMT 110202HQ	6.35	2.38	2.8	0.2	11°	●
	110204HQ				0.4		●
	WPMT 160304HQ	9.525	3.18	4.4	0.4	11°	●
160308HQ	0.8				●		

● : Standard Stock

## Recommended Cutting Conditions

Workpiece		Recommended Cutting Conditions (Vc : m/min)	
		Min. - Recommendation - Max.	
Low Carbon Steel	SAPH etc.	300 ~ <b>600</b> ~ 800	
Carbon Steel	S××C	200 ~ <b>300</b> ~ 450	
Alloy Steel	SCM etc.	200 ~ <b>300</b> ~ 400	
Gray Cast Iron	FC	300 ~ <b>350</b> ~ 400	
Nodular Cast Iron	FCD	150 ~ <b>250</b> ~ 300	

- 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 (ap should be ≤ 1 mm)