

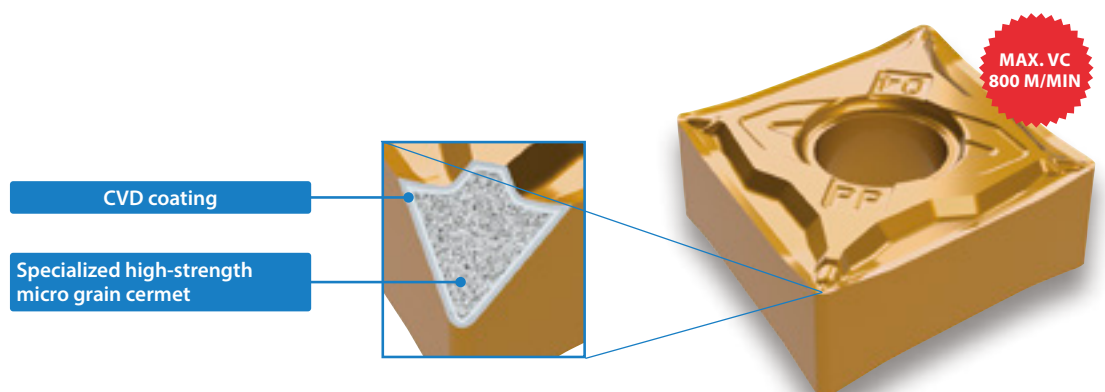
CCX



High speed machining with CVD coated cermet

Newly developed unique cermet base material with thick CVD coating

Excellent wear resistance provides long tool life for low carbon steel, general, steel and cast iron machining



**KEEPS YOU
AHEAD**



CVD coated cermet for finishing

CCX

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 machining. Maintains long tool life in soft steel, general steel and cast iron machining

1 Excellent high speed finishing leads to greater productivity

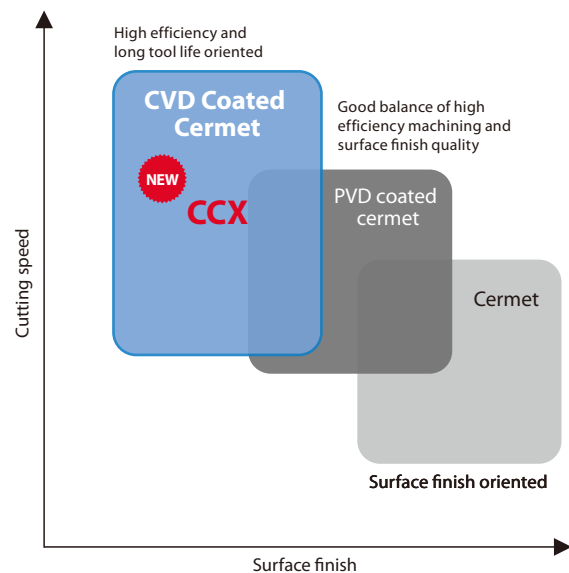
Superior wear resistance with unique cermet grade and thickened CVD coating

Finishing available at a higher speed range

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



Cermet application map



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

Hot rolled automotive structural steel

Vc: 300-600-800 (m/min)



Shaft

34CrMo4

Vc: 200-300-400 (m/min)



Differential gear case

EN-GJS-450-10

Vc: 150-250-300 (m/min)

Recommended cutting conditions

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

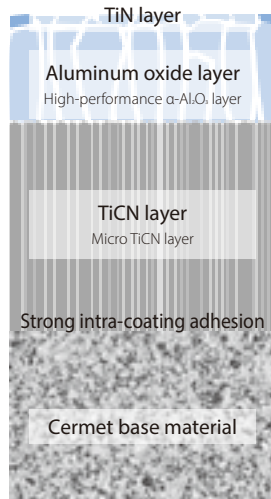
Improved wear resistance with thicker coating than PVD

Al_2O_3 layer provides excellent crater wear resistance

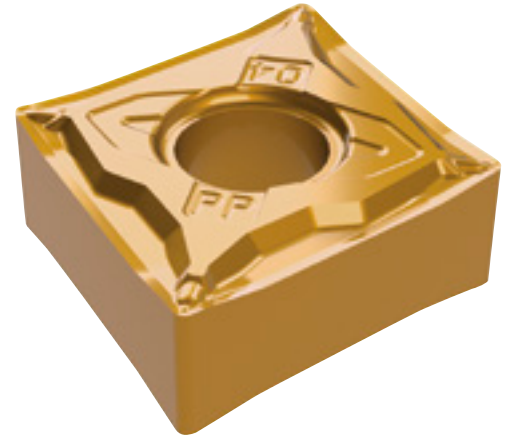
Newly developed unique cermet grade

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

High wear and fracture resistance



CCX image

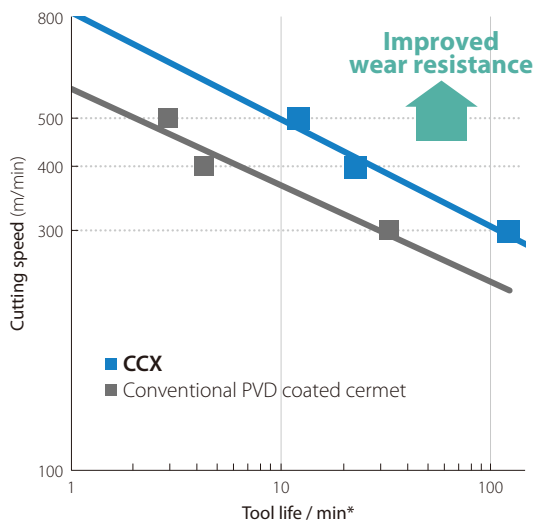


Wear resistance

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

V-T diagram (Internal evaluation)

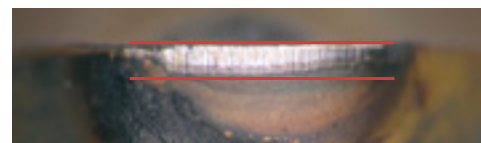
* Tool life criterion (min): Edge wear amount 0.1 mm (Logarithmic chart)



Cutting conditions : $V_c = 300/400/500$ m/min, $a_p = 0.5$ mm, $f = 0.2$ mm/rev, wet CNMG120408 type Workpiece : 34CrMo4

Cutting edge ($V_c = 500$ m/min : After machining 12.4 min)

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Conventional PVD coated cermet A



Chipping resistance

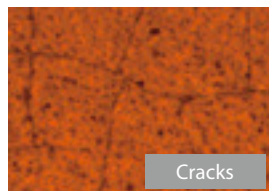
Great chipping resistance with specialized high-strength micro grain substrate and the compressive residual stress of a CVD coating layer

Surface condition after the CVD coating (Internal evaluation)

CCX

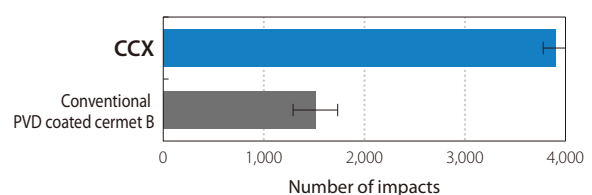


CVD coated carbide



Strong compressive residual stress prevents cracks from occurring

Chipping resistance comparison (Internal evaluation)



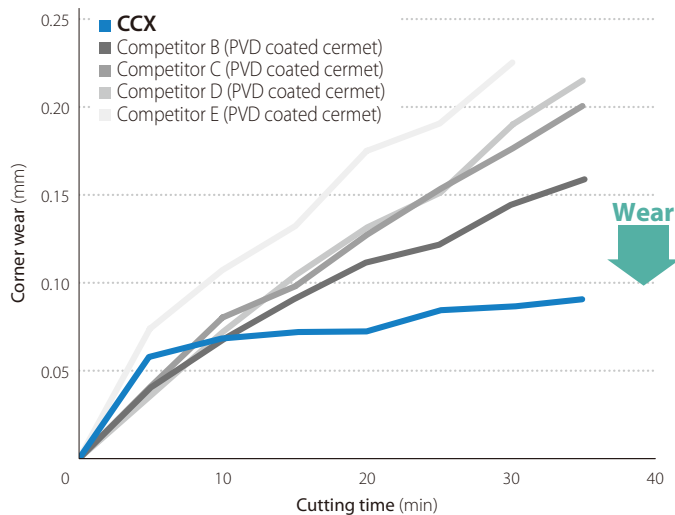
Cutting conditions : $V_c = 300$ m/min, $a_p = 0.5$ mm, $f = 0.3$ mm/rev, $n = 3$, wet CNMG120408 type, workpiece : C45 (with 4 slots)

Alloy Steel - 34CrMo4

High speed comparison: $V_c = 400$ m/min

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

Wear resistance comparison (Internal evaluation)



Cutting conditions: $V_c = 400$ m/min, $a_p = 0.3$ mm, $f = 0.12$ mm/rev, Wet, CNMG120408 type, external turning

Cutting edge (After machining 35 min)

CCX



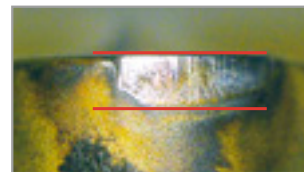
Competitor B (PVD coated cermet)



Competitor C (PVD coated cermet)



Competitor D (PVD coated cermet)



Competitor E (PVD coated cermet)

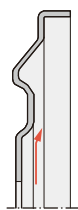


* Picture shows 30 min after machining due to a large amount of wear

Case studies

Cover QStE360TM

$V_c = 540$ m/min
 $a_p = 0.4$ mm
 $f = 0.25$ mm/rev
 Wet
 TNMG160408PQ CCX



Tool life

CCX
 CVD coated cermet

210 pcs/edge (Stable)



Competitor F
 CVD coated carbide

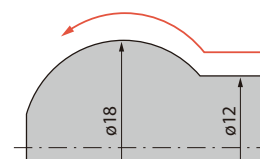
200 pcs/edge (Unstable)

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

User evaluation

Pin C50 etc.

$V_c = 125 \sim 180$ m/min
 $a_p \sim 1.0$ 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

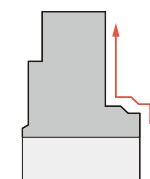
500 pcs/edge (Unstable)

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

User evaluation

Hubs C45

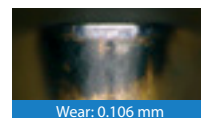
$V_c = 290$ m/min
 $a_p = 0.15$ mm
 $f = 0.27$ mm/rev
 Wet
 VNMG160404PQ CCX



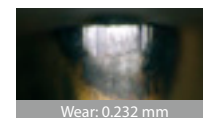
Cutting edge (After machining 320 pcs)

CCX

CVD coated cermet



Wear: 0.106 mm

Conventional D
PVD coated cermet

Wear: 0.232 mm

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

User evaluation

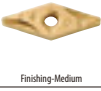
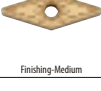
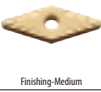
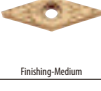
Inserts (Negative)

Shape	Description	Dimensions (mm)				CVD coated cermet
		I.C.	Thickness	Hole diameter	Corner R(RE)	
 Finishing	CNMG 120402PP	12.70	4.76	5.16	0.2	●
	120404PP				0.4	●
	120408PP				0.8	●
	120412PP				1.2	●
 Finishing-Medium	CNMG 120404PQ	12.70	4.76	5.16	0.4	●
	120408PQ				0.8	●
	120412PQ				1.2	●
 Finishing-Medium	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	●
 Finishing / Small ap	CNMG 120404XF	12.70	4.76	5.16	0.4	●
	120408XF				0.8	●
 Low Carbon Steel / Finishing	CNMG 120404XP	12.70	4.76	5.16	0.4	●
	120408XP				0.8	●
 Low Carbon Steel / Medium cutting	CNMG 120404XQ	12.70	4.76	5.16	0.4	●
	120408XQ				0.8	●
 for Cast Iron	CNMG 120404	12.70	4.76	5.16	0.4	●
	120408				0.8	●
	120412				1.2	●
 for Cast Iron (Without Chipbreaker)	CNMA 120404	12.70	4.76	5.16	0.4	●
	120408				0.8	●
 Finishing	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	●
 Finishing-Medium	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)	
 Finishing-Medium	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	12.70	6.35	5.16	1.2	●
	DNMG 150604HQ				0.4	●
	150608HQ				0.8	●
 Finishing / Small ap	DNMG 150404XF	12.70	4.76	5.16	0.4	●
	150408XF				0.8	●
 Low Carbon Steel / Finishing	DNMG 150404XP	12.70	4.76	5.16	0.4	●
	150408XP				0.8	●
	DNMG 150604XP	12.70	6.35	5.16	0.4	●
	150608XP				0.8	●
 Low Carbon Steel / Medium cutting	DNMG 150404XQ	12.70	4.76	5.16	0.4	●
	150408XQ				0.8	●
 for Cast Iron	DNMG 150408	12.70	4.76	5.16	0.8	●
 for Cast Iron (Without Chipbreaker)	DNMA 150408	12.70	4.76	5.16	0.8	●
 Finishing-Medium	SNMG 120404PQ	12.70	4.76	5.16	0.4	●
	120408PQ				0.8	●
 Finishing-Medium	SNMG 120404HQ	12.70	4.76	5.16	0.4	●
	120408HQ				0.8	●
	120412HQ				1.2	●
 Low Carbon Steel / Finishing	SNMG 120408XP	12.70	4.76	5.16	0.8	●
 Low Carbon Steel / Medium cutting	SNMG 120408XQ	12.70	4.76	5.16	0.8	●
 Low Carbon Steel / Roughing	SNMG 120408XS	12.70	4.76	5.16	0.8	●
 for Cast Iron	SNMG 120408	12.70	4.76	5.16	0.8	●

● : Available

Inserts (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	●

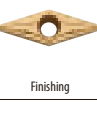
● : Available

Shape Handed Insert shows Right-hand	Description	Dimensions (mm)						CVD coated cermet
		I.C.	Thickness	Hole diameter	Corner R(RE)	Relief angle	CCX	
 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		●	
	CPMH 080204	7.94	2.38	3.5	0.4	11°	●	
	080208				0.8		●	
 Medium cutting	CPMH 090304	9.525	3.18	4.5	0.4	11°	●	
	090308				0.8		●	
	CPMT 080204XP	7.94	2.38	3.3	0.4	11°	●	
	090304XP				0.4	11°	●	
	090308XP	9.525	3.18	4.4	0.8		●	
 Low carbon steel / Finishing	CPMT 090304XQ	9.525	3.18	4.4	0.4	11°	●	
	090308XQ				0.8		●	
 Low carbon steel / Medium cutting	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	DCMT 070202GK	6.35	2.38	2.8	0.2	7°	●	
	070204GK				0.4		●	
	DCMT 070208GK	9.525	3.97	4.4	0.8	7°	●	
	11T302GK				0.2		●	
	11T304GK				0.4		●	
 Finishing-Medium	11T308GK	9.525	3.97	4.4	0.8	7°	●	
	11T308GK				0.8		●	

Shape Handed Insert shows Right-hand	Description	Dimensions (mm)						CVD coated cermet
		I.C.	Thickness	Hole diameter	Corner R(RE)	Relief angle	CCX	
 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		●	
	11T308XP				0.8		●	
	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		●	
	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		●	
 Finishing-Medium	TCMT 16T304HQ	9.525	3.97	4.4	0.4	7°	●	
	16T308HQ				0.8		●	
	16T312HQ				1.2		●	
	TPMT 090202PP	5.56	2.38	2.8	0.2	11°	●	
	090204PP				0.4		●	
 Finishing	TPMT 110302PP	6.35	3.18	3.3	0.2	11°	●	
	110304PP				0.4		●	
	110308PP				0.8		●	
	TPMT 090202HQ	5.56	2.38	2.8	0.2	11°	●	
	090204HQ				0.4		●	
 Finishing-Medium	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		●	

● : Available

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		●
 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 ^R / _L -DP	3.97	1.59	2.3	0.2	5°	●
	060104 ^R / _L -DP				0.4		●
	WBMT 080202 ^R / _L -DP	4.76	2.38	2.3	0.2	5°	●
	080204 ^R / _L -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		●

● : Available

Recommended cutting conditions

Workpiece	Vc: m/min
	Min. - Recommendation - Max.
Low carbon steel	300 ~ 600 ~ 800
Carbon steel	200 ~ 300 ~ 450
Alloy steel	200 ~ 300 ~ 400
Gray cast iron	300 ~ 350 ~ 400
Nodular cast iron	150 ~ 250 ~ 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)

