TRUPRO-TEC Industrial Co., Ltd.
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Tel. 886-4-25358299(Rep) Fax. 886-4-25332009 E-mail: turpro@seed.net.tw http:// www.trupro.com.tw

THE NEW VALUE FRONTIER
KYOCERA

Insert Grades CA5 Series

CA5 Series

CVD Coated Grade for Steel

New coated grade CA5 series for longer tool life and stable machining

CRYSTAL INTERFACE ORIENTATION STRUCTURE

High speed and longer tool life
NEW **CA510**

Continuous to light interrupted machining
CA515

General use
CA525

Heavy interrupted machining and high feed rate
NEW **CA530**

NEW
Negative type for Medium-Roughing
PG Chipbreaker

NEW
Positive type for finishing
PP Chipbreaker

ADVANCING PRODUCTIVITY
- KYOCERA, Contributing To Advancing Productivity -

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CVD Coated Grade for Steel

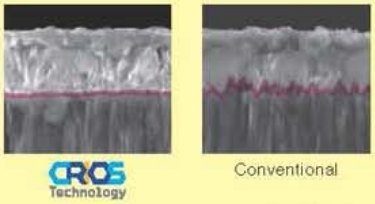
CA5 Series

Productivity innovation in steel machining
by CA5 series and P series Chipbreaker!!

CROS Technology Advanced CVD coating new ERA of CROS Technology

Kyocera's unique crystal control technology and coating adhesion lead CVD coating to the next level

Longer tool life	Prevent peeling of layer	Control Chipping
Control α-Al2O3 crystal growth for improved wear and fracture resistance	Optimized interface improves film adhesion by 40%	Higher film strength and fracture resistance by high aspect ratio TiCN



"CRIOS Technology" is Kyocera's original CVD coating technology.

New carbide substrate

- Special carbide substrate with deformation resistance at high temperature (10% improved hardness at high temperature)
- Suitable for high efficiency machining


Special carbide substrate

P series PP/PQ/PG Chipbreaker

Negative type PG Chipbreaker and Positive type PP Chipbreaker are newly available

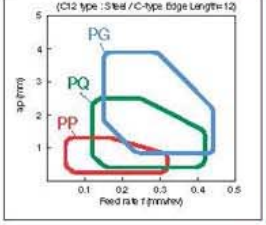
NEW

For Medium-Roughing PG Chipbreaker

Wide chip control range

- Stable machining with good balance of edge sharpness and strength
- Prevent chip entangle at high feed rate Good chip control even at low feed rate

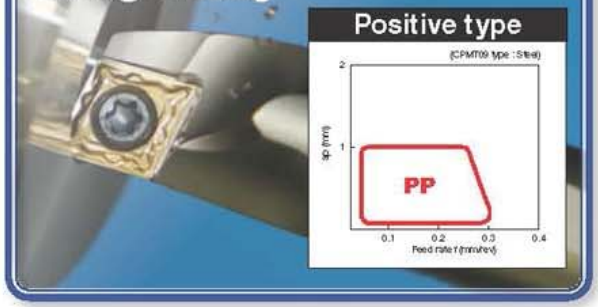
Negative type



NEW

Positive type PP Chipbreaker

Improve finishing productivity with high reliability



Positive type

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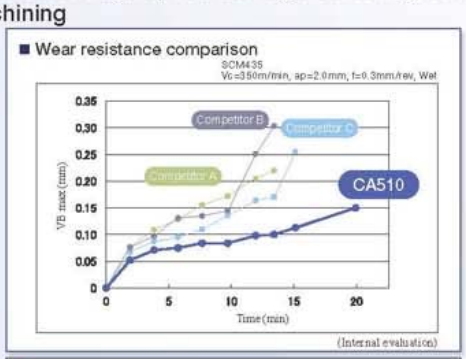
High speed and longer tool life — CA510

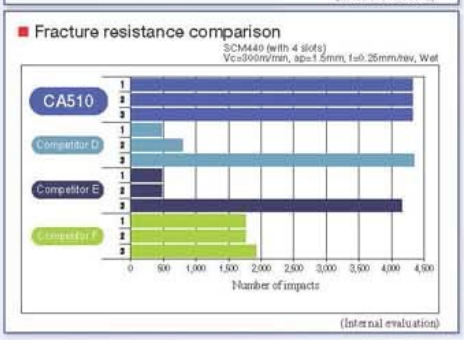
- Special substrate with thermal deformation resistance along with a thick and tough coating film provide high wear resistance

Application: High speed and high efficiency steel machining

■ Wear resistance comparison



■ Fracture resistance comparison



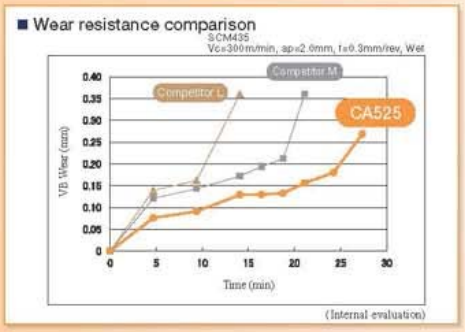
1st Recommendation

General use — CA525

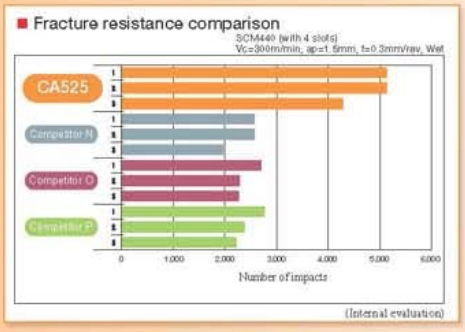
- Special substrate and tough coating film provide high wear and fracture resistance

Application: 1st recommendation for steel machining

■ Wear resistance comparison



■ Fracture resistance comparison

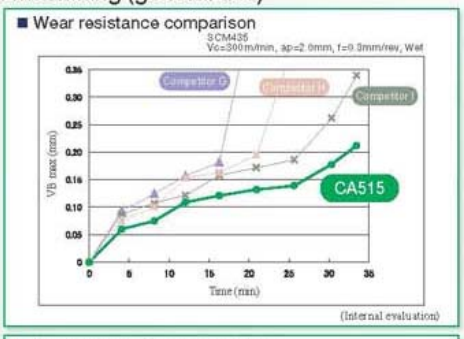


Continuous to light interrupted machining — CA515

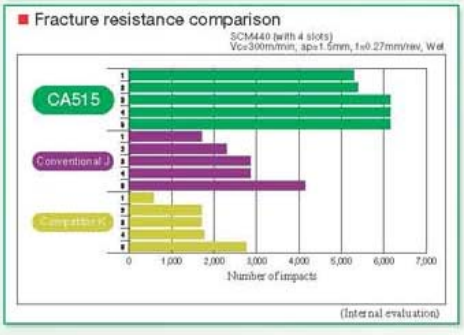
- Special substrate and tough coating film provide thermal deformation and high wear resistance

Application: For continuous to light interrupted steel machining (general use)

■ Wear resistance comparison



■ Fracture resistance comparison

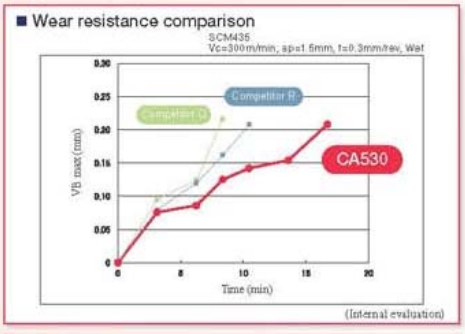


Heavy interrupted and high feed rate — CA530

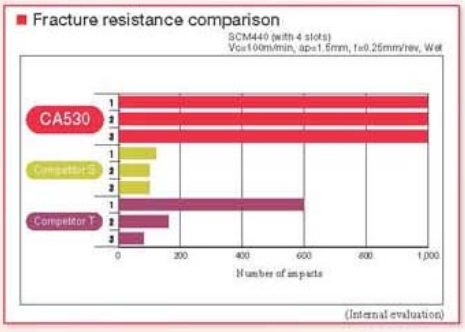
- Special tough substrate and tough coating film provide high stability and wear resistance

Application: General to heavy interrupted machining (stability oriented)

■ Wear resistance comparison



■ Fracture resistance comparison



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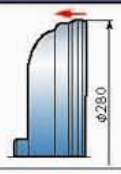
CA5 series High performanc

Hot rolled steel

·Automotive parts
·Vc=500m/min
·ap=0.7mm
·f=0.3mm/rev
·Wet
·CNMG120408PG



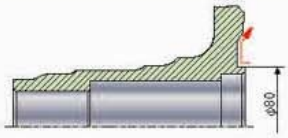
CA510	100 pcs/edge
Competitor U (CVD Coated)	75pcs/edge

·CA510 achieves 1.3 times longer tool life than Competitor U (CVD).

(Evaluation by the user)

S35C (Carbon steel)

·Automotive parts
·Vc=300m/min
·ap=1.0mm
·f=0.3mm/rev
·Wet
·DNMG150408PQ



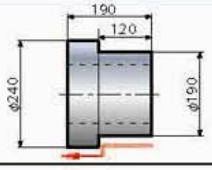
CA510	200 pcs/edge
Competitor V (CVD Coated)	150 pcs/edge

·CA510 achieves 1.3 times longer tool life than Competitor V (CVD).

(Evaluation by the user)

SCM440 (Alloy steel)

·Cover
·Vc=140~150m/min
·ap=3.0~3.5mm
·f=0.35~0.4mm/rev
·Wet
·CNMG120408PT



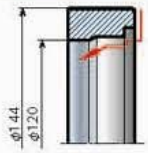
CA515	10pcs/edge
Competitor W (CVD Coated)	7pcs/edge

·CA515 achieves 1.4 times longer tool life than Competitor W (CVD).

(Evaluation by the user)

SCr415H (Alloy steel)

·Gear
·Vc=380m/min
·ap=1.5~2.0mm
·f=0.3~0.4mm/rev
·Wet
·WNMG080408PQ



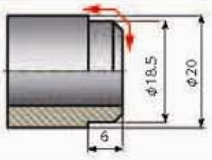
CA515	430pcs/edge
Competitor X (CVD Coated)	380pcs/edge

·CA515 achieves longer tool life than Competitor X (CVD).

(Evaluation by the user)

SS400 (Rolled steel)

·Machine part
·Vc=170m/min
·ap=0.8mm
·f=0.2mm/rev
·Wet
·CNMG120408PQ



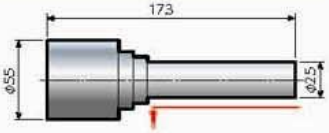
CA525	1,400 pcs/edge and more
Competitor Y (CVD Coated) Molded Chipbreaker	800-1,000pcs/edge

·CA525 achieves 1.4 times longer tool life than Competitor Y (CVD).
·Smooth chip control.

(Evaluation by the user)

SCM420 (Alloy steel)

·Shaft
·Vc=120m/min
·ap=2.0mm
·f=0.25mm/rev
·Dry
·TNMG160408R-ST



CA525	10pcs/edge
Competitor Z (CVD Coated)	2pcs/edge

·CA525 achieves 5 times longer tool life than Competitor Z (CVD).

(Evaluation by the user)

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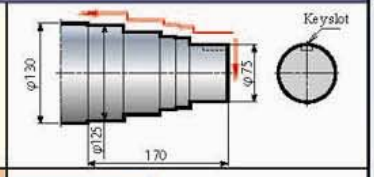
ce of Various case Studies !!

S45C (Carbon steel)

·Shaft
·Vc=250m/min
·ap=3.0mm
·f=0.3mm/rev
·Wet
·CNMG120408PS



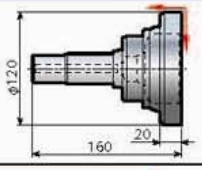
CA525	10pcs/edge	
Competitor a (CVD Coated) Competitor b (PVD Coated)	a: 6pcs/edge	b: Instant breakage

·CA525 achieves 1.6 times longer tool life than Competitor a (CVD).
·Competitor b's PVD carbide could not complete any piece before brakage.

(Evaluation by the user)

SCM420 (Alloy steel)

·Flange shaft
·Vc=260~280m/min
·ap=0.6mm
·f=0.3~0.5mm/rev
·Wet
·CNMG120408PQ



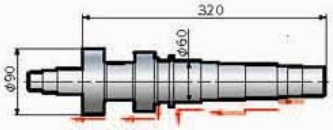
CA525	180 pcs/edge
Competitor c (CVD Coated)	150pcs/edge

·CA525 achieves 1.2 times longer tool life than Competitor c (CVD).

(Evaluation by the user)

S45C (Carbon steel)

·Shaft
·Vc=100m/min
·ap=2.0~4.0mm
·f=0.4mm/rev
·Wet
·WNMG080408PS



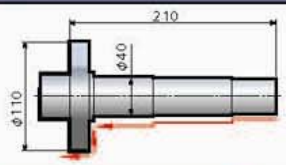
CA525	70 pcs/edge
Conventional d (CVD Coated)	40pcs/edge

·CA525 achieves 1.7 times longer tool life than Conventional d (CVD).

(Evaluation by the user)

SCr420 (Alloy steel)

·Shaft
·Vc=90m/min
·ap=2.0~3.0mm
·f=0.32mm/rev
·Wet
·WNMG080408PS



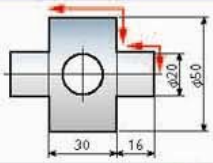
CA525	260 pcs/edge
Conventional e (CVD Coated)	190pcs/edge

·CA525 achieves 1.3 times longer tool life than Conventional e (CVD).

(Evaluation by the user)

SCr420H (Alloy steel)

·Gear
·Vc=180m/min
·ap=2.0mm
·f=0.2mm/rev
·Wet
·DNMG150404CQ



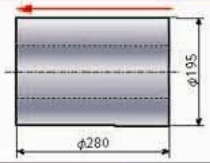
CA530	10 pcs/edge
Competitor f (CVD Coated)	3-8 pcs/edge

·CA530 achieves average 1.25 times longer tool life than Competitor f (CVD).

(Evaluation by the user)

13Cr (Stainless steel)

·Machine parts
·Vc=100m/min
·ap=2.0mm
·f=0.4mm/rev
·Wet
·SNMG120412PH



CA530	9 pcs/edge
Competitor g (CVD Coated)	5pcs/edge

·CA530 achieves 1.8 times longer tool life than Competitor g (CVD).
·Improved machining efficiency by 1.1 times.

(Evaluation by the user)

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NEW For Finishing Improve steel finishing productivity with high reliability

PP Chipbreaker

Stable machining by resolving problems in boring, such as productivity decrease caused by entangled chip

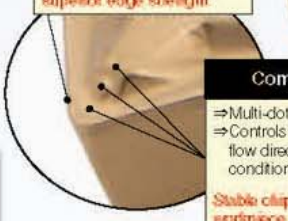
Features

- Stable chip control in steel finishing
- High efficiency and stable tool life in high feed machining, by special edge design with sharpness and strength

Highly stable cutting edge design

⇒Suitable shape for controlling the edge stress and heat generation

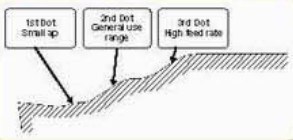
Stable performance with superior edge strength



Composite-dot Chipbreaker

⇒Multi-dot design with different functions
⇒Controls chip's curling condition and flow direction depending on the cutting conditions and workpiece materials

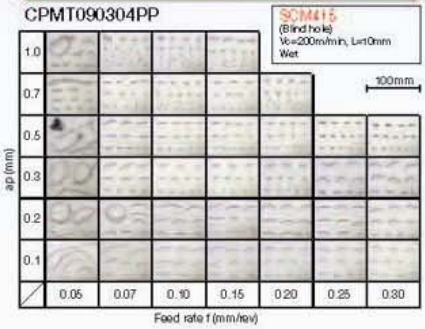
Stable chip control in any feed rate and workpiece materials

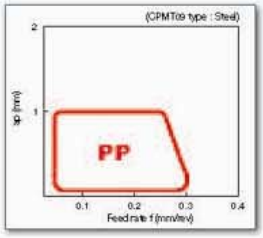


PP

CPMT090304PP

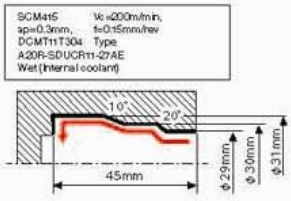
SCM415 (Blind hole) Vc=200m/min, L=10mm Wet





Chip Evacuation Comparison

PP Chipbreaker breaks chips and controls entangled chip



PP Chipbreaker

No chip remains after machining

Competitor h

Chips remain in the hole

(Internal evaluation)

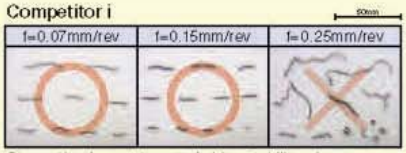
Chip Control Performance

PP Chipbreaker covers a wide range of feed rate

PP Chipbreaker

PP Chipbreaker controls chips stability at high feed rate.

Competitor i



Competitor i cannot control chips stability when increase the feed rate.

SCM415 (Blind hole), Wet (Internal coolant) Vc=200m/min, ap=0.3mm, f=0.07-0.25mm/rev OCMT09T304 Type

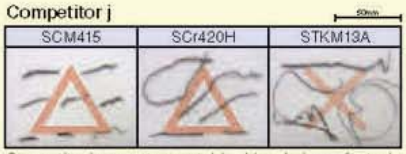
○: Good △: OK ×: Bad

PP Chipbreaker covers a wide range of workpiece materials

PP Chipbreaker

PP Chipbreaker controls chips stability from general steel to soft steel.

Competitor j



Competitor j generates unstable chips during soft steel machining.

Various work materials, Wet (Internal coolant) Vc=200m/min, ap=0.3mm, f=0.20mm/rev OCMT09T304 Type

○: Good △: OK ×: Bad

(Internal evaluation)

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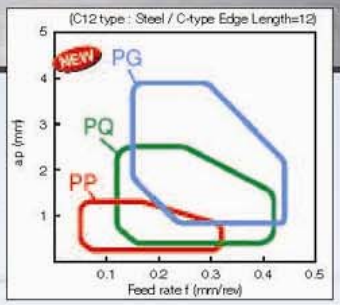
Negative type

Chipbreaker for steel machining

P Perfect **Series**



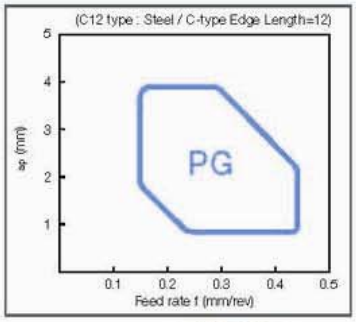
PP / PQ / PG Chipbreaker improves steel machining

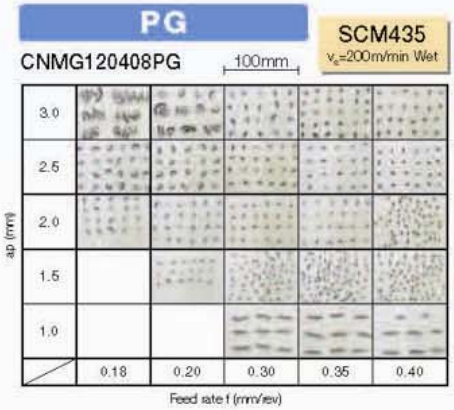
NEW For Medium - Roughing Stable machining with wide chip control range

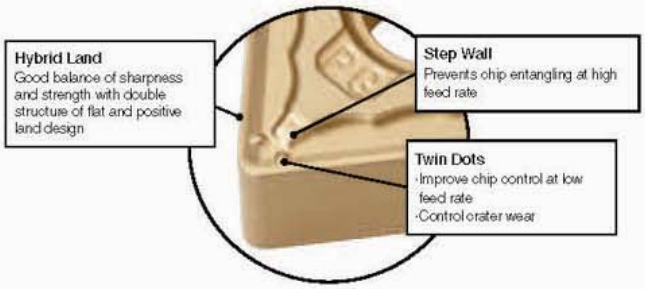
PG Chipbreaker

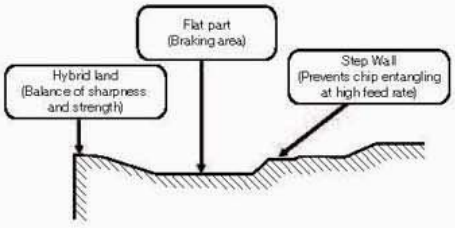
Features

- Stable machining with good balance of edge sharpness and strength
- Prevent chip entangle at high feed rate. Good chip control even at low feed rate

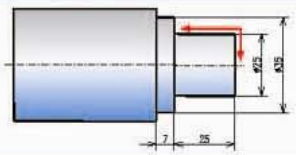








Case Studies

SCM435 (Alloy steel)	
·Joint ·Vc=280m/min ·ap=3.0mm ·f=0.25mm/rev ·Wet ·CNMG120408PG	
CA525	400 more than pcs/edge
Competitor k (CVD Coated)	350 pcs/edge

·CA525 achieves 1.2 times longer tool life than Competitor k (CVD).
·PG Chipbreaker stabilized the chip condition and prevented burr formation. Good surface finish.
(Evaluation by the user)

Wear Resistance Comparison

SCM435 Vc=300m/min ap=2.0 mm f=0.3mm/rev Wet

Time (min)	14 min	20 min	26 min
CNMG120408PG (CA525)			
Competitor l			Stop cutting due to facture
Competitor m			Stop cutting due to facture

(Internal evaluation)

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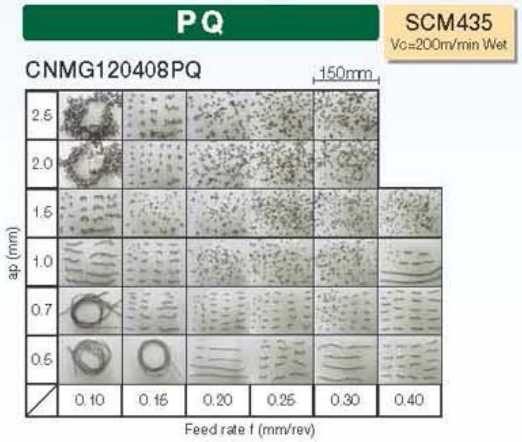
For Finishing-Medium

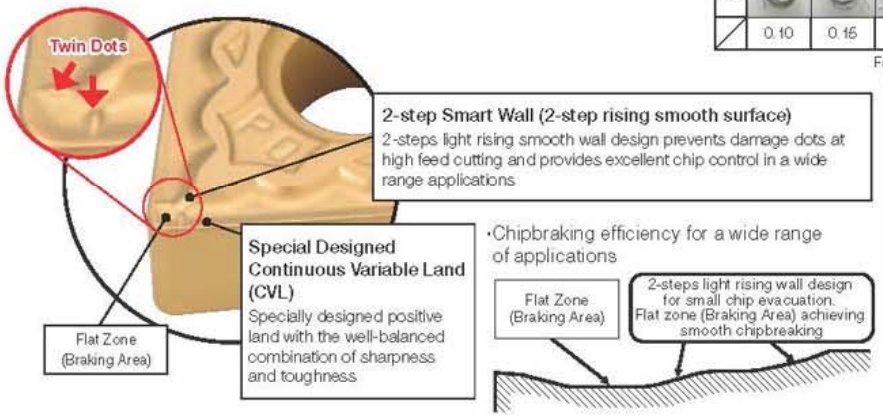
Prevents chip entanglement and reduces cutting force at high feed cutting

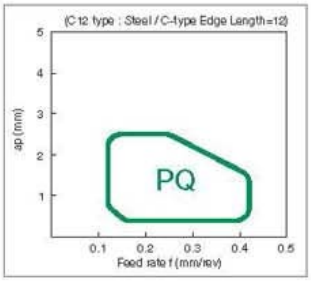
PQ Chipbreaker

Features

- Stable chip control in a wide range of feed rates from finishing to medium realized by newly developed "Flat Zone" (Braking Area) and 2-steps rising smooth wall
- Twin dots on the cutting edge provide smooth chip control at low ap and high feed turning and facing
- Special designed Continuous Variable Land (CVL) with a well-balanced edge sharpness and toughness

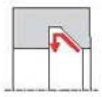






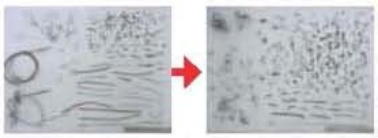
Case Studies (Chip Control Comparison)

Automotive part (S45C)



DNMG150408PQ
Vc=200m/min
ap=0.5-1.2mm
f=0.3mm/rev
Wet

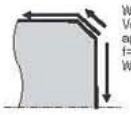
Competitor n | PQ Chipbreaker



PQ Chipbreaker prevents chip entanglement and minimizes breakage

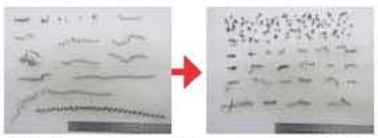
(Evaluation by the user)

Automotive part (S45C)



WNMG080408PQ
Vc=250m/min
ap=1.0mm
f=0.3mm/rev
Wet

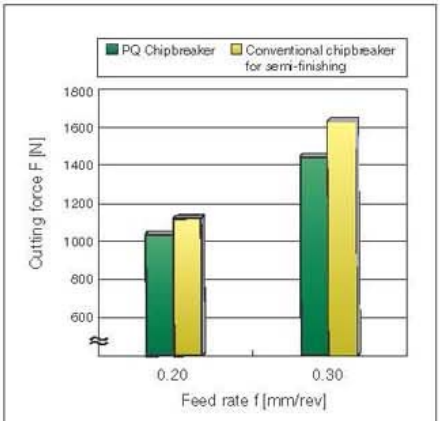
Competitor o | PQ Chipbreaker



With Competitor o, chips were entangled in the turret and the process was interrupted frequently, but PQ Chipbreaker break chips into small pieces and improve productivity

(Evaluation by the user)

Cutting Force



Vc=200m/min, ap=2.0mm, CNMG120408 type

PQ Chipbreaker provides low cutting force in high feed cuttings.

(Internal evaluation)

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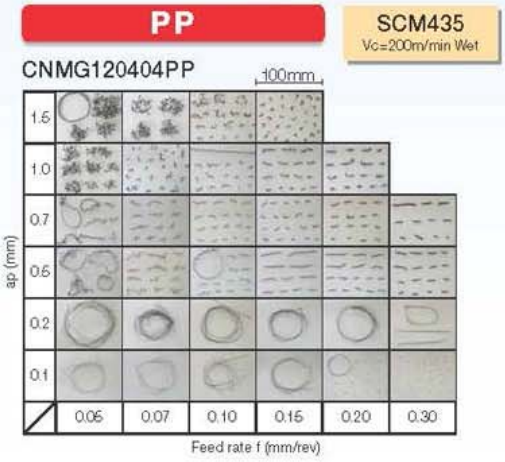
For Finishing

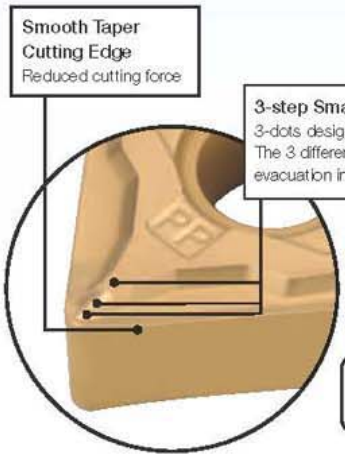
Solution for chip entanglement in small ap or high feed machining

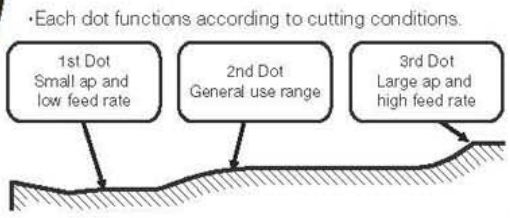
PP Chipbreaker

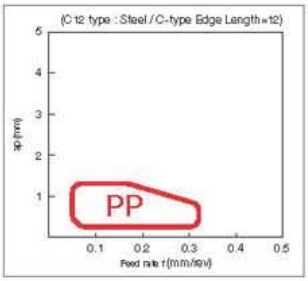
Features

- 3-dots design of PP smart chipbreaker is suitable for a wide range of feed rate in steel finishing
- Smooth Taper Cutting Edge reduces cutting force
- Corner-R(rε) 0.2mm-1.2mm are available









Case Studies (Chip Control Comparison)

Automotive part (SCM420)	Competitor p	PP Chipbreaker
CNMG120408PP Vc=350m/min ap=0.3mm f=0.3mm/rev Wet		

PP Chipbreaker prevents chip entanglement and provides stable machining

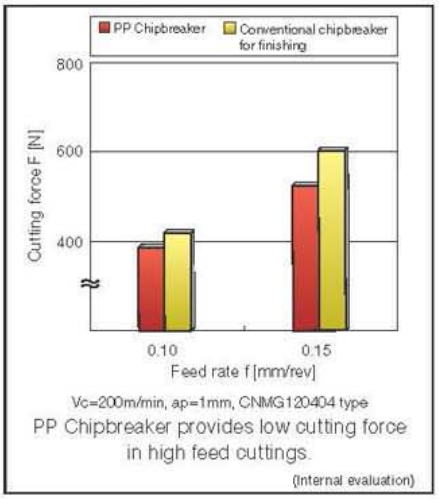
(Evaluation by the user)

Automotive part (SCr420H)	Competitor q	PP Chipbreaker
CNMG120408PP Vc=200m/min ap=0.2-0.3mm f=0.2-0.3mm/rev Wet		

PP Chipbreaker prevents chip entanglement and provides stable machining

(Evaluation by the user)

Cutting Force



Vc=200m/min, ap=1mm, CNMG120404 type

PP Chipbreaker provides low cutting force in high feed cuttings.

(Internal evaluation)

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■ Stock Items (Negative)

Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Finishing With Wiper Edge	CNMG 120404WP	12.70	4.76	5.16	0.4	●	●	●	●
	120408WP				0.8	●	●	●	●
 Finishing-Medium With Wiper Edge	CNMG 120404WQ	12.70	4.76	5.16	0.4	●	●	●	●
	120408WQ				0.8	●	●	●	●
	120412WQ				1.2	●	●	●	●
 Finishing	CNMG 120402PP	12.70	4.76	5.16	0.2	●	●	●	●
	120404PP				0.4	●	●	●	●
	120408PP				0.8	●	●	●	●
	120412PP				1.2	●	●	●	●
 Finishing	CNMG 120402GP	12.70	4.76	5.16	0.2	●	●	●	●
	120404GP				0.4	●	●	●	●
	120408GP				0.8	●	●	●	●
 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-Medium · Up Facing	CNMG 120404CQ	12.70	4.76	5.16	0.4	●	●	●	●
	120408CQ				0.8	●	●	●	●
	120412CQ				1.2	●	●	●	●
	CNMG 160608CQ	15.875	6.35	6.35	0.8	●	●	●	●
	160612CQ				1.2	●	●	●	●
 Finishing-Medium · Up Facing	CNMG 120408CJ	12.70	4.76	5.16	0.8	●	●	●	●
	120412CJ				1.2	●	●	●	●
	CNMG 160612CJ	15.875	6.35	6.35	1.2	●	●	●	●
	160616CJ				1.6	●	●	●	●
 Medium-Roughing	CNMG 090404GS	9.525	4.76	3.81	0.4	●	●	●	●
	090408GS				0.8	●	●	●	●
	CNMG 120404GS	12.70	4.76	5.16	0.4	●	●	●	●
	120408GS				0.8	●	●	●	●
	120412GS				1.2	●	●	●	●
NEW!  Medium-Roughing	CNMG 120404PG	12.70	4.76	5.16	0.4	●	●	●	●
	120408PG				0.8	●	●	●	●
	120412PG				1.2	●	●	●	●
	120416PG				1.6	●	●	●	●

Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Medium-Roughing	CNMG 120404PS	12.70	4.76	5.16	0.4	●	●	●	●
	120408PS				0.8	●	●	●	●
	120412PS				1.2	●	●	●	●
	120416PS				1.6	●	●	●	●
	CNMG 160612PS	15.875	6.35	6.35	1.2	●	●	●	●
	160616PS				1.6	●	●	●	●
 Medium-Roughing · High Feed	CNMG 120408PT	12.70	4.76	5.16	0.8	●	●	●	●
	120412PT				1.2	●	●	●	●
	CNMG 160608PT	15.875	6.35	6.35	0.8	●	●	●	●
	160612PT				1.2	●	●	●	●
	160616PT				1.6	●	●	●	●
 Medium-Roughing · High Feed	CNMG 120408GT	12.70	4.76	5.16	0.8	●	●	●	●
	120412GT				1.2	●	●	●	●
 Roughing	CNMG 120404	12.70	4.76	5.16	0.4	●	●	●	●
	120408				0.8	●	●	●	●
	120412				1.2	●	●	●	●
	CNMG 160608	15.875	6.35	6.35	0.8			●	●
	160612				1.2			●	●
	CNMG 190612	19.05	6.35	7.94	1.2	●	●	●	●
	190616				1.6	●	●	●	●
 Roughing	CNMG 120408PH	12.70	4.76	5.16	0.8	●	●	●	●
	120412PH				1.2	●	●	●	●
	120416PH				1.6	●	●	●	●
	CNMG 160608PH	15.875	6.35	6.35	0.8	●	●	●	●
	160612PH				1.2	●	●	●	●
	160616PH				1.6	●	●	●	●
	CNMG 190608PH	19.05	6.35	7.94	0.8	●	●	●	●
	190612PH				1.2	●	●	●	●
	190616PH				1.6	●	●	●	●
	190624PH				2.4	●	●	●	●
 Single Sided Roughing · High Feed	CNMM 120408PX	12.70	4.76	5.16	0.8	●	●	●	●
	120412PX				1.2	●	●	●	●
	120416PX				1.6			●	●
	CNMM 160608PX	15.875	6.35	6.35	0.8	●	●	●	●
	160612PX				1.2	●	●	●	●
	160616PX				1.6	●	●	●	●
	CNMM 190608PX	19.05	6.35	7.94	0.8			●	●
	190612PX				1.2	●	●	●	●
	190616PX				1.6	●	●	●	●
	190624PX				2.4			●	●
 Low Carbon Steel Finishing	CNMG 120404XP	12.70	4.76	5.16	0.4	●	●	●	●
	120408XP				0.8	●	●	●	●

●: Std. Item

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Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Low Carbon Steel Medium Cutting	CNMG 120404XQ 120408XQ	12.70	4.76	5.16	0.4 0.8	● ●	● ●	● ●	● ●
 Low Carbon Steel Roughing	CNMG 120408XS	12.70	4.76	5.16	0.8	●	●	●	●
 Finishing	DNMG 150402PP 150404PP 150408PP 150412PP	12.70	4.76	5.16	0.2 0.4 0.8 1.2	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
	DNMG 150602PP 150604PP 150608PP 150612PP	12.70	6.35	5.16	0.2 0.4 0.8 1.2	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Finishing	DNMG 110404GP 110408GP	9.525	4.76	3.81	0.4 0.8	● ●	● ●	● ●	● ●
	DNMG 150402GP 150404GP 150408GP	12.70	4.76	5.16	0.2 0.4 0.8	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	DNMG 150404PQ 150408PQ 150412PQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
	DNMG 150604PQ 150608PQ 150612PQ	12.70	6.35	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	DNMG 110402HQ 110404HQ	9.525	4.76	3.81	0.2 0.4	● ●	● ●	● ●	● ●
	DNMG 150404HQ 150408HQ 150412HQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
	DNMG 150604HQ 150608HQ 150612HQ	12.70	6.35	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium · Up Facing	DNMG 150404CQ 150408CQ 150412CQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
	DNMG 150604CQ 150608CQ 150612CQ	12.70	6.35	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●

Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Finishing-Medium · Up Facing	DNMG 150408CJ 150412CJ	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
	DNMG 150608CJ 150612CJ	12.70	6.35	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Medium-Roughing	DNMG 110404GS 110408GS	9.525	4.76	3.81	0.4 0.8	● ●	● ●	● ●	● ●
	DNMG 150404GS 150408GS 150412GS	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
	DNMG 150604GS 150608GS	12.70	6.35	5.16	0.4 0.8			● ●	● ●
NEW  Medium-Roughing	DNMG 150404PG 150408PG 150412PG 150416PG	12.70	4.76	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
	DNMG 150604PG 150608PG 150612PG 150616PG	12.70	6.35	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Medium-Roughing	DNMG 150404PS 150408PS 150412PS	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
	DNMG 150604PS 150608PS 150612PS 150616PS	12.70	6.35	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Medium-Roughing · High Feed	DNMG 150408PT 150412PT	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
	DNMG 150608PT 150612PT	12.70	6.35	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Medium-Roughing · High Feed	DNMG 150408GT 150412GT	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
	DNMG 150608GT 150612GT	12.70	6.35	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Roughing	DNMG 150404 150408	12.70	4.76	5.16	0.4 0.8	● ●	● ●	● ●	● ●
	DNMG 150608 150612	12.70	6.35	5.16	0.8 1.2	● ●	● ●	● ●	● ●

●: Std. Item

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■ Stock Items (Negative)

Shape	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (rε)	CVD Coated Carbide CA510	CA515	CA525	CA530
 Roughing	DNMG 150408PH	12.70	4.76	5.16	0.8	●	●	●	●
	DNMG 150412PH				1.2	●	●	●	●
	DNMG 150416PH				1.6			●	●
	DNMG 150608PH	12.70	6.35	5.16	0.8	●	●	●	●
	DNMG 150612PH				1.2	●	●	●	●
	DNMG 150616PH				1.6	●	●	●	●
 Single Sided Roughing · High Feed	DNMM 150408PX	12.70	4.76	5.16	0.8			●	●
	DNMM 150412PX				1.2			●	●
	DNMM 150416PX				1.6			●	●
	DNMM 150608PX	12.70	6.35	5.16	0.8	●	●	●	●
	DNMM 150612PX				1.2	●	●	●	●
	DNMM 150616PX				1.6			●	●
 Low Carbon Steel Finishing	DNMG 150404XP	12.70	4.76	5.16	0.4	●	●	●	●
	DNMG 150408XP				0.8	●	●	●	●
 Low Carbon Steel Medium Cutting	DNMG 150404XQ	12.70	4.76	5.16	0.4	●	●	●	●
	DNMG 150408XQ				0.8	●	●	●	●
 Low Carbon Steel Roughing	DNMG 150408XS	12.70	4.76	5.16	0.8	●	●	●	●
 Medium-Roughing	RNMG 090300	9.525	3.18	3.81	-	●	●	●	●
	RNMG 120400	12.70	4.76	5.16	-	●	●	●	●
	RNMG 150600	15.875	6.35	6.35	-			●	●
 Finishing-Medium	SNMG 120404PQ	12.70	4.76	5.16	0.4	●	●	●	●
	SNMG 120408PQ				0.8	●	●	●	●
	SNMG 120412PQ				1.2	●	●	●	●
 Finishing-Medium	SNMG 120404HQ	12.70	4.76	5.16	0.4	●	●	●	●
	SNMG 120408HQ				0.8	●	●	●	●
	SNMG 120412HQ				1.2	●	●	●	●
NEW  Medium-Roughing	SNMG 120408PG	12.70	4.76	5.16	0.8	●	●	●	●
	SNMG 120412PG				1.2	●	●	●	●
	SNMG 120416PG				1.6	●	●	●	●
 Medium-Roughing	SNMG 120408PS	12.70	4.76	5.16	0.8	●	●	●	●
	SNMG 120412PS				1.2	●	●	●	●
	SNMG 120416PS				1.6	●	●	●	●
 Medium-Roughing · High Feed	SNMG 120408PT	12.70	4.76	5.16	0.8	●	●	●	●
	SNMG 120412PT				1.2	●	●	●	●

Shape	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (rε)	CVD Coated Carbide CA510	CA515	CA525	CA530
 Roughing	SNMG 090304	9.525	3.18	3.81	0.4			●	●
	SNMG 090308				0.8			●	●
	SNMG 120408	12.70	4.76	5.16	0.8	●	●	●	●
	SNMG 120412				1.2	●	●	●	●
	SNMG 120416				1.6			●	●
 Roughing	SNMG 120408PH	12.70	4.76	5.16	0.8	●	●	●	●
	SNMG 120412PH				1.2	●	●	●	●
	SNMG 120416PH				1.6	●	●	●	●
	SNMG 150612PH	15.875	6.35	6.35	1.2	●	●	●	●
	SNMG 150616PH				1.6	●	●	●	●
	SNMG 190612PH	19.05	6.35	7.94	1.2			●	●
	SNMG 190616PH				1.6			●	●
 Single Sided Roughing · High Feed	SNMM 120408PX	12.70	4.76	5.16	0.8	●	●	●	●
	SNMM 120412PX				1.2	●	●	●	●
	SNMM 120416PX				1.6			●	●
	SNMM 150612PX	15.875	6.35	6.35	1.2			●	●
	SNMM 150616PX				1.6			●	●
	SNMM 190612PX	19.05	6.35	7.94	1.2	●	●	●	●
	SNMM 190616PX				1.6	●	●	●	●
	SNMM 190624PX				2.4			●	●
 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	●	●	●	●
 Finishing	TNMG 160402PP	9.525	4.76	3.81	0.2	●	●	●	●
	TNMG 160404PP				0.4	●	●	●	●
	TNMG 160408PP				0.8	●	●	●	●
	TNMG 160412PP				1.2	●	●	●	●
 Finishing	TNMG 160402GP	9.525	4.76	3.81	0.2	●	●	●	●
	TNMG 160404GP				0.4	●	●	●	●
	TNMG 160408GP				0.8	●	●	●	●
 Finishing-Medium	TNMG 160404PQ	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408PQ				0.8	●	●	●	●
	TNMG 160412PQ				1.2	●	●	●	●
 Finishing-Medium	TNMG 110404HQ	6.35	4.76	2.26	0.4	●	●	●	●
	TNMG 110408HQ				0.8	●	●	●	●
	TNMG 160404HQ	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408HQ				0.8	●	●	●	●
	TNMG 160412HQ				1.2	●	●	●	●

●: Std. Item

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Shape Right-hand shown	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (re)	CVD Coated Carbide CA510	CA515	CA525	CA530
 Finishing-Medium · Up Facing	TNMG 160404CQ	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408CQ				0.8	●	●	●	●
	TNMG 160412CQ				1.2	●	●	●	●
	TNMG 220408CQ	12.70	4.76	5.16	0.8	●	●	●	●
	TNMG 220412CQ				1.2	●	●	●	●
 Medium-Roughing	TNMG 110404GS	6.35	4.76	2.26	0.4			●	●
	TNMG 110408GS				0.8			●	●
	TNMG 160404GS	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408GS				0.8	●	●	●	●
NEW  Medium-Roughing	TNMG 160404PG	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408PG				0.8	●	●	●	●
	TNMG 160412PG				1.2	●	●	●	●
 Medium-Roughing	TNMG 160404PS	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408PS				0.8	●	●	●	●
	TNMG 160412PS				1.2	●	●	●	●
	TNMG 220404PS	12.70	4.76	5.16	0.4	●	●	●	●
	TNMG 220408PS				0.8	●	●	●	●
	TNMG 220412PS				1.2	●	●	●	●
	TNMG 220416PS				1.6	●	●	●	●
 Medium-Roughing · High Feed	TNMG 160408PT	9.525	4.76	3.81	0.8	●	●	●	●
	TNMG 160412PT				1.2	●	●	●	●
 Medium-Roughing · High Feed	TNMG 160408GT	9.525	4.76	3.81	0.8	●	●	●	●
	TNMG 160412GT				1.2	●	●	●	●
 Roughing	TNMG 160404	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408				0.8	●	●	●	●
	TNMG 160412				1.2	●	●	●	●
	TNMG 220408	12.70	4.76	5.16	0.8	●	●	●	●
	TNMG 220412				1.2	●	●	●	●
 Roughing	TNMG 160408PH	9.525	4.76	3.81	0.8	●	●	●	●
	TNMG 160412PH				1.2	●	●	●	●
	TNMG 220408PH	12.70	4.76	5.16	0.8	●	●	●	●
	TNMG 220412PH				1.2	●	●	●	●
	TNMG 220416PH				1.6	●	●	●	●
 Single Sided Roughing · High Feed	TNMM 160408PX	9.525	4.76	3.81	0.8			●	●
	TNMM 160412PX				1.2			●	●
	TNMM 220408PX	12.70	4.76	5.16	0.8			●	●
	TNMM 220412PX				1.2			●	●
	TNMM 220416PX				1.6			●	●

Shape	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (re)	CVD Coated Carbide CA510	CA515	CA525	CA530
 Low Carbon Steel Finishing	TNMG 160404XP	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408XP				0.8	●	●	●	●
 Low Carbon Steel Medium Cutting	TNMG 160404XQ	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408XQ				0.8	●	●	●	●
 Low Carbon Steel Roughing	TNMG 160408XS	9.525	4.76	3.81	0.8	●	●	●	●
 Medium-Roughing	TNMG 160404PL-ST	9.525	4.76	3.81	0.4	●	●	●	●
	TNMG 160408PL-ST				0.8	●	●	●	●
 Finishing	VNMG 160402PP	9.525	4.76	3.81	0.2	●	●	●	●
	VNMG 160404PP				0.4	●	●	●	●
	VNMG 160408PP				0.8	●	●	●	●
	VNMG 160412PP				1.2	●	●	●	●
 Finishing	VNMG 160402GP	9.525	4.76	3.81	0.2	●	●	●	●
	VNMG 160404GP				0.4	●	●	●	●
	VNMG 160408GP				0.8	●	●	●	●
 Finishing-Medium	VNMG 160404VF	9.525	4.76	3.81	0.4	●	●	●	●
	VNMG 160408VF				0.8	●	●	●	●
	VNMG 160412VF				1.2	●	●	●	●
 Finishing-Medium	VNMG 160404PQ	9.525	4.76	3.81	0.4	●	●	●	●
	VNMG 160408PQ				0.8	●	●	●	●
	VNMG 160412PQ				1.2	●	●	●	●
 Finishing-Medium	VNMG 160404HQ	9.525	4.76	3.81	0.4	●	●	●	●
	VNMG 160408HQ				0.8	●	●	●	●
	VNMG 160412HQ				1.2	●	●	●	●
 Roughing	VNMG 160404	9.525	4.76	3.81	0.4	●	●	●	●
	VNMG 160408				0.8	●	●	●	●
 Finishing With Wiper Edge	WNMG 080404WP	12.70	4.76	5.16	0.4	●	●	●	●
	WNMG 080408WP				0.8	●	●	●	●
 Finishing-Medium With Wiper Edge	WNMG 080404WQ	12.70	4.76	5.16	0.4	●	●	●	●
	WNMG 080408WQ				0.8	●	●	●	●
	WNMG 080412WQ				1.2	●	●	●	●

●: Std. Item

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■ Stock Items (Negative)

Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Finishing	WNMG 080402PP 080404PP 080408PP 080412PP	12.70	4.76	5.16	0.2 0.4 0.8 1.2	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Finishing-Medium	WNMG 080404PQ 080408PQ 080412PQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	WNMG 06T304HQ 06T308HQ	9.525	3.97	3.81	0.4 0.8			● ●	● ●
	WNMG 060404HQ 060408HQ	9.525	4.76	3.81	0.4 0.8	● ●	● ●	● ●	● ●
	WNMG 080404HQ 080408HQ 080412HQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium · Up Facing	WNMG 080404CQ 080408CQ 080412CQ	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium · Up Facing	WNMG 080408CJ 080412CJ	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Medium-Roughing	WNMG 060404GS 060408GS	9.525	4.76	3.81	0.4 0.8	● ●	● ●	● ●	● ●
	WNMG 080404GS 080408GS 080412GS	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
NEW  Medium-Roughing	WNMG 080404PG 080408PG 080412PG 080416PG	12.70	4.76	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Medium-Roughing	WNMG 080404PS 080408PS 080412PS 080416PS	12.70	4.76	5.16	0.4 0.8 1.2 1.6	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Medium-Roughing · High Feed	WNMG 080408PT 080412PT	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Medium-Roughing · High Feed	WNMG 080408GT 080412GT	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●

Shape	Description	Dimension (mm)				CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (re)	CA510	CA515	CA525	CA530
 Roughing	WNMG 080404 080408 080412	12.70	4.76	5.16	0.4 0.8 1.2	● ● ●	● ● ●	● ● ●	● ● ●
 Roughing	WNMG 080408PH 080412PH	12.70	4.76	5.16	0.8 1.2	● ●	● ●	● ●	● ●
 Low Carbon Steel Finishing	WNMG 080404XP 080408XP	12.70	4.76	5.16	0.4 0.8	● ●	● ●	● ●	● ●
 Low Carbon Steel Medium Cutting	WNMG 080404XQ 080408XQ	12.70	4.76	5.16	0.4 0.8	● ●	● ●	● ●	● ●
 Low Carbon Steel Roughing	WNMG 080408XS	12.70	4.76	5.16	0.8	●	●	●	●

●: Std. Item

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■ Stock Items (Positive)

Shape	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (re)	Relief Angle	CVD Coated Carbide CA510	CA515	CA525	CA530
NEW  Finishing	CCMT 060202PP 060204PP	6.35	2.38	2.8	0.2 0.4	7°	● ●	● ●	● ●	● ●
	CCMT 09T302PP 09T304PP 09T308PP	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	CCMT 060202GK 060204GK	6.35	2.38	2.8	0.2 0.4	7°	● ●	● ●	● ●	● ●
	CCMT 09T302GK 09T304GK	9.525	3.97	4.4	0.2 0.4	7°	● ●	● ●	● ●	● ●
	CCMT 120404GK 120408GK 120412GK	12.70	4.76	5.5	0.4 0.8 1.2	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	CCMT 060202HQ 060204HQ	6.35	2.38	2.8	0.2 0.4	7°	● ●	● ●	● ●	● ●
	CCMT 09T302HQ 09T304HQ 09T308HQ	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Medium	CCMT 09T308	9.525	3.97	4.4	0.8	7°	●	●	●	●
NEW  Finishing	CPMT 080202PP 080204PP	7.94	2.38	3.3	0.2 0.4	11°	● ●	● ●	● ●	● ●
	CPMT 090302PP 090304PP 090308PP	9.525	3.18	4.4	0.2 0.4 0.8	11°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing	CPMT 080204GP	7.94	2.38	3.3	0.4	11°	●	●	●	●
	CPMT 090304GP 090308GP	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Finishing-Medium	CPMH 080204HQ 080208HQ	7.94	2.38	3.5	0.4 0.8	11°	● ●	● ●	● ●	● ●
	CPMH 090304HQ 090308HQ	9.525	3.18	4.5	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Medium	CPMH 080204 080208	7.94	2.38	3.5	0.4 0.8	11°	● ●	● ●	● ●	● ●
	CPMH 090304 090308	9.525	3.18	4.5	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Low Carbon Steel Finishing	CPMT 080204XP	7.94	2.38	3.3	0.4	11°	●	●	●	●
	CPMT 090304XP 090308XP	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Low Carbon Steel Medium Cutting	CPMT 090304XQ 090308XQ	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
NEW  Finishing	DCMT 070202PP 070204PP	6.35	2.38	2.8	0.2 0.4	7°	● ●	● ●	● ●	● ●
	DCMT 11T302PP 11T304PP 11T308PP	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing	DCMT 070202GP 070204GP	6.35	2.38	2.8	0.2 0.4	7°	● ●	● ●	● ●	● ●
	DCMT 11T304GP 11T308GP	9.525	3.97	4.4	0.4 0.8	7°	● ●	● ●	● ●	● ●

Shape	Description	Dimension (mm) I.C.	Thickness	Hole	Corner-R (re)	Relief Angle	CVD Coated Carbide CA510	CA515	CA525	CA530
 Finishing-Medium	DCMT 070202GK 070204GK 070208GK	6.35	2.38	2.8	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
	DCMT 11T302GK 11T304GK 11T308GK	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing-Medium	DCMT 070202HQ 070204HQ 070208HQ	6.35	2.38	2.8	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
	DCMT 11T302HQ 11T304HQ 11T308HQ	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Low Carbon Steel Finishing	DCMT 070204XP	6.35	2.38	2.8	0.4	7°	●	●	●	●
	DCMT 11T302XP 11T304XP 11T308XP	9.525	3.97	4.4	0.2 0.4 0.8	7°	● ● ●	● ● ●	● ● ●	● ● ●
 Low Carbon Steel Finishing-Medium	DCMT 11T304XQ 11T308XQ	9.525	3.97	4.4	0.4 0.8	7°	● ●	● ●	● ●	● ●
 Medium	RCMX 1003M0	10.0	3.18	3.6	-	7°	●	●	●	●
	RCMX 1204M0	12.0	4.76	4.2	-	7°	●	●	●	●
 Finishing-Medium	SCMT 09T304HQ 09T308HQ	9.525	3.97	4.4	0.4 0.8	7°	● ●	● ●	● ●	● ●
 Medium	SPMR 090304 090308	9.525	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●
	SPMR 120304 120308	12.70	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Finishing	TBMT 060102DP 060104DP	3.97	1.59	2.3	0.2 0.4	5°	● ●	● ●	● ●	● ●
 Finishing-Medium	TCMT 110204HQ 110208HQ	6.35	2.38	2.8	0.4 0.8	7°	● ●	● ●	● ●	● ●
NEW  Finishing	TPMT 090202PP 090204PP	5.56	2.38	2.8	0.2 0.4	11°	● ●	● ●	● ●	● ●
	TPMT 110302PP 110304PP 110308PP	6.35	3.18	3.3	0.2 0.4 0.8	11°	● ● ●	● ● ●	● ● ●	● ● ●

●: Std. Item

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■ Stock Items (Positive)

Shape	Description	Dimension (mm)					CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA510	CA515	CA525	CA530
 Finishing	TPMT 090204GP	5.56	2.38	2.8	0.4	11°	●	●	●	●
	TPMT 110304GP 110308GP	6.35	3.18	3.3	0.4 0.8	11°	● ●	● ●	● ●	● ●
	TPMT 160304GP	9.525	3.18	4.4	0.4	11°	●	●	●	●
 Finishing-Medium	TPMT 090202HQ 090204HQ	5.56	2.38	2.8	0.2 0.4	11°	● ●	● ●	● ●	● ●
	TPMT 110302HQ 110304HQ 110308HQ	6.35	3.18	3.3	0.2 0.4 0.8	11°	● ● ●	● ● ●	● ● ●	● ● ●
	TPMT 160304HQ 160308HQ	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Low Carbon Steel Finishing	TPMT 090204XP	5.56	2.38	2.8	0.4	11°	●	●	●	●
	TPMT 110304XP 110308XP	6.35	3.18	3.3	0.4 0.8	11°	● ●	● ●	● ●	● ●
	TPMT 160304XP 160308XP	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Low Carbon Steel Finishing-Medium	TPMT 110304XQ 110308XQ	6.35	3.18	3.3	0.4 0.8	11°	● ●	● ●	● ●	● ●
	TPMT 160304XQ 160308XQ	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Finishing	TPMR 160304GP	9.525	3.18	-	0.4	11°	●	●	●	●
 Finishing-Medium	TPMR 110304HQ 110308HQ	6.35	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●
	TPMR 160304HQ 160308HQ	9.525	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●
 Medium	TPMR 110304 110308	6.35	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●
	TPMR 160304 160308	9.525	3.18	-	0.4 0.8	11°	● ●	● ●	● ●	● ●

Shape Left-hand shown	Description	Dimension (mm)					CVD Coated Carbide			
		I.C.	Thickness	Hole	Corner-R (rε)	Relief Angle	CA510	CA515	CA525	CA530
 Finishing	VBMT 110304GP	6.35	3.18	2.8	0.4	5°	●	●	●	●
	VBMT 160404GP 160408GP	9.525	4.76	4.4	0.4 0.8	5°	● ●	● ●	● ●	● ●
 Finishing	VBMT 110302VF 110304VF 110308VF	6.35	3.18	2.8	0.2 0.4 0.8	5°	● ● ●	● ● ●	● ● ●	● ● ●
	VBMT 160402VF 160404VF 160408VF 160412VF	9.525	4.76	4.4	0.2 0.4 0.8 1.2	5°	● ● ● ●	● ● ● ●	● ● ● ●	● ● ● ●
 Finishing-Medium	VBMT 110304HQ 110308HQ	6.35	3.18	2.8	0.4 0.8	5°	● ●	● ●	● ●	● ●
	VBMT 160404HQ 160408HQ 160412HQ	9.525	4.76	4.4	0.4 0.8 1.2	5°	● ● ●	● ● ●	● ● ●	● ● ●
 Finishing	VCMT 080202VF 080204VF	4.76	2.38	2.3	0.2 0.4	7°	● ●	● ●	● ●	● ●
 Finishing-Medium	VCMT 080202HQ 080204HQ	4.76	2.38	2.3	0.2 0.4	7°	● ●	● ●	● ●	● ●
 Finishing	WBMT 060102$^{R}_{L}$-DP 060104$^{R}_{L}$-DP	3.97	1.59	2.3	0.2 0.4	5°	L L	L L	L L	L L
	WBMT 080202$^{R}_{L}$-DP 080204$^{R}_{L}$-DP	4.76	2.38	2.3	0.2 0.4	5°	L L	L L	L L	L L
 Finishing	WPMT 110204GP	6.35	2.38	2.8	0.4	11°	●	●	●	●
	WPMT 160304GP	9.525	3.18	4.4	0.4	11°	●	●	●	●
 Finishing-Medium	WPMT 110202HQ 110204HQ	6.35	2.38	2.8	0.2 0.4	11°	● ●	● ●	● ●	● ●
	WPMT 160304HQ 160308HQ	9.525	3.18	4.4	0.4 0.8	11°	● ●	● ●	● ●	● ●

●: Std. Item L: L-hand Only