THE NEW VALUE FRONTIER

KYOCERA

Cutter for Cast Iron | MFK

High Efficiency Multi-edge Cutter for Cast Iron

MFK

Double-Sided Insert with Free Cutting Geometry to Resist Chatter

10 usable cutting edges per insert

Tough edge with low cutting forces

New CVD grade CA420M for longer tool life

NEW

Ceramic Insert with Chipbreaker

Wiper Insert for Finishing

CRYSTAL INTERFACE ORIENTATION STRUCTURE Technology

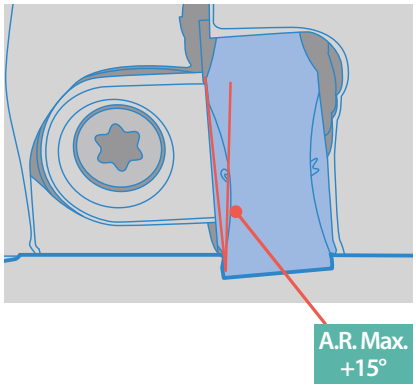
Cutter for Cast Iron

MFK

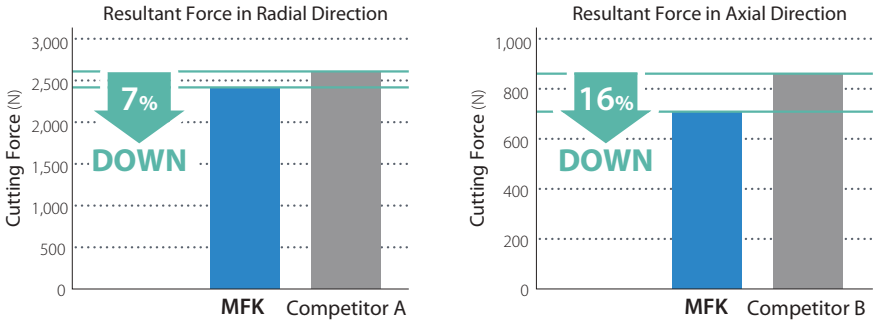
Tough edge with low cutting forces enable stable machining.
Uses 10-edge inserts for economical machining.

Point 1 Low Cutting Forces Prevent Chattering

Low Cutting Forces with Helical Cutting Edge Design.



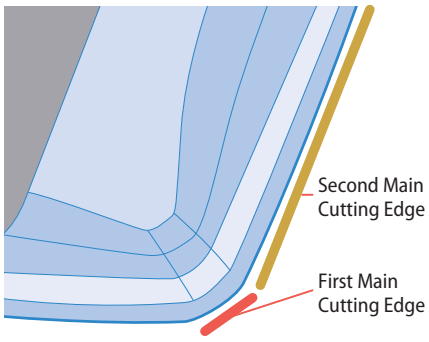
Cutting Force Comparison (In-house Evaluation)



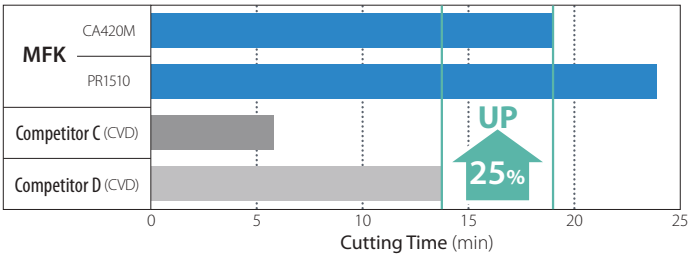
Cutting Conditions: Vc = 180 m/min, fz = 0.3 mm/t, ap × ae = 3.0 × 62 mm, Dry Workpiece: FCD600, ø125

Point 2 Tough and Reliable Insert Construction Prevents Fracturing

Tough and Reliable Dual Angle Edge Design.

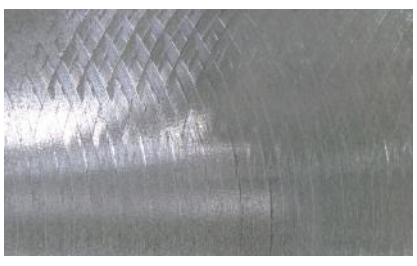


Fracture Resistance Comparison (In-house Evaluation)

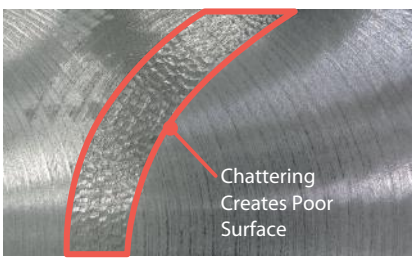


Cutting Conditions: Vc = 300 m/min, fz = 0.5 mm/t, ap = 2.0 mm, Wet Workpiece: FCD450 (4 bores)

Surface Finish Comparison (In-house Evaluation)



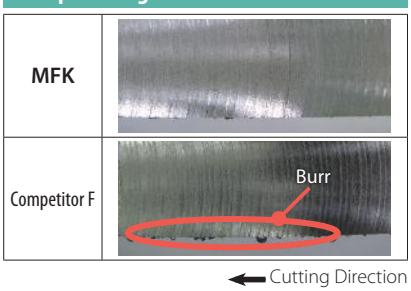
MFK



Competitor E

Burr Comparison

Sharp Cutting Prevents Burr Formation



Cutting Direction

Cutting Conditions: Vc = 180 m/min, fz = 0.3 mm/t, ap × ae = 3 × 78 mm, Dry Workpiece: FCD600

Point 3 Toolholder lineup to meet various applications

Fine and Extra Fine Pitch Types Available.

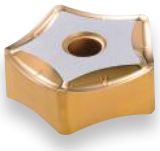
Fine Pitch (Example: ø125 12 inserts)

Recommended for Unstable Setups
General Purpose for Wide Application Ranges

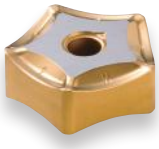
Extra Fine Pitch (Example: ø125 18 inserts)

Recommended for Rigid Setups
Finer Pitch for Higher Efficiency

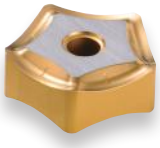
Point 4 Chipbreaker Lineup for Wide Range of Applications



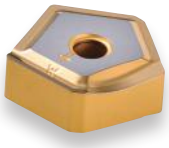
General Purpose:
GM Chipbreaker



Heavy Duty:
GH Chipbreaker



Finishing:
GL Chipbreaker
(Ground)



Wiper Edge:
W Chipbreaker
(Ground)

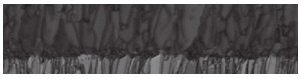
Point 5 Long Tool Life and Stable Machining

CA420M Features Advanced CVD Coated CRIOS Technology.

CRIOS Technology
CRYSTAL INTERFACE ORIENTATION STRUCTURE

Longer Tool Life

Controlled α-Al_2O_3 crystal growth for improving wear resistance and fracture resistance.



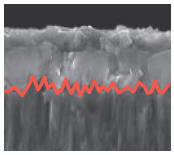
CRIOS Technology

Conventional

Prevents Film Peeling

40 % improved film adhesion by optimized interface.

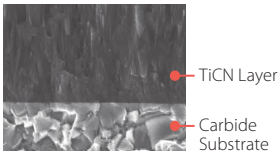
CRIOS Technology



Conventional

Increased Edge Strength

Higher film strength and fracture resistance with high aspect ratio TiCN.



CRIOS Technology

CRIOS Technology is Kyocera's original CVD coating technology.

Insert Grade Lineup

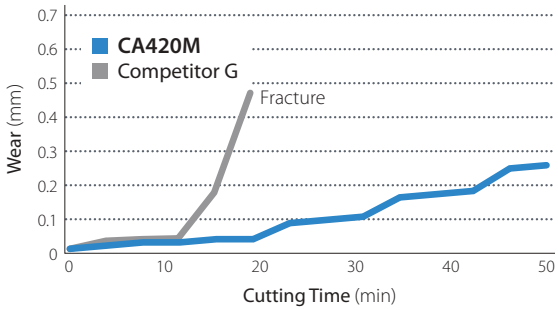
Long Tool Life
(1st Recommendation)
CA420M

Stable Machining
PR1510

Fracture Resistance
PR1525

Use ceramic insert for high speed machining (see page 3).

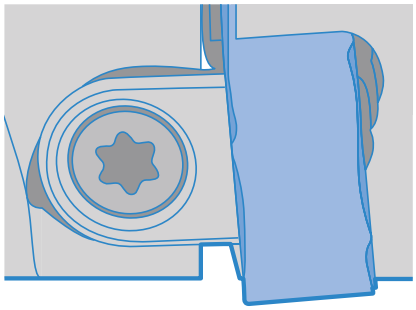
Wear Resistance Comparison (In-house Evaluation)



Cutting Conditions: Vc = 200 m/min, fz = 0.3 mm/t, ap × ae = 2.0 × 80 mm, Dry
Workpiece: FCD450

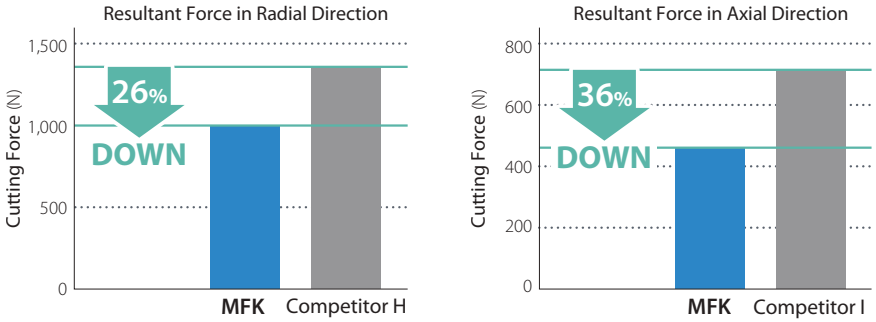
Ceramic Grades for High Speed and High Efficiency Machining

Low cutting force ceramic insert with chipbreaker controls edge chipping.



Rake Angle +6.7°

Cutting Force Comparison (In-house Evaluation)



Cutting Conditions: Vc = 600 m/min, fz = 0.1 – 0.25 mm/t, ae × ap = 62.5 × 2 mm, DRY Workpiece: FC250, ø125, 1 insert

KS6050 First Recommendation for Gray Cast Iron

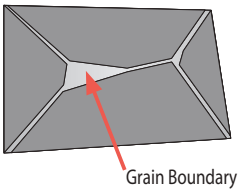
Point 1 High Wear Resistance Enables Stable Machining

Reduces grain boundary phase that generates negative impact on the cutting performance.

KS6050

Less Grain Boundary Phase → Stable Machining Without Chipping

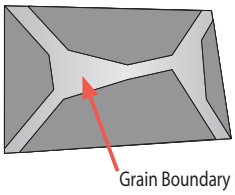
Mechanical and thermal property will be improved by controlling grain boundary phase



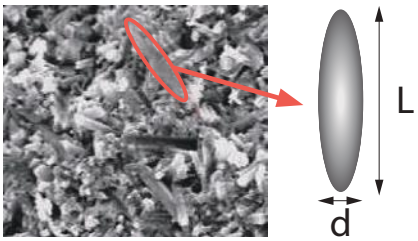
Conventional Grade

More Grain Boundary Phase → Unstable Machining Due to Chipping

The grain boundary phase contained a high proportion of glass, therefore its toughness will be weakened by cutting heat



Point 2 Sudden Fracture Prevention

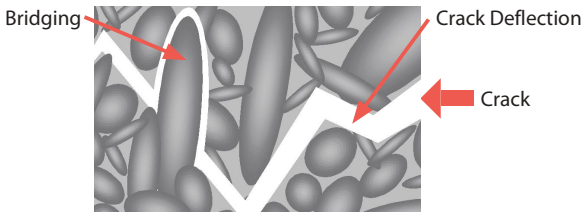


KS6050 has higher aspect ratio compared with conventional grade.

Aspect Ratio = L/d

Fracture Resistance Improvement

Crack Propagation

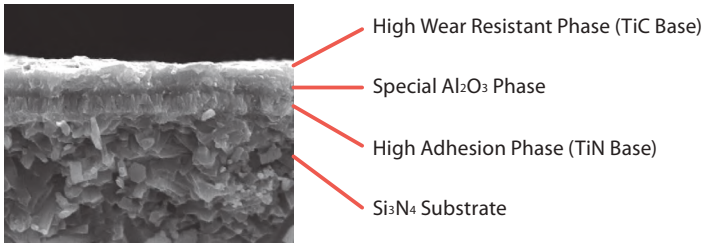


Large Aspect Ratio ⇒ Controls Crack Propagation

CS7050 First Recommendation for Nodular Cast Iron

Wear resistance improvement due to high coating adhesion.

Suitable for high speed cutting.



MFK Face Mill

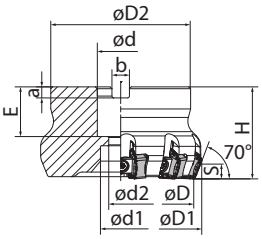


Fig. 1

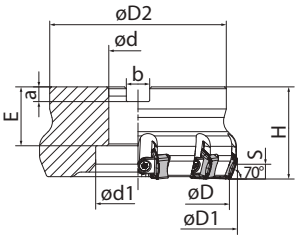


Fig. 2

Rake Angle (°)		
Description	A.R.	R.R.
MFK080R-○○	(MAX.) +15°	-7°
MFK100R-○○		-6°
MFK125R-○○ ⋮ MFK315R-○○		-5°

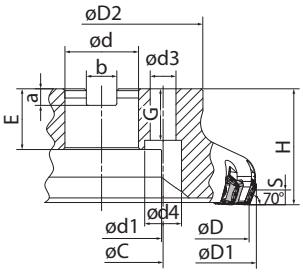


Fig. 3

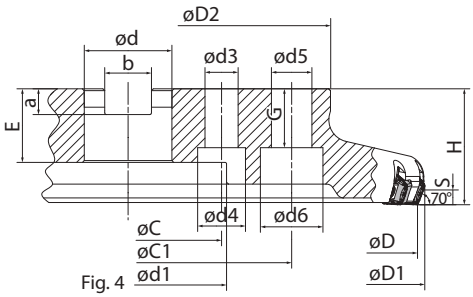


Fig. 4

Toolholder Dimensions

Bore Dia.		Description	Stock	No. of inserts	Dimensions (mm)																			Drawing	Weight (kg)
					øD	øD1	øD2	ød	ød1	ød2	H	E	a	b	s	ød3	ød4	ød5	ød6	øC	øC1	G		
Inch Spec	Fine Pitch	MFK080R-11-8T	●	8	80	89	76	31.75	26	17		32	8	12.7		–	–	–	–	–	–	–	Fig. 1	1.76
		MFK100R-11-10T	●	10	100	109	96	31.75	26	17		32	8	12.7		–	–	–	–	–	–	–	Fig. 1	2.98
		MFK125R-11-12T	●	12	125	134	100	38.1	55	–		38	10	15.9		–	–	–	–	–	–	–	Fig. 2	3.65
		MFK160R-11-16T	●	16	160	169	100	50.8	70	–	63	38	11	19.1	6.0	–	–	–	–	–	–	–	Fig. 2	4.62
		MFK200R-11-20T	●	20	200	209	142	47.625	110	–		40	14	25.4		18	26	–	–	101.6	–	32	Fig. 3	7.65
		MFK250R-11-24T	●	24	250	259	142	47.625	110	–		40	14	25.4		18	26	–	–	101.6	–	32	Fig. 3	10.73
		MFK315R-11-28T	MTO	28	315	324	220	47.625	110	–		40	14	25.4		18	26	22	32	101.6	177.8	32	Fig. 4	19.71
	Extra Fine Pitch	MFK080R-11-10T	●	10	80	89	76	31.75	26	17		32	8	12.7		–	–	–	–	–	–	–	Fig. 1	1.70
		MFK100R-11-14T	●	14	100	109	96	31.75	26	17		32	8	12.7		–	–	–	–	–	–	–	Fig. 1	2.85
		MFK125R-11-18T	●	18	125	134	100	38.1	55	–		38	10	15.9		–	–	–	–	–	–	–	Fig. 2	3.44
		MFK160R-11-22T	●	22	160	169	100	50.8	70	–	63	38	11	19.1	6.0	–	–	–	–	–	–	–	Fig. 2	4.44
		MFK200R-11-28T	●	28	200	209	142	47.625	110	–		40	14	25.4		18	26	–	–	101.6	–	32	Fig. 3	7.40
		MFK250R-11-36T	●	36	250	259	142	47.625	110	–		40	14	25.4		18	26	–	–	101.6	–	32	Fig. 3	10.36
		MFK315R-11-44T	MTO	44	315	324	220	47.625	110	–		40	14	25.4		18	26	22	32	101.6	177.8	32	Fig. 4	19.21
Metric Spec	Fine Pitch	MFK080R-11-8T-M	●	8	80	89	76	27	20	13		24	7	12.4		–	–	–	–	–	–	–	Fig. 1	1.87
		MFK100R-11-10T-M	●	10	100	109	96	32	26	17		28	8	14.4		–	–	–	–	–	–	–	Fig. 1	2.99
		MFK125R-11-12T-M	●	12	125	134	100	40	55	–		33	9	16.4		–	–	–	–	–	–	–	Fig. 2	3.56
		MFK160R-11-16T-M	●	16	160	169	100	40	70	–	63	33	9	16.4	6.0	14	20	–	–	66.7	–	28	Fig. 3	4.51
		MFK200R-11-20T-M	●	20	200	209	142	60	110	–		40	14	25.7		18	26	–	–	101.6	–	32	Fig. 3	7.35
		MFK250R-11-24T-M	●	24	250	259	142	60	110	–		40	14	25.7		18	26	–	–	101.6	–	32	Fig. 3	10.43
		MFK315R-11-28T-M	MTO	28	315	324	220	60	110	–		40	14	25.7		18	26	22	32	101.6	177.8	32	Fig. 4	19.41
	Extra Fine Pitch	MFK080R-11-10T-M	●	10	80	89	76	27	20	13		24	7	12.4		–	–	–	–	–	–	–	Fig. 1	1.81
		MFK100R-11-14T-M	●	14	100	109	96	32	26	17		28	8	14.4		–	–	–	–	–	–	–	Fig. 1	2.86
		MFK125R-11-18T-M	●	18	125	134	100	40	55	–		33	9	16.4		–	–	–	–	–	–	–	Fig. 2	3.38
		MFK160R-11-22T-M	●	22	160	169	100	40	70	–	63	33	9	16.4	6.0	14	20	–	–	66.7	–	28	Fig. 3	4.32
		MFK200R-11-28T-M	●	28	200	209	142	60	110	–		40	14	25.7		18	26	–	–	101.6	–	32	Fig. 3	7.10
		MFK250R-11-36T-M	●	36	250	259	142	60	110	–		40	14	25.7		18	26	–	–	101.6	–	32	Fig. 3	10.07
		MFK315R-11-44T-M	MTO	44	315	324	220	60	110	–		40	14	25.7		18	26	22	32	101.6	177.8	32	Fig. 4	18.92

● : Std. Item MTO: Made To Order

Spare Parts and Applicable Inserts

Description	Spare Parts				Applicable Inserts
	Wedge	Wedge Screw	Wrench	Mounting Bolt	
MFK080R-11-8T	C09N	W6X18N	TT-15	HH16X40	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-10T					
MFK125R-11-12T				–	
MFK160R-11-16T					
MFK200R-11-20T					
MFK250R-11-24T					
MFK315R-11-28T					
MFK080R-11-10T	C09N	W6X18N	TT-15	HH16X40	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-14T					
MFK125R-11-18T				–	
MFK160R-11-22T					
MFK200R-11-28T					
MFK250R-11-36T					
MFK315R-11-44T					

Description	Spare Parts				Applicable Inserts
	Wedge	Wedge Screw	Wrench	Mounting Bolt	
MFK080R-11-8T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-10T-M				HH16X40	
MFK125R-11-12T-M				–	
MFK160R-11-16T-M					
MFK200R-11-20T-M					
MFK250R-11-24T-M					
MFK315R-11-28T-M					
MFK080R-11-10T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-14T-M				HH16X40	
MFK125R-11-18T-M				–	
MFK160R-11-22T-M					
MFK200R-11-28T-M					
MFK250R-11-36T-M					
MFK315R-11-44T-M					

Applicable Inserts

Insert		Description	Dimensions (mm)				CVD Coated Carbide	MEGACOAT NANO		Silicon Nitride Ceramic	CVD Silicon Nitride Ceramic
			A	T	X	Z	CA420M	PR1510	PR1525	KS6050	CS7050
General		PNMG1106XNEN-GM	17.23	6.35	2.0	2.0	●	●	●	–	–
Tough Edge		PNMG1106XNEN-GH	17.23	6.35	2.0	2.0	●	●	●	–	–
Surface Finish Oriented		PNEG1106XNEN-GL	17.18	6.35	2.6	2.6	●	●	●	–	–
Wiper Insert (2-edge)		PNEG1106XNER-W	18.02	6.35	2.0	10.0	●	●	●	–	–
High Speed		PNEA1106XNTN-T01020	16.94	6.5	1.5	1.5	–	–	–	●	●
NEW High Speed (with Chipbreaker)		PNEG1106XNTR-T00515	17.07	6.35	–	–	–	–	–	●	●

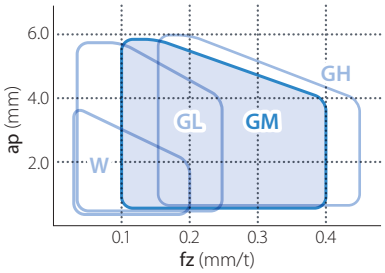
● : Std. Item

Recommended Conditions ★1st Recommendation ☆2nd Recommendation

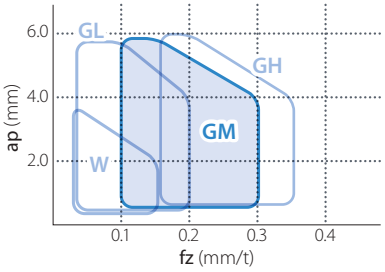
Workpiece Material	Insert Grade	Cutting Speed (m/min)	Chipbreaker	Feed per Tooth fz (mm/t) 0.06 0.1 0.2 0.3 0.4
Gray Cast Iron (FC)	CA420M	170 – 230 – 300	GM ★	0.25
	PR1510	120 – 180 – 250	GH ☆	0.3
	PR1525		GL	0.12
Nodular Cast Iron (FCD)	CA420M	150 – 200 – 250	GM ★	0.2
	PR1510	100 – 150 – 200	GH ☆	0.25
	PR1525		GL	0.1

Recommended Application Range

Workpiece : FC



Workpiece : FCD



Notes :
1. When using W (wiper), please use together with GM or GH. (Not recommended for use with GL)
2. When using wiper, do not exceed fz = 0.2 or insert corner may be damaged. The main cutting edge of W (wiper) insert is receding from that of GM and GH. Therefore, the feed rate for the insert next to W (wiper) is double that of other inserts.

Recommended Conditions (Ceramic) ★1st Recommendation ☆2nd Recommendation

Without Chipbreaker

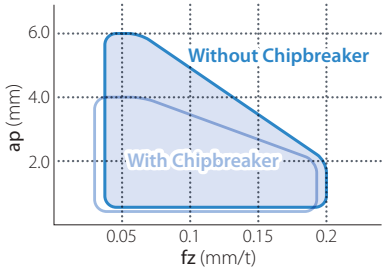
Workpiece Material	Insert Grade	Cutting Speed (m/min)	Edge Preparation	Feed per Tooth fz (mm/t) 0.05 0.1 0.2 0.3 0.4
Gray Cast Iron (FC)	KS6050 ★ CS7050 ☆	600 – 900 – 1200	0.10 × 20°	0.1
Nodular Cast Iron (FCD)	KS6050 ☆ CS7050★	400 – 600 – 900		

With Chipbreaker

Workpiece Material	Insert Grade	Cutting Speed (m/min)	Edge Preparation	Feed per Tooth fz (mm/t) 0.06 0.1 0.2 0.3 0.4
Gray Cast Iron (FC)	KS6050 ★ CS7050 ☆	600 – 900 – 1200	0.05 × 15°	0.1
Nodular Cast Iron (FCD)	KS6050 ☆ CS7050 ★	400 – 600 – 900		

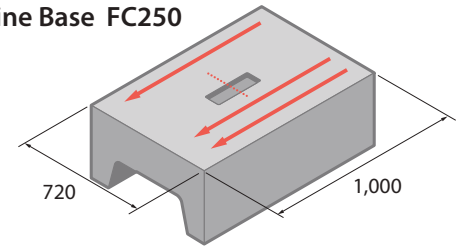
Recommended Application Range (Ceramic)

Workpiece : FC/FCD



Case Studies

Machine Base FC250



Vc = 160 m/min
fz = 0.16 mm/t (Vf = 782 mm/min)
ap × ae = 3 × 100 mm
Dry
MFK125R-11-12T (12 Inserts)
PNMG1106XNEN-GM PR1510

Chip Removal Rate — **Efficiency**

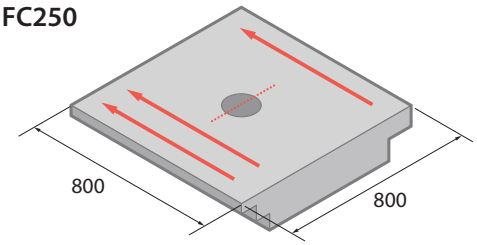
PR1510 **235cc/min** — 2 Times

Competitor J (12 Inserts) **125cc/min**

Little noise and vibration with increased cutting speed and feed rate.

(User Evaluation)

Base FC250



Vc = 160 m/min
fz = 0.18 mm/t (Vf = 917 mm/min)
ap × ae = 3 × 140 mm
Dry
MFK200R-11-20T (20 Inserts)
PNMG1106XNEN-GM CA420M

Chip Removal Rate — **Efficiency**

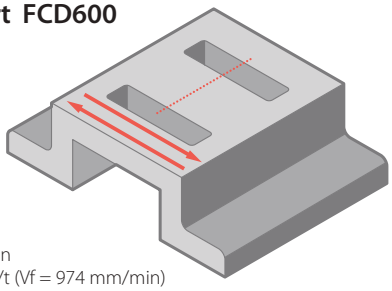
CA420M **385cc/min** — 2.3 Times

Competitor K (12 Inserts) **167cc/min**

CA420M performed at 2.3 times the efficiency of Competitor K. Little noise and stable machining.

(User Evaluation)

Mold Part FCD600



Vc = 90 m/min
fz = 0.34 mm/t (Vf = 974 mm/min)
ap × ae = 2 × – 60 mm
Dry
MFK080R-11-8T (8 Inserts)
PNMG1106XNEN-GM PR1525

Machining Efficiency — **Tool Life**

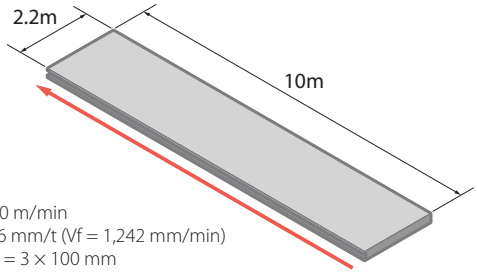
PR1525 **3pcs/edge** — 3 Times

Competitor L (8 Inserts) **1pcs/edge**

Competitor L had chipping after machining 1pc. PR1525 kept good edge condition and stable machining after machining 3 pcs.

(User Evaluation)

Bed FC300



Vc = 150 m/min
fz = 0.26 mm/t (Vf = 1,242 mm/min)
ap × ae = 3 × 100 mm
Dry
MFK160R-11-16T (16 Inserts)
PNMG1106XNEN-GM CA420M

Chip Removal Rate — **Efficiency**

CA420M **372cc/min** — 4 Times

Competitor M (8 Inserts) **93cc/min**

CA420M improved the efficiency by 4 times compared with Conventional M.

(User Evaluation)

