

THE NEW VALUE FRONTIER



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



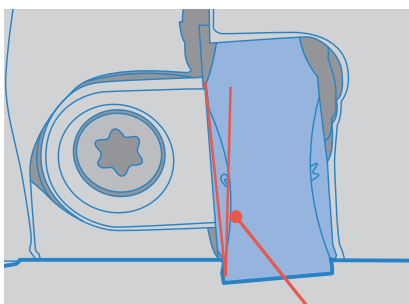
Cutter for Cast Iron

MFK

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

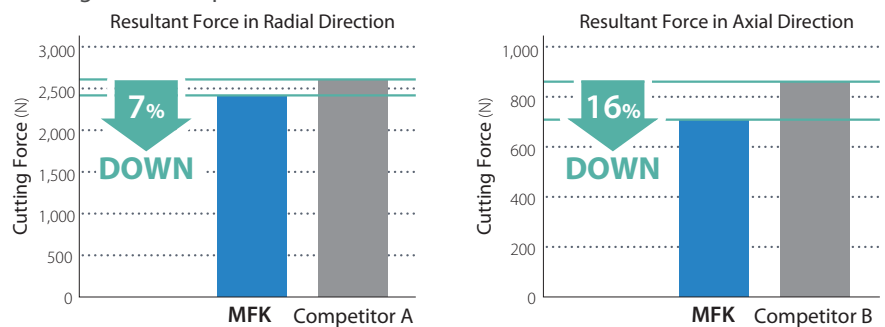
Point 1 Low Cutting Forces Prevent Chattering

Low Cutting Forces with Helical Cutting Edge Design.



A.R. Max. +15°

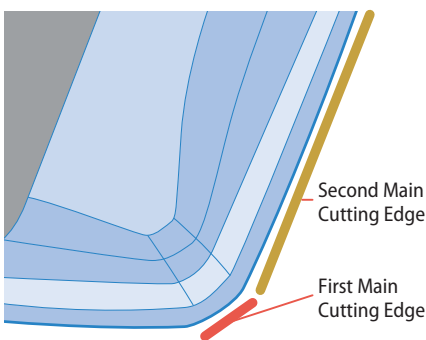
Cutting Force Comparison (In-house Evaluation)



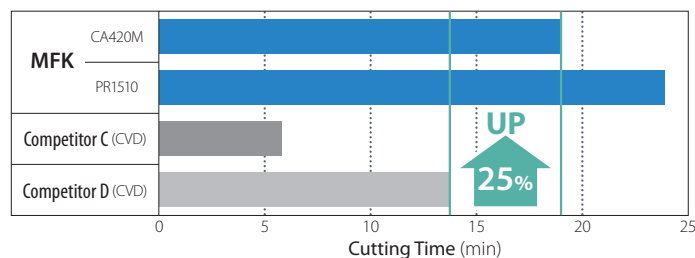
Cutting Conditions: $V_c = 180$ m/min, $f_z = 0.3$ mm/t, $a_p \times a_e = 3.0 \times 62$ mm, Dry Workpiece: FCD600, $\phi 125$

Point 2 Tough and Reliable Insert Construction Prevents Fracturing

Tough and Reliable Dual Angle Edge Design.

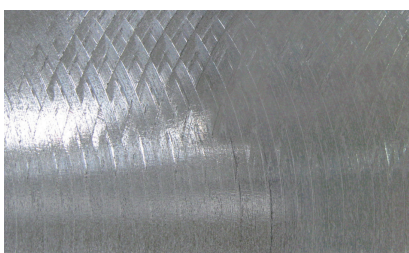


Fracture Resistance Comparison (In-house Evaluation)

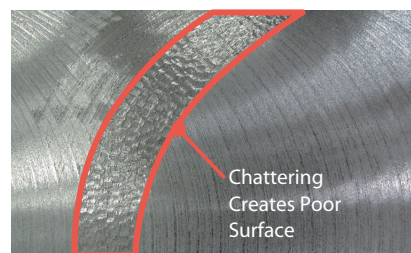


Cutting Conditions: $V_c = 300$ m/min, $f_z = 0.5$ mm/t, $a_p = 2.0$ mm, Wet Workpiece: FCD450 (4 bores)

Surface Finish Comparison (In-house Evaluation)



MFK

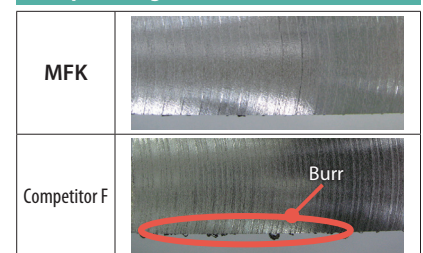


Competitor E

Cutting Conditions: $V_c = 180$ m/min, $f_z = 0.3$ mm/t, $a_p \times a_e = 3 \times 78$ mm, Dry Workpiece: FCD600

Burr Comparison

Sharp Cutting Prevents Burr Formation

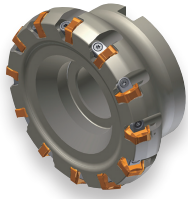


← Cutting Direction

Point 3

Toolholder lineup to meet various applications

Fine and Extra Fine Pitch Types Available.



Fine Pitch (Example: $\phi 125$ 12 inserts)

Recommended for Unstable Setups
General Purpose for Wide Application Ranges



Extra Fine Pitch (Example: $\phi 125$ 18 inserts)

Recommended for Rigid Setups
Finer Pitch for Higher Efficiency

Point 4

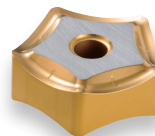
Chipbreaker Lineup for Wide Range of Applications



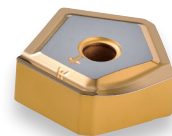
General Purpose:
GM Chipbreaker



Heavy Duty:
GH Chipbreaker



Finishing:
GL Chipbreaker
(Ground)



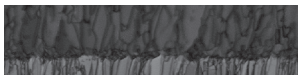
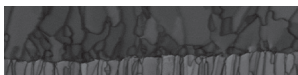
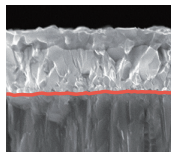
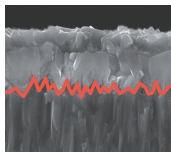
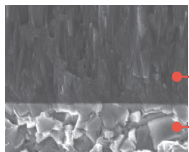
Wiper Edge:
W Chipbreaker
(Ground)

Point 5

Long Tool Life and Stable Machining

CA420M Features Advanced CVD Coated CRIOS Technology.



Longer Tool Life	Prevents Film Peeling	Increased Edge Strength
Controlled α -Al ₂ O ₃ crystal growth for improving wear resistance and fracture resistance.	40 % improved film adhesion by optimized interface.	Higher film strength and fracture resistance with high aspect ratio TiCN.
 CRIOS Technology  Conventional	 CRIOS Technology  Conventional	 TiCN Layer Carbide Substrate CRIOS Technology
CRIOS Technology is Kyocera's original CVD coating technology.		

Insert Grade Lineup



Long Tool Life
(1st Recommendation)
CA420M



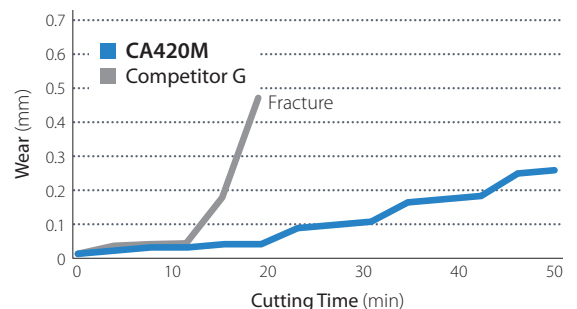
Stable Machining
PR1510



Fracture Resistance
PR1525

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

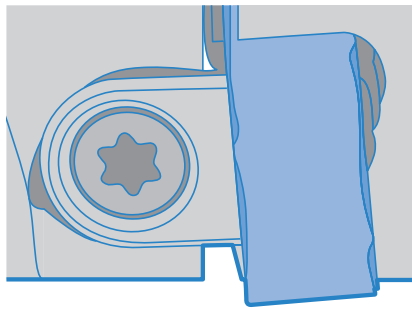
Wear Resistance Comparison (In-house Evaluation)



Cutting Conditions: $V_c = 200$ m/min, $f_z = 0.3$ mm/t, $a_p \times a_e = 2.0 \times 80$ mm, Dry Workpiece: FCD450

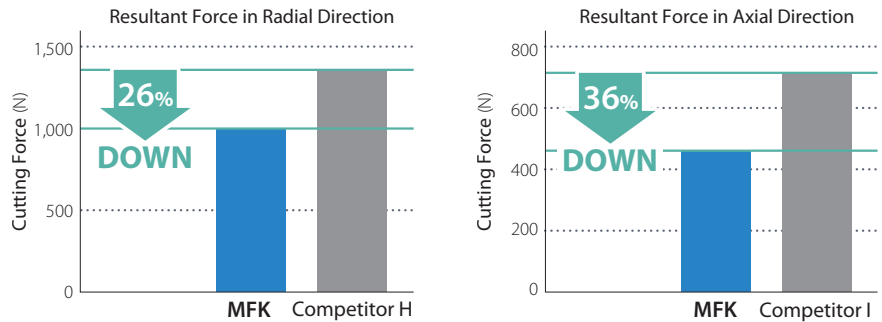
Ceramic Grades for High Speed and High Efficiency Machining

Low cutting force ceramic insert with chipbreaker controls edge chipping.



Rake Angle +6.7°

Cutting Force Comparison (In-house Evaluation)



Cutting Conditions: $V_c = 600$ m/min, $f_z = 0.1 - 0.25$ mm/t, $a_e \times a_p = 62.5 \times 2$ mm, DRY Workpiece: FC250, $\phi 125$, 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.

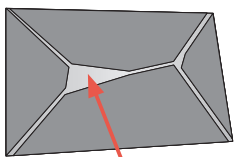
KS6050

Less Grain Boundary Phase



Stable Machining Without Chipping

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



Grain Boundary Phase

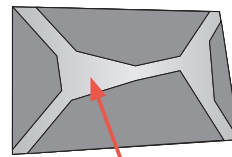
Conventional Grade

More Grain Boundary Phase



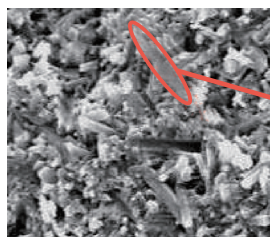
Unstable Machining Due to Chipping

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



Grain Boundary Phase

Point 2 Sudden Fracture Prevention

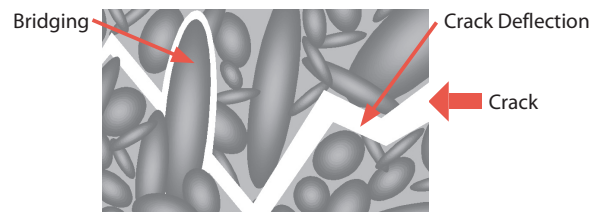


KS6050 has higher aspect ratio compared with conventional grade.

Aspect Ratio = L/d

Crack Propagation

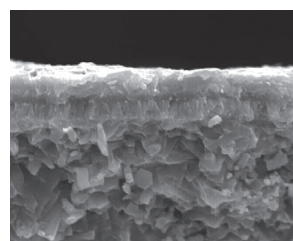
Fracture Resistance Improvement



Large Aspect Ratio \Rightarrow Controls Crack Propagation

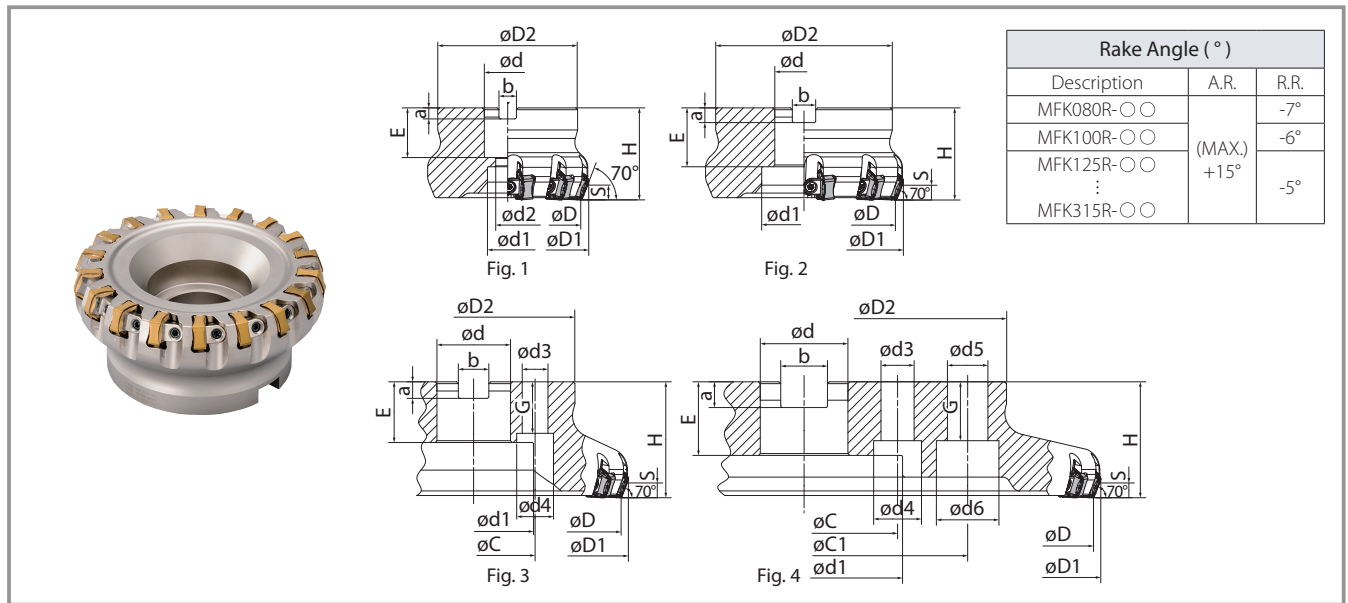
CS7050 First Recommendation for Nodular Cast Iron

Wear resistance improvement due to high coating adhesion.
Suitable for high speed cutting.



- High Wear Resistant Phase (TiC Base)
- Special Al_2O_3 Phase
- High Adhesion Phase (TiN Base)
- Si_3N_4 Substrate

MFK Face Mill



Toolholder Dimensions


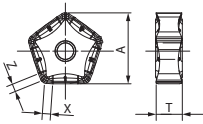

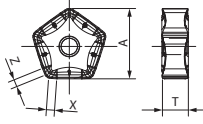

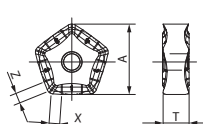

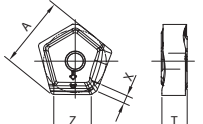

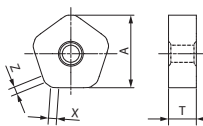

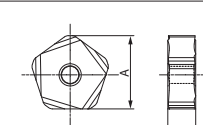
Bore Dia.	Description	Stock	No. of inserts	Dimensions (mm)																	Drawing	Weight (kg)			
				øD	øD1	øD2	ød	ød1	ød2	H	E	a	b	s	ød3	ød4	ød5	ød6	øC	øC1			G		
Inch Spec	Fine Pitch	MFK080R-11-8T	●	8	80	89	76	31.75	26	17	63	32	8	12.7	6.0	-	-	-	-	-	-	-	Fig. 1	1.76	
		MFK100R-11-10T	●	10	100	109	96	31.75	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	-		38	11	19.1		-	-	-	-	-	-	-	-	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	63	32	8	12.7	6.0	-	-	-	-	-	-	-	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	-		38	11	19.1		-	-	-	-	-	-	-	-	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	63	24	7	12.4	6.0	-	-	-	-	-	-	-	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	-		33	9	16.4		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	63	24	7	12.4	6.0	-	-	-	-	-	-	-	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	-		33	9	16.4		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	Description	Spare Parts				Applicable Inserts
	Wedge	Wedge Screw	Wrench	Mounting Bolt			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	MFK080R-11-8T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-10T				HH16X40		MFK100R-11-10T-M				HH16X40	
MFK125R-11-12T				-		MFK125R-11-12T-M				-	
MFK160R-11-16T				-		MFK160R-11-16T-M				-	
MFK200R-11-20T				-		MFK200R-11-20T-M				-	
MFK250R-11-24T				-		MFK250R-11-24T-M				-	
MFK315R-11-28T				-		MFK315R-11-28T-M				-	
MFK080R-11-10T	C09N	W6X18N	TT-15	HH16X40	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515	MFK080R-11-10T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM PNMG1106XNEN-GH PNEG1106XNEN-GL PNEG1106XNER-W PNEA1106XNTN-T01020 PNEG1106XNTR-T00515
MFK100R-11-14T				HH16X40		MFK100R-11-14T-M				HH16X40	
MFK125R-11-18T				-		MFK125R-11-18T-M				-	
MFK160R-11-22T				-		MFK160R-11-22T-M				-	
MFK200R-11-28T				-		MFK200R-11-28T-M				-	
MFK250R-11-36T				-		MFK250R-11-36T-M				-	
MFK315R-11-44T				-		MFK315R-11-44T-M				-	

Applicable Inserts

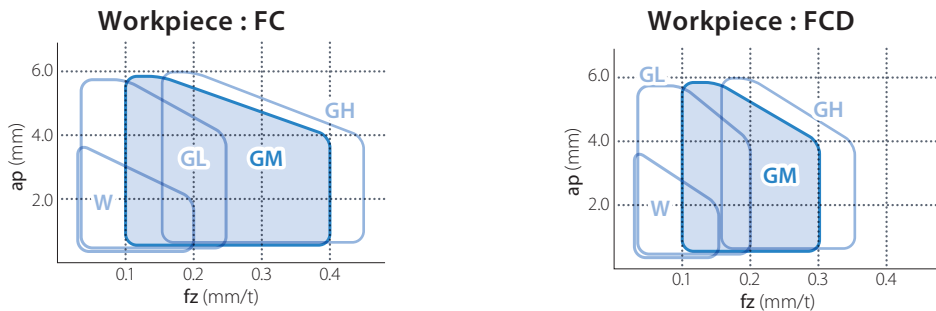
Insert	Description	Dimensions (mm)				CVD Coated Carbide	MEGACOAT NANO		Silicon Nitride Ceramic	CVD Silicon Nitride Ceramic	
		A	T	X	Z		CA420M	PR1510			PR1525
 General		PNMG1106XNEN-GM	17.23	6.35	2.0	2.0	●	●	●	-	-
 Tough Edge		PNMG1106XNEN-GH	17.23	6.35	2.0	2.0	●	●	●	-	-
 Surface Finish Oriented		PNEG1106XNEN-GL	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	-	-	-	●	●
 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



Notes :

- When using W (wiper), please use together with GM or GH. (Not recommended for use with GL)
- 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

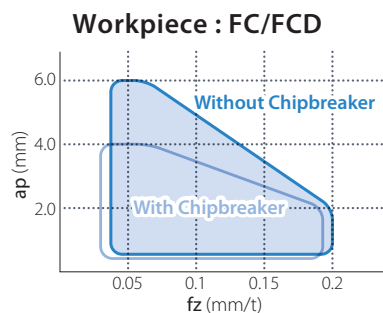
Without Chipbreaker

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

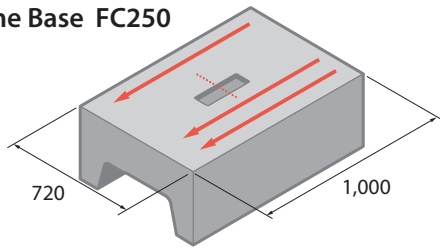
Workpiece Material	Insert Grade	Cutting Speed (m/min)	Edge Preparation	Feed per Tooth fz (mm/t)				
				0.06	0.1	0.2	0.3	0.4
Gray Cast Iron (FC)	KS6050 ★ CS7050 ☆	600 – 900 – 1200	0.05 × 15°		● 0.1			
Nodular Cast Iron (FCD)	KS6050 ☆ CS7050 ★	400 – 600 – 900						

Recommended Application Range (Ceramic)



Case Studies

Machine Base FC250



$V_c = 160$ m/min
 $f_z = 0.16$ mm/t ($V_f = 782$ mm/min)
 $a_p \times a_e = 3 \times 100$ mm
 Dry
 MFK125R-11-12T (12 Inserts)
 PNMG1106XNEN-GM PR1510

Chip Removal Rate

PR1510 **235 cc/min**

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

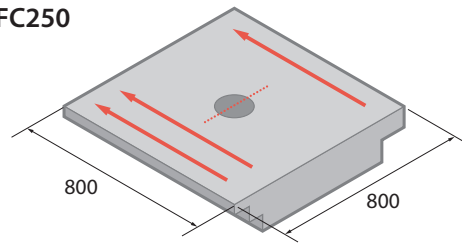
Efficiency



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

(User Evaluation)

Base FC250



$V_c = 160$ m/min
 $f_z = 0.18$ mm/t ($V_f = 917$ mm/min)
 $a_p \times a_e = 3 \times 140$ mm
 Dry
 MFK200R-11-20T (20 Inserts)
 PNMG1106XNEN-GM CA420M

Chip Removal Rate

CA420M **385 cc/min**

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

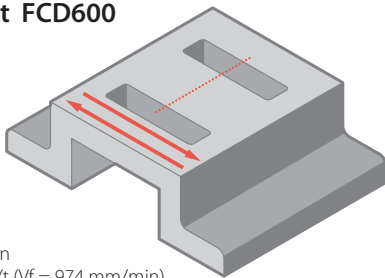
Efficiency



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

(User Evaluation)

Mold Part FCD600



$V_c = 90$ m/min
 $f_z = 0.34$ mm/t ($V_f = 974$ mm/min)
 $a_p \times a_e = 2 \times 60$ mm
 Dry
 MFK080R-11-8T (8 Inserts)
 PNMG1106XNEN-GM PR1525

Machining Efficiency

PR1525 **3 pcs/edge**

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

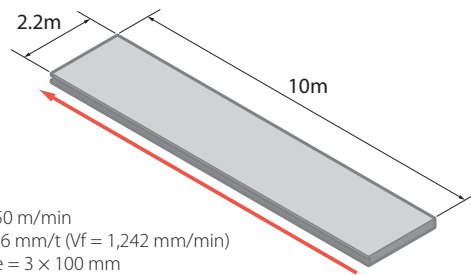
Tool Life



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

(User Evaluation)

Bed FC300



$V_c = 150$ m/min
 $f_z = 0.26$ mm/t ($V_f = 1,242$ mm/min)
 $a_p \times a_e = 3 \times 100$ mm
 Dry
 MFK160R-11-16T (16 Inserts)
 PNMG1106XNEN-GM CA420M

Chip Removal Rate

CA420M **372 cc/min**

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

Efficiency



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

(User Evaluation)