

THE NEW VALUE FRONTIER



Multi-edge cutter for cast iron | **MFK**

# 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



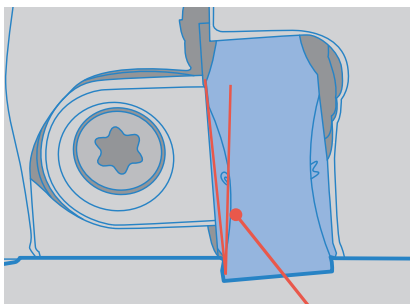
Cutter for cast iron

# MFK

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

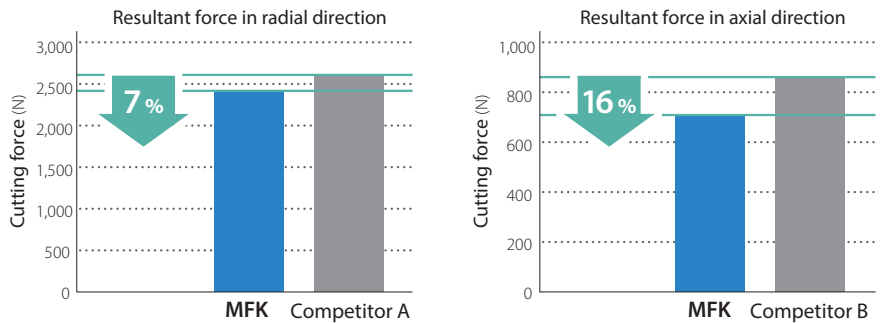
## 1 Low cutting forces prevent chattering

Low cutting forces with helical cutting edge design.



A.R. Max.  
+15°

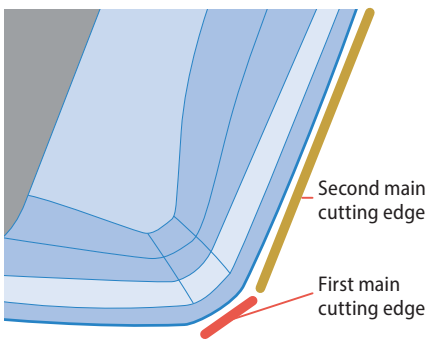
Cutting force comparison (In-house evaluation)



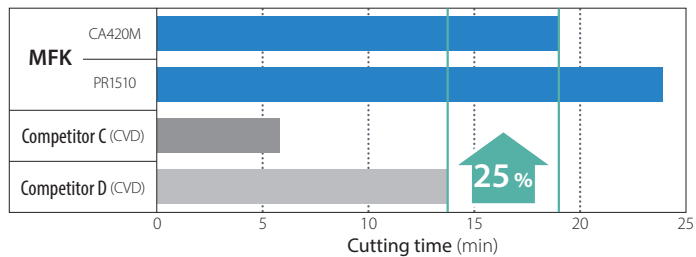
Cutting conditions:  $V_c = 180$  m/min,  $f_z = 0.3$  mm/t,  $a_p \times a_e = 3.0 \times 62$  mm, dry  
Workpiece: GGG60,  $\phi 125$

## 2 Tough and reliable insert construction prevents fracturing

Tough and reliable dual angle edge design.

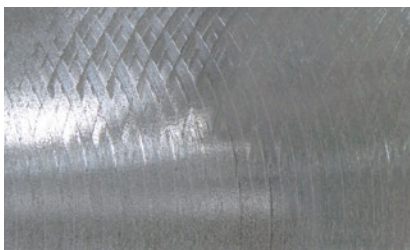


Fracture resistance comparison (In-house evaluation)

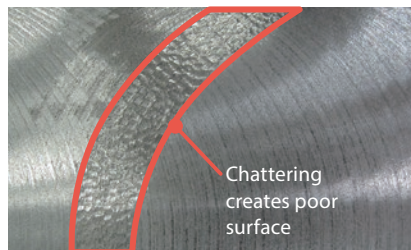


Cutting conditions:  $V_c = 300$  m/min,  $f_z = 0.5$  mm/t,  $a_p = 2.0$  mm, wet  
Workpiece: Nodular cast iron (4 bores)

Surface finish comparison (In-house evaluation)



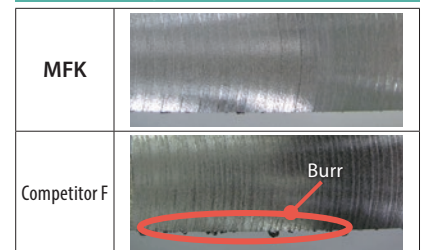
MFK



Competitor E

Burr comparison

Sharp cutting prevents burr formation



← Cutting direction

Cutting conditions:  $V_c = 180$  m/min,  $f_z = 0.3$  mm/t,  $a_p \times a_e = 3 \times 78$  mm, dry  
Workpiece: GGG60

### 3 Toolholder lineup to meet various applications

Fine and extra fine pitch types available.



**Fine pitch** (Example:  $\phi 125$ , 12 inserts)

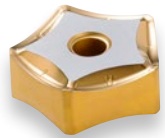
- Recommended for unstable setups
- General purpose for wide application ranges



**Extra fine pitch** (Example:  $\phi 125$ , 18 inserts)

- Recommended for rigid setups
- Finer pitch for higher efficiency

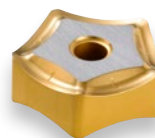
### 4 Chipbreaker lineup for wide range of applications



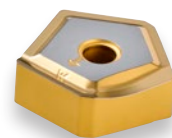
General purpose:  
GM chipbreaker



Heavy duty:  
GH chipbreaker



Finishing:  
GL chipbreaker  
(Ground)



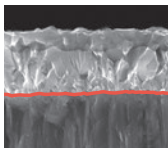
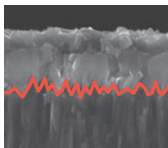
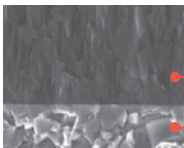


Wiper edge:  
W chipbreaker  
(Ground)

### 5 Long tool life and stable machining

CA420M features advanced CVD coated CRIOS technology.



Longer tool life	Prevents film peeling	Increased edge strength
Controlled $\alpha$ -Al <sub>2</sub> O <sub>3</sub> 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.
 <b>CRIOS technology</b>  Conventional	 <b>CRIOS technology</b>  Conventional	 <b>CRIOS technology</b> TiCN layer Carbide substrate
CRIOS technology is Kyocera's original CVD coating technology.		

Insert grade lineup



Long tool life  
(1st recommendation)  
CA420M



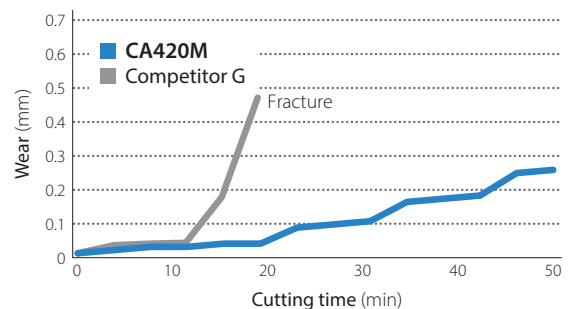
Stable machining  
PR1510



Fracture resistance  
PR1525

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

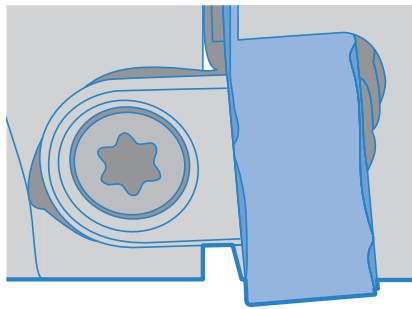
Wear resistance comparison (In-house evaluation)



Cutting conditions: Vc = 200 m/min, fz = 0.3 mm/t, ap x ae = 2.0 x 80 mm, dry  
Workpiece: Nodular cast iron

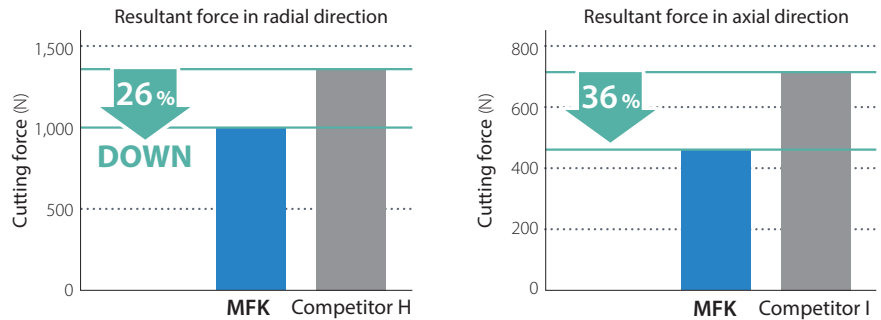
# Ceramic grades for high speed and high efficiency machining

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: GG25,  $\phi 125$ , 1 insert

**KS6050** First recommendation for gray cast iron

## 1 High wear resistance enables stable machining

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

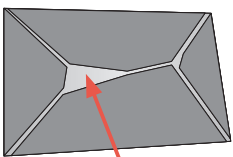
**KS6050**

Less grain boundary phase



Stable machining without chipping

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



Grain boundary phase

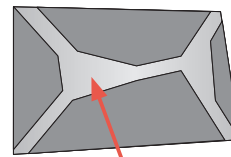
Conventional grade

More grain boundary phase



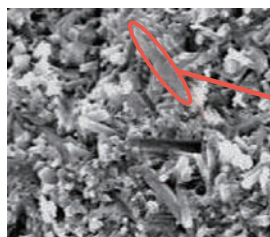
Unstable machining due to chipping

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



Grain boundary phase

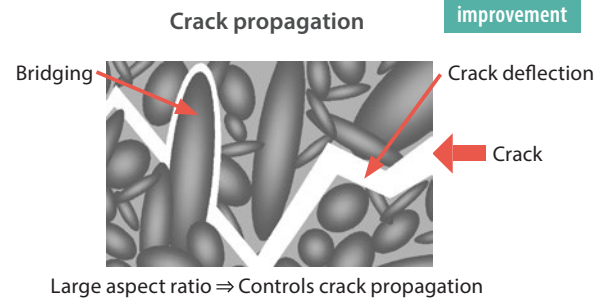
## Point 2 Sudden fracture prevention



**KS6050** has higher aspect ratio compared with conventional grade.

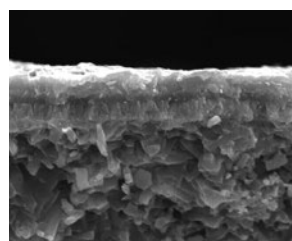
Aspect ratio =  $L/d$

Fracture resistance improvement



**CS7050** First recommendation for nodular cast iron

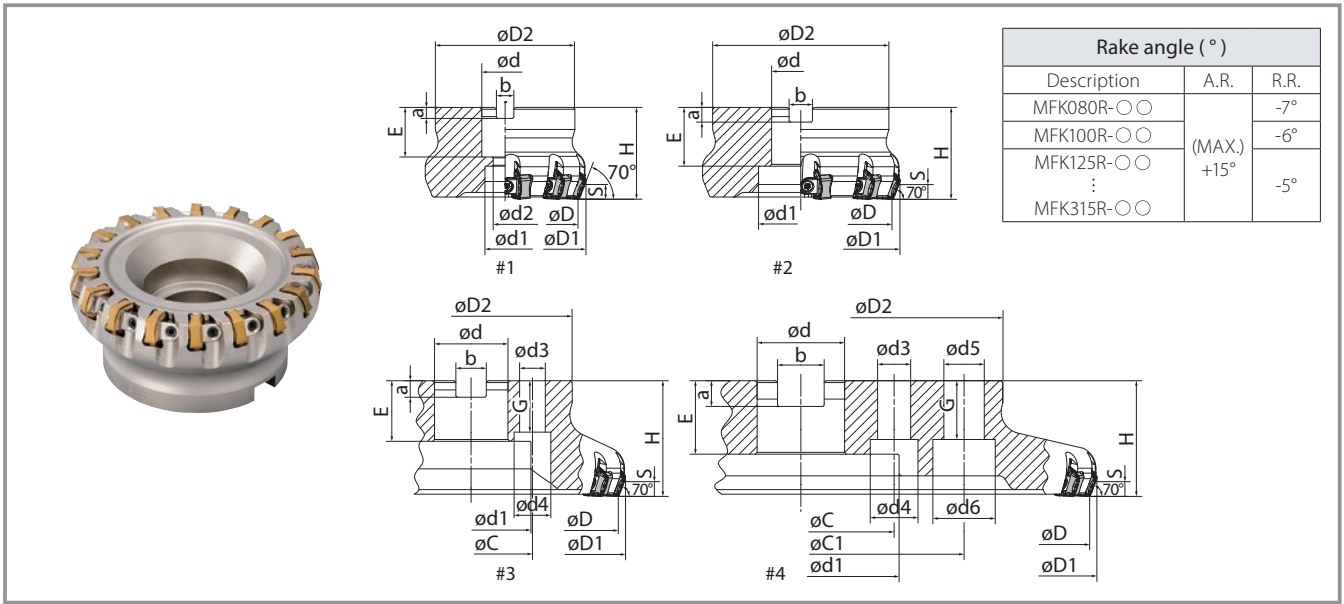
- Wear resistance improvement due to high coating adhesion
- Suitable for high speed cutting



- 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


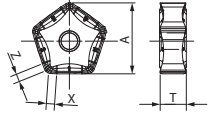

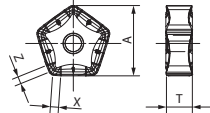

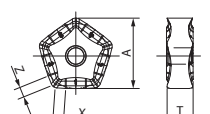

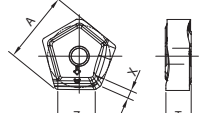

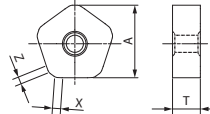

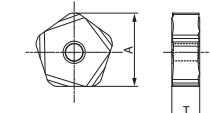
Bore dia.	Description	Availability	No. of inserts	Dimensions (mm)														Drawing	Weight (kg)					
				øD	øD1	øD2	ød	ød1	ød2	H	E	a	b	s	ød3	ød4	ød5			ød6	øC	øC1	G	
Fine pitch	MFK080R-11-8T-M	●	8	80	89	76	27	20	13	63	24	7	12.4	6.0	-	-	-	-	-	-	-	#1	1.87	
	MFK100R-11-10T-M	●	10	100	109	96	32	26	17		28	8	14.4		-	-	-	-	-	-	-	-	#1	2.99
	MFK125R-11-12T-M	●	12	125	134	100	40	55	-		33	9	16.4		-	-	-	-	-	-	-	-	#2	3.56
	MFK160R-11-16T-M	●	16	160	169	100	40	70	-		33	9	16.4		14	20	-	-	66.7	-	28	-	#3	4.51
	MFK200R-11-20T-M	●	20	200	209	142	60	110	-		40	14	25.7		18	26	-	-	101.6	-	32	-	#3	7.35
	MFK250R-11-24T-M	●	24	250	259	142	60	110	-		40	14	25.7		18	26	-	-	101.6	-	32	-	#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	-	#4	19.41
Extra fine pitch	MFK080R-11-10T-M	●	10	80	89	76	27	20	13	63	24	7	12.4	6.0	-	-	-	-	-	-	-	#1	1.81	
	MFK100R-11-14T-M	●	14	100	109	96	32	26	17		28	8	14.4		-	-	-	-	-	-	-	-	#1	2.86
	MFK125R-11-18T-M	●	18	125	134	100	40	55	-		33	9	16.4		-	-	-	-	-	-	-	-	#2	3.38
	MFK160R-11-22T-M	●	22	160	169	100	40	70	-		33	9	16.4		14	20	-	-	66.7	-	28	-	#3	4.32
	MFK200R-11-28T-M	●	28	200	209	142	60	110	-		40	14	25.7		18	26	-	-	101.6	-	32	-	#3	7.10
	MFK250R-11-36T-M	●	36	250	259	142	60	110	-		40	14	25.7		18	26	-	-	101.6	-	32	-	#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	-	#4	18.92

● : Available 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-11-10T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM	MFK080R-11-8T-M	C09N	W6X18N	TT-15	HH12X35	PNMG1106XNEN-GM
MFK100R-11-14T-M				HH16X40	PNMG1106XNEN-GH	MFK100R-11-10T-M				HH16X40	PNMG1106XNEN-GH
MFK125R-11-18T-M				-	PNEG1106XNEN-GL	MFK125R-11-12T-M				-	PNEG1106XNEN-GL
MFK160R-11-22T-M				-	PNEG1106XNER-W	MFK160R-11-16T-M				-	PNEG1106XNER-W
MFK200R-11-28T-M				-	PNEA1106XNTN-T01020	MFK200R-11-20T-M				-	PNEA1106XNTN-T01020
MFK250R-11-36T-M				-	PNEG1106XNTR-T00515	MFK250R-11-24T-M				-	PNEG1106XNTR-T00515
MFK315R-11-44T-M				-	-	MFK315R-11-28T-M				-	-

## Applicable inserts

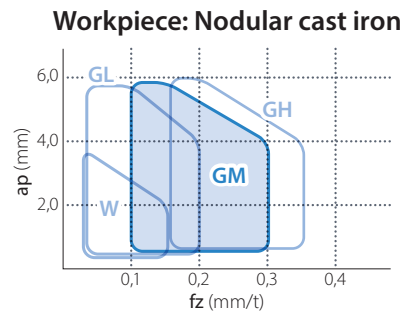
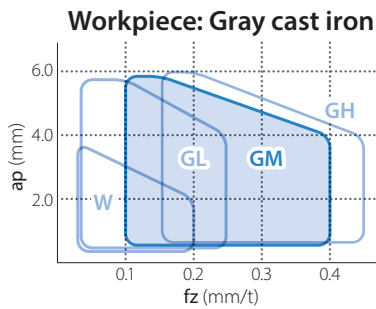
Insert		Description	Dimensions (mm)				CVD Coated carbide	MEGACOAT NANO		Si3N4 ceramic	CVD coated Si3N4 ceramic
			A	T	X	Z	CA420M	PR1510	PR1525	KS6050	CS7050
 General		PNMG1106XNEN-GM	17.23	6.35	2.0	2.0	●	●	●	—	—
 Tough edge		PNMG1106XNEN-GH	17.23	6.35	2.0	2.0	●	●	●	—	—
 Surface finish oriented		PNEG1106XNEN-GL	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	—	—	—	●	●
 High speed (With chipbreaker)		PNEG1106XNTR-T00515	17.07	6.35	—	—	—	—	—	●	●

● : Available

## 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	CA420M	170 – 230 – 300	GM ★			● 0.25		
	PR1510	120 – 180 – 250	GH ☆				● 0.3	
	PR1525		GL		● 0.12			
Nodular cast iron	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

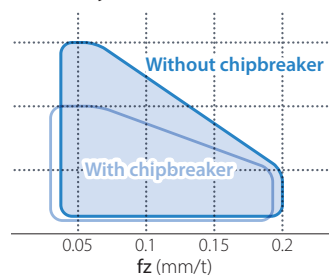
Workpiece material	Insert grade	Cutting speed (m/min)	Edge preparation	Feed per tooth fz (mm/t)				
				0.05	0.1	0.2	0.3	0.4
Gray cast iron	KS6050 ★ CS7050 ☆	600 – 900 – 1200	0.10 × 20°		● 0.1			
Nodular cast iron	KS6050 ☆ CS7050 ★	400 – 600 – 900						

### 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	KS6050 ★ CS7050 ☆	600 – 900 – 1200	0.05 × 15°		● 0.1			
Nodular cast iron	KS6050 ☆ CS7050 ★	400 – 600 – 900						

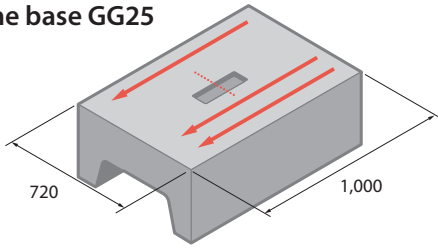
## Recommended application range (Ceramic)

### Workpiece: Gray cast iron, nodular cast iron



## Case studies

### Machine base GG25



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

**PR1510** **235 cc/min**

#### Efficiency

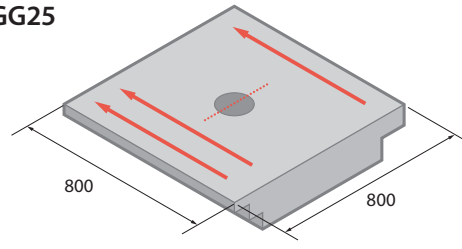


Competitor J  
 (12 Inserts) **125 cc/min**

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

(User evaluation)

### Base GG25



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

**CA420M** **385 cc/min**

#### Efficiency

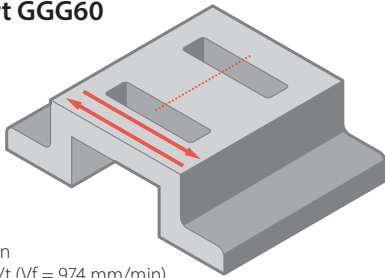


Competitor K  
 (12 Inserts) **167 cc/min**

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

(User evaluation)

### Mold part GGG60



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

**PR1525** **3 pcs/edge**

#### Tool Life

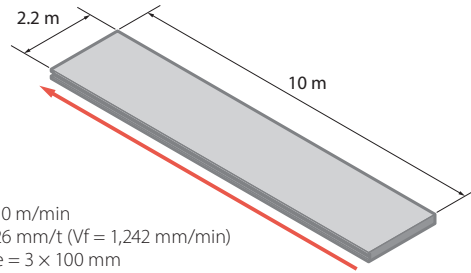


Competitor L  
 (8 Inserts) **1 pcs/edge**

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

(User evaluation)

### Bed GG30



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

**CA420M** **372 cc/min**

#### Efficiency



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

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

(User evaluation)