

THE NEW VALUE FRONTIER



High-Efficiency Mill

MFPN



Low cutting force and excellent fracture resistance



Five Advantages of BIG Pentagon

- 1** Economical Roughing and general-purpose facemill with 10-cornered pentagonal inserts
- 2** New design Low cutting force due to helical cutting-edge design
- 3** Toughness Fractures suppressed by double-edge position
- 4** New chipbreaker Chip evacuation improved by 3-dimensional chipbreaker
- 5** New grades Long tool life with PR12-Series MEGACOAT carbide inserts



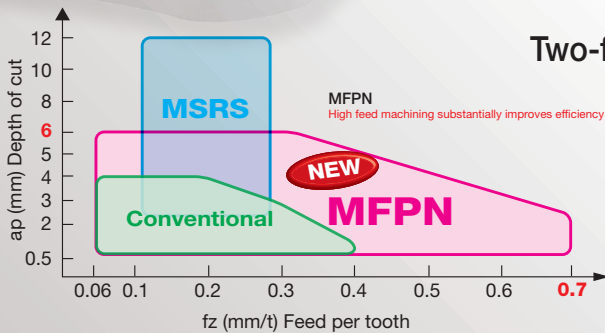
ADVANCING PRODUCTIVITY

Pioneering a new era

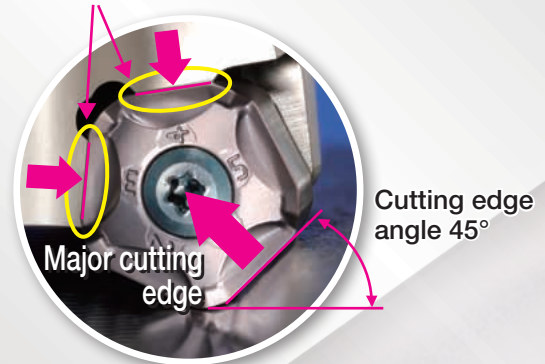


Five Advantages of BIG Pentagon

1 Roughing and general-purpose facemill with 10-cornered pentagonal inserts



Two-face restraint



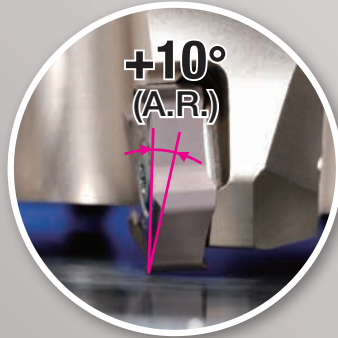
- Pentagonal double-sided tip excellent for constraining stability
- 10-cornered insert cuts cost per corner

Highly stabilized accuracy due to two-face constraint facing the major cutting edge

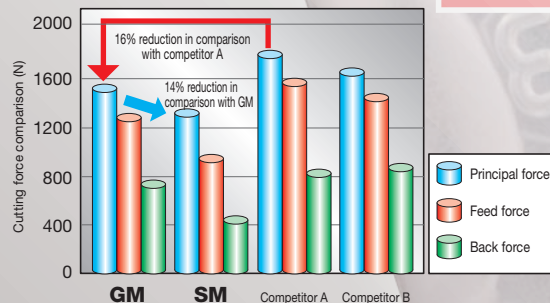
2 Low cutting force due to helical cutting-edge design



- Helical cutting-edge design with low cutting force reduces chattering
- Helical cutting-edge design
 - High rake angle (A.R. Max. +10°)



● Cutting force comparison

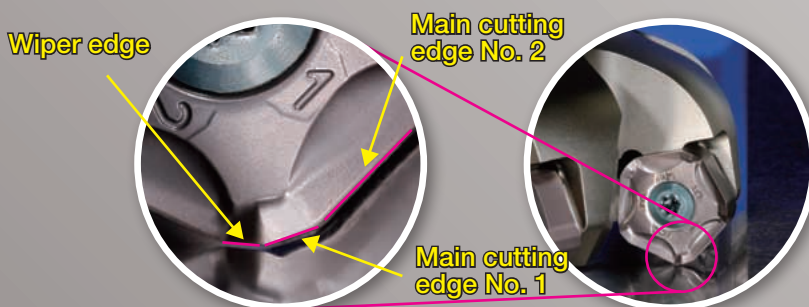


● Cutting conditions
Workpiece :S50C
Vc=150m/min, fz=0.1mm/t, apxae=5x105 mm, Machine :M/C(BT50)

3 Fractures suppressed with double-edge position

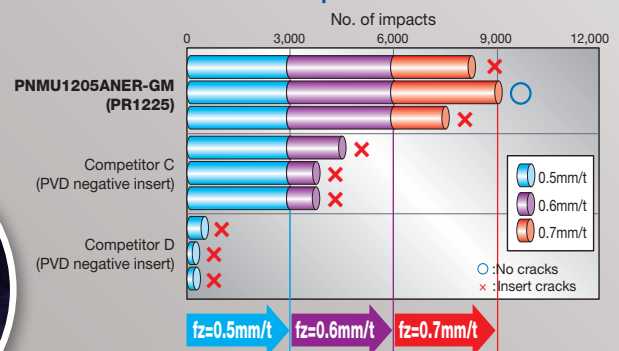


- Double-edge position
 - Major cutting edge makes chips thin, thereby reducing impact load at entrance and exit of workpiece



Double-edge position

● Fracture resistance comparison



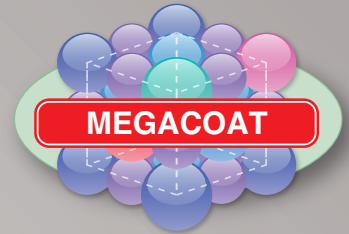
● Cutting conditions
Workpiece :SCM440(38-42HS)
Machine :BT50 M/C
Vc=100m/min, fz=0.5-0.7mm/t,
apxae=2x100mm (workpiece with 20mm width slot)

High-Efficiency Mill

MFPN

Milling-Facing PeNtagonal type

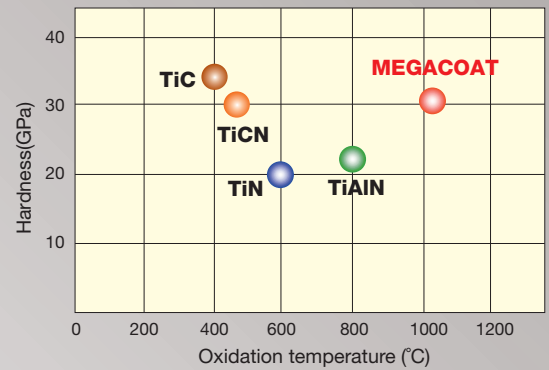
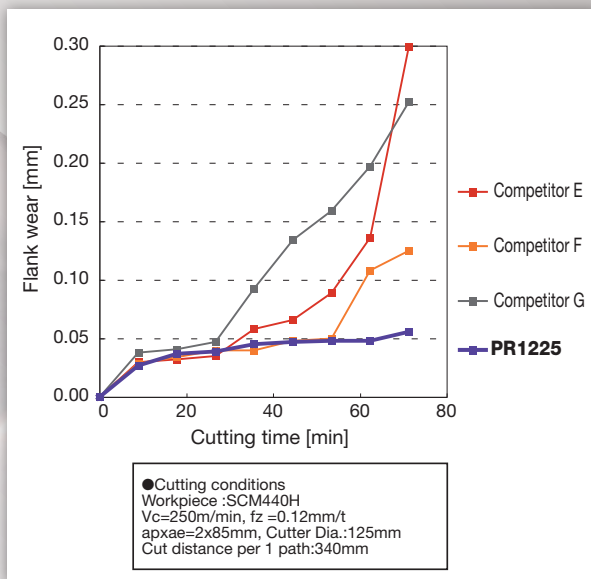
5 Long tool life with PR12-Series MEGACOAT carbide inserts



MEGACOAT

- Long tool life and high-speed milling due to high hardness and high oxidation resistance

Wear comparison



Insert grades	Workpiece
PR1225	Steel/Stainless steel
PR1210	Cast iron/Titanium alloy

4 3-dimensional chipbreaker improves chip evacuation

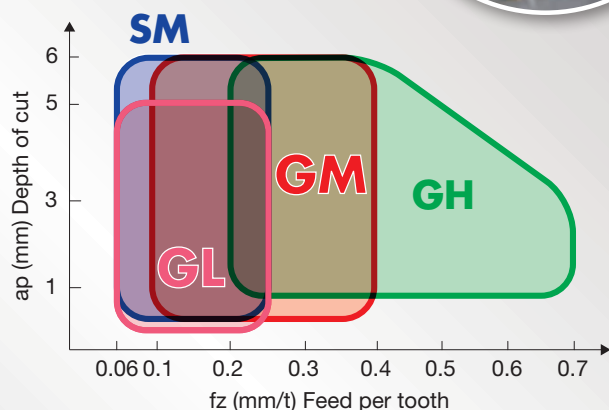


Smooth chip evacuation reduces chip-biting

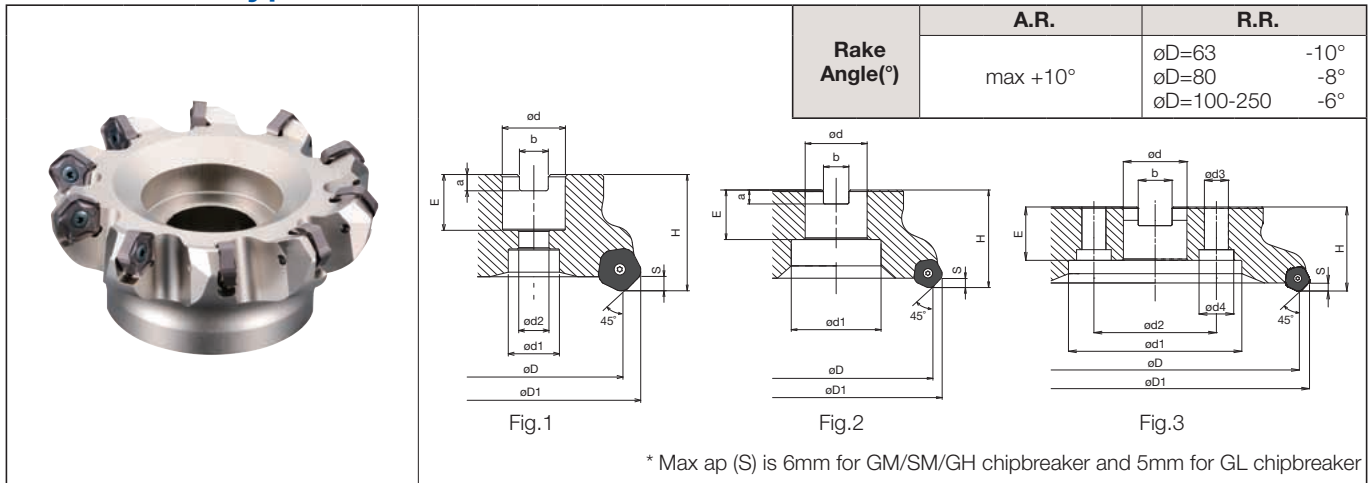
- 4-types of chipbreakers enable coverage of a wide range of milling conditions



Chipbreaker	Applications	Shape
GM	General	
SM	Low cutting force	
GH	Heavy milling	
NEW GL	Surface finish oriented	



MFPN 45 type




Holder Dimension

Description		Stock	No. of Insert	Dimension(mm)											Shape	Weight (kg)	Shim	
				øD	øD1	ød	ød1	ød2	H	E	a	b	ød3	ød4				
Bore Dia. Inch spec	Coarse pitch	MFPN 45080R-5T	●	5	80	93	25.4	22	13	50	27	6	9.5	-	-	Fig.1	1.1	Yes
		MFPN 45100R-6T	●	6	100	113	31.75	48	32		8	12.7	-				-	
		MFPN 45125R-7T	●	7	125	138	38.1	58	63	36	10	15.9		-	-	Fig.2		
		MFPN 45160R-8T	●	8	160	173	50.8	72		38	11	19.1	-				-	
		MFPN 45200R-10T	●	10	200	213	47.625	110	101.6	40	14	25.4		18	26	Fig.3		
		MFPN 45250R-12T	●	12	250	263				40	14	25.4	18				26	
	Cross pitch	MFPN 45080R-6T	●	6	80	93	25.4	22	13	50	27	6	9.5	-	-	Fig.1	1.1	-
		MFPN 45100R-8T	●	8	100	113	31.75	48	32		8	12.7	-				-	
		MFPN 45125R-10T	●	10	125	138	38.1	58	63	36	10	15.9		-	-	Fig.2		
		MFPN 45160R-12T	●	12	160	173	50.8	72		38	11	19.1	-				-	
		MFPN 45200R-14T	●	14	200	213	47.625	110	101.6	40	14	25.4		18	26	Fig.3		
		MFPN 45250R-16T	●	16	250	263				40	14	25.4	18				26	
	Extra cross pitch	MFPN 45080R-8T	●	8	80	93	25.4	22	13	50	27	6	9.5	-	-	Fig.1	1.1	-
		MFPN 45100R-10T	●	10	100	113	31.75	48	32		8	12.7	-				-	
		MFPN 45125R-13T	●	13	125	138	38.1	58	63	36	10	15.9		-	-	Fig.2		
		MFPN 45160R-16T	●	16	160	173	50.8	72		38	11	19.1	-				-	
		MFPN 45200R-18T	●	18	200	213	47.625	110	101.6	40	14	25.4		18	26	Fig.3		
		MFPN 45250R-20T	●	20	250	263				40	14	25.4	18				26	
mm spec	Coarse pitch	MFPN 45063R-4T-M	●	4	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig.1	0.5	Yes
		MFPN 45080R-5T-M	●	5	80	93	27	22	13		50	24	7				12.4	
		MFPN 45100R-6T-M	●	6	100	113	32	48	63	30		8	14.4	-	-	Fig.2	1.4	
		MFPN 45125R-7T-M	●	7	125	138	40	58		66.7	32	9	16.4				14	
		MFPN 45160R-8T-M	●	8	160	173			68		66.7	32	9	16.4	14	20		
		MFPN 45200R-10T-M	●	10	200	213	60	110	101.6	40	14	25.7	18	26			Fig.3	
	MFPN 45250R-12T-M	●	12	250	263	60				110	101.6	40			14	25.7		18
	Cross pitch	MFPN 45063R-5T-M	●	5	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig.1	0.5	-
		MFPN 45080R-6T-M	●	6	80	93	27	22	13		50	24	7				12.4	
		MFPN 45100R-8T-M	●	8	100	113	32	48	63	30		8	14.4	-	-	Fig.2	1.4	
		MFPN 45125R-10T-M	●	10	125	138	40	58		66.7	32	9	16.4				14	
		MFPN 45160R-12T-M	●	12	160	173			68		66.7	32	9	16.4	14	20		
		MFPN 45200R-14T-M	●	14	200	213	60	110	101.6	40	14	25.7	18	26			Fig.3	
	MFPN 45250R-16T-M	●	16	250	263	60				110	101.6	40			14	25.7		18
	Extra cross pitch	MFPN 45063R-6T-M	●	6	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig.1	0.5	-
		MFPN 45080R-8T-M	●	8	80	93	27	22	13		50	24	7				12.4	
		MFPN 45100R-10T-M	●	10	100	113	32	48	63	30		8	14.4	-	-	Fig.2	1.3	
		MFPN 45125R-13T-M	●	13	125	138	40	58		66.7	32	9	16.4				14	
		MFPN 45160R-16T-M	●	16	160	173			68		66.7	32	9	16.4	14	20		
		MFPN 45200R-18T-M	●	18	200	213	60	110	101.6	40	14	25.7	18	26			Fig.3	
		MFPN 45250R-20T-M	●	20	250	263				60	110	101.6			40	14		

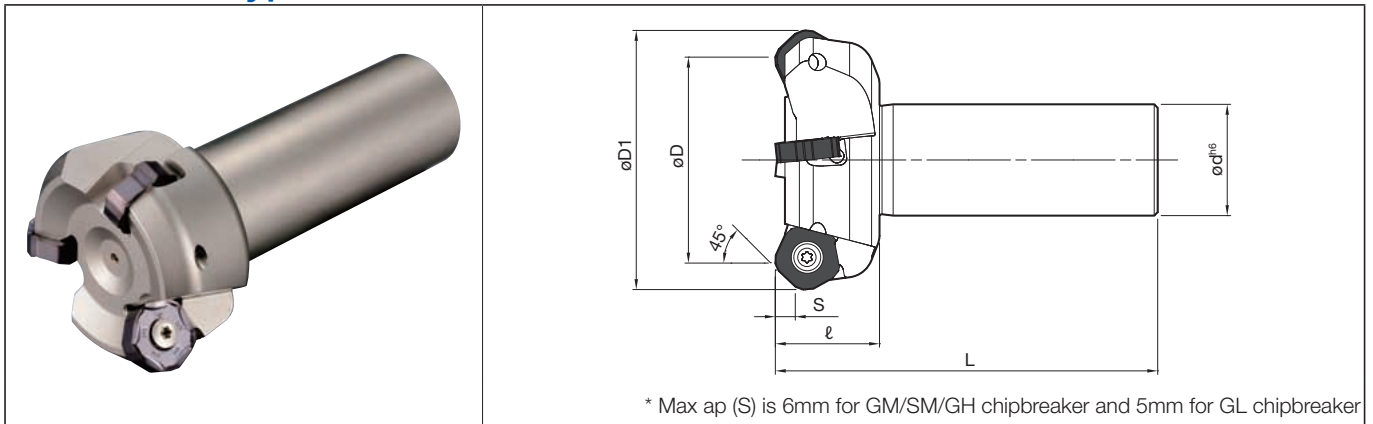
●:Std. Stock

● Spare parts (mm / inch common spec)

Description		Spare Parts							
		Clamp Screw	Wrench		Shim	Shim Screw	Wrench	Anti-seize Compound	Arbar Clamp Screw
			TT	DTM					
Coarse pitch	MFPN 45063R-4T-M	SB-50140TR	TT-15	-	MFPN-45	SPW-7050	LW-5	MP-1	HH10x30
	MFPN 45080R-5T-(M)								HH12x40
	MFPN 45100R-6T-(M) ⋮ 45250R-12T-(M)								for Insert Clamp Recommended torque is 4.2 Nm.
Cross pitch	MFPN 45063R-5T-M	SB-50140TR	TT-15	-	-	-	-	MP-1	HH10x30
	MFPN 45080R-6T-(M)								HH12x40
	MFPN 45100R-8T-(M) ⋮ 45250R-16T-(M)								for Insert Clamp Recommended torque is 4.2 Nm.
Extra cross pitch	MFPN 45063R-6T-M	SB-40140TRN	-	DTM-15	-	-	-	MP-1	HH10x30
	MFPN 45080R-8T-(M)								HH12x40
	MFPN 45100R-10T-(M) ⋮ 45250R-20T-(M)								for Insert Clamp Recommended torque is 3.5 Nm.

 Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

NEW ■ MFPN 45 type end mill



● Holder Dimension





Description	Stock	No. of Insert	Dimension(mm)						Rake Angle(°)		Spare Parts		
			øD	øD1	ød	L	ℓ	S	A.R. (MAX)	R.R.	Clamp Screw	Wrench	Anti-seize Compound
MFPN 45050R-S32-3T	●	3	50	63	32	110	30	6 (5)	+10°	-12°	SB-50140TR	TT-15	MP-1
45063R-S32-4T	●	4	63	76						-10°			
45080R-S32-5T	●	5	80	93						-8°			

 Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

Insert description

●Milling Inserts (with hole)

Classification of usage	P	Steel Die Steel	★	
	★ Roughing / 1st Choice ☆ Roughing / 2nd Choice ■ Finishing / 1st Choice □ Finishing / 2nd Choice (Hardened material is applicable only under 45HRC)	M	Stainless Steel	★
K		Gray Cast Iron Nodular Cast Iron		★
N		Non-ferrous Material		☆
S		Heat-resistant Alloy Titanium alloy	★	★
H		Hardened material		

Shape	Description	Dimension(mm)					MEGACOAT	
		A	T	ød	X	Z	PR1225	PR1210
Handled insert indicates Right-Hand  General	PNMU 1205ANER-GM	17.88	5.56	6.2	2.0	2.0	●	●
 Low cutting force	PNMU 1205ANER-SM						●	●
 Tough Edge (for heavy milling)	PNMU 1205ANER-GH	17.98	6.17				●	●
 High precision (For finishing)	PNEU 1205ANER-GL	17.51	5.56		2.7	2.7	●	●

●.Std. Stock


●Reference for selecting a facemill and insert suitable for each milling purpose

Milling Purpose	Facemill-type			Chipbreaker			
	Coarse pitch	Cross pitch	Extra cross pitch	GM	SM	GH	GL
General milling for steel and alloy steel		○		○			
Steel and alloy steel (to prevent chattering due to low rigidity machine or poor clamping power)	○				○		
Productivity oriented (Running cost decrease) (Over ap=4 mm, over fz=0.35 mm/t)	○					○	
Surface finish oriented	○	○					○
General milling for stainless steel		○			○		
Stainless steel (to prevent chattering due to low rigidity machine or poor clamping power)	○				○		
Cast iron (for processing efficiency improvement)			○	○			
Cast iron (Over ap=4 mm, over fz=0.35 mm/t)	○					○	

Case studies

FC250

- Construction machine part
- Vc=180m/min
- ap×ae=3~4 × 50mm (Roughing)
- ap×ae=0.5 × 50mm (Finishing)
- fz=0.15mm/t (Vf=520mm/min)
- DRY
- Cutter
MFPN45100R-6T (6 edges)
- Insert
PNEU1205ANER-GL (PR1210)

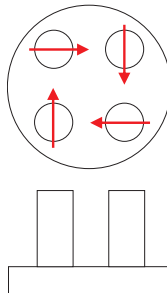


- This user applied two different cutters for roughing and finishing. MFPN was applicable for both roughing and finishing with only one cutter.
- This material is easy to chatter at finishing, but MFPN cutter (GL chipbreaker) realized better surface roughness within 4µmRz. (Conventional tool: 7µmRz)

Evaluation by the user

FCD500

- Construction machine part
- Vc=125m/min
- ap×ae=2~3 × 65mm
- fz=0.25mm/t (Vf=800mm/min)
- WET
- Cutter
MFPN45100R-8T (8 edges)
- Insert
PNMU1205ANER-GM (PR1210)



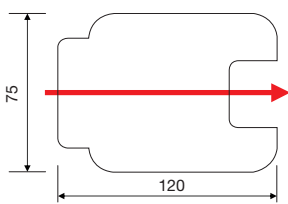
MFPN Cutter (PR1210)	460pcs/edge
Competitor A	200pcs/edge

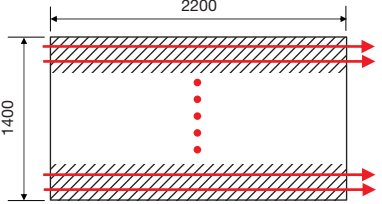
2.3 times longer tool life

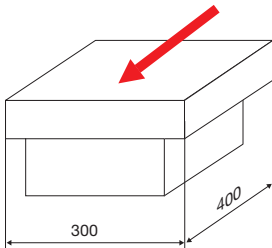
- MFPN cutter prevents chatter without strong noise compared with Competitor A.
- MFPN extended tool life to 2.3 times of the conventional tool.

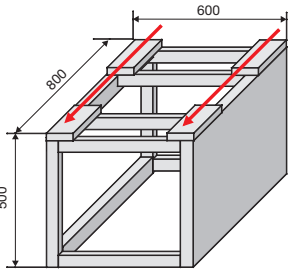
Evaluation by the user

Case studies

SCM440H	
<ul style="list-style-type: none"> ·Construction machine part ·Vc=250m/min ·apxae=2~3 x 75mm ·fz=0.15mm/t (Vf=900mm/min) ·DRY ·Cutter MFPN4580R-6T (6 edges) ·Insert PNMU1205ANER-SM (PR1225) 	<p>face milling</p>  <p style="text-align: right;">Milling efficiency increased 2.1 times</p>
MFPN Cutter (PR1225)	Chip removal 202cc/min
Competitor B	Chip removal 94cc/min
<ul style="list-style-type: none"> •MFPN cutter improved machining efficiency 2.1 times of the Competitor B without changing spindle load. •MFPN cutter was very stable at the entrance and exit of the machining. It controls chatter and remains stable even with low rigid machine. <p style="text-align: right;">Evaluation by the user</p>	

SS400	
<ul style="list-style-type: none"> ·Plate ·Vc=158m/min ·apxae=0.2 x 113mm ·fz=0.13mm/t (Vf=Vf=327mm/min) ·DRY ·Cutter MFPN45160R-8T (8 edges) ·Insert PNMU1205ANER-GM (PR1225) 	<p>Facing</p>  <p style="text-align: right;">Milling efficiency increased 3.3 times</p>
MFPN Cutter (PR1225)	Chip removal 7.4cc/min
Competitor C	Chip removal 2.2cc/min
<ul style="list-style-type: none"> •MFPN cutter machined stability at high table feed (3.3 times of Competitor C) without making chatter. •MFPN cutter was available for further machining even after the fixed tool life of the conventional tool. <p style="text-align: right;">Evaluation by the user</p>	

SCM415	
<ul style="list-style-type: none"> ·Plate ·Vc=180m/min ·apxae=3 x 80mm ·fz=0.15mm/t (Vf=690mm/min) ·DRY ·Cutter MFPN45125R-10T (10 edges) ·Insert PNMU1205ANER-GM (PR1225) 	
<p>[Conventional D] Vc=140m/min apxae=3x80mm fz=0.11mm/t (Vf=230mm/min)</p> <ul style="list-style-type: none"> •Even if the cutting speed and feed rate are raised up to the level of the conventional tool, the tool life of MFPN remains unchanged and milling efficiency increases by 2.6 times •MFPN vibrates less right at entrance and exit on workpiece with reduced cutting sound <p style="text-align: right;">Evaluation by the user</p>	

SUS304	
<ul style="list-style-type: none"> ·Case ·Vc=90m/min ·apxae=0.4 x 50mm ·fz=0.19mm/t (Vf=410mm/min) ·DRY ·Cutter MFPN45080R-6T (6 edges) ·Insert PNMU1205ANER-SM (PR1225) 	 <p style="text-align: right;">Milling efficiency increased 1.5 times</p>
MFPN Cutter (PR1225)	1.5pcs/edge
Competitor E (for roughing)	1 pcs/edge
<ul style="list-style-type: none"> •Even when the cutting depth, cutting speed and feed rate cannot be raised due to the low rigidity of a workpiece, MFPN facemill enables stable milling without chattering and also has an improved tool life of 1.5 times <p style="text-align: right;">Evaluation by the user</p>	

