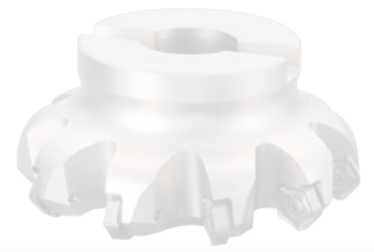


THE NEW VALUE FRONTIER



High-Efficiency Facemill

# MFPN



Low cutting force and excellent fracture resistance



## Five Advantages of BIG Pentagon



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



**2** Low cutting force due to helical cutting-edge design



**3** Fractures suppressed by double-edge position



**4** Chip evacuation improved by 3-dimensional chipbreaker



**5** Long tool life with PR12-Series MEGACOAT carbide inserts

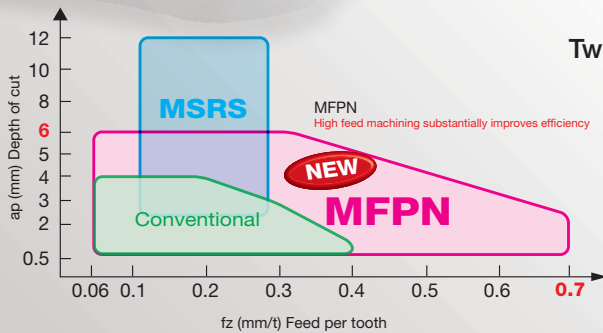
ADVANCING PRODUCTIVITY



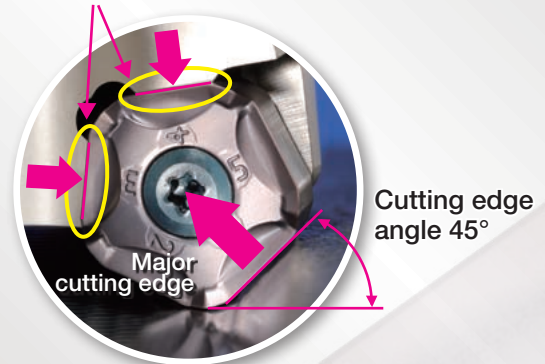
# Pioneering a new era

## Five Advantages of BIG Pentagon

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



Two-face restraint



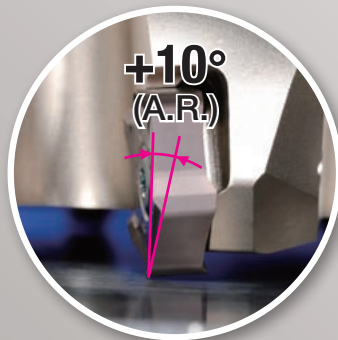
- Pentagonal double-sided tip excellent for constraining stability
- 10-cornered insert cuts cost per corner

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

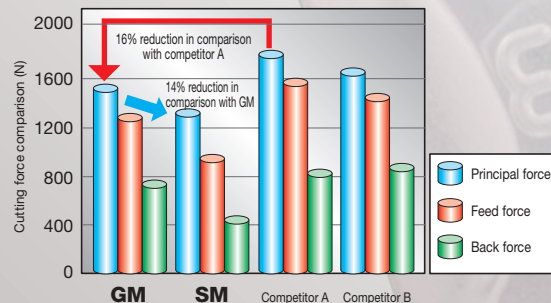
### 2 Low cutting force due to helical cutting-edge design



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



● Cutting force comparison



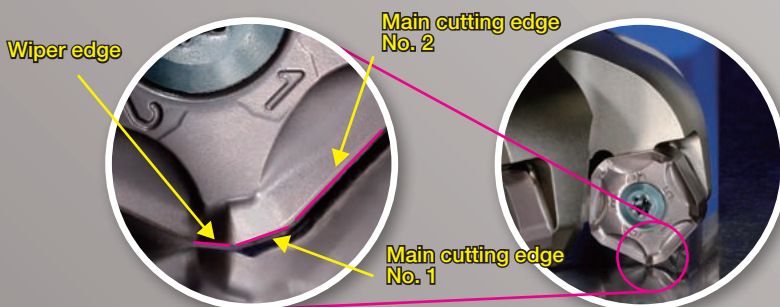
● Cutting conditions  
Workpiece :S50C  
Vc=150m/min, fz=0.1mm/t, apxae=5x105 mm, Machine :M/C(BT50)

### 3 Fractures suppressed with double-edge position



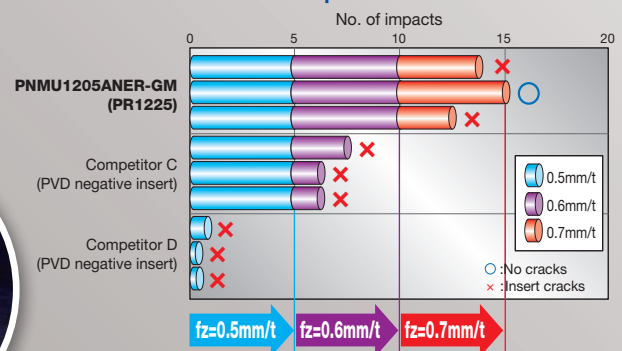
■ Double-edge position

· 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 Facemill

# MFPN

**M**illing-**F**acing **P**entagonal type

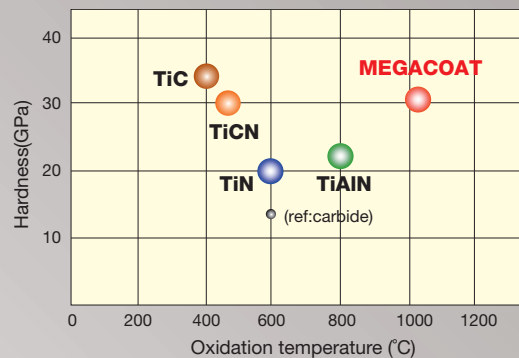
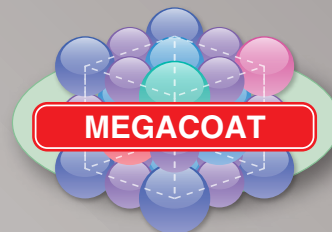
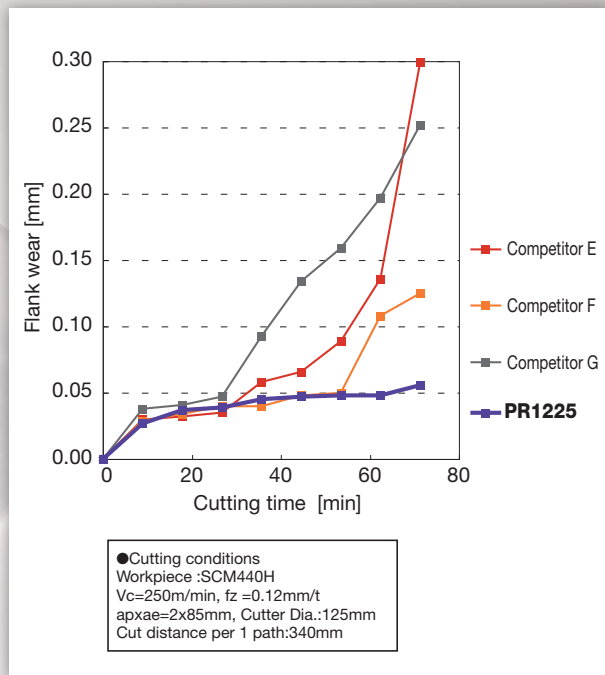
## 5 Long tool life with PR12-Series MEGACOAT carbide inserts



### 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

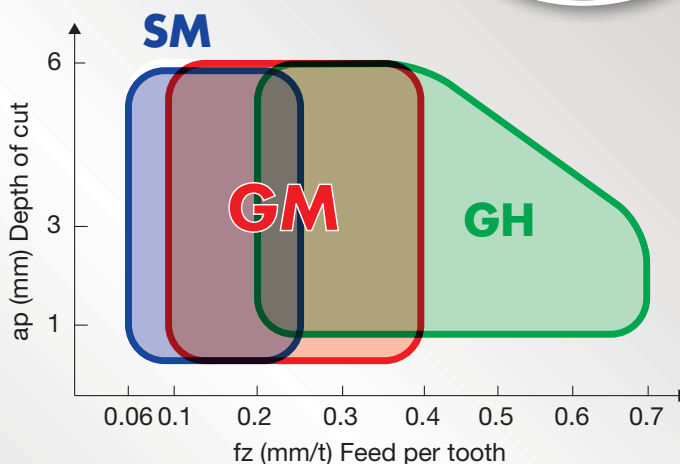
## 4 3-dimensional chipbreaker improves chip evacuation



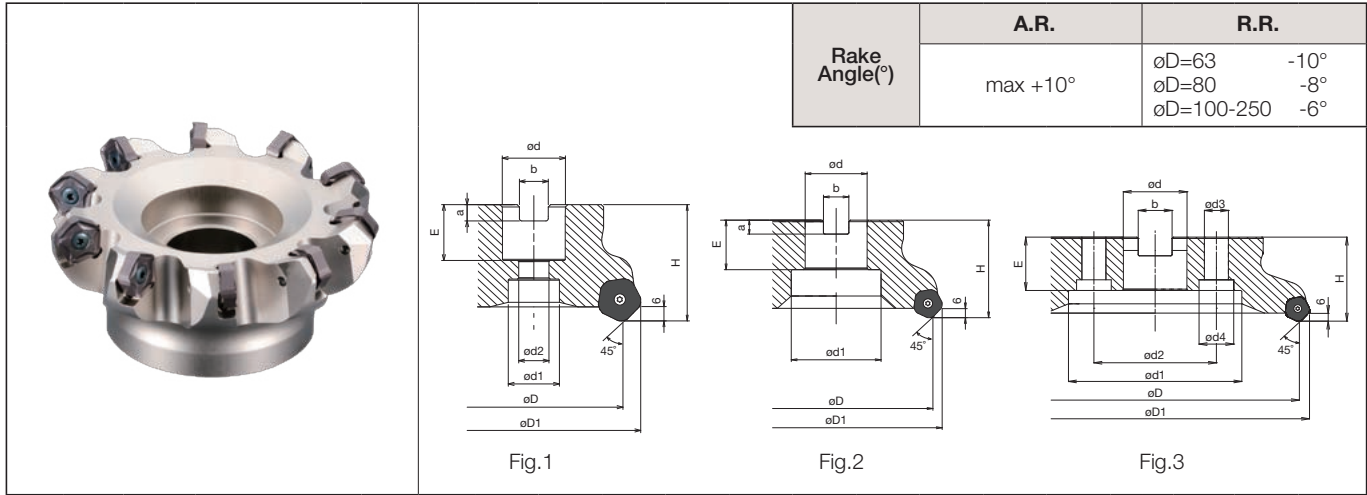
### Smooth chip evacuation reduces chip-biting

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

Chipbreaker	Applications	Shape
GM	General	
SM	Low cutting force	
GH	Heavy milling	



# MFPN45




## Holder Dimension

Description		Stock	No.of Insert	Dimension(mm)											Shape	Weight (kg)	Shim		
				$\phi D$	$\phi D1$	$\phi d$	$\phi d1$	$\phi d2$	H	E	a	b	$\phi d3$	$\phi d4$					
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	
		45100R-6T	●	6	100	113	31.75	48	32		8	12.7	1.4						
		45125R-7T	●	7	125	138	38.1	58	-	63	36	10	15.9			Fig.2	2.6		
		45160R-8T	●	8	160	173	50.8	72			38	11	19.1				4.0		
		45200R-10T	●	10	200	213	47.625	110	101.6	40	14	25.4	18			26	Fig.3		6.7
		45250R-12T	●	12	250	263				40	14	25.4	18			26			9.4
	Cross pitch	MFPN 45080R-6T	●	6	80	93	25.4	22	13	50	27	6	9.5	-	-	Fig.1	1.1	-	
		45100R-8T	●	8	100	113	31.75	48	32		8	12.7	1.4						
		45125R-10T	●	10	125	138	38.1	58	-	63	36	10	15.9			Fig.2	2.7		
		45160R-12T	●	12	160	173	50.8	72			38	11	19.1				4.0		
		45200R-14T	●	14	200	213	47.625	110	101.6	40	14	25.4	18			26	Fig.3		6.9
		45250R-16T	●	16	250	263				40	14	25.4	18			26			9.6
	Extra cross pitch	MFPN 45080R-8T	●	8	80	93	25.4	22	13	50	27	6	9.5	-	-	Fig.1	1.1	-	
		45100R-10T	●	10	100	113	31.75	48	32		8	12.7	1.3						
		45125R-13T	●	13	125	138	38.1	58	-	63	36	10	15.9			Fig.2	2.7		
		45160R-16T	●	16	160	173	50.8	72			38	11	19.1				4.0		
		45200R-18T	●	18	200	213	47.625	110	101.6	40	14	25.4	18			26	Fig.3		6.9
		45250R-20T	●	20	250	263				40	14	25.4	18			26			9.6
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	
		45080R-5T-M	●	5	80	93	27	22	13		24	7	12.4				1.1		
		45100R-6T-M	●	6	100	113	32	48	-	50	30	8	14.4			Fig.2	1.4		
		45125R-7T-M	●	7	125	138	40	58			32	9	16.4				2.6		
		45160R-8T-M	●	8	160	173	40	68	66.7	63	14	20	Fig.3			3.8			
		45200R-10T-M	●	10	200	213										60	110		101.6
		45250R-12T-M	●	12	250	263	60	110	101.6	40	14	25.7	18			26	9.1		
	Cross pitch	MFPN 45063R-5T-M	●	5	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig.1	0.5	-	
		45080R-6T-M	●	6	80	93	27	22	13		24	7	12.4				1.0		
		45100R-8T-M	●	8	100	113	32	48	-	50	30	8	14.4			Fig.2	1.4		
		45125R-10T-M	●	10	125	138	40	58			32	9	16.4				2.5		
		45160R-12T-M	●	12	160	173	40	68	66.7	63	14	20	Fig.3			3.8			
		45200R-14T-M	●	14	200	213										60	110		101.6
		45250R-16T-M	●	16	250	263	60	110	101.6	40	14	25.7	18			26	9.1		
	Extra cross pitch	MFPN 45063R-6T-M	●	6	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig.1	0.5	-	
		45080R-8T-M	●	8	80	93	27	22	13		24	7	12.4				1.1		
		45100R-10T-M	●	10	100	113	32	48	-	50	30	8	14.4			Fig.2	1.3		
		45125R-13T-M	●	13	125	138	40	58			32	9	16.4				2.6		
		45160R-16T-M	●	16	160	173	40	68	66.7	63	14	20	Fig.3			3.9			
		45200R-18T-M	●	18	200	213										60	110		101.6
		45250R-20T-M	●	20	250	263	60	110	101.6	40	14	25.7	18			26	9.3		

## ■ Spare Parts

### ● 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.

## ■ Insert description

### ● Milling Inserts (with hole)

Classification of usage		P	★		
★ Roughing / 1st Choice ☆ Roughing / 2nd Choice ■ Finishing / 1st Choice □ Finishing / 2nd Choice (Hardened material is applicable only under 45HRC)	Steel	★			
	Die Steel	★			
	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 	PNMU 1205ANER-GM  PNMU 1205ANER-SM  PNMU 1205ANER-GH	17.88	5.56	6.2	2.0	2.0	●	●
							●	●
		17.98	6.17				●	●

●: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
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)	○					○
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

SS400	
<ul style="list-style-type: none"> <li>·Construction machine part</li> <li>·Vc=170m/min</li> <li>·apxae=4x10mm</li> <li>·fz=0.3mm/t</li> <li>·Vf=1350mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45125R-10T (10 edges)</li> <li>·Insert PNMU1205ANER-GM (PR1225)</li> </ul>	<p>Face milling (with meltdown surface)</p>
<b>MFPN (PR1225)</b>	3pcs/edge <b>3 times longer tool life</b>
<b>Competitor H</b>	1pcs/edge
<ul style="list-style-type: none"> <li>·MFPN facemill enables stable milling due to reduced chip-biting and edge cracks</li> <li>·MFPN facemill, no chattering, showed 3 times longer tool life than competitor</li> </ul>	
Evaluation by the user	

FCD450	
<ul style="list-style-type: none"> <li>·Pipe</li> <li>·Vc=180m/min</li> <li>·apxae=2x80mm</li> <li>·fz=0.44mm/t</li> <li>·Vf=2010mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45125R-10T (10 edges)</li> <li>·Insert PNMU1205ANER-GM (PR1210)</li> </ul>	
<b>MFPN (PR1210)</b>	3pcs/edge <b>1.5 times longer tool life</b>
<b>Competitor I</b>	2pcs/edge
<ul style="list-style-type: none"> <li>·MFPN facemill showed 1.5 times longer tool life than the competitor</li> <li>·High feed rate of MFPN allowed 1.3 times higher milling efficiency compared to the competitor</li> </ul>	
Evaluation by the user	

Alloy steel	
<ul style="list-style-type: none"> <li>·Construction machine part</li> <li>·Vc=175m/min</li> <li>·apxae=1.5x100mm</li> <li>·fz=0.19mm/t</li> <li>·Vf=790mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45160R-12T (12 edges)</li> <li>·Insert PNMU1205ANER-GM (PR1225)</li> </ul>	<p>Total D.O.C.:15mm</p>
<b>MFPN (PR1225)</b>	2pcs/edge <b>2 times longer tool life</b>
<b>Competitor J</b>	1pcs/edge
<ul style="list-style-type: none"> <li>·MFPN facemill showed 2 times longer tool life than competitor</li> <li>·Competitor caused cracks by chip-biting. MFPN facemill had no cracks and allowed stable milling</li> <li>·MFPN facemill enabled twice the table feed rate compared with the competitor. Milling efficiency improved two-fold.</li> </ul>	
Evaluation by the user	

FCD600	
<ul style="list-style-type: none"> <li>·Press die</li> <li>·Vc=130m/min</li> <li>·apxae=6x150mm</li> <li>·fz=0.15mm/t</li> <li>·Vf=460mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45160R-12T (12 edges)</li> <li>·Insert PNMU1205ANER-GM (PR1210)</li> </ul>	<p>Face milling</p>
<b>MFPN (PR1225)</b>	Cutting time 128 minutes <b>Milling efficiency increased 1.2 times</b>
<b>Competitor K</b>	Cutting time 167 minutes
<ul style="list-style-type: none"> <li>·Highly stable milling into the entrance of workpiece and less vibration than the competitor</li> <li>·Clearly curled chips which barely cause chip-biting</li> <li>·Cutting speed has been changed Vc=110 m/min of conventional competitor's to Vc=130 m/min, thereby the milling efficiency of MFPN increased 1.2 times</li> </ul>	
Evaluation by the user	

## Case studies

SS400	
<ul style="list-style-type: none"> <li>·Plate</li> <li>·Vc=230m/min</li> <li>·<math>a_p \times a_e = 5.0 \times 80\text{mm}</math></li> <li>·<math>f_z = 0.19\text{mm/t}</math></li> <li>·Vf=1090mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45160R-12T (12 edges)</li> <li>·Insert PNMU1205ANER-SM (PR1225)</li> </ul>	
<p><b>MFPN (PR1225)</b></p>	<p>Cutting time 7.3 minutes (4 passes)</p>
<p>Competitor L (for roughing)</p>	<p>Cutting time 19 minutes (4 passes)</p>
<p>·MFPN facemill causes no vibration, enabling stable milling, even though the number of cutting edges of facemill has been increased by 4 and the feed per tooth has been increased by 1.3 times</p> <p>·Does not generate much heat after milling and obtains the lustrous surface finish without burrs</p> <p>·Milling efficiency increased 2.6 times with the high cutting conditions</p>	
<p>Evaluation by the user</p>	

Alloy steel	
<ul style="list-style-type: none"> <li>·Shaft (End face milling)</li> <li>·Vc=140m/min</li> <li>·<math>a_p \times a_e = 0.4 \times 50\text{mm}</math></li> <li>·<math>f_z = 0.19\text{mm/t}</math></li> <li>·Vf=635mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45080R-6T (6 edges)</li> <li>·Insert PNMU1205ANER-SM (PR1225)</li> </ul>	<p>End face milling</p>
<p>·Although the conventional tool causes chattering, MFPN facemill suppresses chattering, enabling stable milling</p> <p>·Even if the feed rate is raised to 1.9 times, the insert wears less and there is no cracks on the insert</p> <p>·Both the milling efficiency and the tool life have been improved</p>	
<p>Evaluation by the user</p>	

SCM415	
<ul style="list-style-type: none"> <li>·Plate</li> <li>·Vc=180m/min</li> <li>·<math>a_p \times a_e = 3 \times 80\text{mm}</math></li> <li>·<math>f_z = 0.15\text{mm/t}</math></li> <li>·Vf=690mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45125R-10T (10 edges)</li> <li>·Insert PNMU1205ANER-GM (PR1225)</li> </ul>	
<p>[Conventional]</p> <p>Vc=140m/min <math>a_p \times a_e = 3 \times 80\text{mm}</math> <math>f_z = 0.11\text{mm/t}</math> (Vf=230mm/min)</p>	
<p>·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</p> <p>·MFPN vibrates less right at entrance and exit on workpiece with reduced cutting sound</p>	
<p>Evaluation by the user</p>	

SUS304	
<ul style="list-style-type: none"> <li>·Case</li> <li>·Vc=90m/min</li> <li>·<math>a_p \times a_e = 0.4 \times 50\text{mm}</math></li> <li>·<math>f_z = 0.19\text{mm/t}</math></li> <li>·Vf=410mm/min</li> <li>·DRY</li> <li>·Cutter MFPN45080R-6T (6 edges)</li> <li>·Insert PNMU1205ANER-SM (PR1225)</li> </ul>	
<p><b>MFPN (PR1225)</b></p>	<p>1.5pcs/edge</p>
<p>Competitor M (for roughing)</p>	<p>1pcs/edge</p>
<p>·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>	
<p>Evaluation by the user</p>	

