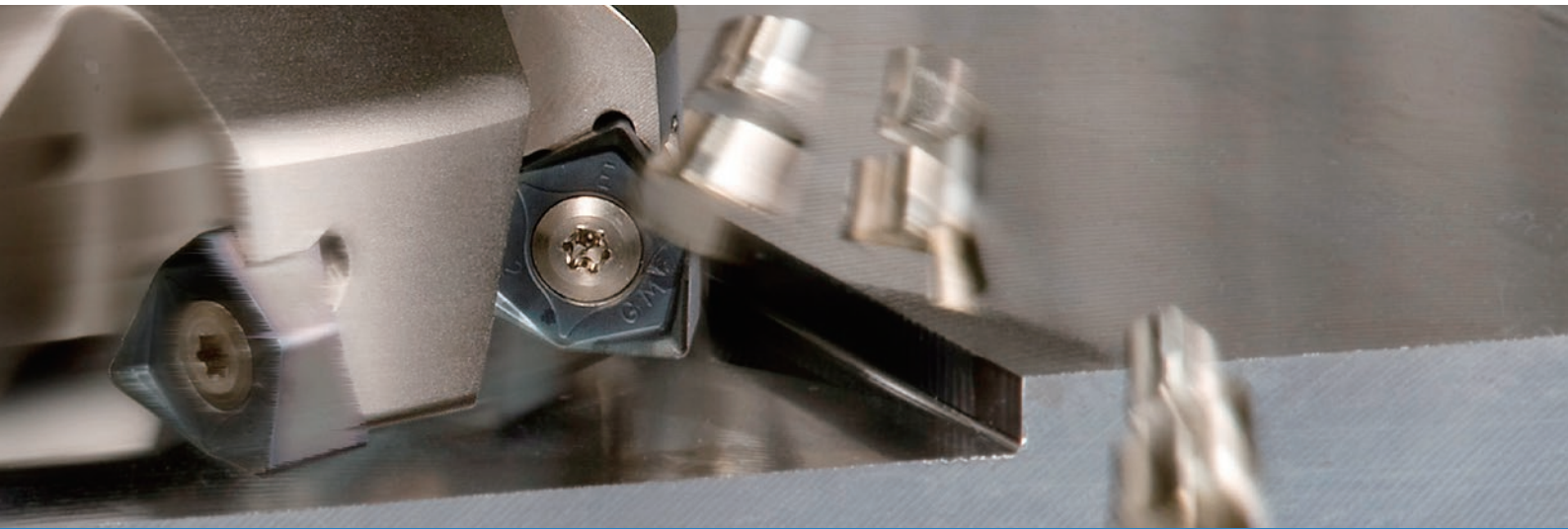


THE NEW VALUE FRONTIER



Double-sided 6-edge insert | **MFWN**

# MFWN



Economical double-sided 6-edge insert and superior fracture resistance due to thick edge design.

Sharp cutting due to lower cutting forces

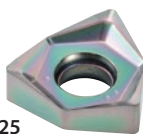
Resistant to chattering and applicable to long overhang

MEGACOAT NANO coated insert grade for long tool life

**NEW**

DLC coated insert grade  
for aluminum machining

New grade PDL025



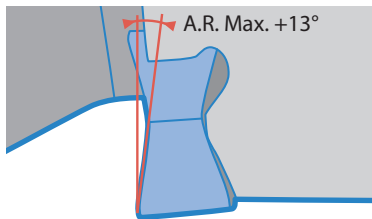
## Double-sided 6-edge insert

# MFWN

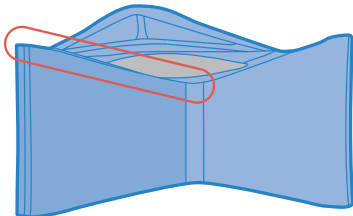
- Economical double-sided 6-edge insert
- Superior fracture resistance due to thick edge design
- Available for a wide range of applications and now including PDL025 DLC coated insert grade for aluminum machining

## 1 Sharp cutting due to lower cutting forces

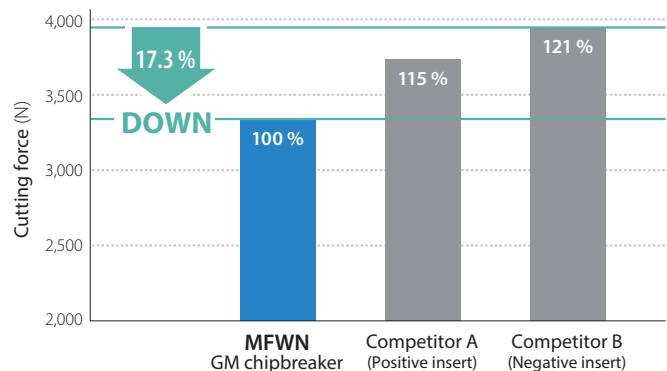
- Low cutting force due to steep rake angle
- Dynamic slant design reduces initial impact when cutting edge enters the workpiece



Dynamic slant design



Cutting force comparison (In-house evaluation)

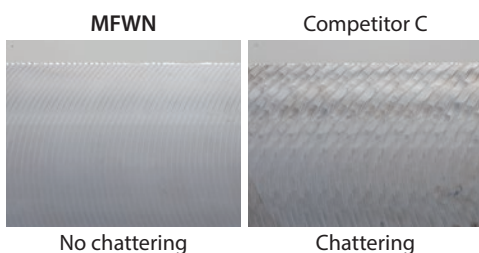


Cutting conditions:  $V_c = 180$  m/min,  $a_p \times a_e = 7 \times 110$  mm,  $f_z = 0.2$  mm/t  
Workpiece: C50, cutter dia.  $\varnothing 125$  mm

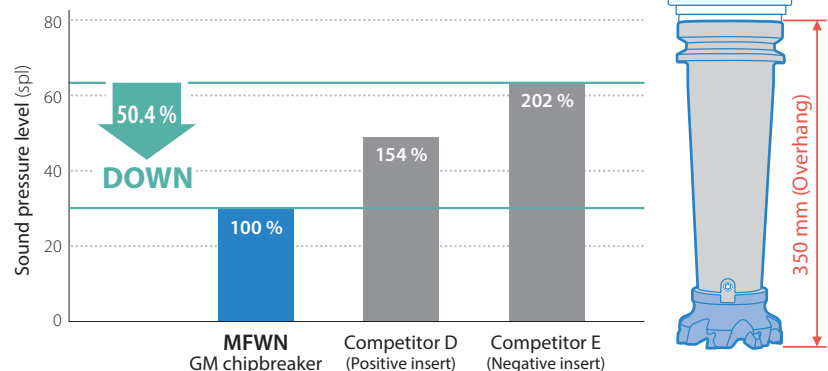
## 2 Reduced chattering

Resistant to chattering due to low cutting force design and applicable to long overhang

Surface roughness comparison (In-house evaluation)



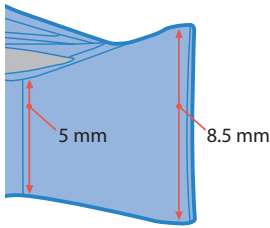
Cutting noise comparison (In-house evaluation)



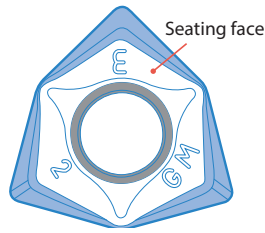
Cutting conditions:  $V_c = 200$  m/min,  $a_p \times a_e = 3 \times 15$  mm,  $f_z = 0.1$  mm/t  
Workpiece: C50, cutter dia.  $\varnothing 80$  mm (7 Inserts)

### 3 Superior fracture resistance with thick edge design

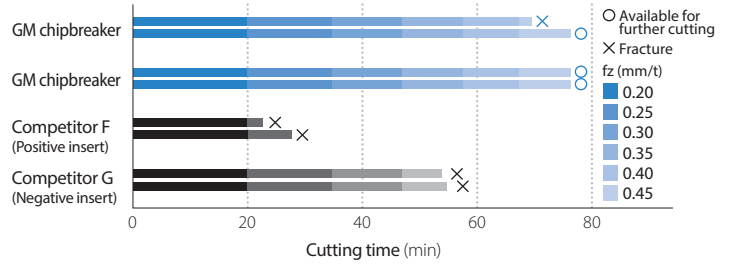
Cutting edge thickness:  
5 mm – 8.5 mm



Stable clamping with the  
unique insert face design



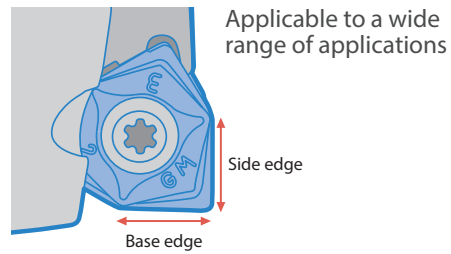
Fracture resistance comparison (In-house evaluation)



Cutting conditions:  $V_c = 100$  m/min,  $a_p \times a_e = 2 \times 100$  mm,  $f_z = 0.2 \sim 0.45$  mm/t, dry  
Workpiece: 42CrMo4 (38 ~ 42 HS), interrupted with a slot in the workpiece

### 4 Neutral inserts

- Available for shouldering and facing
- Neutral inserts are applicable to left-hand cutters (Custom order)

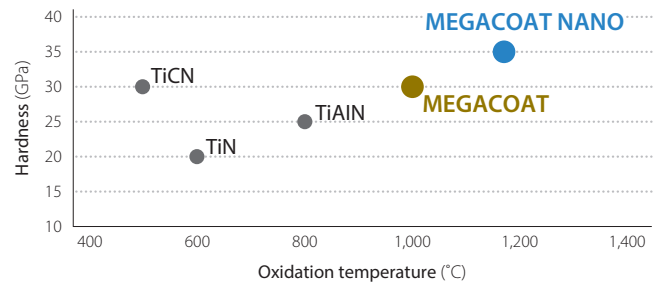


### 5 MEGACOAT NANO coated insert grade for long tool life

PR1525 for steel, PR1510 for cast iron and PR1535 for Ni-base heat-resistant alloy, titanium alloy and precipitation-hardened stainless steel.

Prevents wear and fracturing with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: 1,150°C).

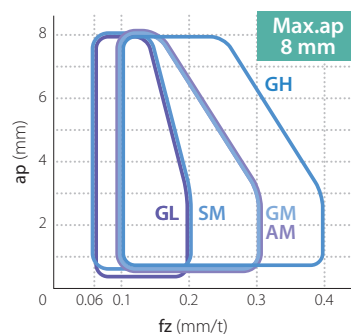
Coating property



### 6 Extensive insert lineup covering various applications

Chipbreaker	Applications	Shape
GM	General purpose	
SM	Low cutting force	
GH	Heavy milling	
GL	Surface-finish oriented	
AM	Aluminum / non-ferrous metals	

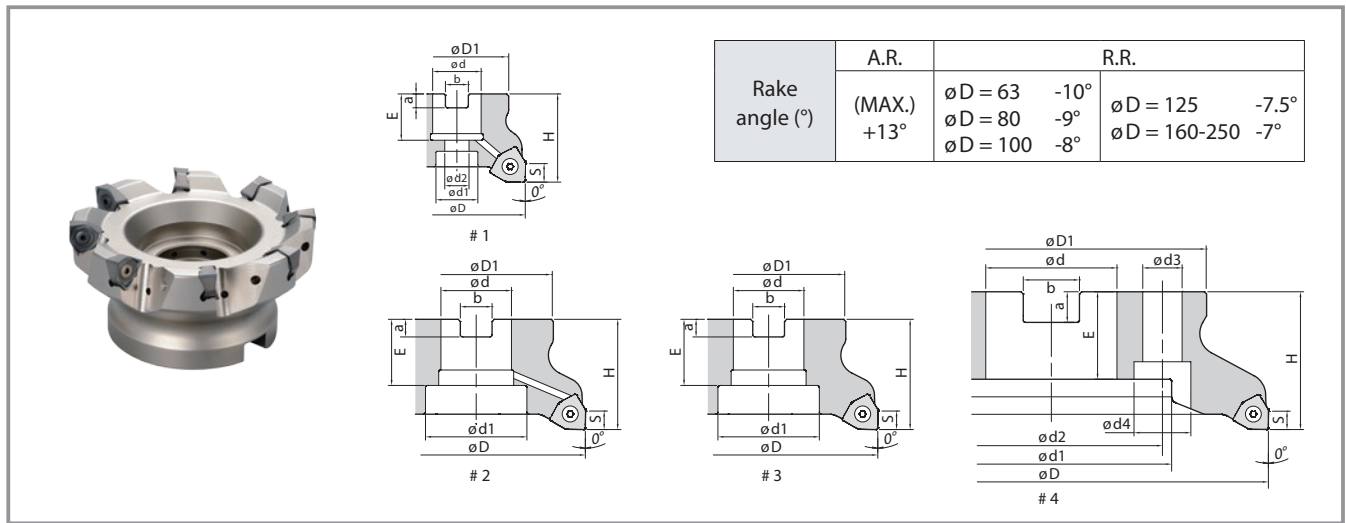
Application range



Smooth chip evacuation



Properly curled chips  
(The photo was taken by a high speed camera)



**Toolholder dimensions**

Description	Availability	No. of inserts	Dimensions (mm)												Drawing	Weight (kg)	Shim	Coolant hole
			∅D	∅D1	∅d	∅d1	∅d2	H	E	a	b	∅d3	∅d4					
Coarse pitch	●	3	63	47	22	19	11	40	21	6.3	10.4			Fig.1	0.5	Yes		
		4	80	60	27	20	13	50	24	7	12.4				1.0			
		5	100	70	32	46			30	8	14.4			Fig.2	1.3			
		6	125	87	40	55			33	9	16.4	14	20		2.5			
		8	160	102	60	68	66.7	63	32					Fig.4	3.8			
		10	200	142	110	101.6			40	14	25.7	18	26		6.0			
		12	250											8.4				
Fine pitch	●	4	63	47	22	19	11	40	21	6.3	10.4			Fig.1	0.5	No		
		5	80	60	27	20	13	50	24	7	12.4				1.0			
		7	100	70	32	46			30	8	14.4			Fig.2	1.3			
		8	125	87	40	55			33	9	16.4	14	20		2.6			
		10	160	102	60	68	66.7	63	32					Fig.4	3.9			
		12	200	142	110	101.6			40	14	25.7	18	26		6.3			
		14	250											8.7				
Extra fine pitch	●	5	63	47	22	19	11	40	21	6.3	10.4			Fig.1	0.5	No		
		7	80	60	27	20	13	50	24	7	12.4				1.1			
		9	100	70	32	46			30	8	14.4			Fig.2	1.3			
		12	125	87	40	55			33	9	16.4	14	20		2.6			
		14	160	102	60	68	66.7	63	32					Fig.4	3.9			
		16	200	142	110	101.6			40	14	25.7	18	26		6.4			
		18	250											8.8				

● Available

## Spare parts

Description		Clamp screw	Wrench		Shim	Shim screw	Wrench	Anti-seize compound	Arbor bolt
			TT	DTM					
Coarse pitch	MFWN 90063R-3T-M	SB-50140TR	TT-15	—	MFWN-90	SPW-7050	LW-5	MP-1	HH10×30
	MFWN 90080R-4T-M								HH12×35
	MFWN 90100R-5T-M } 90250R-12T-M								—
Recommended torque for insert clamp 4.2 N·m		Recommended torque for shim clamp 6.0 N·m							
Fine pitch	MFWN 90063R-4T-M	SB-50140TR	TT-15	—	—	—	—	MP-1	HH10×30
	MFWN 90080R-5T-M								HH12×35
	MFWN 90100R-7T-M } 90250R-14T-M								—
Recommended torque for insert clamp 4.2 N·m									
Extra fine pitch	MFWN 90063R-5T-M	SB-50140TR	TT-15	—	—	—	—	MP-1	HH10×30
	MFWN 90080R-7T-M	SB-40140TRN	—	DTM-15					HH12×35
	MFWN 90100R-9T-M } 90250R-18T-M	Recommended torque for insert clamp 3.5 N·m		—					—

Coat anti-seize compound (MP-1) thinly on portion of taper and thread prior to installation

Recommended cutting conditions → P6

## How to replace the shim (For coarse pitch)

1. Be sure to remove dust and chips from the insert mounting pocket.
2. The shim must be mounted in the proper direction. While aligning the surface of the shim with the mark on it to the corresponding constraint surface (see fig. 1) and lightly pressing the shim toward the constraint surface of the pocket wall (see fig. 2), insert the screw into the hole of the shim and tighten (See fig. 3).

When tightening screw, make sure that the screw is vertical to the pocket floor (See fig 3). Recommended torque is 6.0 Nm.

3. After tightening the screw, make sure that there is no clearance between the shim seat surface and the pocket floor. If there is any clearance, remove the shim and mount it again according to the above steps.

Fig.1

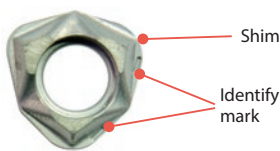


Fig.2

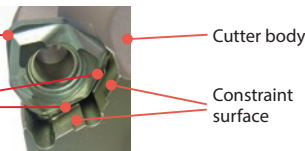
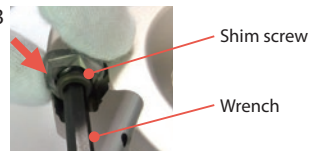
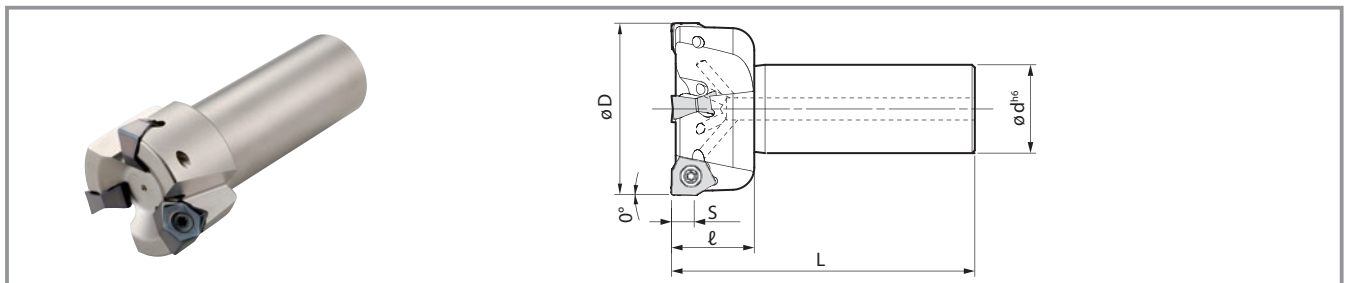


Fig.3



## MFWN90 end mill (With coolant hole)








## Toolholder dimensions

Description	Availability	No. of inserts	Dimensions (mm)					Rake angle (°)		Coolant hole	Spare parts		
			$\phi D$	$\phi d$	L	$\ell$	S	A.R. (MAX.)	R.R.		Clamp screw	Wrench	Anti-seize compound
MFWN 90050R-S32-3T	●	3	50	32	110	30	8	+13°	-12°	Yes	SB-50140TR	TT-15	MP-1
90063R-S32-4T	●	4	63						-10°				
90080R-S32-5T	●	5	80						-9°				
Recommended torque 4.2 N·m													

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

● Available

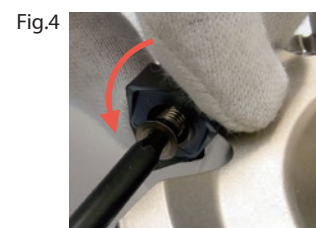
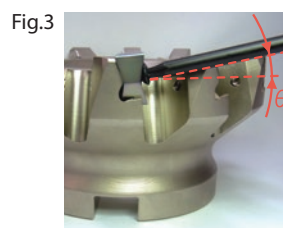
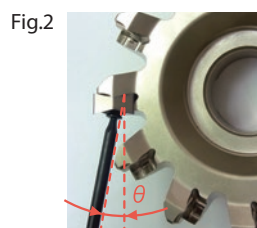
## Applicable inserts

Classification of usage	P	Carbon steel / alloy steel	★							
		Mold steel	★							
★ : Roughing / 1st choice ☆ : Roughing / 2nd choice ■ : Finishing / 1st choice □ : Finishing / 2nd choice (In case hardness is under 45 HRC)	M	Austenitic stainless steel	★	☆				★		
		Martensitic stainless steel	☆							
		Precipitation hardened stainless steel	★							
	K	Gray cast iron					★			
		Nodular cast iron					★			
	N	Non-ferrous metals							★	☆
	S	Heat-resistant alloys	☆					★		
		Titanium alloys	★							
H	Hard materials			□						
Insert	Description	Dimensions (mm)		MEGACOAT NANO			CVD coated carbide	DLC coated carbide	Carbide	
		rE	Z	PR1535	PR1525	PR1510	CA6535	PDL025	GW25	
 General purpose	WNMU 080604EN-GM	0.4	1.7	●	●	●	●			
	080608EN-GM	0.8	1.3	●	●	●	●			
 Low cutting force	WNMU 080608EN-SM	0.8	1.3	●	●	●	●			
 Tough edge (Heavy milling)	WNMU 080608EN-GH	0.8	1.3	●	●	●	●			
 Surface-finish oriented (High precision)	WNEU 080608EN-GL	0.8	1.5	●	●	●	●			
 Aluminum / non-ferrous metals (3-edge)	WNGT 080608FN-AM	0.8	1.5					●	●	

● Available

## How to mount the insert

1. Be sure to remove dust and chips from the insert mounting pocket.
2. After applying anti-seize compound on portion of taper and thread, attach the screw to the front end of the wrench. While lightly pressing the insert against the constraint surfaces, put the screw into the hole of the insert and tighten (See fig. 1).
3. When tightening the screw, make sure that the wrench is parallel to the screw. Remember that the screw hole of the holder for extra fine pitch is angled to the pocket floor (See fig. 2 and fig. 3).
4. Be careful not to tighten the screw with excessive torque. Recommended torque is 4.2 N·m for M5 screw (SB-50140TR) and 3.5 N·m for M4 screw (SB-40140TRN).
5. After tightening the screw, make sure that there is no clearance between the insert seat surface and the pocket floor of the holder or between the insert side surfaces and the constraint surface of the holder. If there is any clearance, remove the insert and mount it again according to the above steps.
6. To index the cutting edge of the insert, turn the insert counterclockwise. (See fig. 4) The insert corner identification number is stamped on the top surface of the insert.



## Recommended cutting conditions ★ 1st recommendation ☆ 2nd recommendation

Chipbreaker	Workpiece	fz (mm/t)	Recommended insert grade (Vc: m/min)					
			MEGACOAT NANO			CVD coated carbide	DLC coated carbide	Carbide
			PR1535	PR1525	PR1510	CA6535	PDL025	GW25
GM	Carbon steel	0.1-0.2-0.3	☆ 120-180-250	★ 120-180-250	—	—	—	—
	Alloy steel	0.1-0.2-0.3	☆ 100-160-220	★ 100-160-220	—	—	—	—
	Mold steel	0.1-0.15-0.25	☆ 80-140-180	★ 80-140-180	—	—	—	—
	Austenitic stainless steel	0.1-0.15-0.25	☆ 100-160-200	☆ 100-160-200	—	—	—	—
	Martensitic stainless steel	0.1-0.15-0.25	☆ 150-200-250	—	—	☆ 180-240-300	—	—
	Precipitation hardened stainless steel	0.1-0.15-0.25	★ 90-120-150	—	—	—	—	—
	Gray cast iron	0.1-0.2-0.3	—	—	★ 120-180-250	—	—	—
	Nodular cast iron	0.1-0.15-0.25	—	—	★ 100-150-200	—	—	—
	Ni-base heat-resistant alloys	0.1-0.12-0.2	☆ 20-30-50	—	—	★ 20-30-50	—	—
SM *(GL)	Carbon steel	0.06-0.12-0.2	☆ 120-180-250	☆ 120-180-250	—	—	—	—
	Alloy steel	0.06-0.12-0.2	☆ 100-160-220	☆ 100-160-220	—	—	—	—
	Mold steel	0.06-0.08-0.15	☆ 80-140-180	☆ 80-140-180	—	—	—	—
	Austenitic stainless steel	0.06-0.12-0.2	★ 100-160-200	☆ 100-160-200	—	—	—	—
	Martensitic stainless steel	0.06-0.12-0.2	☆ 150-200-250	—	—	★ 180-240-300	—	—
	Precipitation hardened stainless steel	0.06-0.12-0.2	☆ 90-120-150	—	—	—	—	—
	Gray cast iron	0.06-0.12-0.2	—	—	☆ 120-180-250	—	—	—
	Nodular cast iron	0.06-0.08-0.15	—	—	☆ 100-150-200	—	—	—
	Ni-base heat-resistant alloys	0.06-0.1-0.15	☆ 20-30-50	—	—	☆ 20-30-50	—	—
	Titanium alloys	0.06-0.08-0.15	★ 40-60-80	—	—	—	—	—
GH	Carbon steel	0.2-0.3-0.4	☆ 120-180-250	☆ 120-180-250	—	—	—	—
	Alloy steel	0.2-0.3-0.4	☆ 100-160-220	☆ 100-160-220	—	—	—	—
	Mold steel	0.15-0.2-0.3	☆ 80-140-180	☆ 80-140-180	—	—	—	—
	Austenitic stainless steel	0.2-0.25-0.3	☆ 100-160-200	☆ 100-160-200	—	—	—	—
	Martensitic stainless steel	0.2-0.25-0.3	☆ 150-200-250	—	—	☆ 180-240-300	—	—
	Precipitation hardened stainless steel	0.2-0.25-0.3	☆ 90-120-150	—	—	—	—	—
	Gray cast iron	0.2-0.3-0.4	—	—	☆ 120-180-250	—	—	—
	Nodular cast iron	0.15-0.2-0.3	—	—	☆ 100-150-200	—	—	—
	Ni-base heat-resistant alloys	0.15-0.2-0.25	☆ 20-30-50	—	—	☆ 20-30-50	—	—
AM	Aluminum alloys	0.1-0.2-0.3	—	—	—	—	★ 200-600-900	☆ 200-500-800

The figures in bold font represent the center value of the recommended cutting conditions. Adjust the cutting speed and the feed rate within the above conditions according to the actual machining situation.

- Machining with coolant is recommended for Ni-base Heat-resistant alloy and Titanium Alloy \*GL chipbreaker is recommended for surface finish oriented milling
- When using GH chipbreaker for fine pitch cutters, recommended feed is fz ≤ 0.3(mm/t)
- GH chipbreaker is not recommended for extra fine pitch cutter

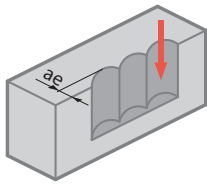
## Applicable chipbreaker

Cutter	GM	SM (GL)	GH	AM
Coarse pitch (with shim)	○	○	○	○
Fine pitch (without shim)	○	○	△ (fz ≤ 0.3 mm/t is recommended)	○
Extra fine pitch (without shim)	○	○	Not recommended	Not recommended

## Cutter type and insert selection guide

Purpose	Cutter			Chipbreaker				
	Coarse pitch	Fine pitch	Extra fine pitch	GM	SM	GH	GL	AM
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 (ap = 4 mm and over fz = 0.25 mm and over)	●					●		
Surface roughness oriented	●	●					●	
General milling for stainless steel		●			●			
Stainless steel (to prevent chattering due to low rigidity machine or poor clamping power)	●				●			
Cast iron milling (Improved efficiency)			●	●				
Cast iron (ap ≥ 4 mm / fz ≥ 0.25 mm/t)	●					●		
General milling for aluminum alloys		●						●
Aluminum alloys (to prevent chattering due to low rigidity)	●							●

# Plunge milling



MFWN is applicable to plunge milling

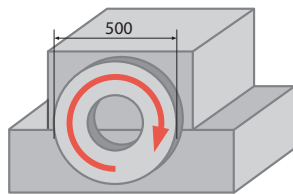
Cutting dia.	Maximum width of cut (ae)
All items	8.0 mm

NOT available for ramping and helical milling, due to interference between workpiece and insert.

## Case studies

### Machine part GG30

Vc = 170 m/min  
 $ap \times ae = 2.5 \times 130$  mm  
 $fz = 0.18$  mm/t  
 $(Vf = 500$  mm/min)  
 Wet  
 MFWN90160R-8T (8 Inserts)  
 WNMU080608EN-GM (PR1510)



Chip removal rate

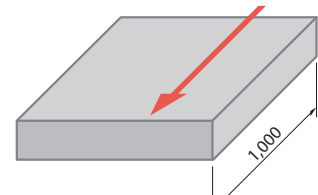
**PR1510** **163 cc/min** **Efficiency** **2.3 Times**

Competitor H (Positive cutter) **68 cc/min**

Competitor H continued to cut under low cutting conditions as the workpiece was slipping due to unstable chucking. With MFWN, stable cutting was possible at higher feed rates. (User evaluation)

### Frame GG25

Vc = 150 m/min  
 $ap \times ae = 4 \times 160$  mm  
 $fz = 0.24$  mm/t  
 $(Vf = 715$  mm/min)  
 Dry  
 MFWN90160R-10T (10 Inserts)  
 WNMU080608EN-GM (PR1510)



Chip removal rate

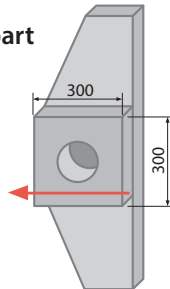
**PR1510** **458 cc/min** **Efficiency** **1.6 Times**

Competitor J (Negative cutter / vertical inserts) **282 cc/min**

While competitor J could not improve the cutting conditions due to chattering, MFWN improved it by 160 % with no chattering. (User evaluation)

### Construction equipment part (Manganese steel)

Vc = 150 m/min  
 $ap \times ae = 1 \times 100$  mm  
 $fz = 0.2$  mm/t  
 $(Vf = 668$  mm/min)  
 Dry  
 MFWN90100R-7T (7 Inserts)  
 WNMU080608EN-GM (PR1525)



Machining efficiency

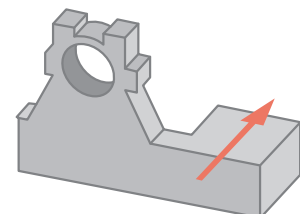
**PR1525** **2 pcs/edge** **Tool life** **2 Times**

Competitor K (Negative cutter / vertical inserts) **1 pcs/edge**

Despite instability with the long overhang, MFWN doubled tool life, improving the efficiency by 150 %. (User evaluation)

### Machine part Ust 42-2

Vc = 260 m/min  
 $ap \times ae = 1.5 \times 80$  mm  
 $fz = 0.16$  mm/t  
 $(Vf = 1,000$  mm/min)  
 Dry  
 MFWN90080R-7T (7 Inserts)  
 WNMU080608EN-GM (PR1525)



Machining efficiency

**PR1525** **3 pcs/edge** **Tool life** **3 Times**

Competitor L (Positive cutter) **1 pcs/edge**

MFWN tripled tool life under the same cutting conditions as competitor L. (User evaluation)