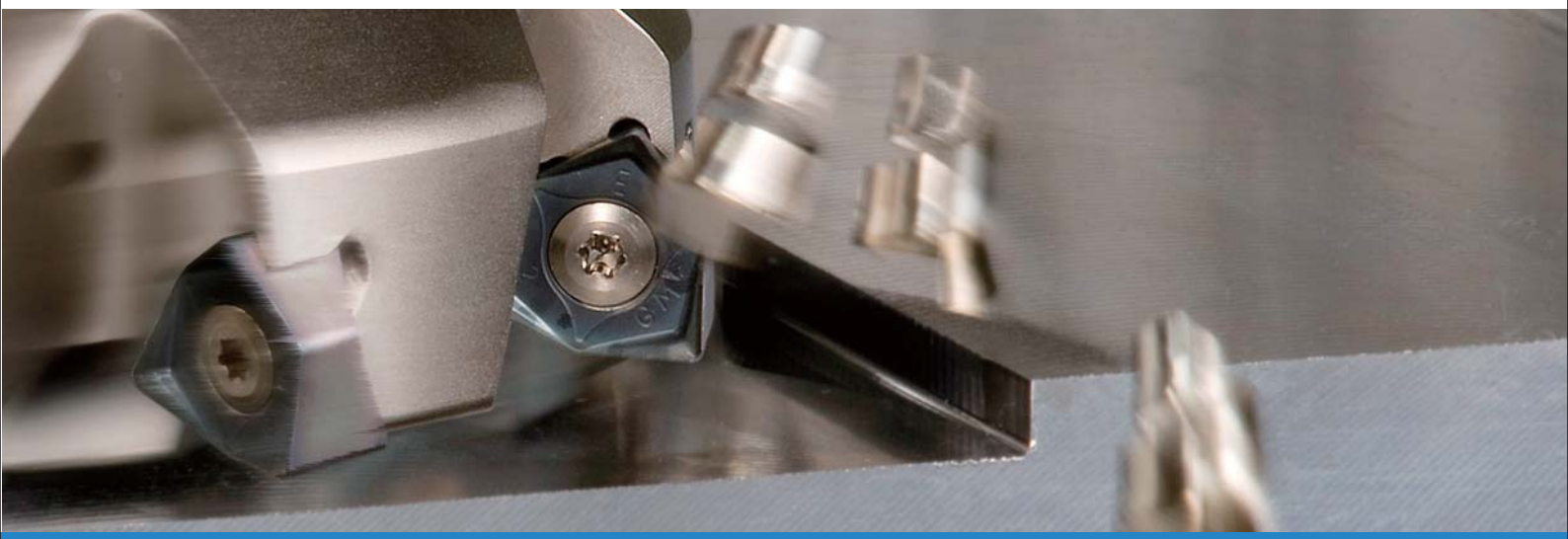
THE NEW VALUE FRONTIER

KYOCERA

Double-sided 6-edge Insert, Low Cutting Force Cutter

MFWN



Economical Double-sided 6-edge Insert. Superior Fracture Resistance due to Thick Edge Design

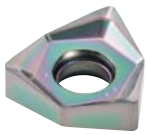
Sharp Cutting due to Lower Cutting Forces

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, Low Cutting Force Cutter

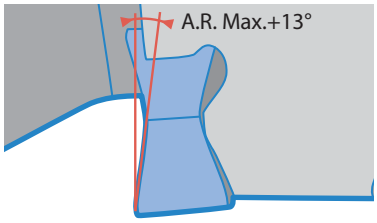
MFWN

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

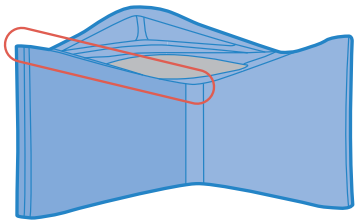
1 Sharp Cutting due to Lower Cutting Forces

Low Cutting Force due to Steep Rake Angle

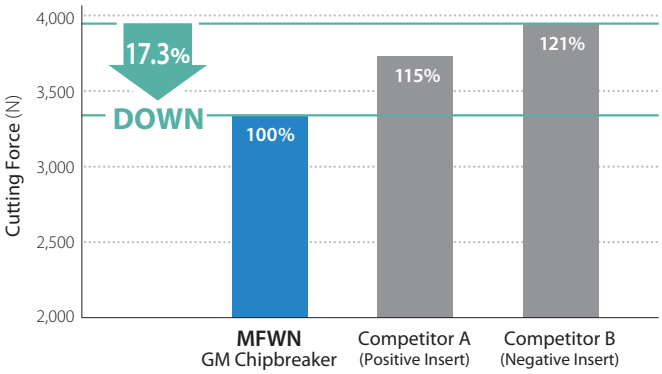
Dynamic Slant Design Reduces Initial Impact when Cutting Edge Enters the Workpiece



Dynamic Slant Design



Cutting Force Comparison (In-house Evaluation)



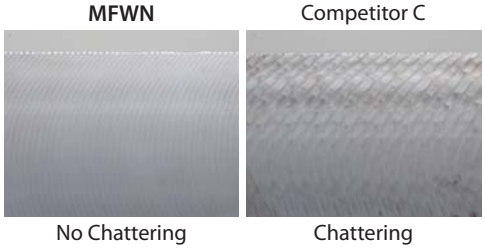
Cutting Force is the Resultant Force of the Principal Force and the Feed Force

Cutting Conditions: Vc = 180 m/min, ap × ae = 7 × 110 mm, fz = 0.2 mm/t
Workpiece: S50C Cutter Dia. ø125 mm

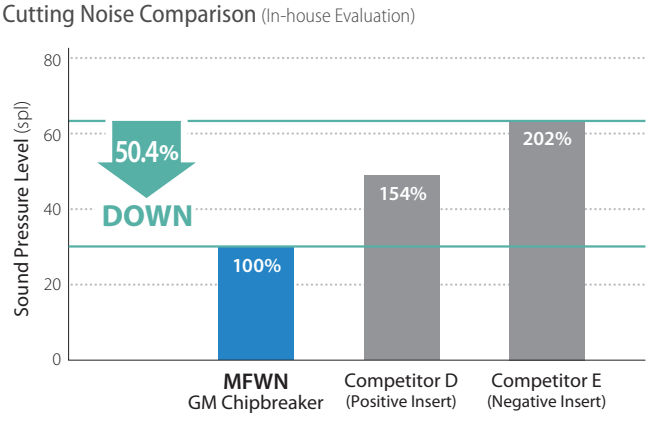
2 Reduced Chattering

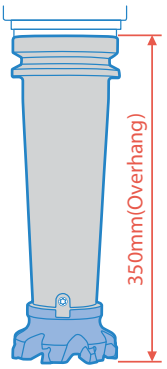
Resistant to Chattering due to Low Cutting Force Design and applicable to long overhang

Surface Roughness Comparison (In-house Evaluation)



Cutting Noise Comparison (In-house Evaluation)

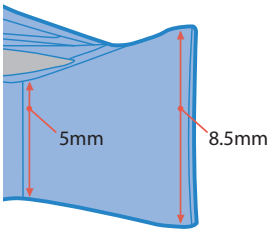




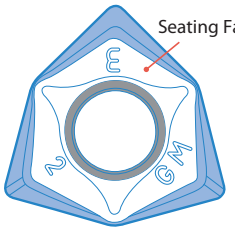
Cutting Conditions: Vc = 200 m/min, ap × ae = 3 × 15 mm, fz = 0.1 mm/t
Workpiece: S50C Cutter Dia. ø80 mm (7 Inserts)

3 Superior Fracture Resistance with Thick Edge Design

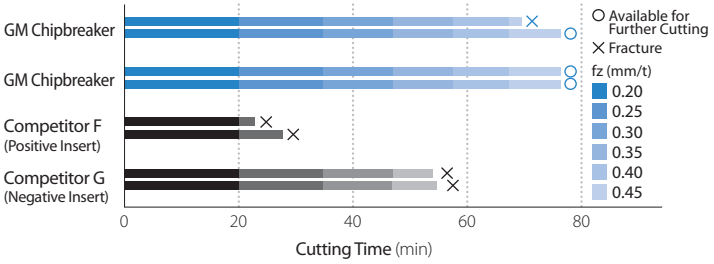
Cutting Edge Thickness: 5 - 8.5mm



Stable Clamping with the Unique Insert Face Design



Fracture Resistance Comparison (In-house Evaluation)



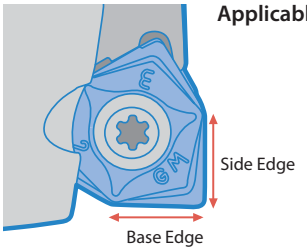
Cutting Conditions: Vc = 100 m/min, ap × ae = 2 × 100 mm, fz = 0.2 ~ 0.45 mm/t, Dry
Workpiece: SCM440H(38 ~ 42HS) Interrupted with a Slot in the Workpiece

4 Neutral Inserts

Available for Shouldering and Facing

Neutral Inserts are Applicable to Left-hand Cutters (Custom Order)

Applicable to a Wide Range of Applications

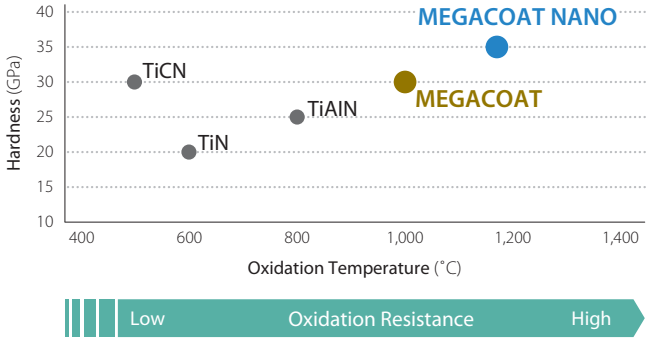


5 MEGACOAT NANO Coated Insert Grade for Long Tool Life

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)

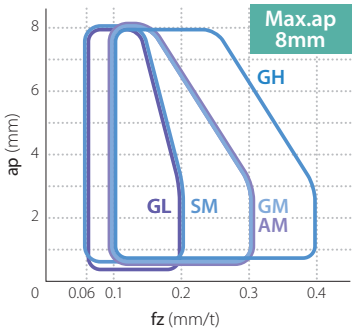
Coating Property



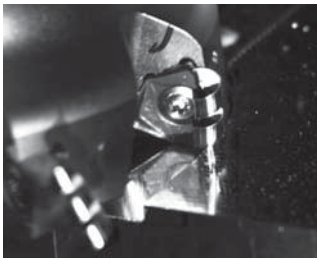
6 Extensive Insert Lineup Covering Various Applications

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)

MFWN90 Face Mill

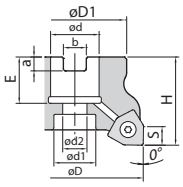


Fig.1

Rake Angle (°)	A.R.	R.R.	
	(MAX.) +13°	øD = 63 -10° øD = 80 -9° øD = 100 -8°	øD = 125 -7.5° øD = 160-250 -7°

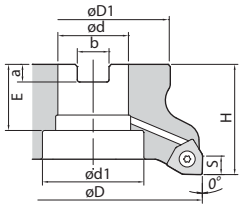


Fig.2

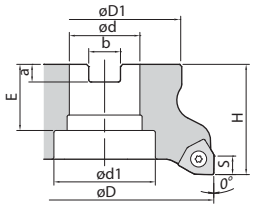


Fig.3

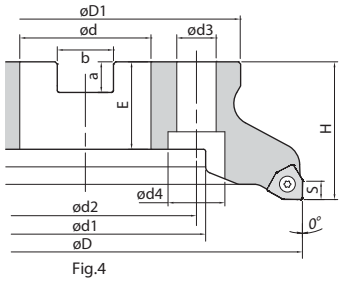


Fig.4

Toolholder Dimensions

		Description		Stock	No. of Inserts	Dimensions (mm)											Drawing	Weight (kg)	Shim	Coolant Hole
						øD	øD1	ød	ød1	ød2	H	E	a	b	ød3	ød4				
Bore Dia. Inch Spec	Coarse Pitch	MFWN	90080R-4T	●	4	80	60	25.4	20	13	50	27	6	9.5	—	—	Fig.1	1.0	Yes	Yes
			90100R-5T	●	5	100	70	31.75	46	—		34	8	12.7			Fig.2	1.3		
			90125R-6T	●	6	125	87	38.1	55		63	38	10	15.9				2.6		
			90160R-8T	●	8	160	102	50.8	72				11	19.1			Fig.3	3.9		No
			90200R-10T	●	10	200	142	47.625	110	101.6		40	14	25.4	18	26	Fig.4	6.3		
			90250R-12T	●	12	250												8.7		
	Fine Pitch	MFWN	90080R-5T	●	5	80	60	25.4	20	13	50	27	6	9.5	—	—	Fig.1	1.0	No	Yes
			90100R-7T	●	7	100	70	31.75	46	—		34	8	12.7			Fig.2	1.4		
			90125R-8T	●	8	125	87	38.1	55		63	38	10	15.9				2.7		
			90160R-10T	●	10	160	102	50.8	72				11	19.1			Fig.3	4.0		No
			90200R-12T	●	12	200	142	47.625	110	101.6		40	14	25.4	18	26	Fig.4	6.6		
			90250R-14T	●	14	250												8.9		
	Extra Fine Pitch	MFWN	90080R-7T	●	7	80	60	25.4	20	13	50	27	6	9.5	—	—	Fig.1	1.1	No	Yes
			90100R-9T	●	9	100	70	31.75	46	—		34	8	12.7			Fig.2	1.3		
			90125R-12T	●	12	125	87	38.1	55		63	38	10	15.9				2.7		
			90160R-14T	●	14	160	102	50.8	72				11	19.1			Fig.3	4.1		No
			90200R-16T	●	16	200	142	47.625	110	101.6		40	14	25.4	18	26	Fig.4	6.7		
			90250R-18T	●	18	250												9.1		
Metric	Coarse Pitch	MFWN	90063R-3T-M	●	3	63	47	22	19	11	40	21	6.3	10.4	—	—	Fig.1	0.5	Yes	Yes
			90080R-4T-M	●	4	80	60	27	20	13	50	24	7	12.4				1.0		
			90100R-5T-M	●	5	100	70	32	46	—		30	8	14.4			Fig.2	1.3		
			90125R-6T-M	●	6	125	87	40	55		63	33	9	16.4				2.5	Yes	
			90160R-8T-M	●	8	160	102		68	66.7		32			14	20	Fig.4	3.8		No
			90200R-10T-M	●	10	200	142	60	110	101.6		40	14	25.7	18	26		6.0		
			90250R-12T-M	●	12	250												8.4		
	Fine Pitch	MFWN	90063R-4T-M	●	4	63	47	22	19	11	40	21	6.3	10.4	—	—	Fig.1	0.5	No	Yes
			90080R-5T-M	●	5	80	60	27	20	13	50	24	7	12.4				1.0		
			90100R-7T-M	●	7	100	70	32	46	—		30	8	14.4			Fig.2	1.3		
			90125R-8T-M	●	8	125	87	40	55		63	33	9	16.4				2.6		
			90160R-10T-M	●	10	160	102		68	66.7		32			14	20	Fig.4	3.9		No
			90200R-12T-M	●	12	200	142	60	110	101.6		40	14	25.7	18	26		6.3		
			90250R-14T-M	●	14	250												8.7		
	Extra Fine Pitch	MFWN	90063R-5T-M	●	5	63	47	22	19	11	40	21	6.3	10.4	—	—	Fig.1	0.5	No	Yes
			90080R-7T-M	●	7	80	60	27	20	13	50	24	7	12.4				1.1		
			90100R-9T-M	●	9	100	70	32	46	—		30	8	14.4			Fig.2	1.3		
			90125R-12T-M	●	12	125	87	40	55		63	33	9	16.4				2.6		
			90160R-14T-M	●	14	160	102		68	66.7		32			14	20	Fig.4	3.9		No
			90200R-16T-M	●	16	200	142	60	110	101.6		40	14	25.7	18	26		6.4		
			90250R-18T-M	●	18	250												8.8		

Dimension S: 8 mm

● : Std. Item

Spare Parts

Description		Clamp Screw	Wrench TT	Wrench DTM	Shim	Shim Screw	Wrench	Anti-seize Compound	Arbor Bolt
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 4.2N·m			Recommended Torque for Shim Clamp 6.0N·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 4.2N·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 3.5N·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 6.0Nm
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

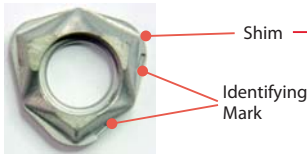


Fig.2

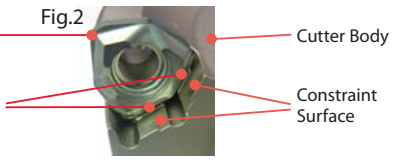
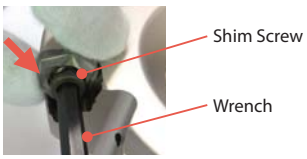
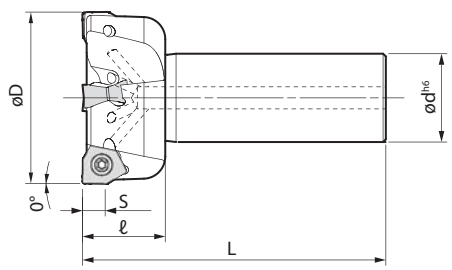


Fig.3



MFWN90 End Mill (With Coolant Hole)



Toolholder Dimensions

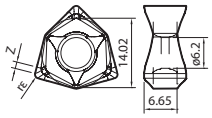
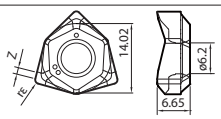
Description		Stock	No. of inserts	Dimensions (mm) øD	ød	L	ℓ	S	Rake Angle (°) A.R. (MAX.)	R.R.	Coolant Hole	Spare Parts: Clamp Screw	Wrench	Anti-seize Compound
MFWN	90050R-S32-3T	●	3	50	32	110	30	8	+13°	-12°	Yes	SB-50140TR	TT-15	MP-1
	90063R-S32-4T	●	4	63						-10°		Recommended Torque 4.2N·m		
	90080R-S32-5T	●	5	80						-9°				

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

● : Std. Item

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 45HRC)	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
			rε	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					●	●

● : Std. Item

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 4.2N·m for M5 screw (SB-50140TR) and 3.5N·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

Fig.1

Fig.2

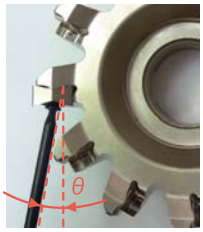


Fig.3

Fig.4

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 chiphreaker is recommended for surface finish oriented milling
When using GH chipbreaker for fine pitch cutters, recoomended feed is fz ≦ 0.3(mm/t)
GH chipbreaker is not recommended for extra fine pitch cutter

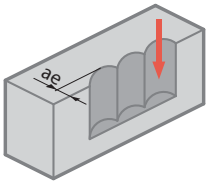
Applicable Chipbreaker

Cutter	GM	SM (GL)	GH	AM
Coarse Pitch (with shim)	○	○	○	○
Fine Pitch (without shim)	○	○	△ (fz ≦ 0.3mm/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 Iton (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

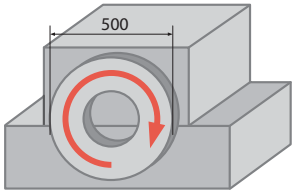
Cutting Dia.	Maximum Width of Cut (ae)
All Items	8.0 mm

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

Case Studies

Machine Part FC300

Vc = 170 m/min
ap × ae = 2.5 × 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**

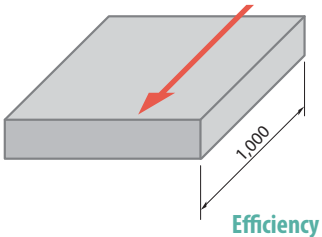
Competitor H (Positive Cutter) **68 cc/min**

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 FC250

Vc = 150 m/min
ap × ae = 4 × 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**

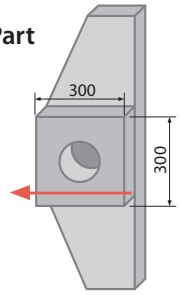
Competitor J (Negative Cutter / Vertical Inserts) **282 cc/min**

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 × ae = 1 × 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**

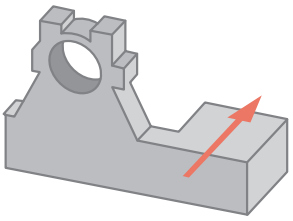
Competitor K (Negative Cutter / Vertical Inserts) **1 pcs/edge**

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

(User Evaluation)

Machine Part SS400

Vc = 260 m/min
ap × ae = 1.5 × 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)