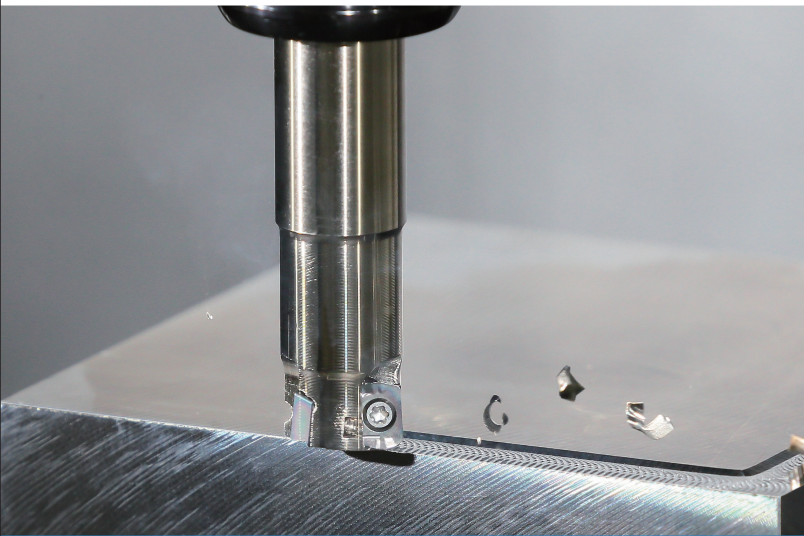
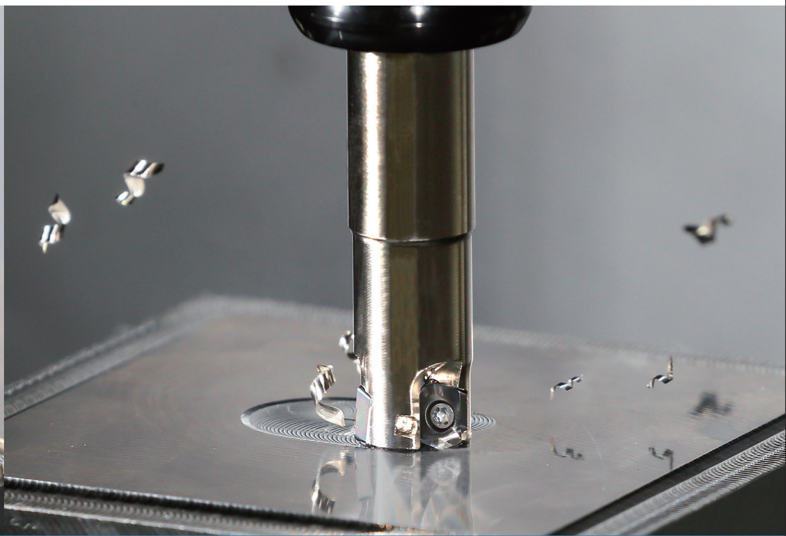
THE NEW VALUE FRONTIER
KYOCERA

Micro Diameter High Feed Mills | MFH Micro

Micro Dia. Cutter for High Feed Machining

MFH Micro





Low Resistance and Durable Against Chatter for Highly Efficient Machining

Shortens Rough Machining Times

Replaces Solid End Mills to Reduce Machining Costs

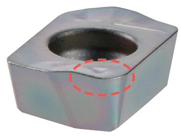
Supports Small Machining Centers Such as BT30

Micro Diameter / High Feed Mills

MFH Micro

Low Resistance and Durable Against Chatter for Highly Efficient Machining
Maximum ap 0.5 mm. Stable High Feed Machining on a Wide Range of Applications

Molded Convex Cutting Edge

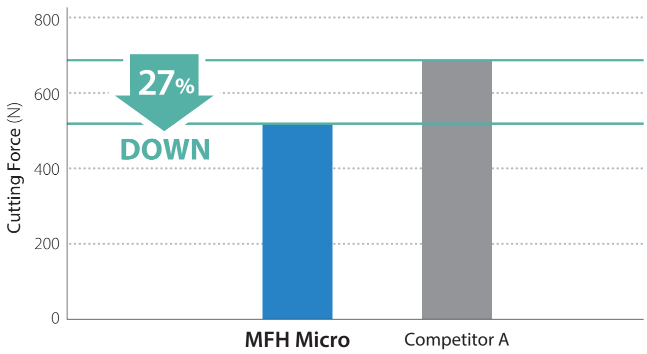


High Precision G Class Insert

1 Stable Machining with Chattering Resistance

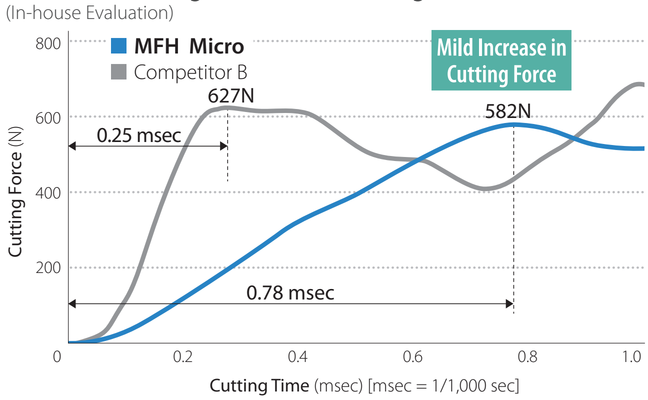
Molded Convex Cutting Edge Controls Initial Impact when Entering the Workpiece

Cutting Force Comparison (In-house evaluation)



Cutting Conditions: Vc = 120 m/min, fz = 0.6 mm/t, ap = 0.4 mm
Cutter Dia. ø10 mm, Slotting, Dry Workpiece: S50C

Increase in Cutting Force when Entering Work Piece
(In-house Evaluation)



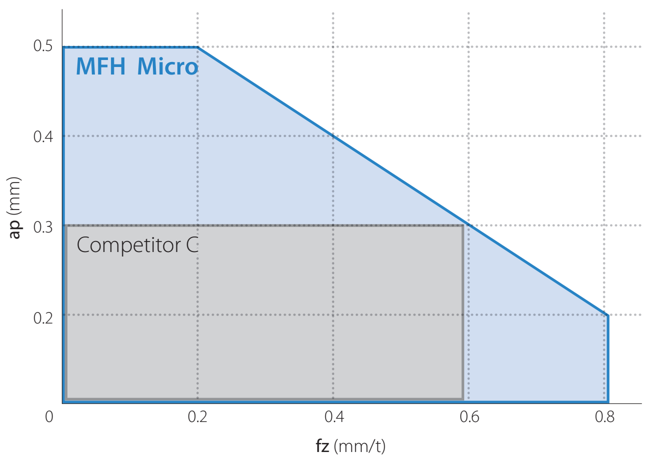
Cutting Conditions: Vc = 120 m/min, fz = 0.6 mm/t, ap × ae = 0.4 × 5 mm
Cutter Dia. ø10mm, Dry Workpiece: S50C

2 Wide Range of Machining Applications

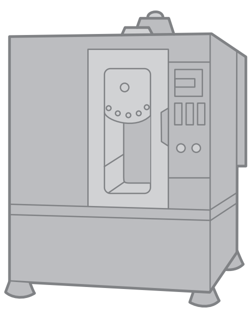
Wide Range of Machining Applications at a Maximum Depth of Cut of 0.5 mm

Stable Machining Even with Small Machining Centers

Cutting Performance Map (Cutter Dia. ø10 mm)



(In-house Evaluation)

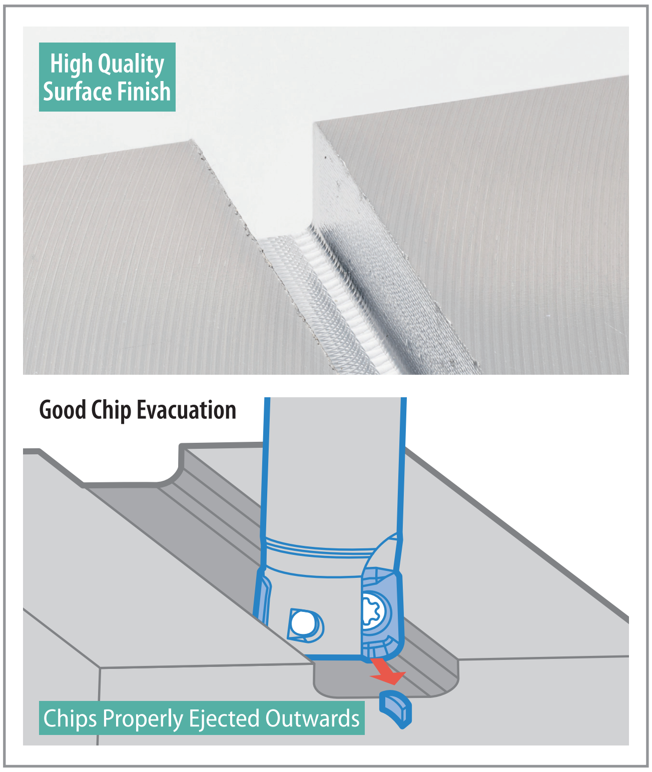


Supports BT30/BT40

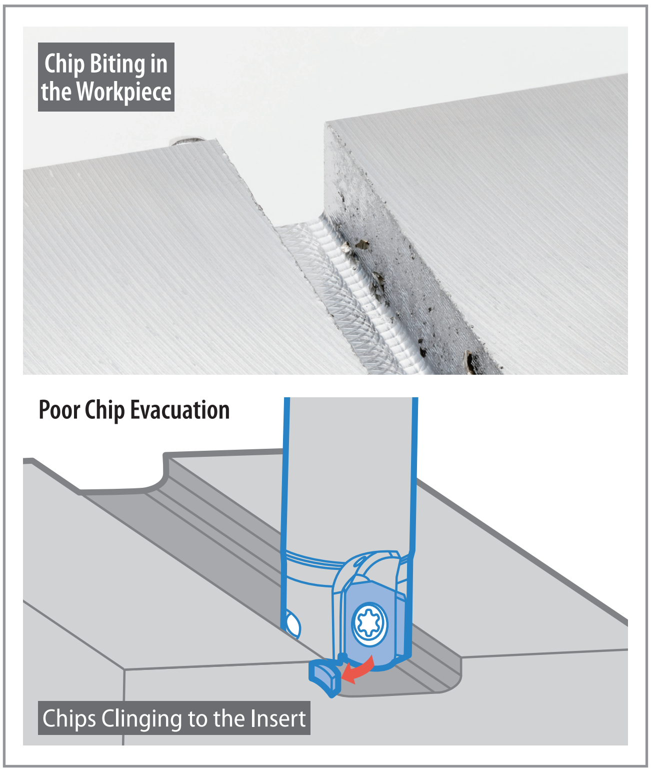
3 Good Chip Evacuation

Controls Chip Biting with Convex Cutting Edge

MFH Micro



Competitor F



Cutting Conditions: Cutter Dia. Dc = ø10 mm, Vc = 120 m/min, fz = 0.6 mm/t, ap = 0.4 mm (25 Passes) Total 10 mm, Dry Workpiece: SS400 (In-house Evaluation)

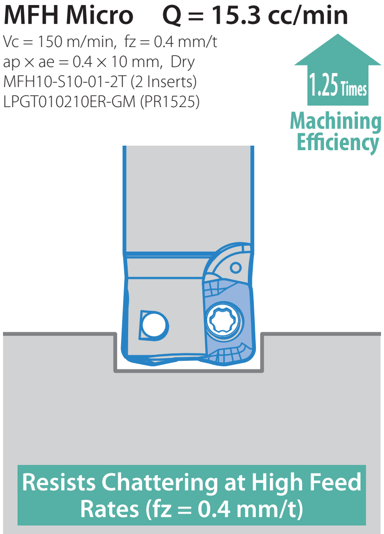
4 Replaces Solid End Mills to Reduce Machining Costs

Suppresses Chattering and Increases Milling Efficiency

MFH Micro Compared to Solid End Mills

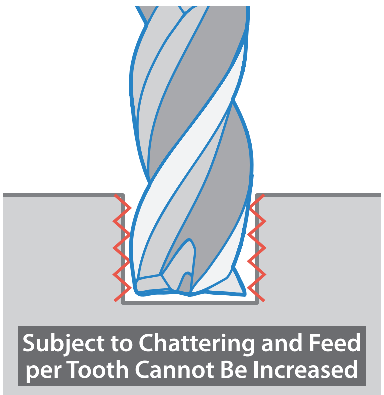
MFH Micro Q = 15.3 cc/min

Vc = 150 m/min, fz = 0.4 mm/t
ap × ae = 0.4 × 10 mm, Dry
MFH10-S10-01-2T (2 Inserts)
LPGT010210ER-GM (PR1525)

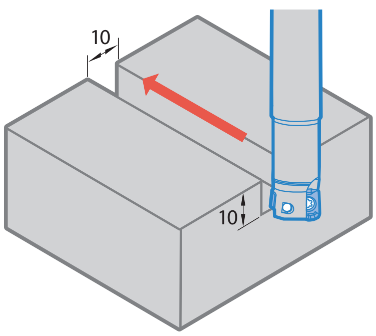


Solid End Mill Q = 12.2 cc/min

Vc = 80 m/min, fz = 0.04 mm/t
ap × ae = 3 × 10 mm, Dry
ø10 (4 Flute)



Mechanical Parts Slotting
Workpiece: S50C



(User Evaluation)

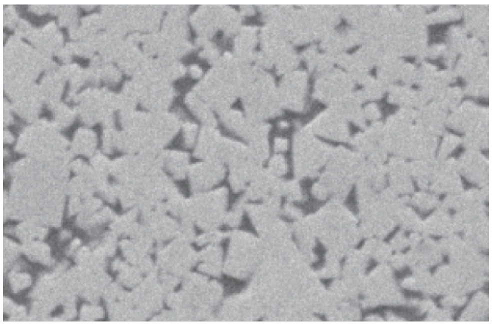
MEGACOAT NANO **PR1535**

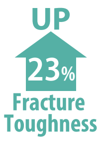
MEGACOAT NANO Grade PR1535 for stable machining of difficult-to-cut materials such as heat-resistant alloy, titanium, and precipitation hardened stainless steel

1 Toughening by a New Cobalt Mixing Ratio

An increase in cobalt content yields a substrate with greater toughness. Fracture toughness values are improved by 23% over previous grades.

High Toughness Carbide Base Material

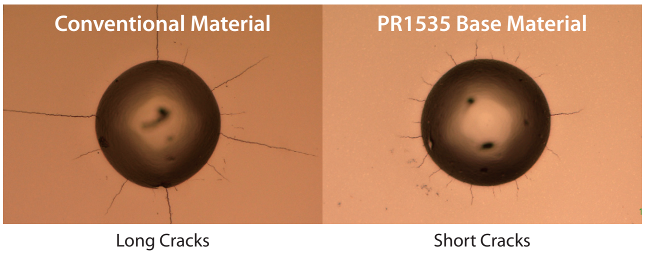




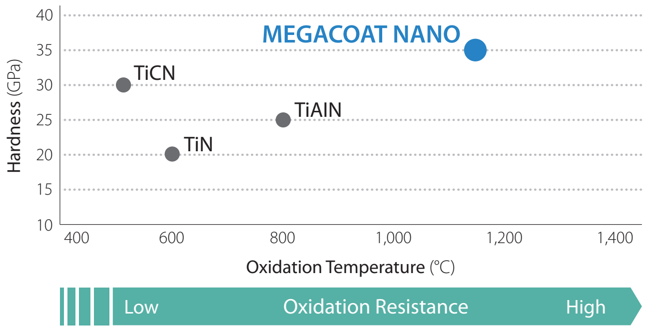
2 Stability Improvement

The coarse grain structure and uniform particle size correspond to improved heat resistance, with conductivity values decreased by 11%. The uniform structure also reduces crack propagation.

Cracks Compare by Diamond Indenter (In-house Evaluation)

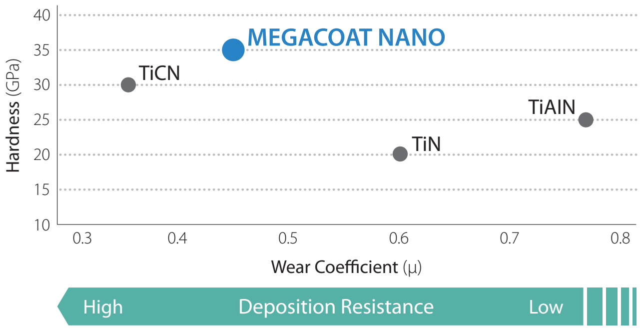


Coating Properties (Abrasion Resistance)



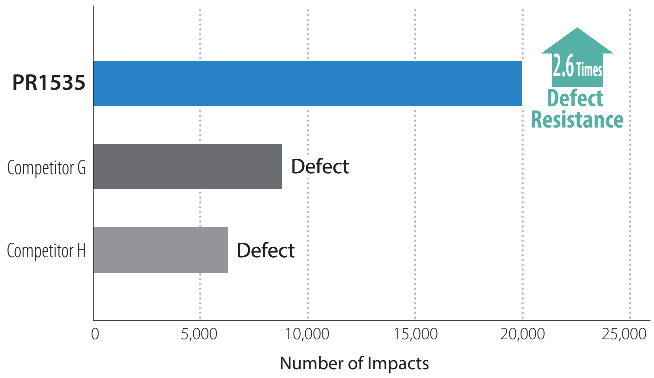
Achieve long tool life with the combination of a tough substrate and a special Nano coating layer

Coating Properties (Deposition Resistance)



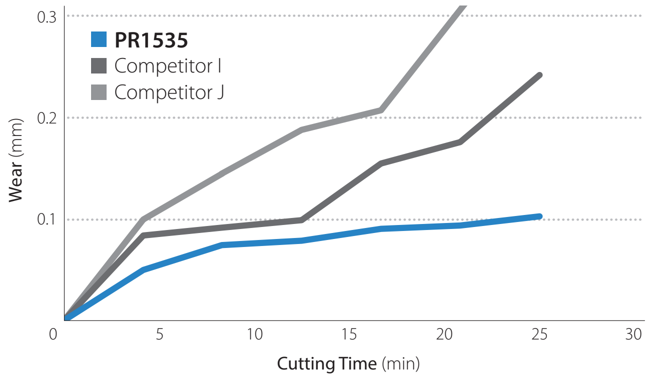
Stable Machining with Excellent Wear Resistance

Defect Resistance Comparison (in-house Evaluation)



Cutting Conditions: Vc = 120 m/min, fz = 1.5 mm/t, ap × ae = 0.4 mm × 2.5 mm
Cutting Dia. ø10, Dry Workpiece: SKD61 (40 to 45 HRC)

Abrasion Resistance Comparison (in-house Evaluation)



Cutting Conditions: Vc = 180 m/min, fz = 0.5 mm/t, ap x ae = 0.3 × 8 mm
Cutting Dia. ø10, Dry Workpiece: SUS304

MFH Micro

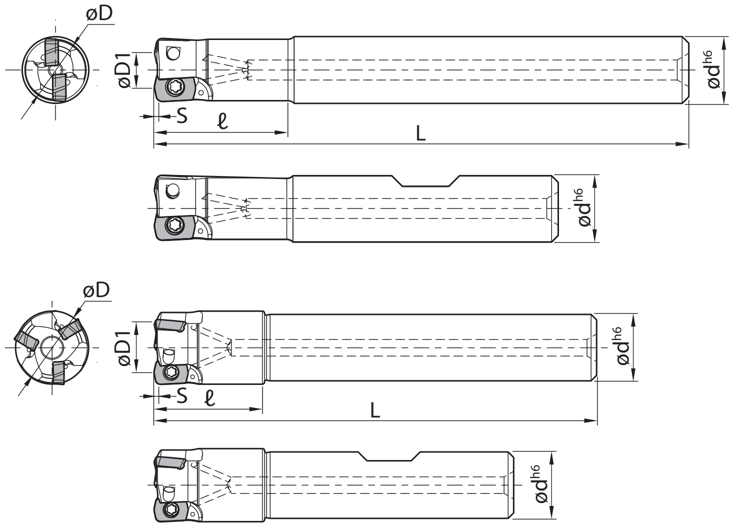


Fig. 1

Fig. 2

Fig. 3

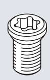
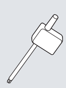
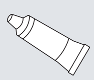
Fig. 4

Toolholder Dimensions

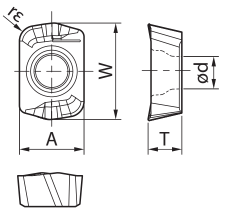
Shank	Description	Stock	No. of Inserts	Dimensions (mm)						Maximum Ramping Angle	A.R.	Coolant Hole	Shape	Weight (kg)	Max. Revolution (min^{-1})	Clamp Screw
				øD	øD1	ød	L	ℓ	S							
Standard	MFH08-S10-01-1T	●	1	8	4.2	10	75	16	0.5	4°	5°	Yes	Fig. 1	0.04	20,000	SB-1840TRP
	MFH10-S10-01-2T	●	2	10	6.2	10	80	20		3°				0.04	16,200	
	MFH12-S12-01-3T	●	3	12	8.2	12	80	20		2°				0.06	14,000	
	MFH16-S16-01-4T	●	4	16	12.2	16	90	25		1.2°				0.12	11,400	
Long Shank	MFH14-S12-01-3T	●	3	14	10.2	12	80	20	0.5	1.5°	5°	Yes	Fig. 3	0.07	12,500	
Standard (Weldon)	MFH08-W10-01-1T	●	1	8	4.2	10	58	16	0.5	4°	5°	Yes	Fig. 2	0.03	20,000	
	MFH10-W10-01-2T	●	2	10	6.2	10	60	20		3°				0.03	16,200	
	MFH12-W12-01-3T	●	3	12	8.2	12	65	20		2°				0.05	14,000	
	MFH16-W16-01-4T	●	4	16	12.2	16	73	25		1.2°				0.1	11,400	
Over Size (Weldon)	MFH14-W12-01-3T	●	3	14	10.2	12	65	20	0.5	1.5°	5°	Yes	Fig. 4	0.05	12,500	

● : Standard Stock

Spare Parts

Description	Spare Parts			Applicable Inserts
	Clamp Screw	Wrench	Anti-seize Compound	
				
MFH…-01-…	SB-1840TRP	FTP-6	MP-1	LPGT010210ER-GM

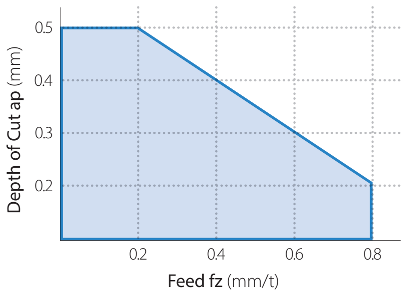
Applicable Inserts

Shape		Description	Dimensions (mm)					MEGACOAT NANO		CVD Coating
			A	T	ø d	W	rε	PR1525	PR1535	CA6535
 General Purpose		LPGT 010210ER-GM	4.19	2.19	2.1	6.26	1.0	●	●	●

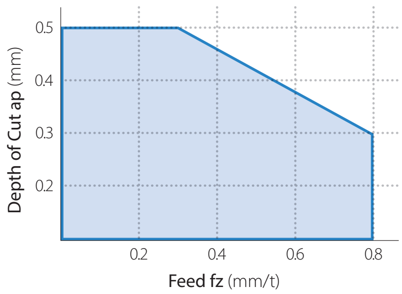
● : Standard Stock

Cutting Performance

Cutter Dia: ø8 to ø12



Cutter Dia: ø14 to ø16

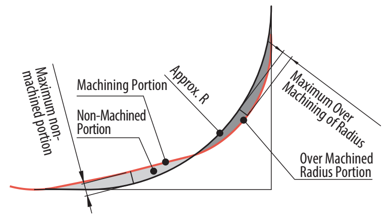


Recommended Cutting Conditions ★ 1st Recommended ☆ 2nd Recommended

Chipbreaker	Workpiece	Holder Description and Recommended Feed Rate (fz: mm/t) Recommended ap = 0.3mm Reference Value					Recommended Insert Grade and Cutting Speed (Vc: m/min)		
		MFH08-… -1T	MFH10-… -2T	MFH12-… -3T	MFH14-… -3T	MFH16-… -4T	MEGACOAT NANO PR1525	MEGACOAT NANO PR1535	CVD Coating CA6535
GM	Carbon Steel (SxxC)	0.2 – **0.4** – 0.6			0.2 – **0.5** – 0.8		★ 120 – **180** – 250	☆ 120 – **180** – 250	—
	Alloy Steel (SCM, etc.)						★ 100 – **160** – 220	☆ 100 – **160** – 220	—
	Mold Steel (SKD, etc.) (~40HRC)	0.2 – **0.3** – 0.5			0.2 – **0.4** – 0.6		★ 80 – **140** – 180	☆ 80 – **140** – 180	—
	Mold Steel (SKD/NAK, etc.) (40 ~ 50HRC)	0.2 – **0.25** – 0.3			0.2 – **0.25** – 0.4		★ 60 – **100** – 130	☆ 60 – **100** – 130	—
	Austenitic Stainless Steel (SUS304, etc.)	0.2 – **0.3** – 0.5			0.2 – **0.4** – 0.6		☆ 100 – **160** – 200	★ 100 – **160** – 200	—
	Martensitic Stainless Steel (SUS403, etc.)						—	☆ 150 – **200** – 250	★ 180 – **240** – 300
	Precipitation Hardened Stainless Steel (SUS630, etc.)						—	★ 90 – **120** – 150	—
	Gray Cast Iron (FC)	0.2 – **0.4** – 0.6			0.2 – **0.5** – 0.8		★ 120 – **180** – 250	—	—
	Nodular Cast Iron (FCD)	0.2 – **0.3** – 0.5			0.2 – **0.4** – 0.6		★ 100 – **150** – 200	—	—
	Ni-based Heat-resistant Alloy (Inconel®718, etc.)	0.2 – **0.25** – 0.3			0.2 – **0.25** – 0.4		—	☆ 20 – **30** – 50	★ 20 – **30** – 50
	Titanium Alloy (Ti-6Al-4V)						—	★ 40 – **60** – 80	—

Machining with coolant is recommended for Ni-base heat-resistant alloy and titanium alloy.
The numbers in bold are the recommended starting conditions. Adjust the cutting speed and the feed rate within the above conditions according to the actual machining situation.
Internal coolant is recommended for slotting applications.

Approximate Programming Radius Adjustment

Drawing	Approx. R (mm)	Maximum Wall Angle (mm)	Maximum Non-Machined Portion (mm)
	R1.0	0	0.21
	R1.2 (Recommended)	0	0.17
	R1.5	0.08	0.1
	R2.0	0.28	0.01

Cutting Edge Angle: 12°

Ramping Reference Data

Description	Cutter Dia. øD (mm)	8	10	12	14	16
MFH…-01-…	Maximum Ramping Angle α_{max}	4.0°	3.0°	2.0°	1.5°	1.2°
	tan α_{max}	0.070	0.052	0.035	0.026	0.021

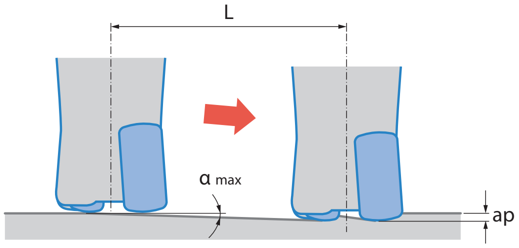
Decrease Ramping Angle if Chips Become Excessively Long

Ramping

Ramping angle should be under α_{max} (maximum ramping angle) in the above conditions
Reduce recommended feed rate in cutting conditions above by 70%

Formula for Max. cutting length (L) at Max. ramping angle

$$L = \frac{ap}{\tan \alpha_{max}}$$

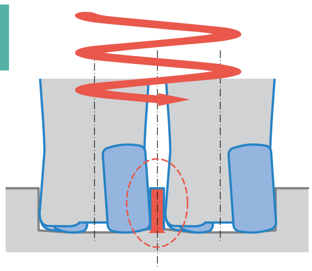


Helical Milling

For helical milling, use between Min. drilling dia. and Max. drilling dia.

✕ Exceeding Max. Machining Dia.

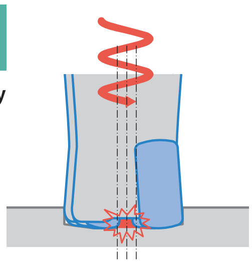
Center Core Remains

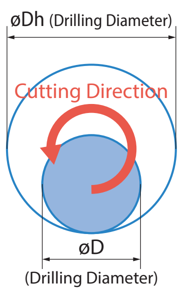


Center Core Remains

✕ Under Min. Machining Dia.

Center Core Hits Holder Body



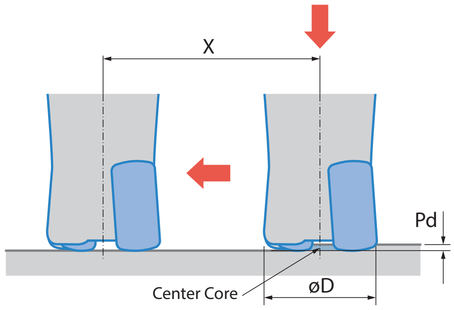


Holder	Min. Drilling Dia. øDh1	Max. Drilling Dia. øDh2
MFH…-01-…	2×D–3.5	2×D–2

Unit: mm

Keep machine depth per rotation less than Max. ap (0.5 mm)
Use climb milling (See figure on right)
Feed rates should be reduced to 50% of recommended cutting condition
Use caution to eliminate incidences caused by producing long chips

Drilling

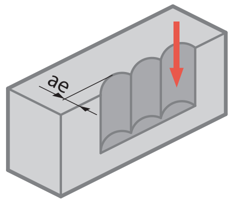


Holder	GM	
	Max. Drilling Depth (Pd)	Min. Cutting Length X for Flat Bottom Surface
MFH…-01-…	0.5	øD – 3.5

Unit: mm

When traversing after drilling, it is recommended to reduce the feed by 25% of recommended cutting conditions
When drilling, axial feed rate recommendation per revolution is f = 0.2 mm/rev

Plunging



Plunging

Insert Description	Maximum Width of Cut (ae)
LPGT01 Type	1.7 mm

When plunging, reduce feed rate to fz = 0.2 mm/t or less