KYOCERA

MFH-RAPTOR MiCRO

Smallest Diameter in MFH High Feed Milling Series

Low Cutting Resistance with a Durable Design Aids in Highly Efficient Machining

Shortens Rough Machining Cycle Times

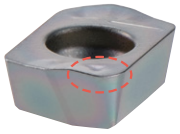
Replaces Solid End Mills to Reduce Machining Costs

Supports Small Machining Centers

MFH Micro

Durable Design Aids in Chatter Resistance
Maximum D.O.C. 0.020". Stable High Feed Machining on a Wide Range of Applications

Molded Convex Cutting Edge

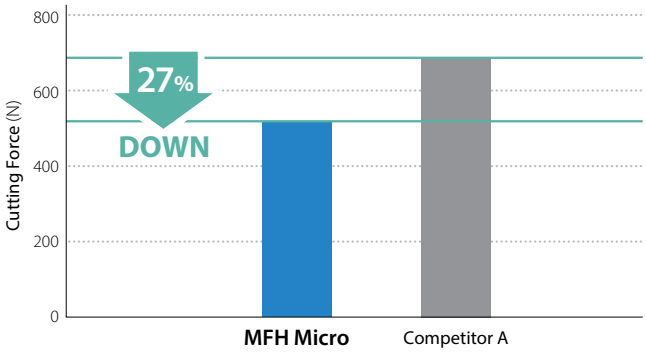


High Precision G Class Insert

1 Stable Machining with Chattering Resistance

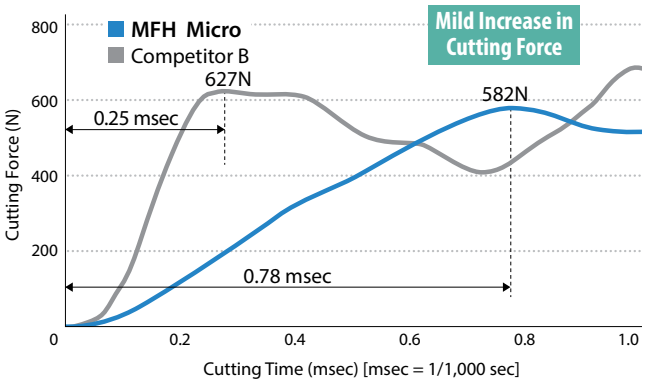
Molded Convex Cutting Edge Controls Initial Impact when Entering the Workpiece

Cutting Force Comparison (In-house Evaluation)



Cutting Conditions: Vc = 390 sfm, fz = 0.024 ipt, D.O.C. = 0.016"
Cutter Dia. Ø0.375", Slotting, Dry Workpiece: 1049

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



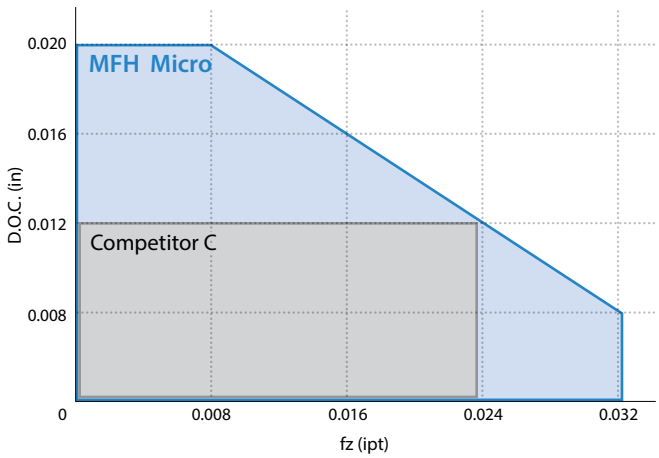
Cutting Conditions: Vc = 390 sfm, fz = 0.024 ipt, D.O.C. × ae = 0.016" × 0.197"
Cutter Dia. Ø0.375", Dry Workpiece: 1049

2 Wide Range of Machining Applications

Wide Range of Machining Applications at a Maximum Depth of Cut of 0.020"

Stable Machining Even with Small Machining Centers

Cutting Performance Map (Cutter Dia. Ø0.375")

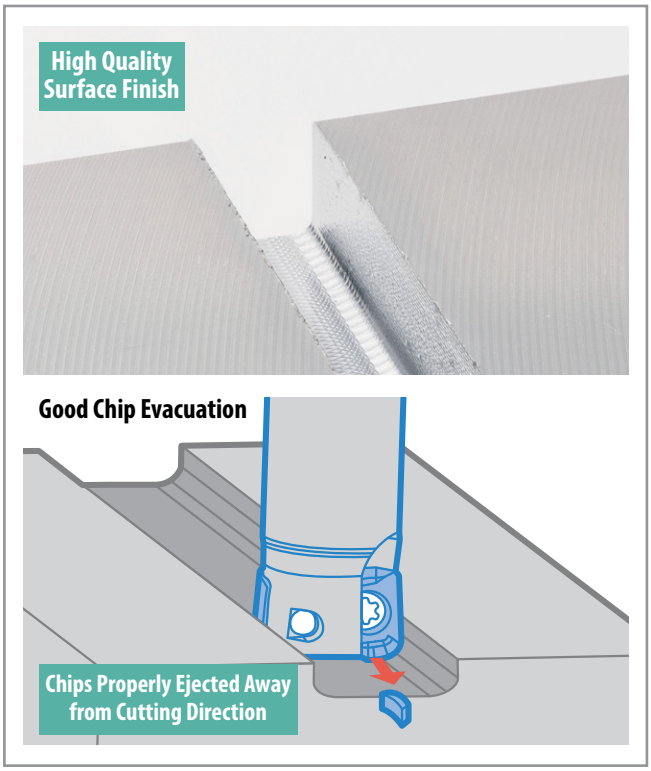


(In-house Evaluation)

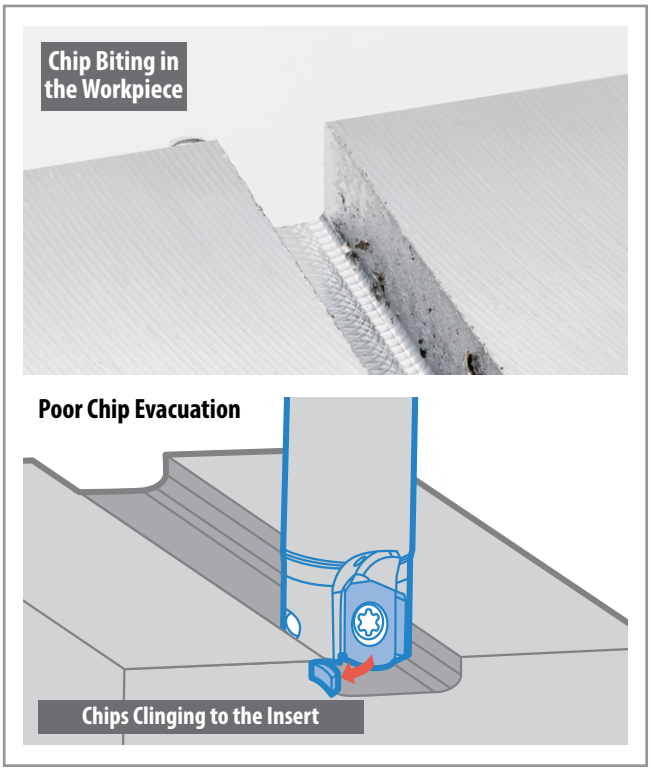
3 Good Chip Evacuation

Controls Chip Biting with Convex Cutting Edge

MFH Micro



Competitor F



Cutting Conditions: Cutter Dia. Dc = Ø0.375", Vc = 390 sfm, fz = 0.024 ipt, D.O.C. = 0.016" (25 Passes) Total 0.394", Dry Workpiece: Structural Steel (In-house Evaluation)

4 Replaces Solid End Mills to Reduce Machining Costs

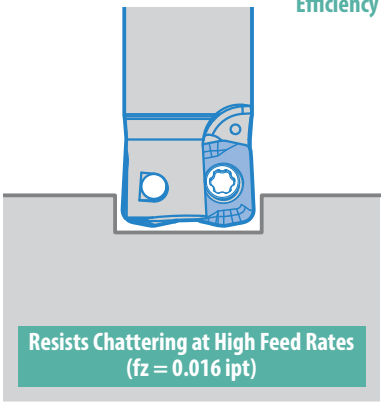
Suppresses Chattering and Increases Milling Efficiency

MFH Micro Compared to Solid End Mills

MFH Micro Q = 15.3 cc/min

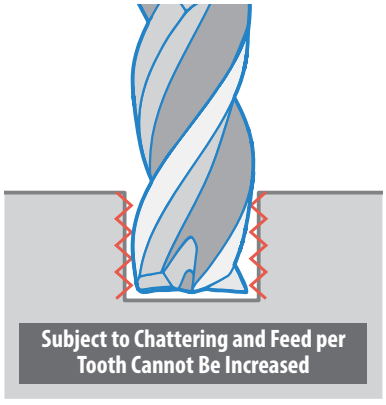
Vc = 490 sfm, fz = 0.016 ipt
D.O.C. × ae = 0.016" × 0.394", Dry
MFH10-S10-01-2T (2 Inserts)
LPGT010210ER-GM (PR1525)

1.2x Machining Efficiency

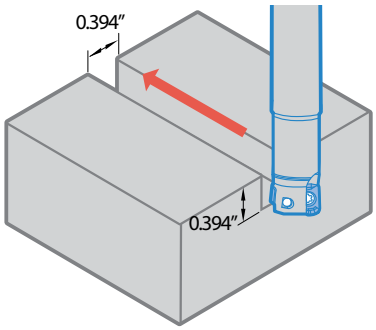


Solid End Mill Q = 12.2 cc/min

Vc = 260 sfm, fz = 0.002 ipt
D.O.C. × ae = 0.012" × 0.394", Dry
Ø10mm (4 Flute)



Mechanical Parts Slotting
Workpiece: 1049



(User Evaluation)

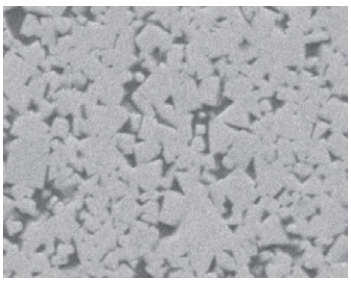
PR1535 MEGACOAT NANO

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

1 23% Improved Fracture Toughness

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

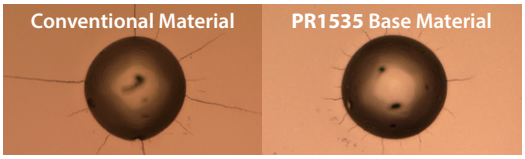


23% Fracture Toughness

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.

Cracking Comparison by Diamond Indentor (In-house Evaluation)

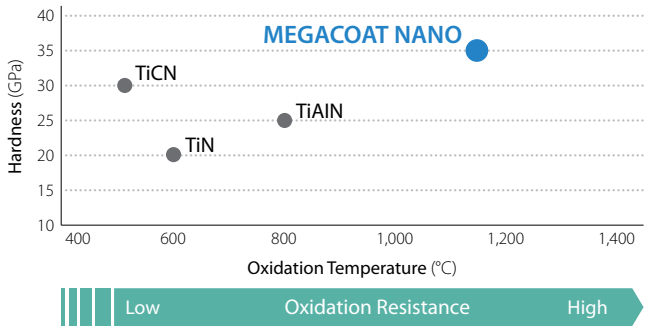


Shock Resistance

Long Cracks

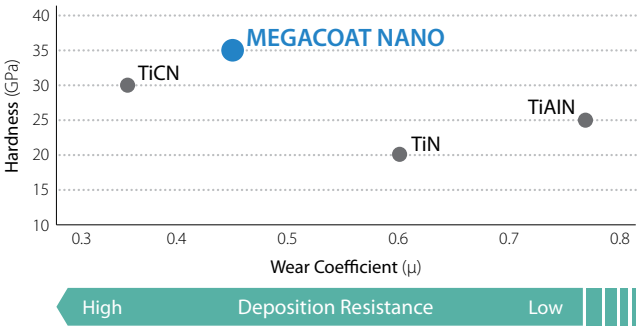
Short Cracks
(High Impact Improvement)

Coating Properties (Abrasion Resistance)



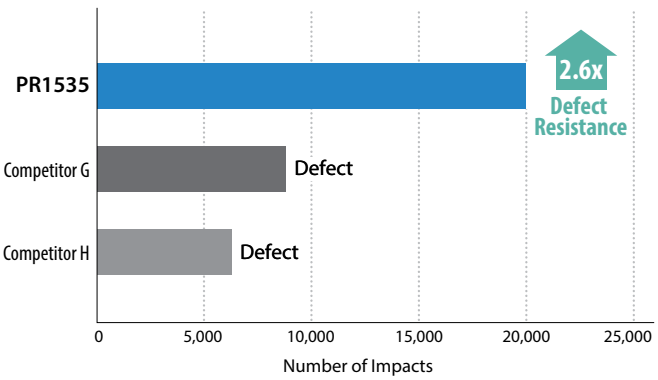
Achieve long tool life with the combination of a tough substrate and a special Nano coating layer

Coating Properties (Deposition Resistance)



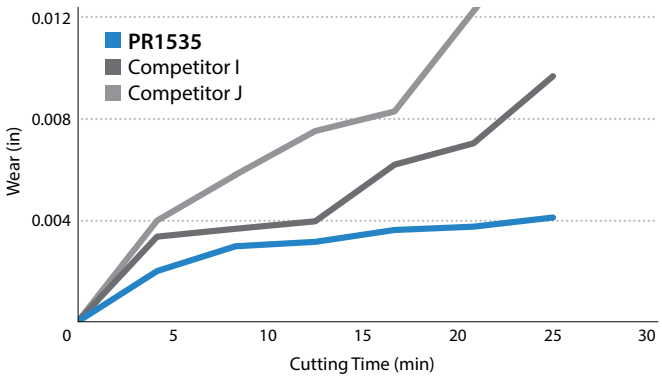
Stable Machining with Excellent Wear Resistance

Defect Resistance Comparison (In-house Evaluation)

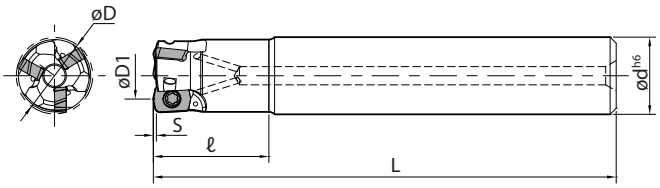


Cutting Conditions: Vc = 120 m/min, fz = 1.5 mm/t, ap × ae = 0.4 mm × 2.5 mm
Cutting Dia. ø10, Dry Workpiece: SKD61 (40 to 45 HRC)

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



MFH0500-S500-01-3T-3

Fig. 1

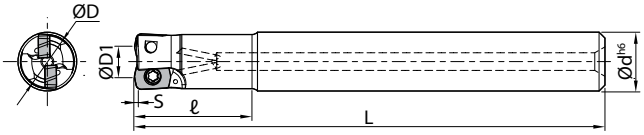


Fig. 2

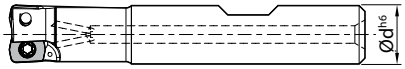


Fig. 3

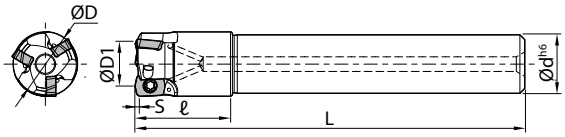


Fig. 4

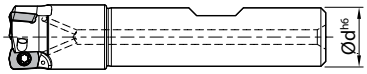


Fig. 5

Toolholder Dimensions (Inch Size)

Shank	Description	Stock	No. of Inserts	Dimensions (in)						Maximum Ramping Angle	Rake Angle (°)	Coolant Hole	Drawing	Weight (kg)	Max. Rev. (min^{-1})	Clamp Screw
				ØD	ØD1	Ød	L	ℓ	S	α	A.R.					
Standard (Cylindrical)	MFH 0375-S375-01-1T-3	■	1	0.375	0.225	0.375	3.000	0.750	0.020	3°	+5°	✓	Fig. 1	0.04	16,200	SB-1840TRP
	0500-S500-01-3T-3	●	3	0.500	0.350	0.500	3.000	0.750		2°				0.07	14,000	
	0625-S625-01-4T35	●	4	0.625	0.475	0.625	3.500	1.000		1.2°				0.12	11,400	

● : U.S. Stock ■ : Made to Order

Toolholder Dimensions (Metric Size)

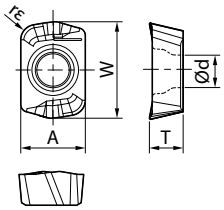
Shank	Description	Stock	No. of Inserts	Dimensions (mm)						Maximum Ramping Angle	Rake Angle (°)	Coolant Hole	Drawing	Weight (kg)	Max. Rev. (min^{-1})	Clamp Screw
				ØD	ØD1	Ød	L	ℓ	S	α	A.R.					
Standard (Cylindrical)	MFH 08-S10-01-1T	○	1	8	4.2	10	75	16	0.5	4°	5°	✓	Fig. 2	0.04	20,000	SB-1840TRP
	10-S10-01-2T	○	2	10	6.2	10	80	20		3°				0.04	16,200	
	12-S12-01-3T	○	3	12	8.2	12	80	20		2°				0.06	14,000	
	16-S16-01-4T	○	4	16	12.2	16	90	25		1.2°				0.12	11,400	
Long Shank (Cylindrical)	MFH 14-S12-01-3T	○	3	14	10.2	12	80	20	0.5	1.5°	5°	✓	Fig. 4	0.07	12,500	
Standard (Weldon)	MFH 08-W10-01-1T	○	1	8	4.2	10	58	16	0.5	4°	5°	✓	Fig. 3	0.03	20,000	
	10-W10-01-2T	○	2	10	6.2	10	60	20		3°				0.03	16,200	
	12-W12-01-3T	○	3	12	8.2	12	65	20		2°				0.05	14,000	
	16-W16-01-4T	○	4	16	12.2	16	73	25		1.2°				0.1	11,400	
Over Size (Weldon)	MFH 14-W12-01-3T	○	3	14	10.2	12	65	20	0.5	1.5°	5°	✓	Fig. 5	0.05	12,500	

○ : World Express (Shipping: 7-10 Business Days)

Spare Parts and Applicable Inserts (Metric Size)

Description	Spare Parts				Applicable Inserts ➡ P6
	Clamp Screw	Wrench	Pre-Set Torque Wrench* NEW	Anti-Seize Compound	
					
MFH…-01-…	SB-1840TRP	FTP-6	PST-IP6	MP-1	LPGT010210ER-GM

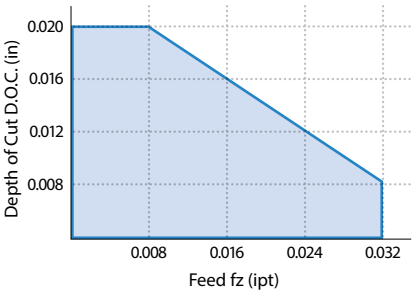
Applicable Inserts

Insert		Description	Dimension (in)					MEGACOAT NANO		CVD
			A	T	Ød	W	rε	PR1535	PR1525	CA6535
 General Purpose		**LPGT010210ER-GM**	0.165	0.086	0.083	0.247	0.039	●	●	●

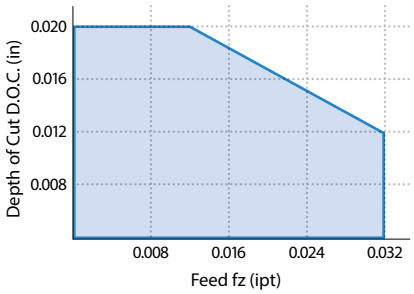
● : U.S. Stock

Cutting Performance

Cutter Dia: Ø0.375" ~ Ø0.500"
Cutter Dia: Ø8 ~ Ø12



Cutter Dia: Ø0.625"
Cutter Dia: Ø14 ~ Ø16

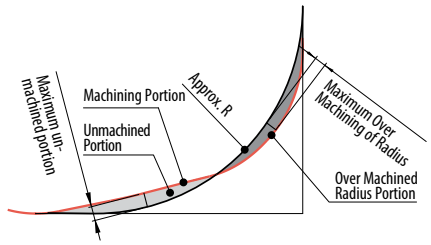


Recommended Cutting Conditions ★ 1st Recommendation ☆ 2nd Recommendation

Chipbreaker	Workpiece Material	Holder Description and Feed Rate (fz: ipt) *Recommended D.O.C. = 0.012" Reference Value*					Recommended Insert Grade (Vc: sfm)		
		MFH08-… -1T	MFH10-… -2T	MFH12-… -3T	MFH14-… -3T	MFH16-… -4T	MEGACOAT NANO		CVD
							PR1525	PR1535	CA6535
GM	Carbon Steel	0.008~**0.016**~0.024			0.008~**0.020**~0.031		★ 390-**590**-820	☆ 390-**590**-820	-
	Alloy Steel						★ 330-**520**-720	☆ 330-**520**-720	-
	Mold Steel (~40 HRc)	0.008~**0.012**~0.020			0.008~**0.016**~0.024		★ 260-**460**-590	☆ 260-**460**-590	-
	Mold Steel (40~50 HRc)	0.008~**0.010**~0.012			0.008~**0.010**~0.016		★ 200-**330**-430	☆ 200-**330**-430	-
	Austenitic Stainless Steel	0.008~**0.012**~0.020			0.008~**0.016**~0.024		☆ 330-**520**-660	★ 330-**520**-660	-
	Martensitic Stainless Steel						-	☆ 490-**660**-820	★ 590-**790**-980
	Precipitation Hardened Stainless Steel						-	★ 300-**390**-490	-
	Gray Cast Iron	0.008~**0.016**~0.024			0.008~**0.020**~0.031		★ 390-**590**-820	-	-
	Nodular Cast Iron	0.008~**0.012**~0.020			0.008~**0.016**~0.024		★ 330-**490**-660	-	-
	Ni-base Heat-Resistant Alloy	0.008~**0.010**~0.012			0.008~**0.010**~0.016		-	☆ 70-**100**-160	★ 70-**100**-160
	Titanium Alloy						-	★ 130-**200**-260	-

- Machining with coolant is recommended for Ni-base Heat Resistant Alloy and Titanium Alloy
- The number in bold font is 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	Programmable R (in)	Maximum Wall Angle (in)	Maximum Unmachined Portion (in)
	**0.039**	0	0.0083
	0.047 (Recommended)	0	0.0067
	0.059	0.0032	0.0039
	0.079	0.0110	0.0004

Cutting Edge Angle: 12°

Ramping Reference Data

Description	Cutter Dia. ØD	0.375"	0.500"	0.625"	8mm	10mm	12mm	14mm	16mm
MFH…-01-…	Maximum Ramping Angle α max	3.0°	2.0°	1.2°	4.0°	3.0°	2.0°	1.5°	1.2°
	tan α max	0.052	0.035	0.021	0.070	0.052	0.035	0.026	0.021

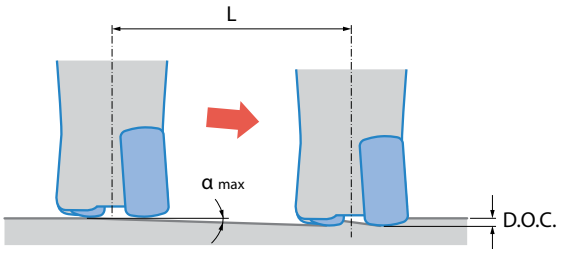
Decrease Ramping Angle if Chips Become Excessively Long

Ramping

- Recommended ramping angle is ≤ max (see chart above for recommended ramp angle)
- Reduce recommended feed rate by 70%

Formula for Max. Cutting Length (L) at Max. Ramping Angle

$$L = \frac{D.O.C.}{\tan \alpha_{max}}$$

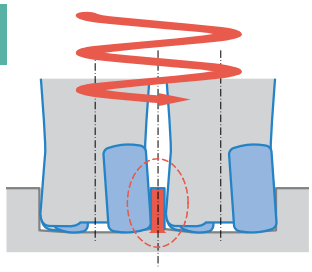


Helical Milling

- For Helical milling, use between Min. Drilling Dia. and Max. Drilling Dia.

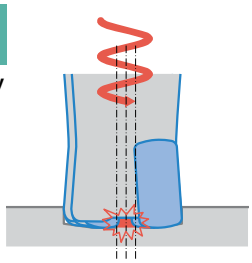
Exceeding Max. Machining Dia.

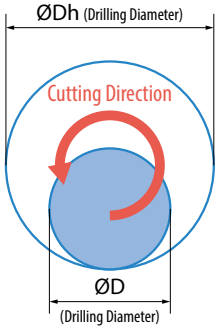
Center Core Remains



Under Min. Machining Dia.

Center Core Hits Holder Body

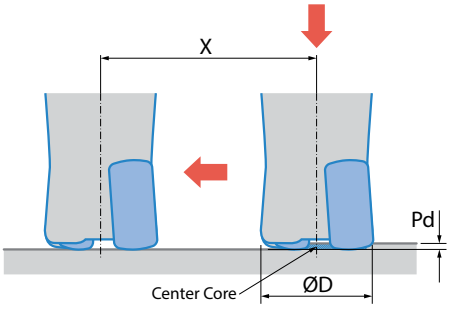




Holder	Min. Drilling Dia.	Max. Drilling Dia.
MFH…-01-…	2xØD-0.138"	2xØD-0.079"

- Keep machine depth per rotation less than max D.O.C. (0.020")
- Use climb milling. (Refer to detail on right)
- Feed rate should be reduced to 50% of recommended cutting condition (**Page 6**)
- Use caution to eliminate incidences caused by producing long chips

Drilling

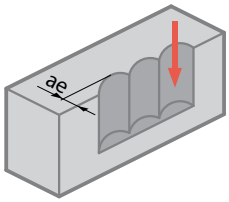


Holder	Min. Drilling Depth (Pd)	Min. Cutting Length X for Flat Bottom Surface
MFH...-01-...	0.020"	ØD-0.138"

Plunging After Drilling

- It is recommended to reduce feed by 25% of recommendation on **Page 6** until Center Core is removed
- Axial feed rate recommendation per revolution is 0.008ipr while drilling

Plunging



Insert Description	Maximum Width of Cut (ae)
LPGT01...	0.067"

- Reduce feed rate to fz ≤ 0.008 ipt when plunging

MFH Series

MFH-RAPTOR
High Feed Machining

Cutter Dia. Ø1.000" ~ Ø6.000"
Cutter Dia. Ø25 ~ Ø160

Large Lineup for High Feed Machining,
Large ap and Low Cutting Force

MFH-RAPTOR MiNi
Small Dia. Cutter for High Feed Machining

Cutter Dia. Ø0.625" ~ Ø2.000"
Cutter Dia. Ø16 ~ Ø32

Economical Inserts with 4 Cutting Edges
High Efficiency with Small Dia. And Fine Pitch
High Feed Machining

KYOCERA

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