KYOCERA

MFF

High-Precision Cutter for Finishing Applications

Innovative Finishing Technology with Excellent Efficiency

Enhanced Cutter Design for a Better Finishing Solution

Molded Wiper Insert Design

High Feed Rates (f = Max 0.197 ipt) and High-Quality Surface Finish (0.8 µm Ra)

Adjustable Cutting Edge Height for Improved Usability

MFF

High-Precision Cutter for Finishing Applications

Cutter Body Design Provides Excellent Reliability
Molded Wiper Inserts Increase Machining Efficiency

1 Innovative Solutions for Finish Machining

Designed with a unique insert combination of semi-finishing and finishing, the MFF drastically improves productivity by reducing finish quality issues.

Semi-finishing Insert
To flatten rugged surfaces

Finishing Insert
Provides excellent surface finish
Adjustable cutting edge and a single insert eliminates runout

SOLUTION

Increase feed to f = 0.197 ipt

Achieved 0.8 µm Ra surface finish

No grinding required

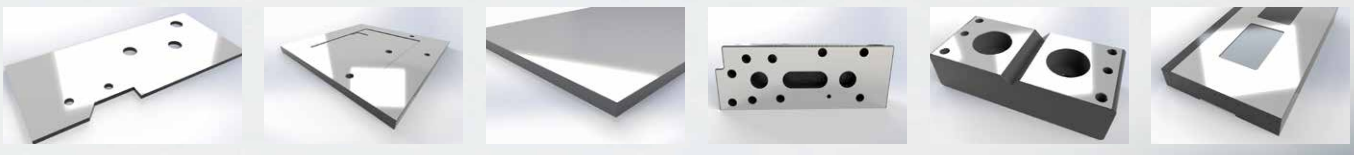
Achieved 5 µm flatness

The above is the result of a field test. Actual results will depend on machining environment, workpiece rigidity, machine, etc.
For more details, see case studies on page 4 and 5.

MFF Machining Solutions

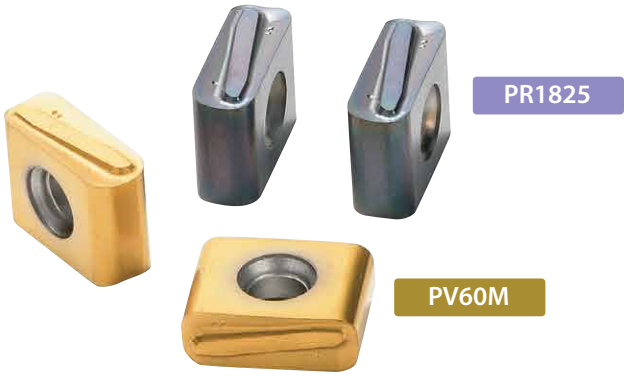
Can be used on a wide variety of parts and workpieces

Parts	Workpieces	Industries
Plate / Frame / Case	**SS400 / NO.45 / 80-60-03**	**Industrial Machining**
Cylinder Pump / Rail	**Cast Iron**	**Machine Tools**
Turbine Housing	**Mold Steel**	**Shipbuilding / Automotive**
Casing / Mold Base	**Carburized and Hardened Steel (60 HRC)**	**Construction Machinery**
		Molds



2 Molded Wiper Insert for High-Quality Surface Finish

Utilizes Kyocera's unique molded insert technology for high feed rates and excellent surface finish



Low cutting force with special edge preparation

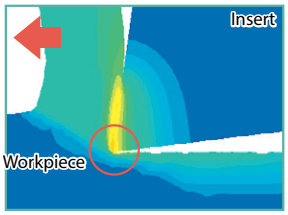
Micro-honing
Good sharpness

Wiper edge

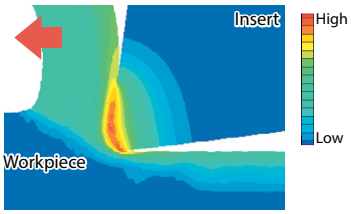
Large S-curve shape developed for higher feed rates

Edge Temperature Simulation Comparison (Internal Evaluation)

MFF



Conventional Tool **After 2 sec machining**



MEGACOAT NANO Cermet PV60M

For high-speed machining
Recommended Vc = ~ 1,150 sfm

High-quality surface finish

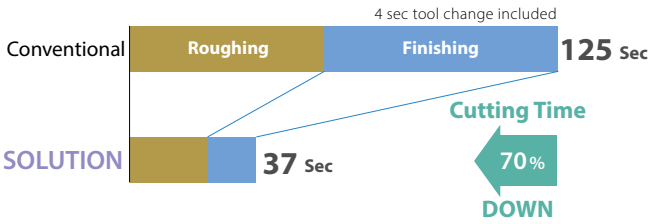
Molded TT Chipbreaker

Reduces chip clogging
High feed machining

Comprehensive Machining Solutions

From Roughing to Finish Machining Improvements (Internal Evaluation)

Combine with Kyocera's MFH high feed cutter to improve quality and efficiency



Cutting Conditions
Conventional Ø200mm (6 flute)
Vc = 660 sfm
Roughing : Vf = 11.26 ipm (fz = 0.006 ipt), D.O.C. = 0.047"
Finishing : Vf = 9.06 ipm (fz = 0.005 ipt), D.O.C. = 0.012"

SOLUTION
Roughing: MFH-RAPTOR Ø63mm (6 flute)
Vc = 660 sfm
Vf = 287.40 ipm (fz = 0.047 ipt), D.O.C. = 0.028"
Finishing: MFF Ø200mm (2 flute)
Vc = 980 sfm
Vf = 94.49 ipm (f = 0.197 ipt), D.O.C. = 0.004"

Surface Finish Quality after Machining

The MFF SOLUTION

Excellent Surface Finish (0.27 µm Ra)

Conventional Machining

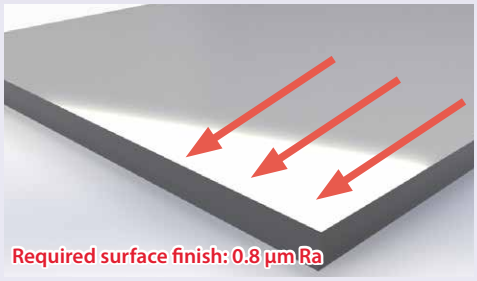
Cloudy Surface Finish (1.01 µm Ra)

Take advantage of innovative finishing solutions with the MFF

User Evaluations

SOLUTION 1 — 1.7 times increase in efficiency at f = 0.197 ipt with a 0.8 µm Ra surface finish

Plate (SS400)

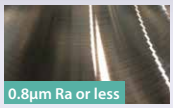


SOLUTION
MFF
Ø200mm 2 flute

1.7 times Machining Efficiency

Vf = **8,530** sfm

Vc = 1,080 sfm, f = 0.169 ipt, D.O.C. = 0.004", Dry



Conventional
Competitor A
Ø200mm 2 flute

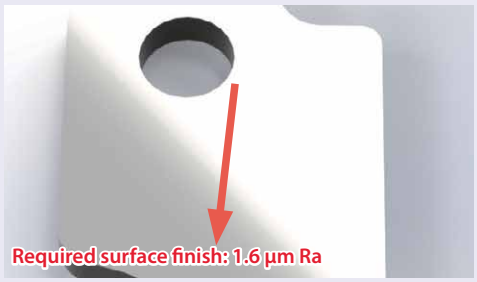
Vf = **4,920** sfm

Vc = 720 sfm, f = 0.169 ipt, D.O.C. = 0.004", Dry

The conventional cutter was not able to feed faster than f = 0.169 ipt as surface finish deteriorated.
The MFF showed good surface finish of 0.8 µmRa or less even at f = 0.197 ipt.
Increasing the cutting speed increased machining efficiency by 1.7 times.

SOLUTION 2 — Surface finish 0.5 µm Ra. No grinding required (Fewer Processes)

Valve (65-45-12)

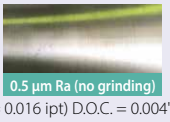


SOLUTION
MFF
Ø160mm 2 flute

No grinding required

127 sec

Vc = 980 sfm, Vf = 9.84 ipm (f = 0.016 ipt) D.O.C. = 0.004", Wet



Conventional
Competitor B
Ø200mm 10 flute

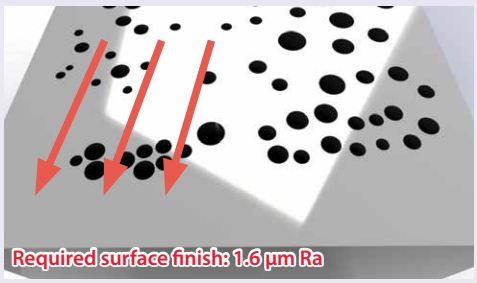
Machining **32** sec + Grinding **10** min

Vc = 980 sfm, Vf = 31.50 ipm (f = 0.063 ipt) D.O.C. = 0.004", Wet

Conventional cutter showed cloudy finished surface, MFF provided 0.5 µm Ra with a glossy finish.
Reduced grinding process and cycle time by 80%.

SOLUTION 3 Improved flatness and machining efficiency tripled in interrupted mold steel

Mold (H13 Equivalent)

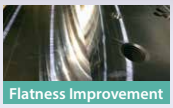


SOLUTION
MFF
Ø200mm 2 flute

Machining Efficiency x 3

Vf = 14.96 ipm 6 Pass

Vc = 390 sfm, f = 0.079 ipt, D.O.C. = 0.002", Dry



Conventional
Competitor C
Ø125mm 5 flute

Vf = 8.27 ipm 10 Pass

Vc = 390 sfm, f = 0.026 ipt, D.O.C. = 0.002", Dry

The MFF left a good finished surface with no gaps among tool path seams.
Larger cutter diameter reduced the number of passes to six and improved productivity.
Desirable chip shape and size were achieved.

SOLUTION 4 Flatness of 5 µm was achieved. Showed good surface finish with reduced chattering on the thin part

Case (NO.45)

SOLUTION
MFF
Ø100mm 2 flute

Machining Quality Improvement

Reduced Chattering and Good Finish

Vc = 1,080 sfm, Vf = 62.99 ipm (f = 0.059 ipt) D.O.C. = 0.004", Dry

Conventional
Competitor D
Ø100mm 8 flute (CBN)

Chattering occurred in thin wall

Vc = 3,940 sfm, Vf = 96.46 ipm (f = 0.025 ipt) D.O.C. = 0.004", Dry

Conventional cutter needed adjustment due to chattering on the thin portion.
MFF prevented chattering. Finished surface is good and there is no gap in the tool path seams.
Flatness of 5 µm achieved.

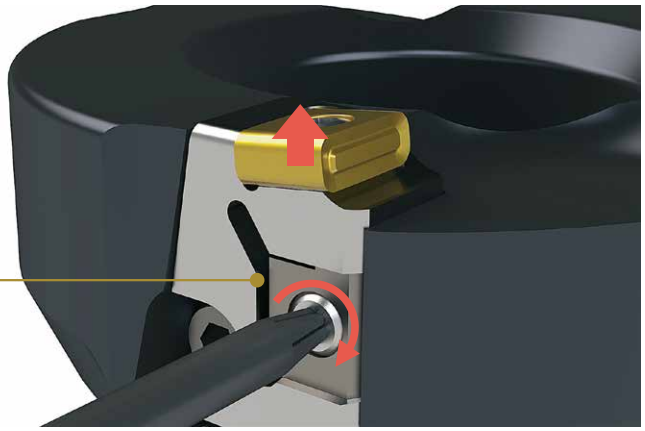
3 Adjustable Cutting Edge Height for Increased Usability

Cartridge height comes pre-adjusted and adjustment should not be necessary.

Adjustment is not required after replacing insert.

Easy-to-adjust Cutting Edge Height

Cutting edge height can be adjusted easily with one screw

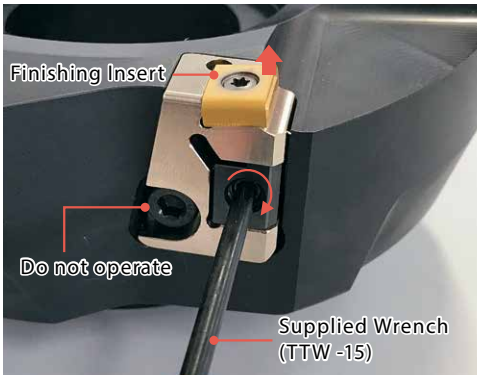


Included adjustment wrench

Edge Adjustment

If D.O.C. is 0.004"~0.008" (0.1mm ~ 0.2mm), no adjustment is necessary (Pre-adjusted before holder is shipped).
Cutting edge adjustment is NOT required when replacing inserts.

If D.O.C. is less than 0.004" (0.1mm) or if you prefer a different edge height, use the following method:



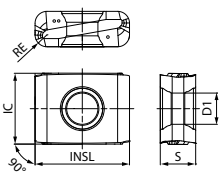
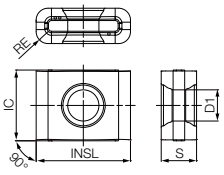
Adjusting the Cutting Edge
Use the supplied TTW-15 wrench to rotate the screw and easily adjust the cutting edge position.

Procedure
To adjust, start with the screw turned counterclockwise about two rotations (lowering the cutting edge). Tighten the screw clockwise (raising the cutting edge) to adjust the amount of protrusion.
*Use a dial gauge to measure protrusion amount.

Precautions:
Make sure to lower the cutting edge below the desired height first (turning screw counterclockwise) and then raise the edge up to the final height (turning screw clockwise). If cutting edge is simply lowered to the final edge height, chattering or loosening of the screw may occur due to backlash. Make sure the measurement position of the cutting edge is the same machining diameter.

Standard Cutting Edge Height
D.O.C. = 0.0020" => protrusion against rough edge: 0.0012"
ap = 0.0039" ~ => protrusion against rough edge : 0.0024" *Pre-adjusted before shipment

Applicable Inserts

Shape		Part Number	Dimensions (mm)					MEGACOAT NANO Cermet	MEGACOAT NANO EX Carbide	MEGACOAT NANO Carbide
			IC	S	D1	INSL	RE	PV60M	PR1825	PR1525
 Steel and Stainless Steel (Low Cutting Force)		**LNGX 120916R-TT**	3/8	1/4	0.165	1/2	1/16	●	●	●
 Cast Iron		**LNGX 120916**	3/8	1/4	0.165	1/2	1/16	●	●	●

● : Standard Item

MFF

Rake Angle	
A.R.	R.R.
-8°	Medium-Finishing Insert: -9° Finishing Insert: -20°

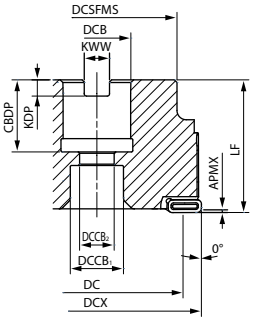


Fig.1

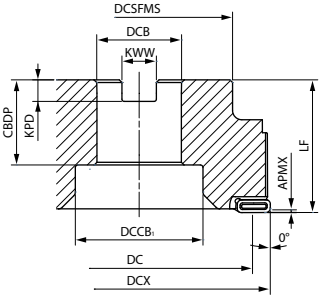


Fig.2

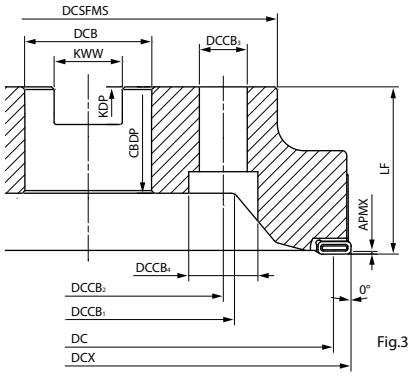


Fig.3

Toolholder Dimensions (Metric)

Part Number		Stock	No. of Inserts	Dimensions (mm)													Coolant Hole	Drawing	Weight (kg)	Max. RPM
				DCX	DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	$DCCB_3$	$DCCB_4$	LF	CBDP	KDP	KWW	APMX				
Inch Bore Dia.	MFF 080R-SF	●	2	80	67.3	60	1.000"	20	13	-	-	50	1.063"	0.236"	0.375"	0.3	No	Fig.1	1.3	2,000
	100R-SF	●		100	87.3	70	1.250"	48	-	-	-	50	1.260"	0.315"	0.500"			Fig.2	1.8	1,600
	125R-SF	●		125	112.3	87	1.500"	58	-	-	-	63	1.496"	0.394"	0.625"				3.5	1,300
	160R-SF	●		160	147.3	102	2.000"	72	-	-	-	63	1.496"	0.433"	0.750"				5.9	1,000
	200R-SF	●		200	187.3	142	1.875"	110	101.6	26	18	63	1.575"	0.551"	1.000"			Fig.3	8.1	800
	250R-SF	●		250	237.3	142	1.875"	110	101.6	26	18	63	1.575"	0.551"	1.000"				10.8*	800
Metric Bore Dia.	MFF 080R-M-SF	●	2	80	67.3	60	27	20	13	-	-	50	24	7	12.4	0.3	No	Fig.1	1.3	2,000
	100R-M-SF	●		100	87.3	70	32	48	-	-	-	50	32	8	14.4			Fig.2	1.8	1,600
	125R-M-SF	●		125	112.3	87	40	55	-	-	-	63	33	9	16.4				3.5	1,300
	160R-M-SF	●		160	147.3	102	40	72	-	-	-	63	33	9	16.4				5.9	1,000
	200R-M-SF	●		200	187.3	142	60	110	101.6	26	18	63	40	14	25.7			Fig.3	7.7	800
	250R-M-SF	●		250	237.3	142	60	110	101.6	26	18	63	40	14	25.7				10.5*	800

*Ø250mm sizes have holes for lighter weight.

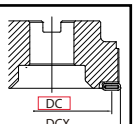
● : Standard Item

Caution with Max. Revolution

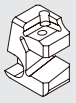
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on back cover. Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

Surface Finish

The surface will be finished flat within the range of DC shown on the right.



Spare Parts

Spare Parts							
Clamp Screw	Wrench	Wedge	Cartridge	Cartridge Clamp Screw	Wrench	Adjustment Screw	Anti-seize Compound
							
SB-3592TR	DTM-10	AD-MFF	CR-MFF	HH5X15L	TTW-15	W6X18N	P-37

Tightening Torque for Insert Screw 1.2 Nm

Recommended Cutting Conditions ★ 1st recommendation ☆ 2nd recommendation

Chipbreaker	Workpiece	f (ipr)*	D.O.C. (in)	Recommended Insert Grade (Cutting Speed Vc: sfm)	
				PV60M	PR1825 (PR1525)
TT	Structural Steel	0.059 - **0.158** - 0.197	0.001 - **0.004** - 0.012	★ 750 - **920** - 1,150	☆ 750 - **920** - 1,150
	Carbon Steel	0.039 - **0.158** - 0.197		★ 660 - **820** - 1,150	☆ 660 - **820** - 1,150
	Alloy Steel	0.039 - **0.158** - 0.197		★ 660 - **820** - 1,150	☆ 660 - **820** - 1,150
	Mold Steel	0.039 - **0.079** - 0.158	0.001 - **0.004** - 0.008	☆ 390 - **660** - 820	★ 390 - **660** - 820
	Mold Steel (50 HRC~)	0.024 - **0.039** - 0.047	0.001 - **0.002** - 0.004	-	★ 160 - **230** - 260
	Austenitic Stainless Steel *	0.039 - **0.079** - 0.158	0.001 - **0.004** - 0.008	☆ 390 - **660** - 820	★ 390 - **660** - 820
	Martensitic Stainless steel *	0.039 - **0.118** - 0.158		☆ 490 - **660** - 980	★ 490 - **660** - 980
Standard	Gray Cast Iron	0.039 - **0.079** - 0.158	0.001 - **0.004** - 0.012	☆ 660 - **820** - 1,150	★ 660 - **820** - 1,150
	Nodular Cast Iron	0.059 - **0.079** - 0.158		☆ 490 - **820** - 980	★ 490 - **820** - 980

*These cutters are 1-flute effective (recommended feed rates are in inches per rev)
*Machining with coolant is recommended for stainless steel
The number in **bold** is recommended starting conditions. Adjust the cutting speed and the feed rate within the above conditions according to the actual machining situation.

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