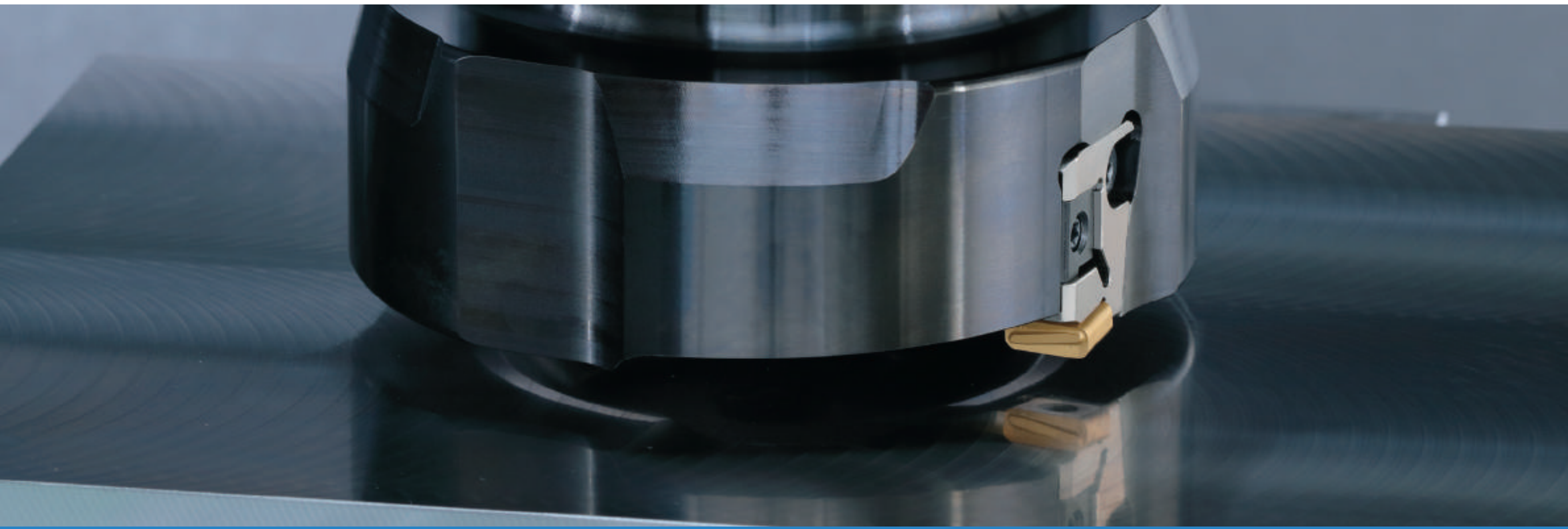
High-Precision Cutter for Finishing Applications

MFF NEW



Innovative Finishing Technology with Increased Efficiency

Enhanced Cutter Design for a Better Finishing Solution

Molded Wiper Insert Design

High Feed Rates (f = Max 5.0 mm/rev) and High-Quality Surface Finish (0.8 μm Ra) *

Adjustable Cutting Edge Height for Improved Usability

*User evaluation

High-Precision Cutter for Finishing Applications

MFF

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

1 Our Solution for Finish Machining

MFF was made to solve the problems in machining.

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

Semi-finishing Insert

To flatten ruggedness when roughing

Finishing Insert

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

SOLUTION

Increase feed to f = 5.0 mm/rev

Achieved 0.8 µm Ra surface finish

No grinding required

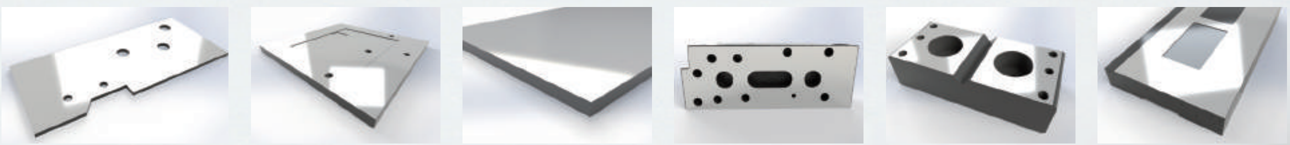
Achieved 5 µm flatness

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 3 and 4.

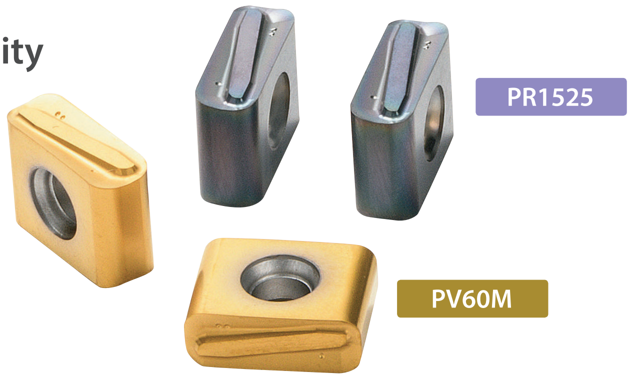
MFF Machining Solutions

Can be used on a wide variety or parts and workpieces

Part Name	Workpiece	Industry
Plate / Frame / Case Cylinder Pump / Rail Turbine Housing Casing / Mold Base	SS400 / FC250 / FCD600 Ni-resist Cast Iron SKD 61 equivalent (Mold Steel) Carburized and hardened steel (60 HRC)	Industrial Machining Machine Tools Shipbuilding / Automotive 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

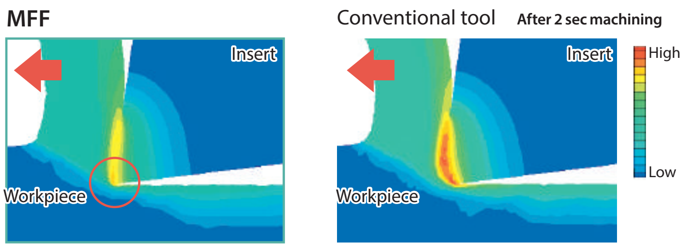
Low cutting force with special edge preparation

Micro-honing
Good sharpness

Wiper edge

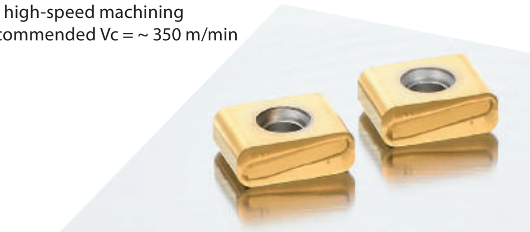
Large S-curve shape developed for higher feed rates

Edge Temperature Simulation Comparison (Internal Evaluation)



MEGACOAT NANO Cermet PV60M

For high-speed machining
Recommended Vc = ~ 350 m/min



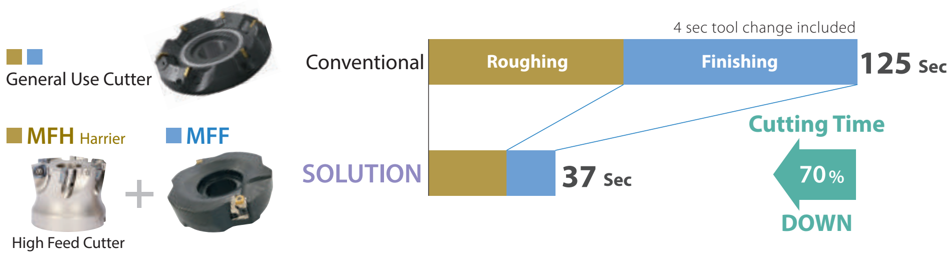
Molded TT Chipbreaker

Reduces chip clogging
High feed machining

Comprehensive Machining Solutions

From Roughing to Finishing Machining Improvements (Internal Evaluation)

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



Cutting Conditions
Conventional ø200 (6 inserts)
Vc = 200 m/min
Roughing : Vf = 286 mm/min (fz = 0.15 mm/t), ap = 1.2 mm
Finishing : Vf = 230 mm/min (fz = 0.12 mm/t), ap = 0.3 mm

SOLUTION
Roughing: MFH Harrier ø 63 (6 inserts)
Vc = 200 m/min
Vf = 7,300 mm/min (fz = 1.2 mm/t), ap = 0.7 mm
Finishing: MFF ø 200 (2 inserts)
Vc = 300 m/min
Vf = 2,400 mm/min (f = 5.0 mm/rev), ap = 0.1 mm

Surface Finish Quality after Machining

SOLUTION

Excellent Surface Finish (0.27 μm Ra)

Conventional Machining

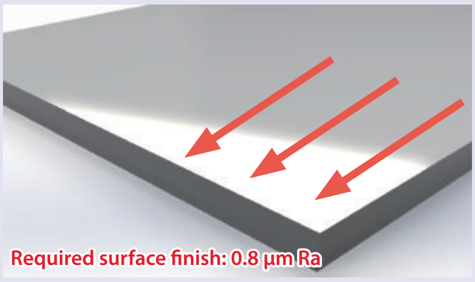
Cloudy Surface Finish (1.01 μm Ra)

The MFF provides excellent finishing solutions

*User evaluation

SOLUTION 1 — 1.7 times increase in efficiency at f = 5.0 mm/rev with a 0.8 μm Ra surface finish

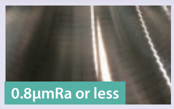
Plate (SS400)



SOLUTION
MFF
ø 200 2 inserts

1.7 times Machining Efficiency

Vf = **2,600** mm/min



Vc = 330 m/min, f = 5.0 mm/rev, ap = 0.1 mm, Dry

Conventional
Competitor A
ø 200 2 inserts

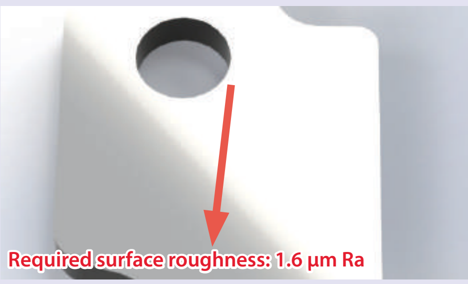
Vf = **1,500** mm/min

Vc = 220 m/min, f = 4.3 mm/rev, ap = 0.1 mm, Dry

The conventional cutter was not able to feed faster than f = 4.3 mm/rev as surface finish deteriorated.
The MFF showed good surface finish of 0.8 μmRa or less even at f = 5.0 mm/rev.
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 (FCD450)



SOLUTION
MFF
ø 160 2 inserts

No grinding required

127 sec

Vc = 300 m/min, Vf = 250 mm/min (f = 0.4 mm/rev) ap = 0.1 mm, Wet

Conventional
Competitor B
ø 200 10 inserts

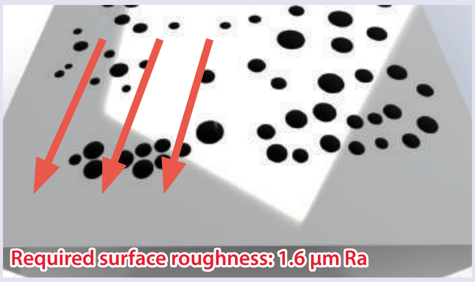
Machining **32** sec + Grinding **10** min

Vc = 300 m/min, Vf = 800 mm/min (f = 1.6 mm/rev) ap = 0.1 mm, Wet

Conventional tool 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 (SKD61 equivalent)



SOLUTION
MFF
ø 200 2 inserts

Machining Efficiency x 3

Vf = **380** mm/min **6** Pass

Vc = 120 m/min, f = 2.0 mm/rev, ap = 0.05 mm, Dry

Conventional
Competitor C
ø 125 5 inserts

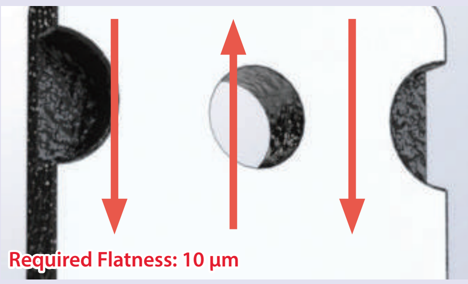
Vf = **210** mm/min **10** Pass

Vc = 120 m/min, f = 0.65 mm/rev, ap = 0.05 mm, 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 (FC250)



SOLUTION
MFF
ø 100 2 inserts

Machining Quality Improvement

Reduced Chattering and Good Finish

Vc = 330 m/min, Vf = 1,600 mm/min (f = 0.1.5 mm/rev) ap = 0.1 mm, Dry

Conventional
Competitor D
ø 100 8 inserts (CBN)

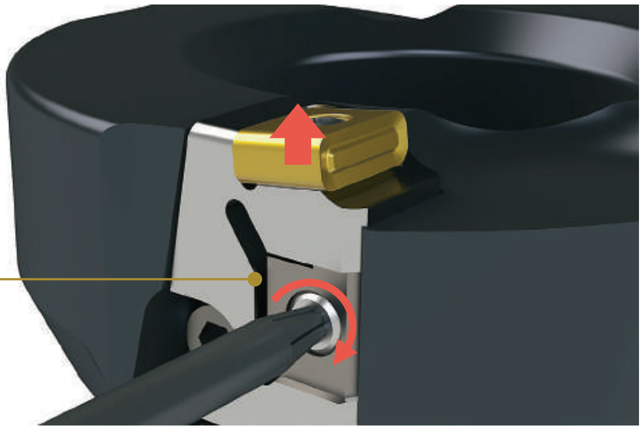
Chattering occurred in thin wall

Vc = 1,200 m/min, Vf = 2,450 mm/min (f = 0.64 mm/rev) ap = 0.1 mm, Dry

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

3 Adjustable cutting edge for increased usability

Cartridge height comes pre-adjusted and should not be necessary.
Adjustment is not required after replacing insert.



Easy-to-adjust Cutting Edge

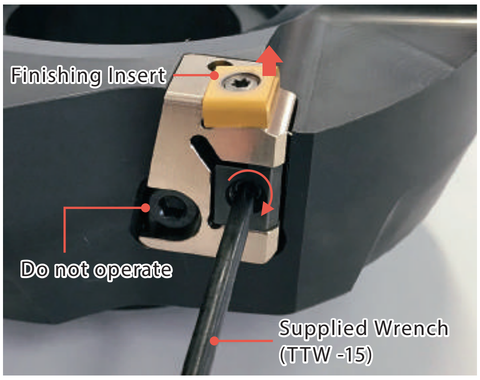
Cutting edge height can be adjusted easily with one screw

Included adjustment wrench

Edge Adjustment

If D.O.C. is ap 0.1 ~ 0.2 mm, 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 0.1 mm or if you prefer a different edge height, use the following method:



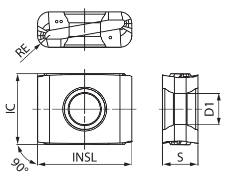
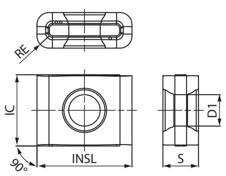
Adjusting the Cutting Edge
Use the supplied TTW-15 wrench to rotate the screw and easily adjust the cutting edge position.

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
ap = 0.05 mm => protrusion against rough edge: 0.03 mm
ap = 0.10 mm ~ => protrusion against rough edge : 0.06 mm *Pre-adjusted before shipment

Applicable Inserts

Shape		Description	Dimensions (mm)					MEGACOAT NANO Cermet	MEGACOAT NANO
			IC	S	D1	INSL	RE	PV60M	PR1525
 For steel and stainless steel (Low cutting force)		LNGX 120916R-TT	9.525	6.35	4.2	12.7	1.6	MTO	MTO
 For Cast Iron		LNGX 120916	9.525	6.35	4.2	12.7	1.6	MTO	MTO

MTO : Made to order

MFF

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

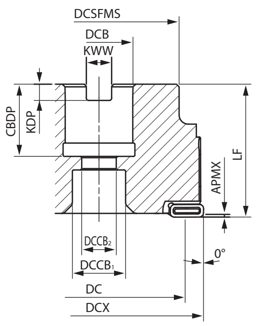


Fig.1

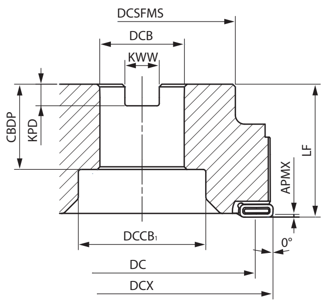


Fig.2

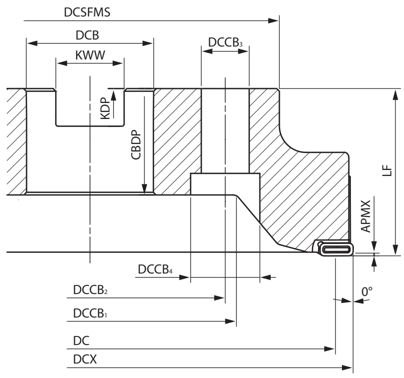


Fig.3

Toolholder Dimensions

	Description	Stock	No. of Inserts	Dimensions (mm)													Coolant hole	Shape	Weight (kg)	Max. Revolution (min^{-1})
				DCX	DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	$DCCB_3$	$DCCB_4$	LF	CBDP	KDP	KWW	APMX				
Bore dia. Inch Spec	MFF080R-SF	MTO	2	80	67.3	60	25.4	20	13	-	-	50	27	6	9.5	0.3	No	Fig.1	1.3	2,000
	MFF100R-SF	MTO		100	87.3	70	31.75	48	-	-	-	50	32	8	12.7			Fig.2	1.8	1,600
	MFF125R-SF	MTO		125	112.3	87	38.1	58	-	-	-	63	38	10	15.9				3.5	1,300
	MFF160R-SF	MTO		160	147.3	102	50.8	72	-	-	-	63	38	11	19.1				5.9	1,000
	MFF200R-SF	MTO		200	187.3	142	47.625	110	101.6	26	18	63	40	14	25.4			Fig.3	8.1	800
	MFF250R-SF	MTO		250	237.3	142	47.625	110	101.6	26	18	63	40	14	25.4				10.8*	800
Metric Spec	MFF080R-M-SF	MTO	2	80	67.3	60	27	20	13	-	-	50	24	7	12.4	0.3	No	Fig.1	1.3	2,000
	MFF100R-M-SF	MTO		100	87.3	70	32	48	-	-	-	50	32	8	14.4			Fig.2	1.8	1,600
	MFF125R-M-SF	MTO		125	112.3	87	40	55	-	-	-	63	33	9	16.4				3.5	1,300
	MFF160R-M-SF	MTO		160	147.3	102	40	72	-	-	-	63	33	9	16.4				5.9	1,000
	MFF200R-M-SF	MTO		200	187.3	142	60	110	101.6	26	18	63	40	14	25.7			Fig.3	7.7	800
	MFF250R-M-SF	MTO		250	237.3	142	60	110	101.6	26	18	63	40	14	25.7				10.5*	800

*ø250 sizes have holes for lighter weight.

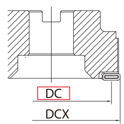
MTO : Made to order

Caution with Max. Revolution

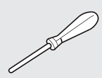
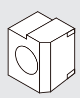
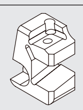
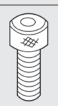
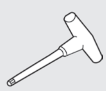
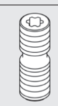
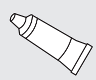
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on back cover. Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

Surface Finish

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



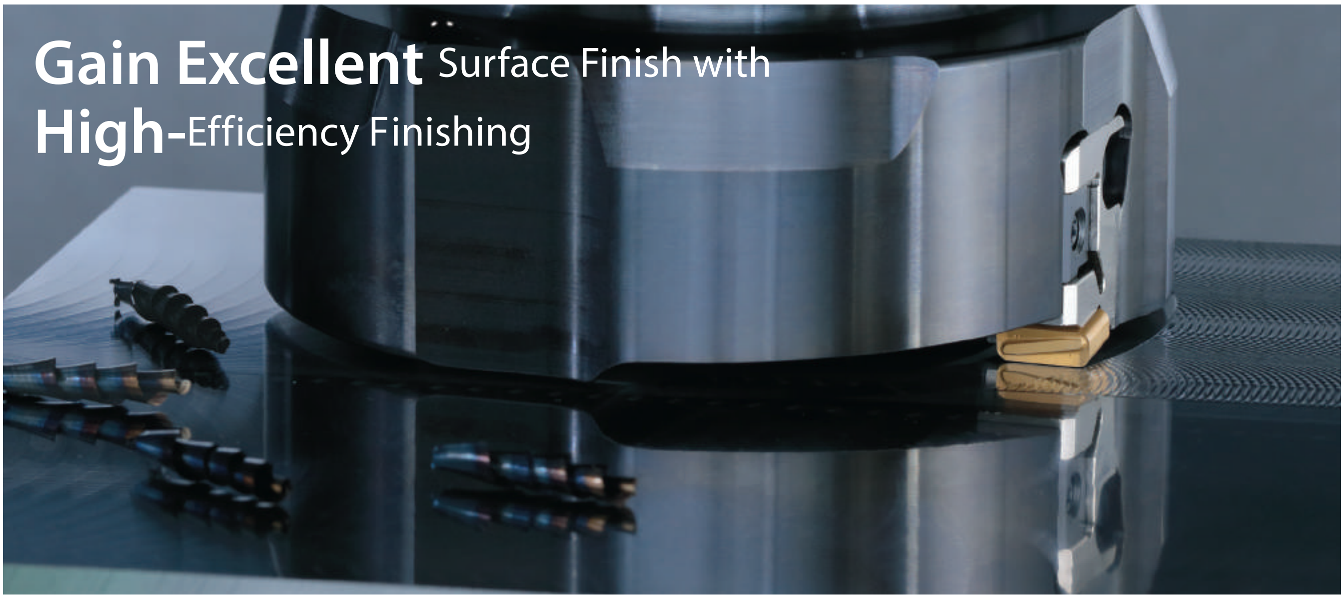
Parts

Parts							
Clamp screw	Wrench	Wedge	Cartridge	Cartridge clamp screw	Wrench	Adjusting screw	Anti-seize compound
							
SB-3592TR	DTM-10	AD-MFF	CR-MFF	HH5X15L	TTW-15	W6X18N	P-37
Fastening torque for clamp insert 1.2 Nm							

Recommended Cutting Conditions Table ★1st recommendation ☆2nd recommendation

Chipbreaker	Workpiece	f (mm/rev)	Depth of cut ap (mm)	Recommended Insert Grade (Cutting speed Vc: m/min)	
				PV60M	PR1525
TT	Structural Steel (SS 400, etc.)	1.5 – **4.0** – 5.0	0.03 – **0.1** – 0.3	★ 230 – **280** – 350	☆ 230 – **280** – 350
	Carbon Steel (S * * C, etc.)	1.0 – **4.0** – 5.0		★ 200 – **250** – 350	☆ 200 – **250** – 350
	Alloy Steel (SCM, etc.)	1.0 – **4.0** – 5.0		★ 200 – **250** – 350	☆ 200 – **250** – 350
	Mold Steel (SKD, etc.)	1.0 – **2.0** – 4.0	0.03 – **0.1** – 0.2	☆ 120 – **200** – 250	★ 120 – **200** – 250
	Mold Steel (SKD 50 HRC ~ etc.)	0.6 – **1.0** – 1.2	0.03 – **0.05** – 0.1	–	★ 50 – **70** – 80
	Austenitic stainless steel * (SUS 304, etc.)	1.0 – **2.0** – 4.0	0.03 – **0.1** – 0.2	☆ 120 – **200** – 250	★ 120 – **200** – 250
	Martensitic stainless steel * (SUS 403, etc.)	1.0 – **3.0** – 4.0		☆ 150 – **200** – 300	★ 150 – 200 – 300
Standard	Gray Cast Iron (FC)	1.0 – **2.0** – 4.0	0.03 – **0.1** – 0.3	☆ 200 – **250** – 350	★ 200 – **250** – 350
	Nodular Cast Iron (FCD)	1.5 – **2.0** – 4.0		☆ 150 – **250** – 300	★ 150 – **250** – 300

*Machining with coolant is recommended for stainless steel
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.



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