THE NEW VALUE FRONTIER

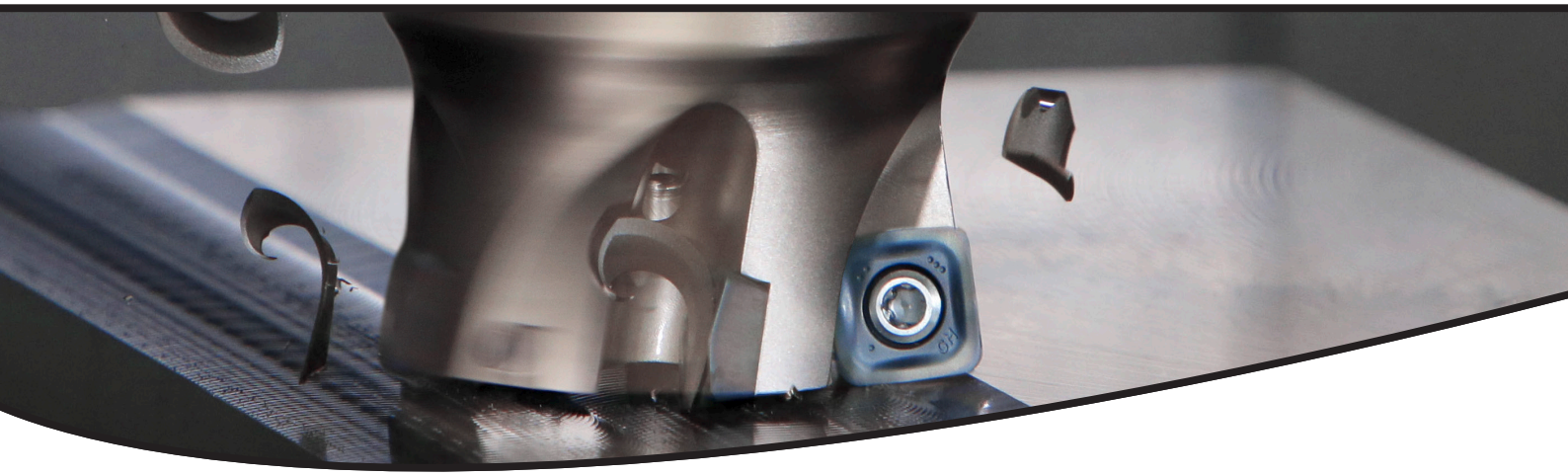
KYOCERA

PROTOOL

SZERSZÁMIPARI Kft. BUDAPEST

MFH high feed cutter

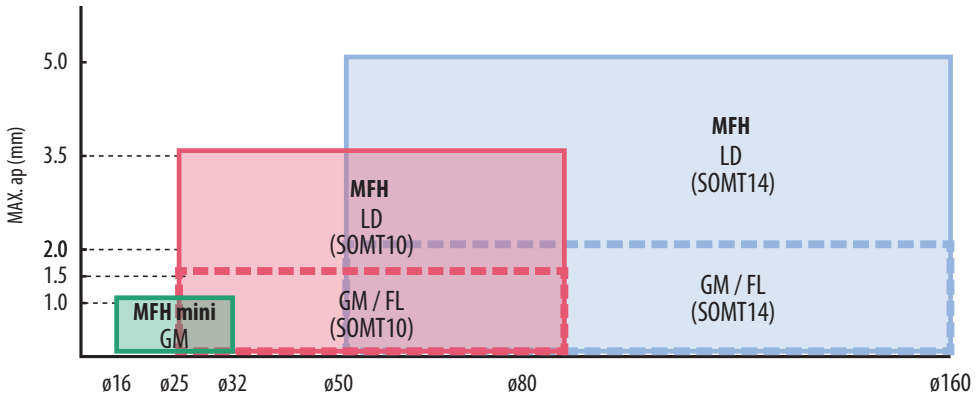
High efficiency milling cutter for various applications



High feed cutter

High resistance to chattering and applicable to various applications.
Increased chip evacuation and shortened cutting time.

NEW
MFH mini



Application range

Multi functional for various types of applications.

Facing, Shouldering | Slotting | Ramping | Helical milling | Pocketing | Contouring

In case of MFH

- **GM** type is applicable for all the above applications.
- **LD** type and **FL** type are not applicable for helical milling, plunging and contouring of rising wall. (Please refer to page 18 + 19)

MFH mini: Usable for all applications shown above.

MFH mini

Please refer page 4 for details P4

Cutter diameter: 16 - 32 mm; ap MAX. = 1 mm
Double-sided insert: 4 cutting edges
Toolholder lineup: End mill and screw on type

Features

- High efficiency machining with small machining center.
- Good chip evacuation prevents chip-biting.
- Multi-edge design enables high efficiency machining.

MFH

Please refer page 3 for details P6

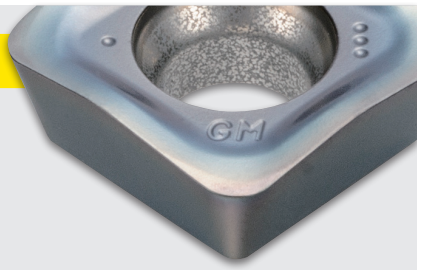
Cutter diameter: 25 - 160 mm; ap MAX. = 5 mm (LD type)
Single-sided insert: 4 cutting edges
Toolholder lineup : Face mill, end mill and screw on type

Features

- Applicable to various applications.
- 3 types of geometry available.
- Applicable for high feed and large ap machining.

MEGACOAT NANO PR1535

1st recommendation
for difficult-to-cut materials

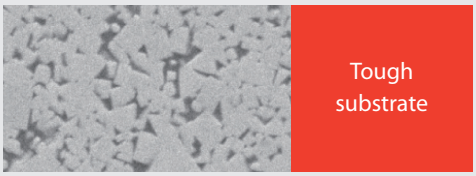


New grade for difficult-to-cut material

- Reduces sudden fracture and realizes stable machining.
- For Ni-base heat resistant alloy, titanium alloy and precipitation hardened stainless steel.

Improved toughness by new cobalt mixing ratio.

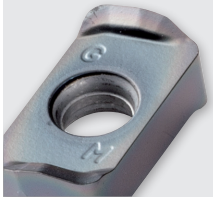
Fracture toughness values are improved by approximately 23 %



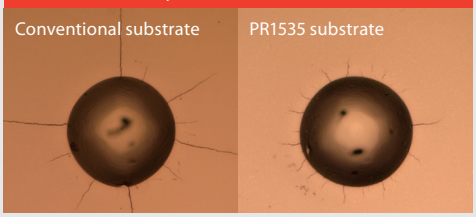
Stability improvement by optimization and homogenization of the particles of matrix.

- The optimization of the particles, corresponding strong impact and processing instability.
- Heat cracks at wet machining is repressed by 11% improved heat conductivity.*
- In uniformalize tissue, fracture origins of interstitial is reduced.

* Compared to our conventional material.



Comparison of cracks
by diamond indentor



Deep cracks

Short and dispersed cracks

Highly improved
impact resistance

Long tool life
CA6535 (CVD coated carbide)

Steel machining
PR1525 (MEGACOAT NANO)

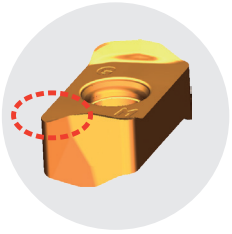
Cast iron machining
PR1510 (MEGACOAT NANO)

MFH mini
ø16 - 32 mm

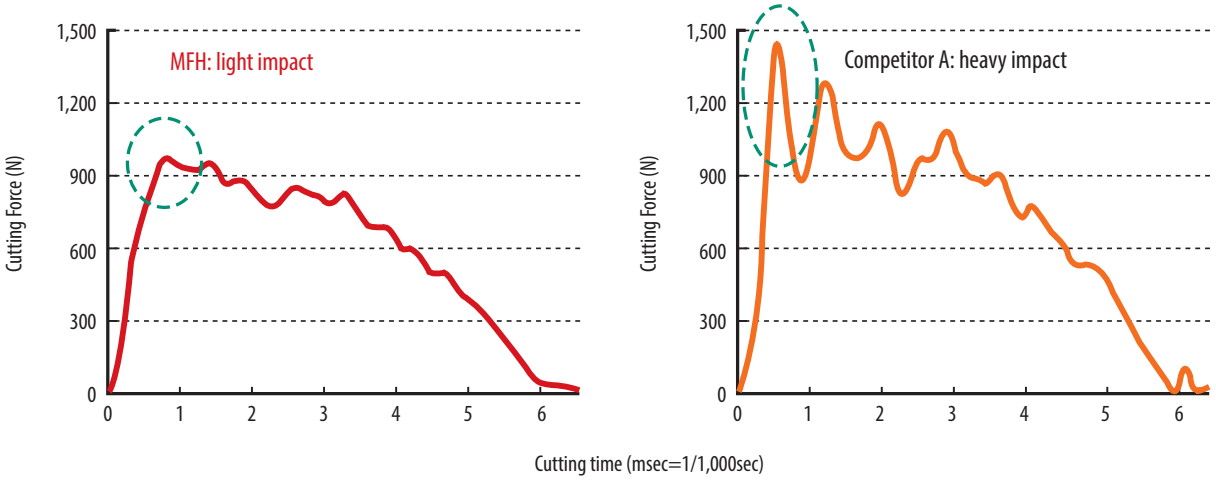
High efficiency and high feed cutting at small diameter even at small machining center.

Convex edge

The convex cutting edge reduces impact while entering the workpiece.



Comparison of cutting force



Cutting conditions:
Workpiece material: C50, Dc = ø16 mm; Vc = 150 m/min; fz = 1.0 mm/t; ap = 0.5 mm, ae = 8 mm; dry

Multi-edge design enables high efficiency

- High efficiency and high feed machining at small machining center (BT30/BT40).
- Suitable for roughing of mold.

MFH mini

5 inserts

MFH25-S25-03-5T

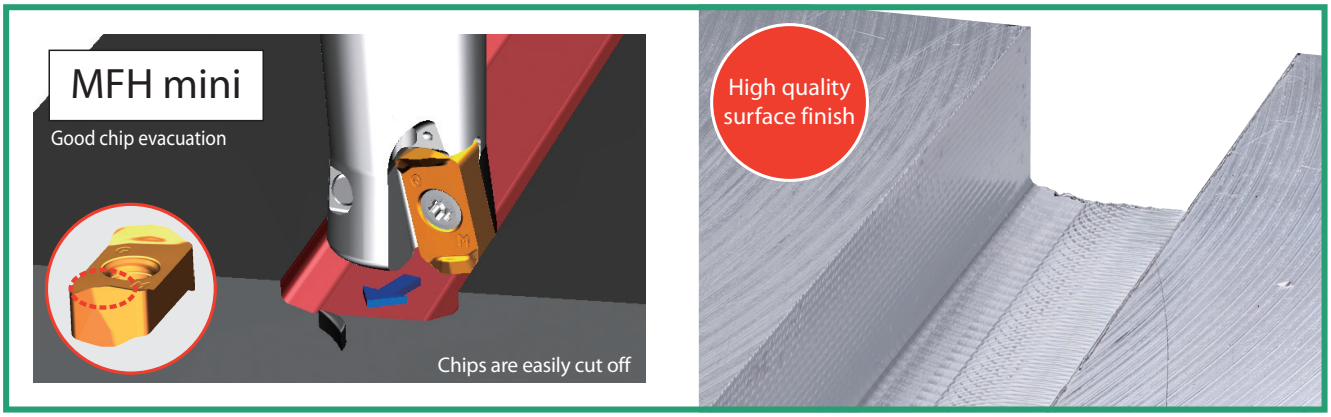
MFH

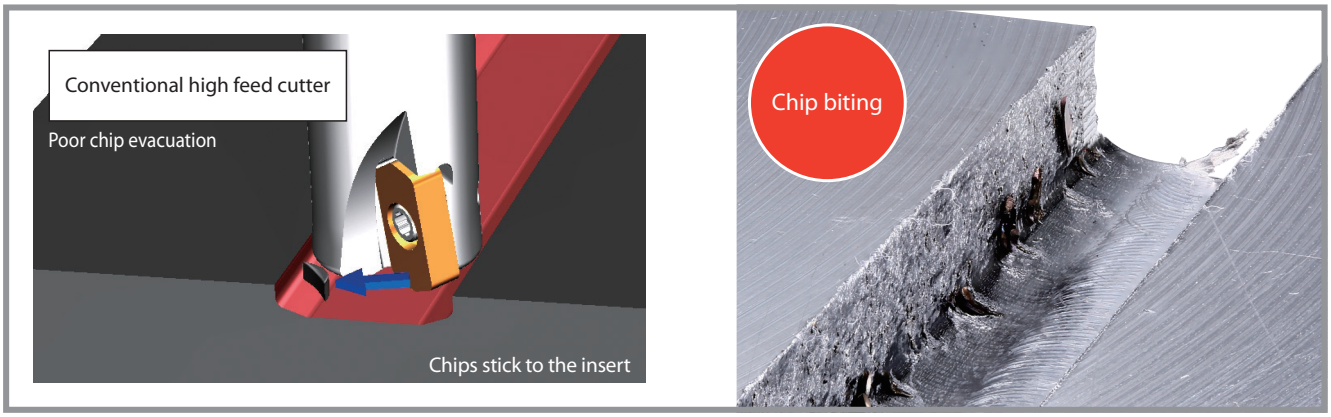
2 inserts

MFH25-S25-10-2T

Good chip evacuation

MFH mini reduces chip biting with 3D convex cutting edge.

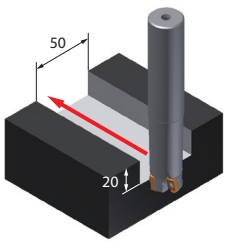




Cutting condition: DC = ø16 mm; workpiece: 1.0040; Vc = 150 m/min; fz = 0.6 mm/t; ap×ae = 0.5 mm (20 pass): Total 10 × 16 mm, Dry

Case study

Precipitation hardened stainless steel



Tool life: more than 1.8 times

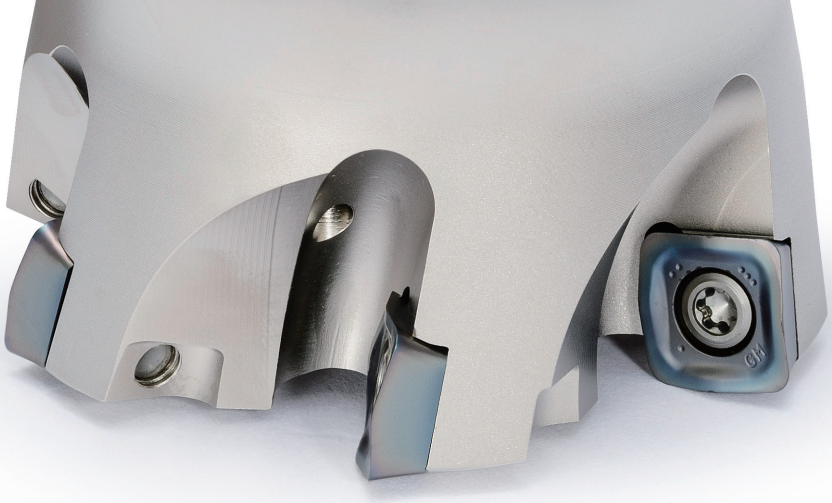
- Aircraft parts: Vc = 120m/min, fz = 0.6 mm/t
- ap × ae = 0.7 × 25 mm, Dry
- MFH25-S25-03-4T, LOGU030310ER-GM (PR1535)

PR1535	100 pcs
Competitor A (5 inserts)	55 pcs

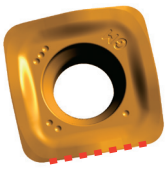
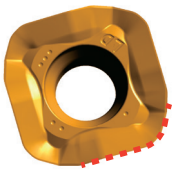
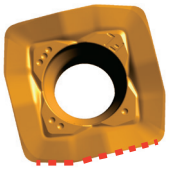
PR1535 kept good cutting edge condition and stable machining after machining 100 pcs.

MFH
ø25 - 160 mm

Applicable to various applications with 3 types of geometry for significant cutting time reduction.



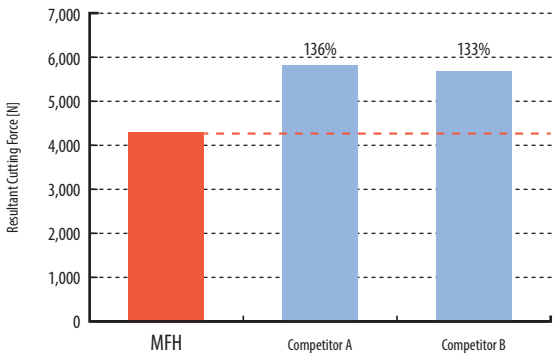
Wide application range

	GM (general purpose)	LD (large ap)	FL (surface oriented)
Shape			
Application	1st recommendation for general application: Facing, Pocketing, Helical milling	MAX ap = 5 mm. Applicable for scale removal at high efficiency.	Applicable for both roughing and finishing, for small machining center.

Convex edge

Convex cutting edge reduces impact while entering workpiece.

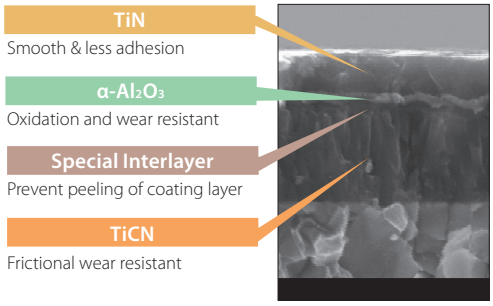
Comparison of cutting force



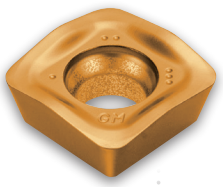
Cutting conditions:
Workpiece: C50; Vc = 150m/min; fz = 1.5 mm/t;
ap x ae = 1.5 x 31.5 mm; Cutter Ø: 63 mm; dry

High performance grades

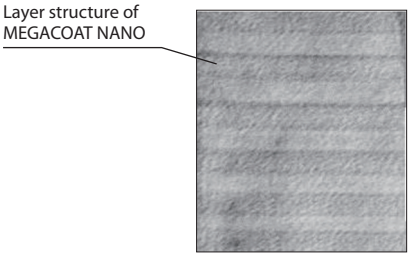
Applicable for a variety of workpieces from steel to heat-resistant alloy.



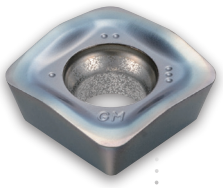
High efficient machining of Ni-base heat resistant alloy and martensitic stainless steel. The CVD coating offers high heat resistance and wear resistance with improved stability due to the thin film coating technology.



CA6535



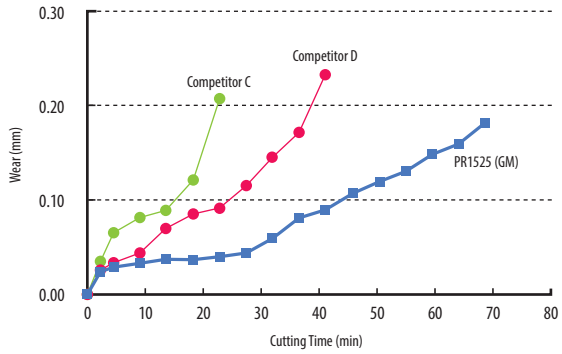
For titanium alloy and precipitation hardened stainless steel. Stabilized milling operation and long tool life with MEGACOAT NANO coating technology.



PR1535

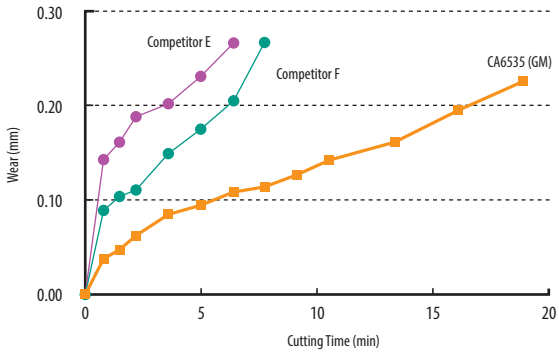
Comparison of wear resistance

1.2379 (alloyed tool steel)



Cutting conditions:
Vc = 150 m/min; fz = 1.5 mm/t; ap x ae = 1.0 x 16 mm; dry

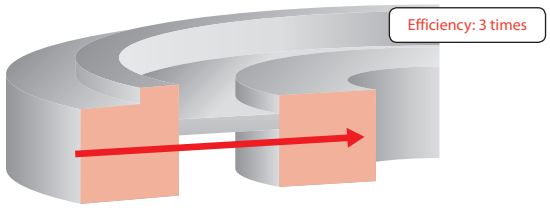
Ni-base heat resistant alloy



Cutting conditions:
Vc = 30 m/min; fz = 0.8 mm/t; ap x ae = 1.0 x 40 mm; wet

Case studies

Forged alloy steel

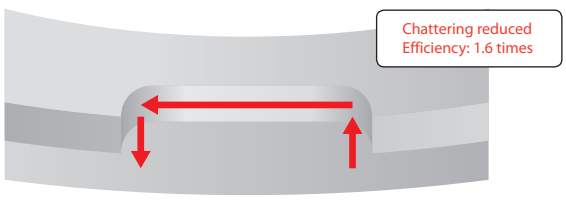


Turbine parts, Vc = 160m/min, fz = 1.17 mm/t
ap × ae = 1.5 × max. 160 mm, Dry
MFH160R-14-8T, SOMT140520ER-GM (PR1525)

PR1525	Chip removal rate = 720 cc/min
Competitor F	Chip removal rate = 240 cc/min

- Small cutting noise even at 3 times higher feed rate.
- Good edge condition without chipping and stable cutting.

1.4301

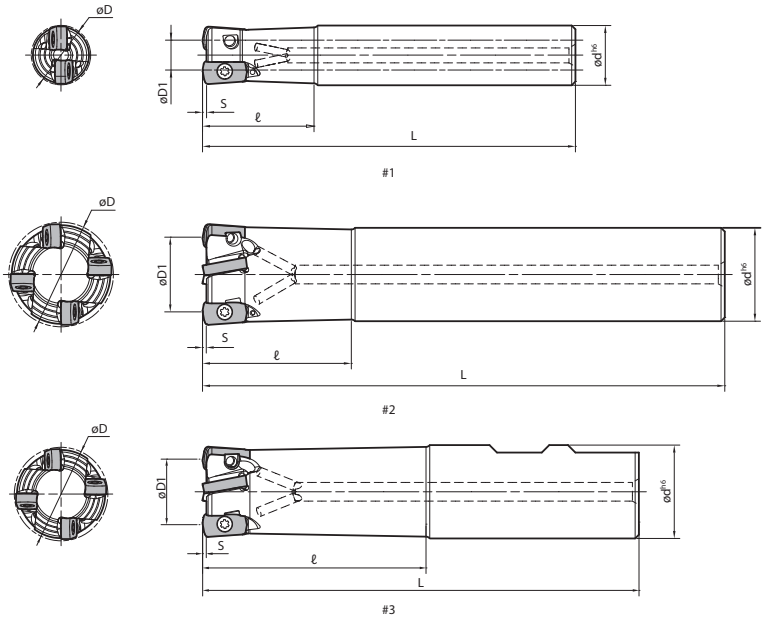


Clutch, Vc = 120m/min, fz = 1.2 mm/t
ap × ae = 1.0 × 20 mm, Dry
MFH32-S32-10-2T, SOMT100420ER-GM (PR1535)

PR1535	Chip removal rate = 58 cc/min
Competitor G	Chip removal rate = 36 cc/min

- Competitor G caused chattering but MFH realized stable machining.
- Good edge condition and long tool life.

MFH mini – end mill



Toolholder dimension

Shank type	Description		Standard	No. of inserts	Dimension (mm)						Rake angle (°)		Coolant hole	Drawing	Weight (kg)	Max. revolution (min^{-1})
					øD	øD1	ød	L	ℓ	S	A.R.	R.R.				
Standard (straight)	MFH	16-S16-03-2T	●	2	16	8	16	100	30	1	-10°	-15°	Yes	#1	0.1	18,800
		20-S20-03-3T	●	3	20	12	20	130	50						0.3	15,700
		20-S20-03-4T	●	4												
		25-S25-03-4T	●		25	17	25	140	60						0.5	13,400
		25-S25-03-5T	●	5												
		32-S32-03-5T	●		32	24	32	150	70						0.8	11,400
		32-S32-03-6T	●	6												
Over size (straight)	MFH	17-S16-03-2T	●	2	17	9	16	100	20					#2	0.1	17,900
		18-S16-03-2T	●		18	10										17,000
		22-S20-03-3T	●	3	22	14	20	130	30						0.3	14,700
		22-S20-03-4T	●	4												
		28-S25-03-4T	●		28	20	25	140	40						0.5	12,400
		28-S25-03-5T	●	5												
Standard (weldon)	MFH	16-W16-03-2T	●	2	16	8	16	79	30					#3	0.1	18,800
		20-W20-03-3T	●	3	20	12	20	101	50						0.2	15,700
		20-W20-03-4T	●	4												
		25-W25-03-4T	●		25	17	25	117	60						0.4	13,400
		25-W25-03-5T	●	5												
		32-W32-03-5T	●		32	24	32	131	70						0.7	11,400
		32-W32-03-6T	●	6												
Long shank (straight)	MFH	16-S16-03-2T-150	●	2	16	8	16	150	50					#1	0.2	18,800
		20-S20-03-3T-160	●	3	20	12	20	160	80						0.3	15,700
		25-S25-03-4T-180	●	4	25	17	25	180	100						0.6	13,400
		32-S32-03-5T-200	●	5	32	24	32	200	120						1.1	11,400

Spare parts and applicable inserts

Description	Clamp screw	Wrench	Anti-seize compound	Mounting bolt	Applicable inserts
					
MFH …-03-…	SB-3065TRP	DTPM-8	MP-1	HH10x30	LOGU030310ER-GM
	Recommended torque for insert clamp 1.2 N m				

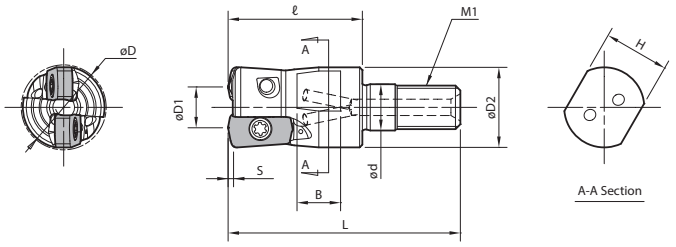
Caution with max. revolution

- When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat anti-seize compound (MP-1) thinly on portion of taper and thread when insert is fixed.

Recommended cutting conditions → P10

●: Standard item

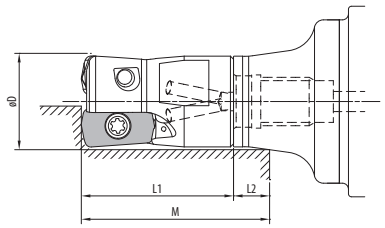
MFH mini – screw on type



Toolholder dimension

Description		Standard	No. of inserts	Dimension (mm)										Rake angle (°)		Coolant hole	Max. revolution (min^{-1})
				øD	øD$_1$	øD$_2$	ød	L	ℓ	M1	H	B	S	A.R.	R.R.		
MFH	16-M08-03-2T	●	2	16	8	14.7	8.5	43	25	M8xP1.25	12	8	1	-10°	-15°	Yes	18,880
	17-M08-03-2T	●		17	9												17,900
	18-M08-03-2T	●		18	10												17,000
	20-M10-03-3T	●	3	20	12	18.7	10.5	49	30	M10xP1.5	15	9					15,700
	20-M10-03-4T	●	4														
	22-M10-03-3T	●	3	22	14												14,700
	22-M10-03-4T	●	4														
	25-M12-03-4T	●		25	17	23	12.5	57	35	M12xP1.75	19	10					13,400
	25-M12-03-5T	●	5														
	28-M12-03-4T	●	4	28	20	23											12,400
	28-M12-03-5T	●	5														
	32-M16-03-5T	●		32	24	30	17	63	40	M16xP2	24	12					11,400
	32-M16-03-6T	●	6														

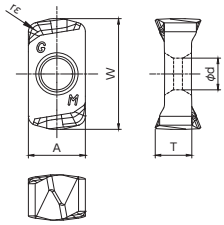
Effective depth of assembled tool



Arbor description		Description	øD	L1	M	L2
BT30K-	M08-45	MFH16-M08-03…	ø16	25	31.8	6.8
		MFH17-M08-03…	ø17		33.2	8.2
		MFH18-M08-03…	ø18		34.2	9.2
	M10-45	MFH20-M10-03…	ø20	30	36.8	6.8
		MFH22-M10-03…	ø22		39.2	9.2
	M12-45	MFH25-M12-03…	ø25	35	42.8	7.8
		MFH28-M12-03…	ø28		45.5	10.5
BT40K-	M08-55	MFH16-M08-03…	ø16	25	31.7	6.7
		MFH17-M08-03…	ø17		33.2	8.2
		MFH18-M08-03…	ø18		34.3	9.3
	M10-60	MFH20-M10-03…	ø20	30	38.7	8.7
		MFH22-M10-03…	ø22		44.5	14.5
	M12-55	MFH25-M12-03…	ø25	35	44.6	9.6
		MFH28-M12-03…	ø28		47.6	12.6
	M16-65	MFH32-M16-03…	ø32	40	51.2	11.2

→ For BT type arbor, see page 15.

Applicable insert

Insert		Description	Dimension (mm)					MEGACOAT NANO			CVD coated carbide
			A	T	ød	W	rε	PR1535	PR1525	PR1510	CA6535
 General purpose		LOGU 030310ER-GM	6.2	3.96	3.45	11.9	1.0	●	●	●	●

●: Standard item

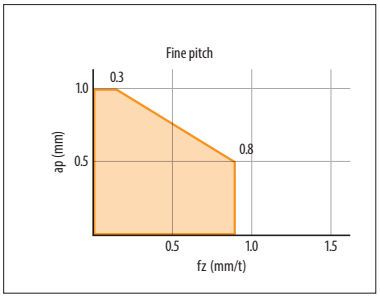
Recommended cutting conditions / MFH mini

Insert	Workpiece material	fz (mm/t) Recommended feed: ap = 0.5 mm (reference value)							Vc (m/min)			
		MFH16 -…-2T	MFH20- …-3T	MFH20 -…-4T	MFH25 -…-4T	MFH25 -…-5T	MFH32 -…-5T	MFH32 -…-6T	MEGACOAT NANO			CVD coated carbide
									PR1535	PR1525	PR1510	CA6535
GM	Carbon steel	0.2 ~ **0.7** ~ 1.2		0.2 ~ **0.5** ~ 0.8	0.2 ~ **0.8** ~ 1.5	0.2 ~ **0.5** ~ 0.8	0.2 ~ **0.8** ~ 1.5	0.2 ~ **0.5** ~ 0.8	☆ 120 ~ **180** ~ 250	★ 120 ~ **180** ~ 250	–	–
	Alloy steel								☆ 100 ~ **160** ~ 220	★ 100 ~ **160** ~ 220	–	–
	Die steel (~ 40 HRC)	0.2 ~ **0.5** ~ 0.9		0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6** ~ 1.2	0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6** ~ 1.2	0.2 ~ **0.4** ~ 0.6	☆ 80 ~ **140** ~ 180	★ 80 ~ **140** ~ 180	–	–
	Die steel (40 ~ 50HRC)	0.2 ~ **0.3** ~ 0.5		0.2 ~ **0.25** ~ 0.3	0.2 ~ **0.3** ~ 0.6	0.2 ~ **0.25** ~ 0.3	0.2 ~ **0.3** ~ 0.6	0.2 ~ **0.25** ~ 0.3	☆ 60 ~ **100** ~ 130	★ 60 ~ **100** ~ 130	–	–
	Austenitic stainless steel	0.2 ~ **0.5** ~ 0.9		0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6** ~ 1.2	0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6**~ 1.2	0.2 ~ **0.4** ~ 0.6	★ 100 ~ **160** ~ 200	☆ 100 ~ **160** ~ 200	–	–
	Martensitic stainless steel								☆ 150 ~ **200** ~ 250	–	–	★ 180 ~ **240** ~ 300
	Precipitation hardened stainless steel								★ 90 ~ **120** ~ 150	–	–	–
	Gray cast iron	0.2 ~ **0.7** ~ 1.2		0.2 ~ **0.5** ~ 0.8	0.2 ~ **0.8** ~ 1.5	0.2 ~ **0.5** ~ 0.8	0.2 ~ **0.8** ~ 1.5	0.2 ~ **0.5** ~ 0.8	–	–	★ 120 ~ **180** ~ 250	–
	Nodular cast iron	0.2 ~ **0.5** ~ 0.9		0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6** ~ 1.2	0.2 ~ **0.4** ~ 0.6	0.2 ~ **0.6** ~ 1.2	0.2 ~**0.4** ~ 0.6	–	–	★ 100 ~ **150** ~ 200	–
	Ni-base heat resistant alloy	0.2 ~ **0.3** ~ 0.6		0.2 ~ **0.25** ~ 0.4	0.2 ~ **0.4** ~ 0.8	0.2 ~ **0.25** ~ 0.4	0.2 ~ **0.4** ~ 0.8	0.2 ~ **0.25** ~ 0.4	☆ 20 ~ **30** ~ 50	–	–	★ 20 ~ **30** ~ 50
	Titanium alloy (Ti-6Al-4V)								★ 40 ~ **60** ~ 80	–	☆ 30 ~ **50** ~ 70	–

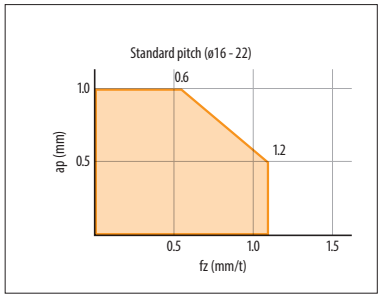
Standard pitch, Fine pitch, ★ 1st recommendation, ☆ 2nd recommendation

Machining with coolant is recommended for Ni-base heat resistant alloy and titanium alloy. Adjust the cutting speed and the feed rate within the above conditions according to the actual machining situation. For machining center equivalent to BT30, reduce feed rate to 25 % or less of the recommended condition. For slotting, internal coolant or center through coolant is recommended.

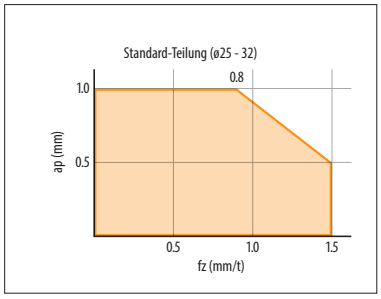
Cutting performance / MFH mini



MFH20-…-4T, MFH22-…-4T, MFH25-…-5T
MFH28-…-5T, MF32-…-6T



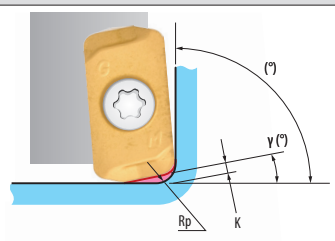
MFH16-…-2T, MFH17-…-2T, MFH18-…-2T
MFH20-…-3T, MFH22-…-3T



MFH25-…-4T, MFH28-…-4T, MFH32-…-5T

When using fine pitch type, reduce the cutting conditions compared with standard type.

Note for machining programm (programming R)

Shape	Holder	Chipbreaker	γ Cutting edge angle	Rp Programming radius	K (mm) Unmachined part	(°) Max. inclination angle of workpiece at contouring
	MFH…-03-…	GM	12°	1.6	0.39	90°

Reference data for ramping

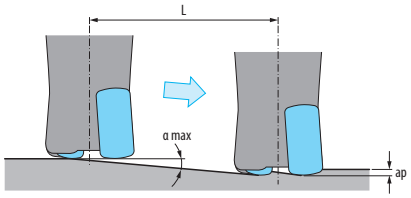
Description	Cutter dia. (mm)	16	17	18	20	22	25	28	32
MFH . . .-03-. . .	α_{max} (°) Max. ramping angle	2.8°	2.5°	2.1°	1.7°	1.4°	1.2°	1°	0.8°
	tan α_{max}	0.049	0.042	0.037	0.03	0.024	0.021	0.017	0.014

Tips for ramping

- Ramping angle should be under α_{max}.
- Feed rate should be under 70 % of the cutting conditions.

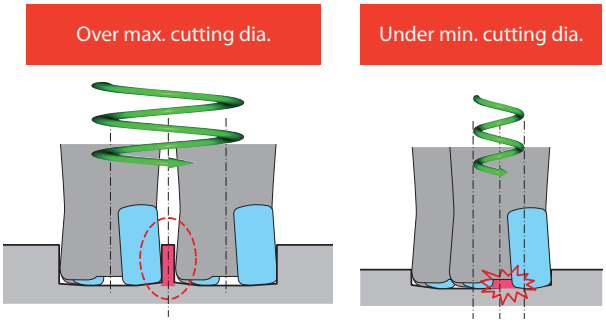
Formula for max. cutting length (L) at max. ramping angle

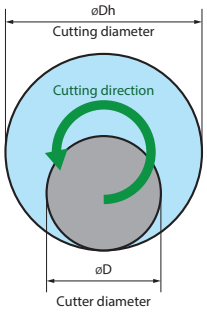
$$L = \frac{ap}{\tan \alpha_{max}}$$



Tips for helical milling

For helical milling, use between min. cutting dia. and max. cutting dia.





Holder	Min. cutting dia. (mm)	Max. cutting dia.(mm)
MFH. . .-03-. . .	2 × D-8	2× D-2

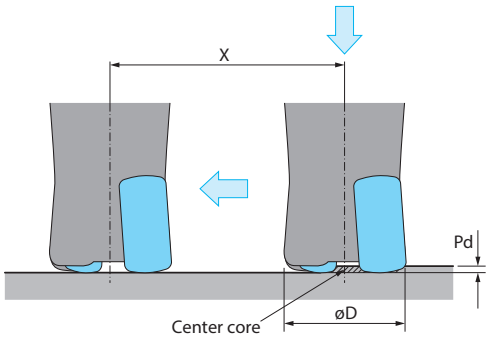
- Sinking depth (h) at helical milling should be under max. ap (1 mm).
- Down-cut milling is recommended.
- Feed rate should be under 50 % of the recommended cutting conditions
- Be careful to machine in a safe environment to avoid accident caused by long chips.

Tips for peck milling

Holder	GM	
	Pd Max. cutting depth	Min. cutting length X for flat bottom surface
MFH. . .-03-. . .	1.5	D-9

Unit: mm

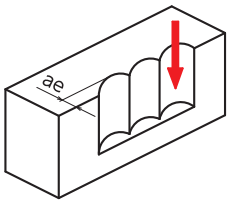
1. Reduce feed rate 25 % or less of the recommended conditions until the center core part (unmachined part) is removed.
2. When pecking, reduce feed rate per revolution to under f = 0.2 mm/rev.



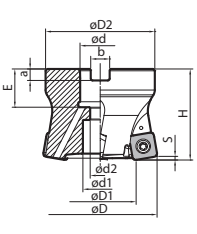
Vertical milling (Plunging)

Insert size	Maximum width of cut (ae)
LOGU03	3.5 mm

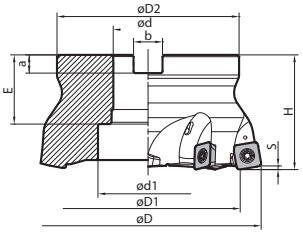
For vertical milling (plunging), reduce feed rate to fz = 0.2 mm/t or less.



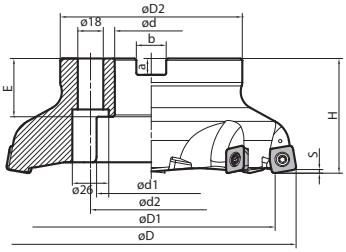
MFH shell mill



#1



#2



#3

Toolholder dimension (SOMT10 type)

Description		Standard	No. of inserts	Dimension (mm)														Rake angle (°)		Coolant hole	Drawing	Weight (kg)	Max. revolution (min^{-1})
				øD	øD$_1$			øD$_2$	ød	ød$_1$	ød$_2$	H	E	a	b	S	S$_L$*1	A.R.	R.R.				
					GM	LD	FL																	
MFH	050R-10-4T-M	●	4	50	33	37.5	36.5	47	22	19	11	50	21	6.3	10.4	1.5 (1.2) *2	3.5	+10°	-5°	Yes	#1	0.4	10,000
	050R-10-5T-M	●	5																				
	052R-10-4T-M	●	4	52	35	39.5	38.5	47															
	052R-10-5T-M	●	5																				
	063R-10-5T-22M	●	5	63	46	50.5	49.5	60											-4°			0.7	8,800
	063R-10-6T-22M	●	6																				
	063R-10-5T-27M	●	5						27	20	13		24	7	12.4								
	063R-10-6T-27M	●	6																				
	080R-10-7T-M	●	7	80	63	67.5	66.5	76				63										1.6	7,600

*1 for S_L dimension, see the figure below *2 dimension in ( ) is when attaching LD type

Toolholder dimension (SOMT14 type)

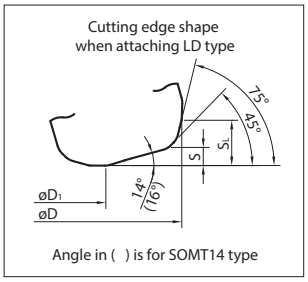
Description		Standard	No. of inserts	Dimension (mm)														Rake angle (°)		Coolant hole	Drawing	Weight (kg)	Max. revolution (min^{-1})
				øD	øD$_1$			øD$_2$	ød	ød$_1$	ød$_2$	H	E	a	b	S	S$_L$*1	A.R.	R.R.				
					GM	LD	FL																	
MFH	063R-14-4T-22M	●	4	63	40	46	45	60	22	19	11	50	21	6.3	10.4	2	5	+10°	-10°	Yes	#1	0.6	7,400
	063R-14-5T-22M	●	5																				
	063R-14-4T-27M	●	4						27	20	13		24	7	12.4								
	063R-14-5T-27M	●	5																				
	066R-14-4T-22M	●	4	66	43	49	48	60	22	19	11		21	6.3	10.4								
	066R-14-5T-22M	●	5																				
	066R-14-4T-27M	●	4						27	20	13		24	7	12.4								
	066R-14-5T-27M	●	5																				
	080R-14-5T-M	●	5	80	57	63	62	76	27	20	13	63	24	7	12.4				-8°			1.4	6,400
	080R-14-6T-M	●	6																				
	100R-14-6T-M	●	6	100	77	83	82	96	32	26	17		28	8	14.4				-7°		#2	2.4	5,600
	100R-14-7T-M	●	7																				
	125R-14-7T-M	●	7	125	102	108	107	100	40	55	-		33	9	16.4							2.8	4,800
	160R-14-8T-M	●	8	160	137	143	142			68	66.7		32						-6°	No	#3	3.7	4,200

*1 for S_L dimension, see the figure below

Spare parts and applicable inserts

Description		Clamp screw	Wrench		Anti-seize compound	Mounting bolt	Applicable inserts
			DTPM	TTP			
MFH	050R-10-...-M	SB-4090TRPN	DTPM-15		MP-1	HH10x30	SOMT100420ER-GM SOMT100420ER-LD SOMT100420ER-FL
	063R-10-...-22M					HH10x30	
	063R-10-...-27M					HH12x35	
	080R-10-...-M					HH12x35	
		Recommended torque for insert clamp 3.5 Nm					
MFH	063R-14-...-22M	SB-50120TRP	TTP-20		MP-1	HH10x30	SOMT140520ER-GM SOMT140520ER-LD SOMT140514ER-FL
	063R-14-...-27M					HH12x35	
	080R-14-...-M					HH12x35	
	100R-14-...-M					-	
	125R-14-...-M					-	
	160R-14-...-M					-	
		Recommended torque for insert clamp 4.5 Nm					

Recommended cutting conditions → P17

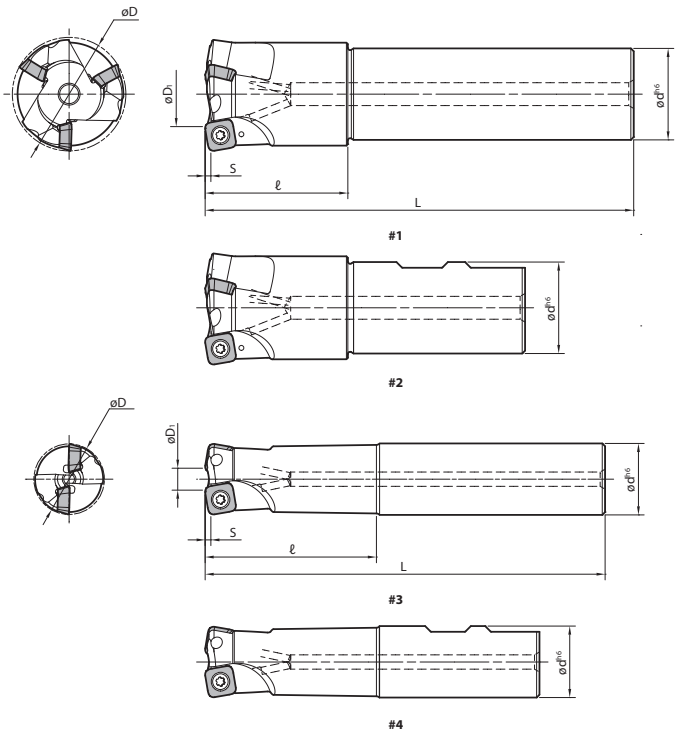


Caution with max. revolution

- When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat anti-seize compound (MP-1) thinly on portion of taper and thread when insert is fixed.

●: Standard item

MFH end mill



Toolholder dimension (SOMT10 type)

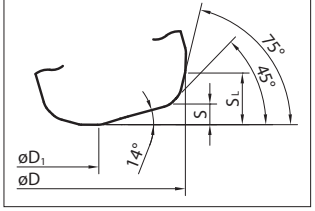
Description			Standard	No. of inserts	Dimension (mm)									Rake angle (°)		Coolant hole	Drawing	Weight (kg)	Max. revolution (min^{-1})
					øD	øD$_1$			ød	L	ℓ	S	S_L	A.R.	R.R.				
						GM	LD	FL											
Cylindrical	MFH	25-S25-10-2T	●	2	25	8	12.5	11.5	25	140	60	1.5 (1.2)*	3.5	+10°	-5°	Yes	#3	0.4	17,000
		28-S25-10-2T	●	2	28	11	15.5	14.5			40						#1	0.5	15,500
		32-S32-10-2T	●	2	32	15	19.5	18.5	32	150	70						#3	0.8	14,000
		32-S32-10-3T	●	3															
		35-S32-10-2T	●	2	35	18	22.5	21.5			50						#1		13,000
		35-S32-10-3T	●	3															
		40-S32-10-3T	●	3	40	23	27.5	26.5										0.9	11,500
		40-S32-10-4T	●	4															
Weldon	MFH	25-W25-10-2T	●	2	25	8	12.5	11.5	25	117	60	1.5 (1.2)*	3.5	+10°	-5°	Yes	#4	0.4	17,000
		32-W32-10-3T	●	3	32	15	19.5	18.5	32	131	70							0.7	14,000
		40-W32-10-3T	●	3	40	23	27.5	26.5		112	50						#2		11,500
		40-W32-10-4T	●	4															
Cylindrical (long)	MFH	25-S25-10-2T-200	●	2	25	8	12.5	11.5	25	200	120	1.5 (1.2)*	3.5	+10°	-5°	Yes	#3	0.6	17,000
		28-S25-10-2T-200	●	2	28	11	15.5	14.5			40							0.7	15,500
		32-S32-10-2T-200	●	2	32	15	19.5	18.5	32		120						#3	1.0	14,000
		35-S32-10-2T-200	●	2	35	18	22.5	21.5			50						#1	1.4	13,000
		40-S32-10-4T-250	●	4	40	23	27.5	26.5		250								1.5	11,500
Extra long shank	MFH	25-S25-10-2T-300	●	2	25	8	12.5	11.5	25	300	180	1.5 (1.2)*	3.5	+10°	-5°	Yes	#3	1.0	17,000
		28-S25-10-2T-300	●	2	28	11	15.5	14.5			40						#1	1.1	15,500
		32-S32-10-2T-300	●	2	32	15	19.5	18.5	32		180						#3	1.6	14,000
		35-S32-10-2T-300	●	2	35	18	22.5	21.5			50						#1	1.7	13,000
		40-S32-10-4T-300	●	4	40	23	27.5	26.5										1.8	11,500

*Dimension in ( ) is when attaching LD type

Spare parts and applicable inserts

Description	Clamp screw	Wrench	Anti-seize compound	Applicable inserts
				
MFH …-10-…	SB-4075TRP	DTPM-15	MP-1	SOMT100420ER-GM SOMT100420ER-LD SOMT100420ER-FL
	Recommended torque for insert clamp 3.5 Nm			

Cutting edge shape when attaching LD type



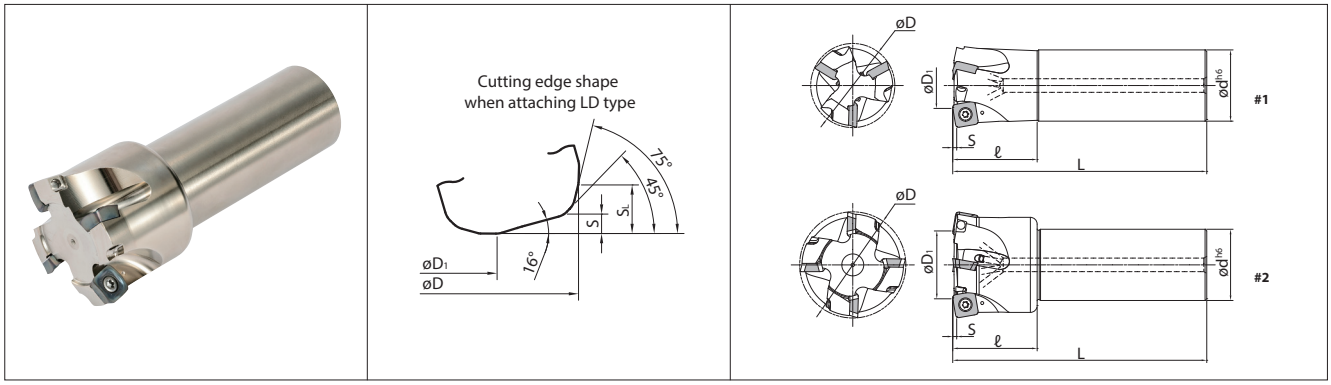
Caution with max. revolution

- When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat anti-seize compound (MP-1) thinly on portion of taper and thread when insert is fixed.

●: Standard item

Recommended cutting conditions → P17

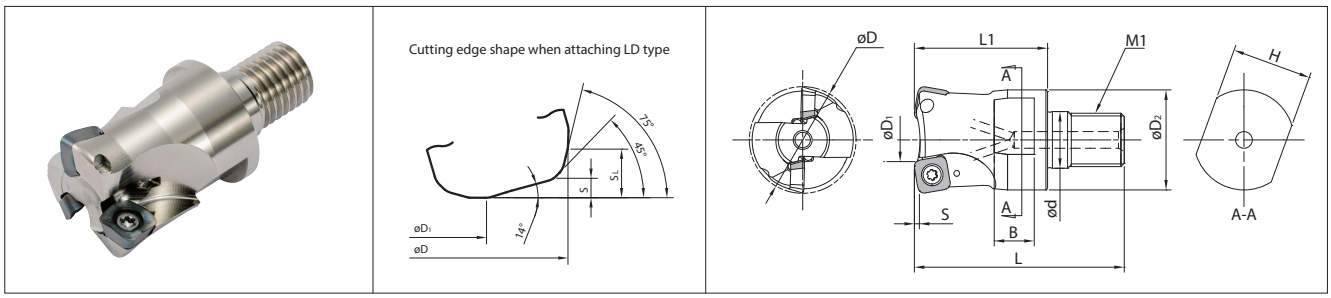
MFH with cylindrical shank



Toolholder dimension (SOMT14 type)

Description		Standard	No. of inserts	Dimension (mm)									Rake angle (°)		Coolant hole	Drawing	Weight (kg)	Max. revolution (min^{-1})
				øD	øD1			ød	L	ℓ	S	SL	A.R.	R.R.				
					GM	LD	FL											
MFH	50-S42-14-3T	●	3	50	27	33	32	42	150	50	2	5	+10°	-10°	Yes	#1	1.4	8,800
	63-S42-14-4T	●	4	63	40	46	45									#2	1.7	7,400
	80-S42-14-5T	●	5	80	57	63	62							-8°			2.3	6,400

MFH screw on type



Toolholder dimension

Description		Standard	No. of inserts	Dimension (mm)													Rake angle (°)		Coolant hole	Max. revolution (min^{-1})
				øD	øD1			øD2	ød	L	L1	M1	H	B	S	SL	A.R.	R.R.		
					GM	LD	FL													
MFH	25-M12-10-2T	●	2	25	8	12.5	11.5	23	12.5	57	35	M12	19	10	1.5 (1.2) *	3.5	+10°	-5°	Yes	17,000
	28-M12-10-2T	●	2	28	11	15.5	14.5													15,500
	32-M16-10-2T	●	2	32	15	19.5	18.5	30	17	63	40	M16	24	12						14,000
	32-M16-10-3T	●	3																	
	35-M16-10-2T	●	2	35	18	22.5	21.5													13,000
	35-M16-10-3T	●	3																	
	40-M16-10-3T	●	3	40	23	27.5	26.5													11,500
	40-M16-10-4T	●	4																	

*Dimension in ( ) is when attaching LD type

Spare parts and applicable inserts

Description	Clamp screw	Wrench	Anti-seize compound	Applicable inserts
				
MFH …-10-…	SB-4075TRP	DTPM-15	MP-1	SOMT100420ER-GM SOMT100420ER-LD SOMT100420ER-FL
	Recommended torque for insert clamp 3.5 Nm			
MFH …-14-…	SB-50120TRP	TTP-20	MP-1	SOMT140520ER-GM SOMT140520ER-LD SOMT140514ER-FL
	Recommended torque for insert clamp 4.5 Nm			

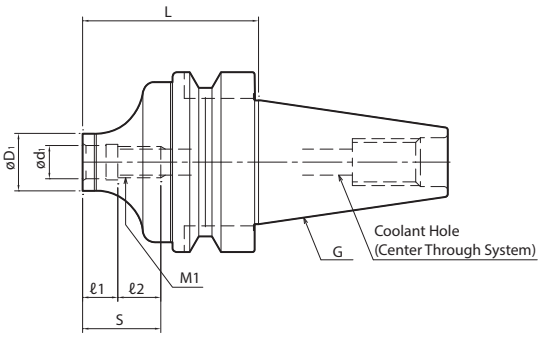
Caution with max. revolution

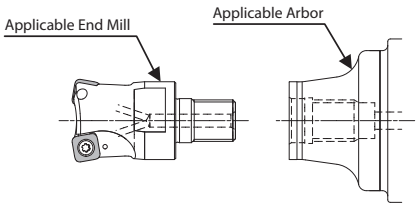
- When running an endmill or a cutter at the maximum revolution, the insert or cutter may be damaged by centrifugal force.
- Coat anti-seize compound (MP-1)  thinly on portion of taper and thread when insert is fixed.

Recommended cutting conditions → P17

● : Standard item

BT Arbor (for screw on type / two face contact)

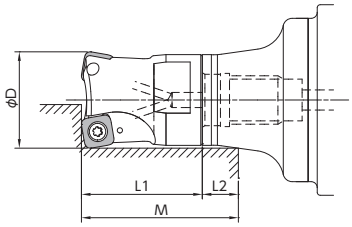




Arbor dimension

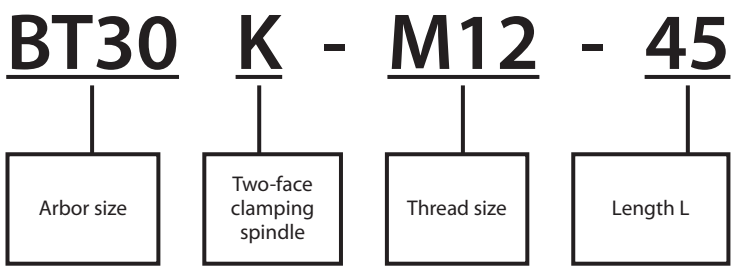
Description		Standard	Dimension (mm)							Coolant hole	Arbor Size	Applicable End Mill
			L	øD1	ød1	S	ℓ1	ℓ2	M1			
BT30K-	M12-45	●	45	23	12.5	24	9	15	M12	Yes	BT30	MFH25-M12·· MFH28-M12··
BT40K-	M12-55	●	55	23	12.5	24	9	15	M12		BT40	MFH25-M12·· MFH28-M12··
	M16-65	●	65	30	17	25		16	M16			MFH32-M16·· MFH35-M16·· MFH40-M16··

Effective depth of assembled tool



Arbor Description		Description	øD	L1	M	L2
BT30K-	M12-45	MFH25-M12-10-2T	25	35	42.8	7.8
		MFH28-M12-10-2T	28		45.5	10.5
BT40K-	M12-55	MFH25-M12-10-2T	25	35	44.6	9.6
		MFH28-M12-10-2T	28		47.6	12.6
	M16-65	MFH32-M16-10-○T	32	40	51.2	11.2
		MFH35-M16-10-○T	35		60.2	20.2
		MFH40-M16-10-○T	40		64	24

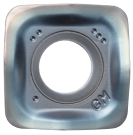
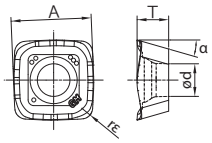
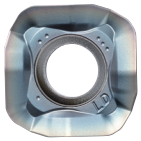
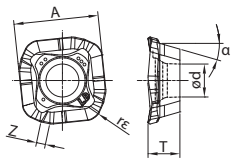
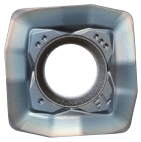
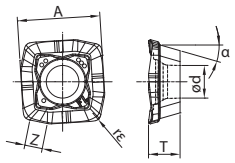
Arbor identification system



●: Standard item

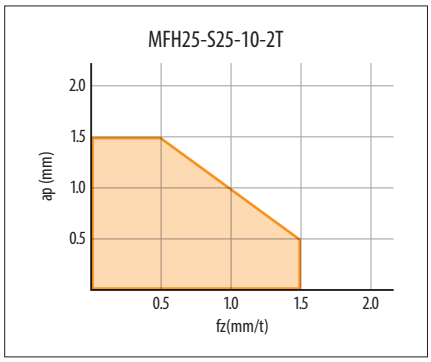
Applicable inserts

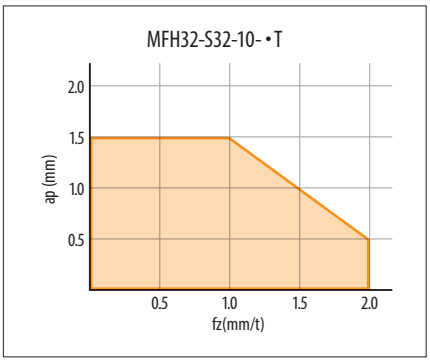
Classification of usage						
★ : Roughing / 1st choice ☆ : Roughing / 2nd choice ■ : Finishing / 1st choice □ : Finishing / 2nd choice	P	Carbon steel / alloy steel	☆	★		
		Die steel	☆	★		
	M	Austenitic stainless steel	★	☆		
		Martensitic stainless steel	☆			★
	K	Gray cast iron			★	
		Nodular cast iron			★	
	S	Heat-resistant alloy	★			☆
		Titanium alloy	★		☆	
	H	Hardened material		□		

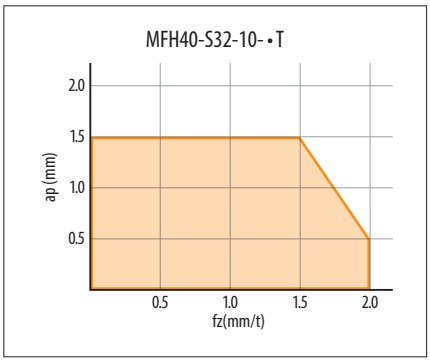
Insert		Description		Dimension (mm)					Angle (°)	MEGACOAT NANO carbide			CVD carbide
				A	T	ød	Z	rε	α	PR1535	PR1525	PR1510	CA6535
 General purpose		SOMT	100420ER-GM	10.3	4.58	4.6	-	2.0	16	●	●	●	●
			140520ER-GM	14.14	5.56	5.8				●	●	●	●
 Large ap		SOMT	100420ER-LD	10.45	4.58	4.6	0.9	2.0	16	●	●	●	●
			140520ER-LD	14.76	5.56	5.8	1.6			●	●	●	●
 Surface oriented		SOMT	100420ER-FL	10.44	4.58	4.6	1.4	2.0	16	●	●	●	●
			140514ER-FL	14.57	5.56	5.8	3.1	1.4		●	●	●	●

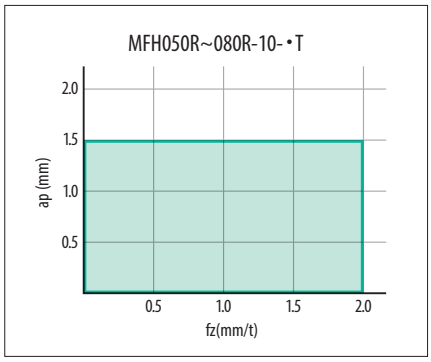
●: Standard item

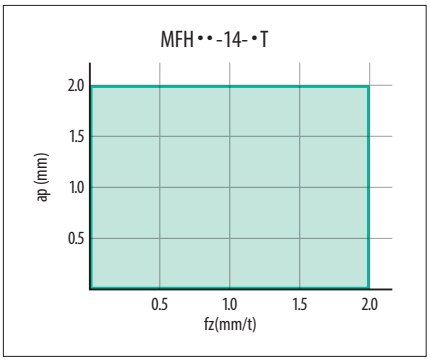
Cutting performance











- Max. ap for LD type is 5 mm (3.5 mm for 10-type). Please refer to page 17 for feed rate.
- Please refer to recommended cutting conditions in the chart for endmill type.
- Maximum feed rate (feed per tooth) of face mill type is fz = 2.0 mm/t.

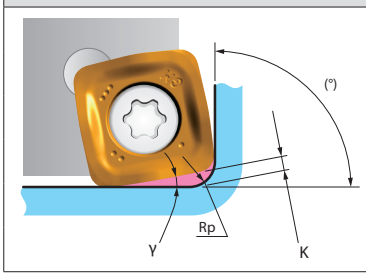
Recommended cutting conditions / MFH

Insert	Workpiece material	fz (mm/t)					Vc (m/min)			
		MFH25-	MFH32-	MFH40-	MFH…R-10	MFH…-14	MEGACOAT NANO			CVD coated carbide
							PR1535	PR1525	PR1510	CA6535
GM	Carbon steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		☆ 120 ~ 180 ~ 250	★ 120 ~ 180 ~ 250	-	-
	Alloy steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		☆ 100 ~ 160 ~ 220	★ 100 ~ 160 ~ 220	-	-
	Die steel (~ 40 HRC)	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		☆ 80 ~ 140 ~ 180	★ 80 ~ 140 ~ 180	-	-
	Die steel (40 ~ 50HRC)	0.15 ~ 0.3 ~ 0.5 (ap ≤ 1.0 mm) 0.15 ~ 0.2 ~ 0.25 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.45 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.7 (ap ≤ 1.5 mm)	0.2 ~ 0.7 ~ 1.0		☆ 60 ~ 100 ~ 130	★ 60 ~ 100 ~ 130	-	-
	Austenitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		★ 100 ~ 160 ~ 200	☆ 100 ~ 160 ~ 200	-	-
	Martensitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		☆ 150 ~ 200 ~ 250	-	-	★ 180 ~ 240 ~ 300
	Precipitation hardened stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		★ 90 ~ 120 ~ 150	-	-	-
	Gray cast iron	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		-	-	★ 120 ~ 180 ~ 250	-
	Nodular cast iron	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		-	-	★ 100 ~ 150 ~ 200	-
	Ni-base heat resistant alloy	0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.0 mm) 0.15 ~ 0.2 ~ 0.3 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.5 mm)	0.2 ~ 0.8 ~ 1.2		★ 20 ~ 30 ~ 50	-	-	☆ 20 ~ 40 ~ 50
	Titanium alloy (Ti-6Al-4V)	0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.0 mm) 0.15 ~ 0.2 ~ 0.3 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.5 mm)	0.2 ~ 0.8 ~ 1.2		★ 40 ~ 60 ~ 80	-	☆ 30 ~ 50 ~ 70	-
LD	Carbon steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 2.0 mm) 0.06 ~ 0.2 ~ 0.4 (ap ≤ 5.0 mm)	☆ 120 ~ 180 ~ 250	★ 120 ~ 180 ~ 250	-	-
	Alloy steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 2.0 mm) 0.06 ~ 0.2 ~ 0.4 (ap ≤ 5.0 mm)	☆ 100 ~ 160 ~ 220	★ 100 ~ 160 ~ 220	-	-
	Die steel (~ 40 HRC)	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.06 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 2.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 5.0 mm)	☆ 80 ~ 140 ~ 180	★ 80 ~ 140 ~ 180	-	-
	Die steel (40 ~ 50HRC)	0.2 ~ 0.3 ~ 0.5 (ap ≤ 1.0 mm) 0.03 ~ 0.05 ~ 0.1 (ap ≤ 3.5 mm)	0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.0 mm) 0.03 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.6 ~ 0.9 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.7 ~ 1.0 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.7 ~ 1.0 (ap ≤ 2.0 mm) 0.03 ~ 0.1 ~ 0.2 (ap ≤ 5.0 mm)	☆ 60 ~ 100 ~ 130	★ 60 ~ 100 ~ 130	-	-
	Austenitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.06 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 2.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 5.0 mm)	★ 100 ~ 160 ~ 200	☆ 100 ~ 160 ~ 200	-	-
	Martensitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.06 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 2.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 5.0 mm)	☆ 150 ~ 200 ~ 250	-	-	★ 180 ~ 240 ~ 300
	Precipitation hardened stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.06 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 2.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 5.0 mm)	★ 90 ~ 120 ~ 150	-	-	-
	Gray cast iron	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 1.0 mm) 0.06 ~ 0.2 ~ 0.3 (ap ≤ 3.5 mm)	0.5 ~ 1.5 ~ 2.0 (ap ≤ 2.0 mm) 0.06 ~ 0.2 ~ 0.4 (ap ≤ 5.0 mm)	-	-	★ 120 ~ 180 ~ 250	-
	Nodular cast iron	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.06 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.06 ~ 0.1 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.06 ~ 0.15 ~ 0.2 (ap ≤ 3.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 2.0 mm) 0.06 ~ 0.15 ~ 0.3 (ap ≤ 5.0 mm)	-	-	★ 100 ~ 150 ~ 200	-
	Ni-base heat resistant alloy	0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.0 mm) 0.03 ~ 0.05 ~ 0.1 (ap ≤ 3.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.03 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.8 ~ 1.2 (ap ≤ 2.0 mm) 0.03 ~ 0.1 ~ 0.2 (ap ≤ 5.0 mm)	★ 20 ~ 30 ~ 50	-	-	☆ 20 ~ 40 ~ 50
	Titanium alloy (Ti-6Al-4V)	0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.0 mm) 0.03 ~ 0.05 ~ 0.1 (ap ≤ 3.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.03 ~ 0.08 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.03 ~ 0.1 ~ 0.15 (ap ≤ 3.5 mm)	0.2 ~ 0.8 ~ 1.2 (ap ≤ 2.0 mm) 0.03 ~ 0.1 ~ 0.2 (ap ≤ 5.0 mm)	★ 40 ~ 60 ~ 80	-	☆ 30 ~ 50 ~ 70	-
FL	Carbon steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		☆ 120 ~ 180 ~ 250	★ 120 ~ 180 ~ 250	-	-
	Alloy steel	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		☆ 100 ~ 160 ~ 220	★ 100 ~ 160 ~ 220	-	-
	Die steel (~ 40 HRC)	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		☆ 80 ~ 140 ~ 180	★ 80 ~ 140 ~ 180	-	-
	Die steel (40 ~ 50HRC)	0.15 ~ 0.3 ~ 0.5 (ap ≤ 1.0 mm) 0.15 ~ 0.2 ~ 0.25 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.45 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.7 (ap ≤ 1.5 mm)	0.2 ~ 0.7 ~ 1.0		☆ 60 ~ 100 ~ 130	★ 60 ~ 100 ~ 130	-	-
	Austenitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		★ 100 ~ 160 ~ 200	☆ 100 ~ 160 ~ 200	-	-
	Martensitic stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		☆ 150 ~ 200 ~ 250	-	-	★ 180 ~ 240 ~ 300
	Precipitation hardened stainless steel	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		★ 90 ~ 120 ~ 150	-	-	-
	Gray cast iron	0.5 ~ 0.8 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.5 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.5 (ap ≤ 1.0 mm) 0.3 ~ 0.7 ~ 1.0 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8 (ap ≤ 1.0 mm) 0.4 ~ 1.0 ~ 1.5 (ap ≤ 1.5 mm)	0.5 ~ 1.5 ~ 2.0		-	-	★ 120 ~ 180 ~ 250	-
	Nodular cast iron	0.5 ~ 0.7 ~ 0.8 (ap ≤ 1.0 mm) 0.2 ~ 0.3 ~ 0.4 (ap ≤ 1.5 mm)	0.5 ~ 0.8 ~ 1.2 (ap ≤ 1.0 mm) 0.3 ~ 0.6 ~ 0.8 (ap ≤ 1.5 mm)	0.5 ~ 1.0 ~ 1.6 (ap ≤ 1.0 mm) 0.4 ~ 0.8 ~ 1.2 (ap ≤ 1.5 mm)	0.5 ~ 1.2 ~ 1.8		-	-	★ 100 ~ 150 ~ 200	-
	Ni-base heat resistant alloy	0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.0 mm) 0.15 ~ 0.2 ~ 0.3 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.5 mm)	0.2 ~ 0.8 ~ 1.2		★ 20 ~ 30 ~ 50	-	-	☆ 20 ~ 40 ~ 50
	Titanium alloy (Ti-6Al-4V)	0.2 ~ 0.4 ~ 0.6 (ap w1.0 mm) 0.15 ~ 0.2 ~ 0.3 (ap ≤ 1.5 mm)	0.2 ~ 0.5 ~ 0.9 (ap ≤ 1.0 mm) 0.2 ~ 0.4 ~ 0.6 (ap ≤ 1.5 mm)	0.2 ~ 0.6 ~ 1.0 (ap ≤ 1.0 mm) 0.2 ~ 0.5 ~ 0.8 (ap ≤ 1.5 mm)	0.2 ~ 0.8 ~ 1.2		★ 40 ~ 60 ~ 80	-	☆ 30 ~ 50 ~ 70	-

★: 1st recommendation ☆: 2nd recommendation

- Machining with coolant is recommended for Ni-base heat resistant alloy and titanium alloy.
- When finishing with LD type and FL type with wiper edge, reduce feed rate to fz = 0.1 - 0.3 mm/t or less.
- For machining center equivalent to BT30, reduce feed rate to 25 % or less of the recommended condition.
- For slotting, internal coolant or center through coolant is recommended.

Note for machining programm (programming R)

Shape	Holder	Chipbreaker	γ Cutting edge angle	Rp Programming radius	K (mm) Unmachined part	(°) Max. inclination angle of workpiece at contouring
	MFH…-10-…	GM	10°	3.0	0.85	90°
		FL	14°	3.0	0.89	80°
		LD	14°	3.5	0.69	65°
	MFH…-14-…	GM	10°	3.5	1.37	90°
		FL	13°	3.0	1.36	80°
		LD	16°	5.0	1.06	65°

Reference data for ramping

MFH…-10-…

Cutter dia. (mm)	25	28	32	35	40	50	63	80
α_{max} (°) Max. ramping angle	5	4.5	4	3.5	3	2.5	2	1
tan α_{max}	0.087	0.078	0.070	0.061	0.052	0.043	0.035	0.017

MFH…-14-…

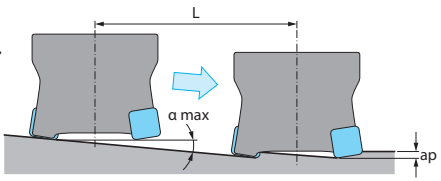
Cutter dia. (mm)	50	63	80	100	125	160
α_{max} (°) Max. ramping angle	2	1.8	1	0.5	0.4	0.2
tan α_{max}	0.035	0.031	0.017	0.009	0.007	0.003

Tips for ramping

- Ramping angle should be under α_{max}.
- Feed rate should be under 70 % of the cutting conditions.

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

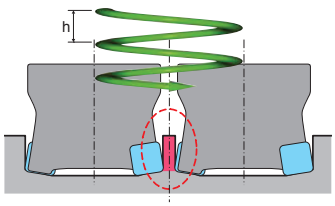
$$L = \frac{ap}{\tan \alpha_{max}}$$



Tips for helical milling

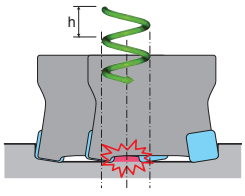
For helical milling, use between min. cutting dia. and max. cutting dia.

Over max. cutting dia.



Center core part remains after machining

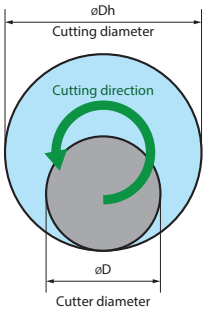
Under min. cutting dia.



Center core part interferes with toolholder

Holder	Min. cutting dia. (mm)	Max. cutting dia.(mm)
MFH…-10-…	2 × D-18	2× D-2
MFH…-14-…	2 × D-25	2 × D-2

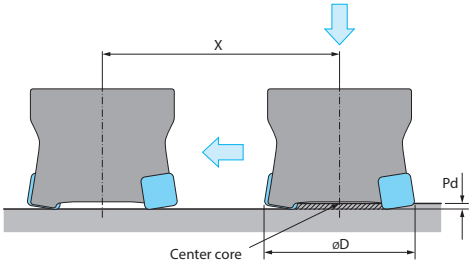
- Sinking depth (h) at helical milling should be under max. ap. in the cutter dimension chart.
- Down-cut milling is recommended.
- Feed rate should be under 50 % of the cutting conditions.



Tips for peck milling

Holder	GM		LD		FL	
	Pd Max. cutting depth	Min. cutting length X for flat bottom surface	Pd Max. cutting depth	Min. cutting length X for flat bottom surface	Pd Max. cutting depth	Min. cutting length X for flat bottom surface
MFH…-10-…	1.5	D-18	1.5	D-14	1.5	D-15
MFH…-14-…	2	D-24	2	D-18	2	D-19

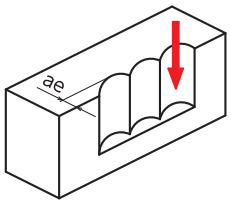
Unit: mm



- Reduce feed rate 25 % or less of the recommended conditions until the center core part (unmachined part) is removed.
- When pecking, reduce feed rate per revolution to under f = 0.2 mm/rev.

Vertical milling (Plunging)

Insert size	Maximum width of cut (ae)
SOMT10	8 mm
SOMT14	11.5 mm

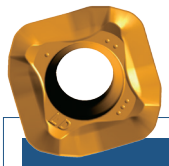


For vertical milling (plunging), reduce feed rate to fz = 0.2 mm/t or less.

3D machining

Chipbreaker	Ramping	Contouring (Rising wall angle)	Vertical	Helical milling	Pocketing
GM	○	○ (90°)	○	○	○
LD	○	△ (65°)	×	×	×
FL	○	△ (80°)	×	×	×

- Some applications are not available depending on insert shape.
- For FL and LD type, there is a limit of rising wall angle at contouring.



LD type

for both large ap (max. 5 mm) and high feed rate at low ap machining, for removing scale.

MFH / LD chipbreaker

Chip removal = 404 cc/min

Roughing for scale removal (2 passes): Large ap
Vc = 200m/min fz = 0.25 mm/t
ap × ae = 4 × 40 mm
Vf = 1,264 mm/min

Roughing (2 passes) after scaling: High feed rate
Vc = 200m/min fz = 1.5 mm/t
ap × ae = 2 × 40 mm Vf = 7,583 mm/min
Workpiece: Ust 42-2

MFH063R-14-5T-22M (Cutter dia. ø 63, 5 teeth)

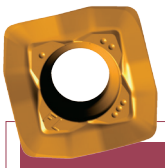
Conventional 45° cutter

Chip removal = 151 cc/min

- Roughing (4 passes): Constant ap and feed rate
  Vc = 200m/min fz = 0.25 mm/t
  ap × ae = 3 × 40 mm Vf = 1,264 mm/min
  Workpiece: Ust 42-2

Cutter dia. ø 63,5 teeth

MFH improved machining efficiency by 2.6 times compared to the conventional 45° cutter.



FL type

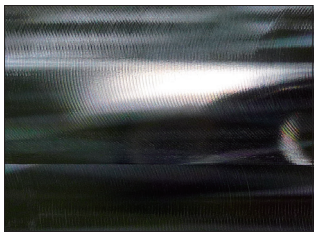
for fine surface finish.

MFH / FL chipbreaker

Roughing (2 passes)
Vc = 200m/min fz = 0.4 mm/t
ap × ae = 1.5 × 35 mm
Vf = 2,038 mm/min
Workpiece: C55

Finishing: Surface roughness oriented
Vc = 200m/min fz = 0.2 mm/t
ap × ae = 0.2 × 35 mm
Vf = 1,019 mm/min
Workpiece: C55

MFH050R-10-4T-M (Cutter dia.ø50, 4 teeth)



Rz = 3.2 µm
Finishing surface roughness depends on the cutting conditions

Reduced chattering and better surface roughness even with long overhang machining (suitable for small machining center too).

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