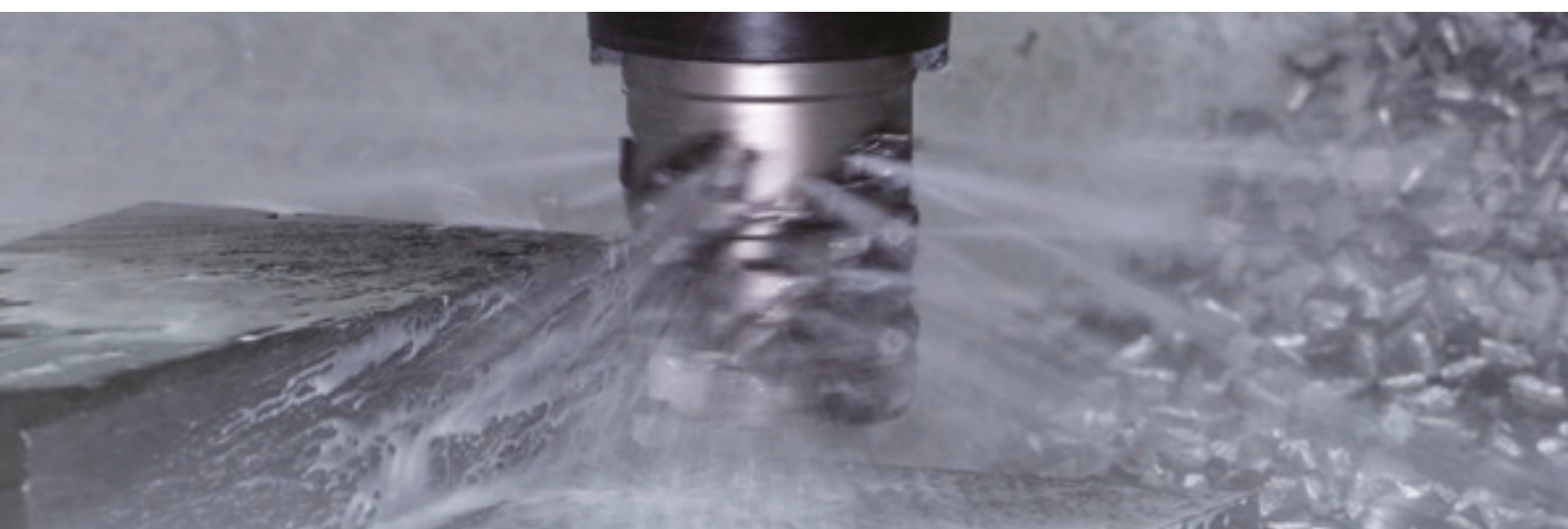


ME90

NEW

Stable, long tool life machining of difficult-to-cut materials

New high-rigidity toolholder design minimizes deflection

**Special arc land geometry
for longer tool life**

**Stable machining with
PM335S, a new grade
for difficult-to-cut
materials such as
titanium alloys**



**KEEPS YOU
AHEAD**



Helical end mill for difficult-to-cut materials

ME90

Addresses the challenges of machining difficult-to-cut materials such as titanium alloys. Proprietary high-rigidity holder, advanced insert design, and new grade delivers stable performance and long tool life.

Double-sided inserts with 8 cutting edges provide excellent economy.

1

Solving titanium alloy machining challenges with stable performance and long tool life

Titanium machining challenges

Unstable machining

Excessive vibration during machining.

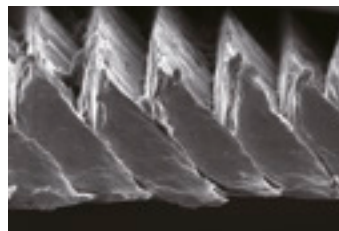
Cutting-edge chipping caused by fluctuating loads can lead to unstable machining.



Short tool life

Heat concentrates at the cutting edge, accelerating wear.

Serrated chip formation causes fluctuating cutting loads and increases the risk of chipping.



High-rigidity toolholder

New high-rigidity holder design minimizes deflection

Proprietary insert

Special arc land geometry for extended tool life

Newly developed grade

Stable machining with PM335S, a new grade for difficult-to-cut materials



Bottom inserts (1st stage only)

Positive-rake insert with 2 cutting edges for low cutting forces.

Available in a wide range of corner radii (RE0.8–RE6.35).

H-class precision insert.

Reduced run-out ensures stable tool life.



Peripheral inserts (2nd stage or above)

Double-sided insert with 8 cutting edges for high cost efficiency.

H-class precision insert.

Reduced run-out ensures stable tool life.



2

New high-rigidity toolholder design minimizes deflection

A unique differential screw clamping design and increased holder wall thickness improve rigidity. Minimizes deflection and resists chatter, even in long-overhang applications.

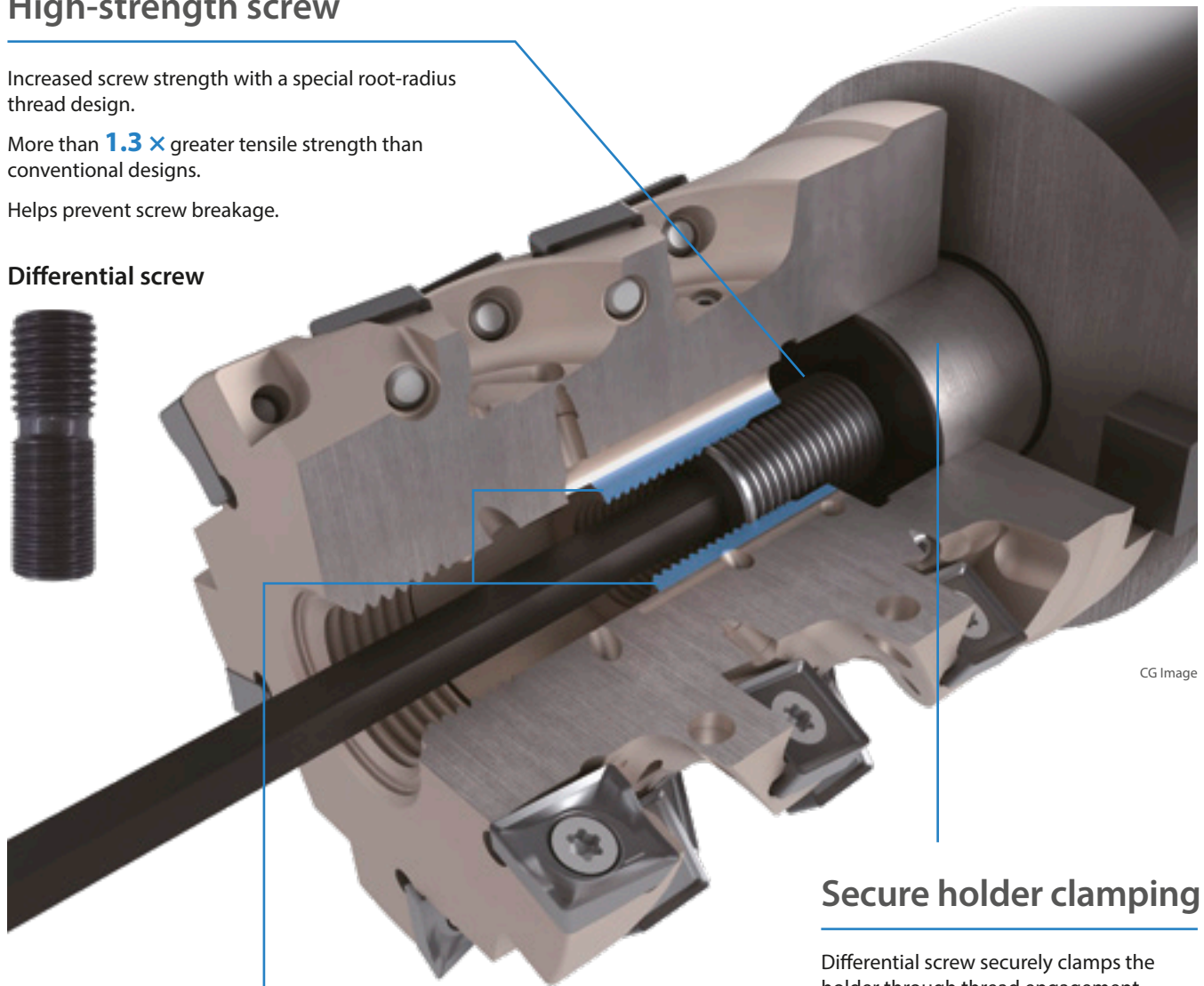
High-strength screw

Increased screw strength with a special root-radius thread design.

More than **1.3 x** greater tensile strength than conventional designs.

Helps prevent screw breakage.

Differential screw



CG Image

High-rigidity toolholder

Differential screw ensures sufficient holder wall thickness.

Suppresses deflection.

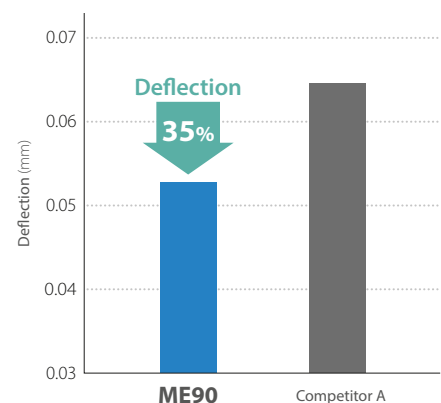
Secure holder clamping

Differential screw securely clamps the holder through thread engagement.

Promotes stable machining.

Toolholder deflection analysis

(Internal evaluation)

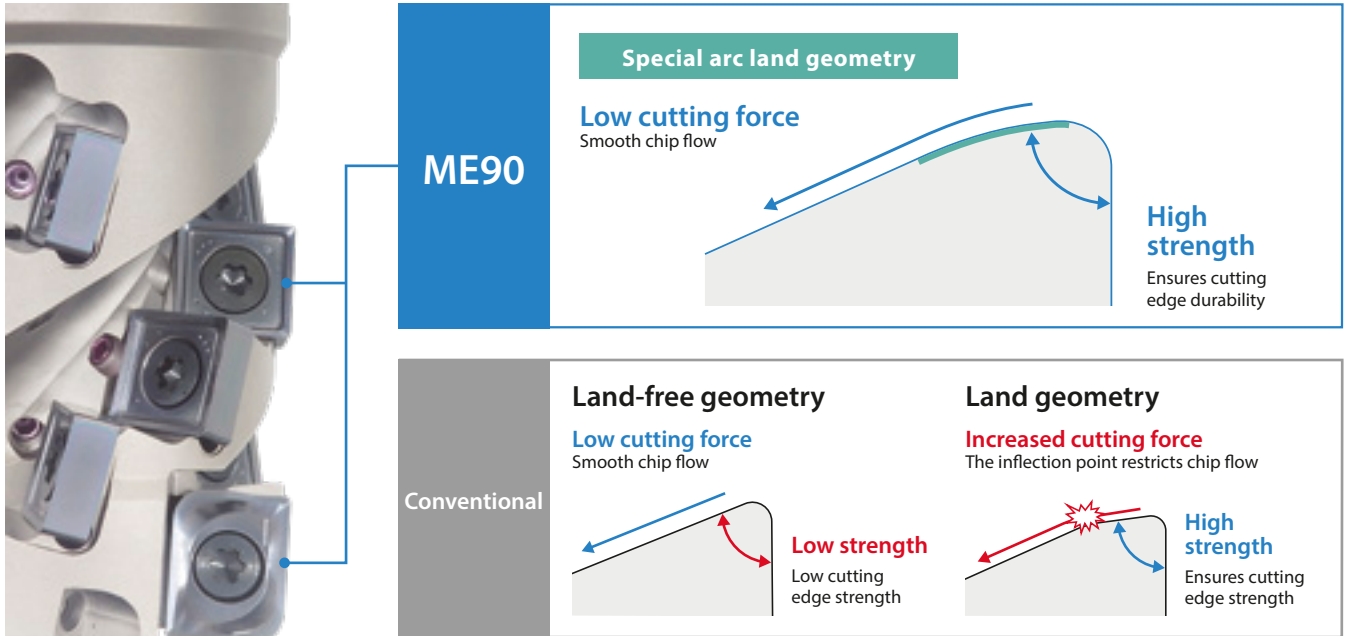


3

Special arc land geometry for extended tool life

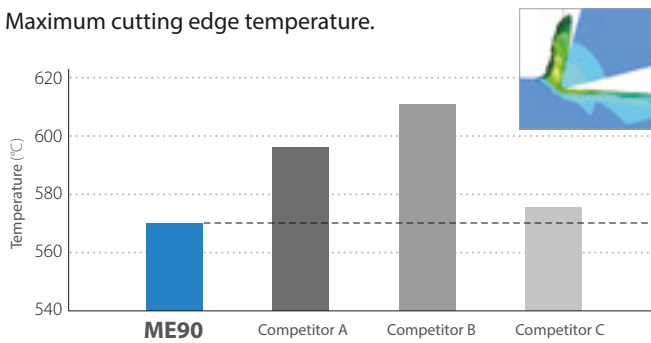
Newly developed special arc land geometry.

Achieves the optimal balance between low cutting force and cutting edge strength.

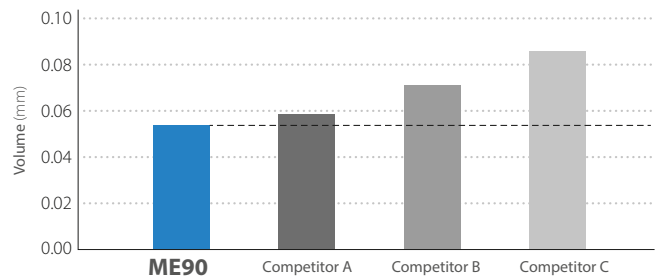


Simulation results (Internal evaluation)

Maximum cutting edge temperature.

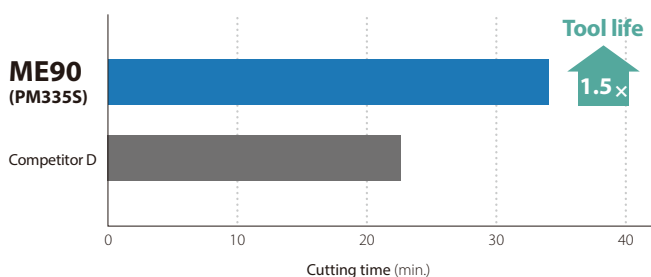


High-stress region volume at the cutting edge.



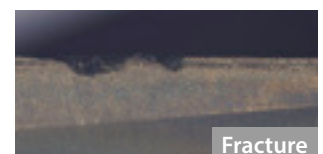
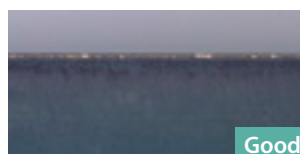
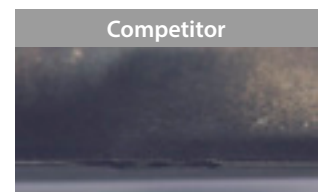
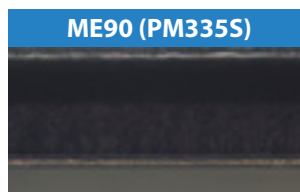
ME90 achieves both, lower cutting edge temperature and stress, providing excellent wear resistance and chipping resistance.

Tool life comparison (Internal evaluation)



$V_c = 30 \text{ m/min}$. ($n = 120 \text{ min}^{-1}$), $ap \times ae = 40 \times 20 \text{ mm}$, $fz = 0.1 \text{ mm/t}$
Wet, Ti-5553, Ø80, BT50

After machining 22.8 minutes



4

New grade PM335S for stable machining of difficult-to-cut materials

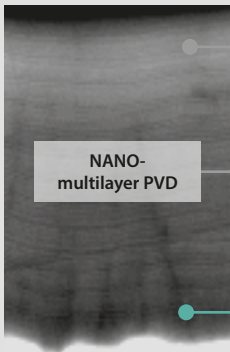
High-adhesion, high-toughness coating improves resistance to chipping.

Maintains high strength even at elevated cutting temperatures.

Combined with a high-toughness carbide substrate, PM335S delivers stable machining and extended tool life in difficult-to-cut materials, including titanium alloys.



Coating



NANO-multilayer PVD



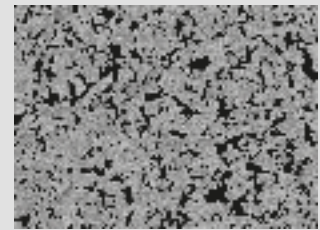
Utilizes AlCrN with superior resistance to adhesion

AlTiN-based / AlCrN nano-multilayer coating
High hot hardness through high-melting-point element addition.
Optimised compressive stress improves coating toughness.

Special interface layer

Enhanced coating adhesion reduces the risk of coating delamination
(Critical load increased by 15%)

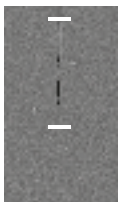
Carbide substrate



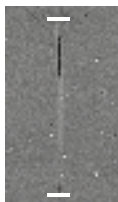
Utilizes a high-toughness carbide substrate.
Delivers excellent fracture and wear resistance.

Coating fracture toughness comparison (Internal evaluation)

The nano-multilayer structure and optimised residual stress suppresses crack propagation.



PM335S coating



Conventional coating

Test conditions
Equipment: Vickers hardness tester
Load: 25 kgf
Temperature: Room temperature.

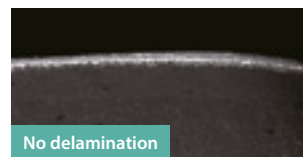
Fracture toughness

1.5x

Coating delamination comparison (Internal evaluation)

Special interface layer improves adhesion between the carbide substrate and the coating.

With interface layer



No delamination

Without interface layer



Coating delamination

Vc = 60 m/min., ap x ae = 0.75 x 10 mm, fz = 0.8 mm/t. Wet, Ti-6Al-4V (Pocketing)
MFH Boost (Ø25)

Case studies



Vc = 45 m/min., ap x ae = 55 x 30 mm, fz = 0.1 mm/t. Wet, Ti-6Al-4V, Ø80, BT50.

Cutting time

ME90
PM335S

46 min./edge

Competitor A

23 min./edge

Tool life

2x

Video

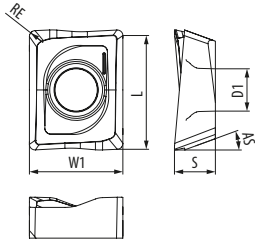
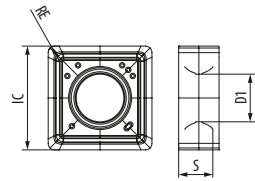


Competitor inserts experienced sudden chipping caused by chip packing.

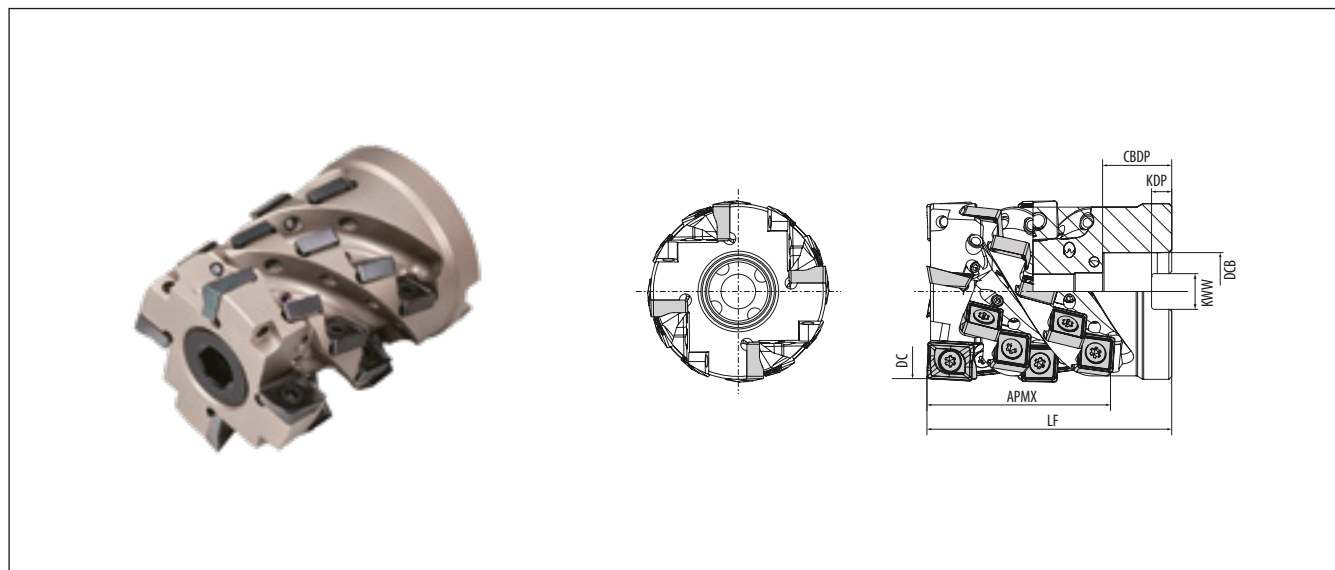
ME90 (PM335S) maintained a stable cutting edge and continued machining even after twice the cutting time.

(User evaluation)

Applicable inserts

Usage classification			P	Carbon steel / Alloy steel							★
				Mould steel							
★: Roughing / 1st Choice ☆: Roughing / 2nd Choice ■: Finishing / 1st Choice □: Finishing / 2nd Choice (For hardened materials ≤ 40 HRC)			M	Austenitic stainless steel							★
				Martensitic stainless steel							★
				Precipitation hardened stainless steel							★
			K	Gray cast iron							
				Nodular cast iron							
			N	Non-ferrous metal							
			S	Heat-resistant alloy (Ni-based heat-resistant alloy)						★	☆
				Titanium alloys						★	☆
			H	Hardened materials							
Insert		Description	Dimensions (mm)						Carbide		
			IC	S	D1	RE	L	W1	AS	PM335S	PR1835
 Bottom insert		LNHT150508ER-GM	-	5.6	5.8	0.8	15.5	12.7	20	●	●
		LNHT150516ER-GM				1.6				●	●
		LNHT150520ER-GM				2.0				●	●
		LNHT150530ER-GM				3.0	15.6			●	●
		LNHT150532ER-GM				3.2				●	●
		LNHT150540ER-GM				4.0				●	●
		LNHT150550ER-GM				5.0	15.7			●	●
		LNHT150560ER-GM				6.0	15.8			●	●
		LNHT150564ER-GM				6.35				●	●
 Peripheral insert		SNHU120408ER-GM	12.7	4.2	5.8	0.8	-	-	-	●	●

●: Standard item



Toolholder dimensions

Description		Availability	No. of Inserts	No. of Insert rows	No. of Stages	Dimensions (mm)							Rake angle		Coolant Hole	Weight (kg)	Max. revolution (min ⁻¹)	Applicable inserts	
						DC	DCB	LF	CDBP	KDP	KWW	APMX	A.R. (°)	R.R. (°)				1 st stage	2 nd stage or above
Standard	ME90-050R-15T3H5C-M	●	15	3	5	50	22	75	21	6.3	10.4	53	+15	-17	Yes	0.5	7,900	LNHT1505**	SNHU1204**
	063R-15T4H6C-M	●	24	4	6	63	27	85	24	7	12.4	63		-16		1.0	7,000		
	080R-15T5H7C-M	●	35	5	7	80	32	100	30	8	14.4	72		-15		2.2	6,200		
Long type	ME90-050R-15T3H7CL-M	●	21	3	7	50	22	95	21	6.3	10.4	73		-17		0.6	7,900		
	063R-15T4H8CL-M	●	32	4	8	63	27	105	24	7	12.4	82		-16		1.1	7,000		
	080R15T5H10CL-M	●	50	5	10	80	32	120	30	8	14.4	101		-15		2.4	6,200		

For inserts with corner radius (RE) ≥ 4.0 mm, modifications to the toolholder are required. (See page 12 for details.)

●: Standard item

Maximum number of revolutions

Set the spindle speed within the recommended cutting speed range for each workpiece material.

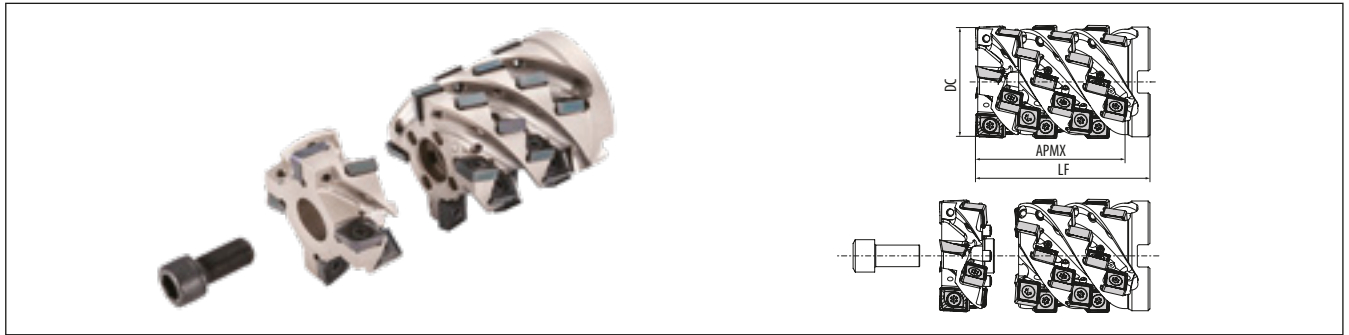
Do not operate the cutter at or above the maximum number of revolutions.

Even under no-load conditions, centrifugal force may cause inserts or components to be ejected, resulting in a hazardous situation.

Spare parts

Description		Arbor bolt (Differential screw)	Arbor wrench (For differential screw)	Clamp screw	Wrench	Mounting bolt	Coolant nozzle
Shell mill	ME90-050R**	W10X38 Torque 15 N.m	TW-5	SB-50100TRP Torque 4.5 N.m	TTP-20	HH8X10	HS4X4-H10
	ME90-063R**	W12X52 Torque 20 N.m	TW-6			HZ22X15	
	ME90-080R**	W16X48 Torque 28 N.m	TW-8			HH12X25F	
Exchangeable head type	ME90-063R**-B	W12X52 Torque 20 N.m	TW-6			HH16X30EF	
	ME90-080R**-B	W16X48 Torque 28 N.m	TW-8				

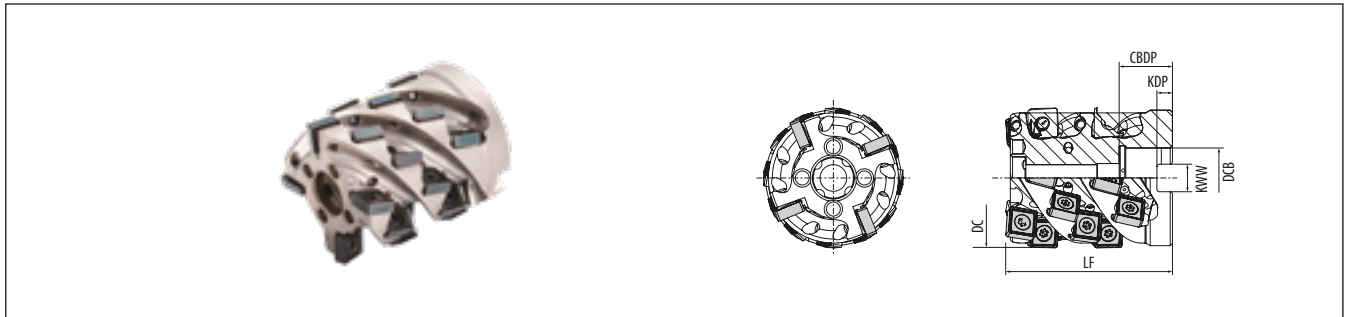
Exchangeable head type (Base unit + front piece)



Assembly dimensions

Base unit + front piece	No. of inserts	No. of insert rows	No. of stages	Dimensions (mm)		
				DC	LF	APMX
ME90-063R**-B + ME90-063R**-F	32	4	8	63	97	82
ME90-080R**-B + ME90-080R**-F	50	5	10	80	120	101

Base unit

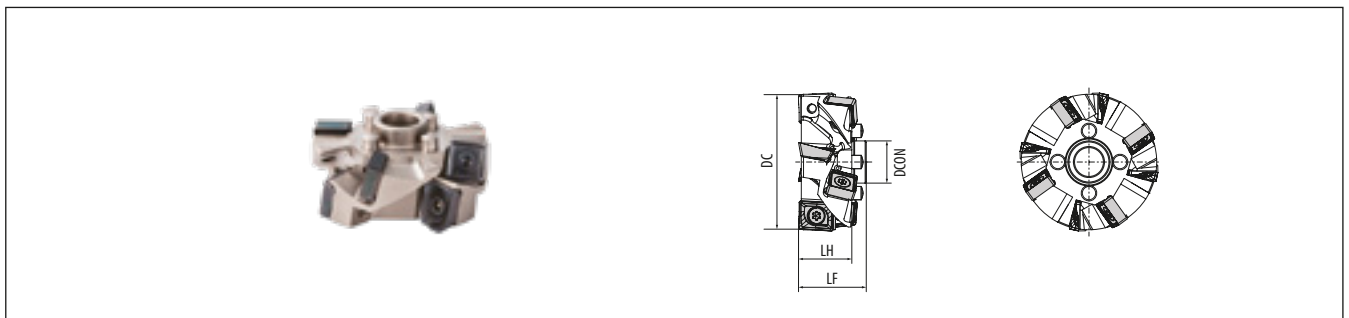


Toolholder dimensions

Bore diameter	Description	Availability	No. of inserts	No. of insert rows	No. of stages	Dimensions (mm)						Rake angle		Coolant hole	Weight (kg)	Max. revolution (min ⁻¹)	Applicable inserts
						DC	DCB	LF	CBDP	KDP	KWW	A.R. (°)	R.R. (°)				
Metric	ME90-063R-12T4H6C-B	●	24	4	6	63	27	74	24	7	12.4	+15	-16	Yes	0.7	7,000	SNHU1204**
	080R-12T5H8C-B	●	40	5	8	80	32	97	30	8	14.4	-15	-15		1.9	6,200	

●: Standard item

Front piece



Toolholder dimensions

Bore diameter	Description	Availability	No. of inserts	No. of insert rows	No. of stages	Dimensions (mm)				Rake angle		Coolant hole	Weight (kg)	Max. revolution (min ⁻¹)	Applicable inserts	
						DC	LF	LH	DCON	A.R. (°)	R.R. (°)				1st stage	2nd stage or above
Metric	ME90-063R-15T4H2C-F	●	8	4	2	63	30.5	24	19	+15	-16	Yes	0.2	7,000	LNHT1505**	SNHU1204**
	080R-15T5H2C-F	●	10	5	2	80	32		27	-15	-15		0.4	6,200		

For inserts with corner radius (RE) ≥ 4.0 mm, modifications to the toolholder are required. (See page 12 for details.)

●: Standard item

Maximum number of revolutions

Set the spindle speed within the recommended cutting speed range for each workpiece material.

Do not operate the cutter at or above the maximum number of revolutions.

Even under no-load conditions, centrifugal force may cause inserts or components to be ejected, resulting in a hazardous situation.

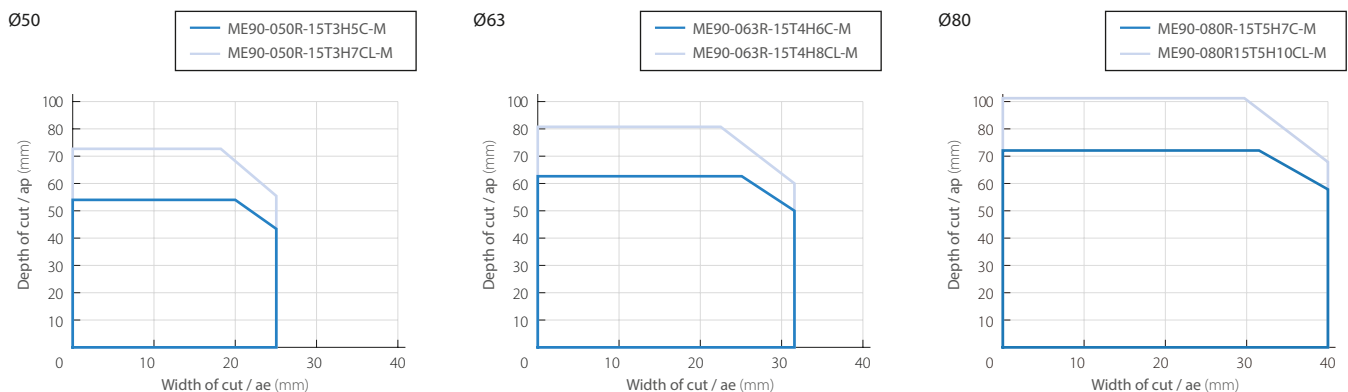
Recommended cutting conditions ★ 1st recommendation ☆ 2nd recommendation

Chipbreaker	Workpiece material	fz (mm/t)	Recommended insert grades	
			MEGACOAT TOUGH	MEGACOAT NANO EX
			PM335S	PR183S
GM	Titanium alloys	0.08 ~ 0.10 ~ 0.15	★ 30 ~ 40 ~ 60	☆ 30 ~ 40 ~ 60
	Ni-based heat-resistant alloys	0.06 ~ 0.08 ~ 0.10	★ 20 ~ 30 ~ 40	☆ 20 ~ 30 ~ 40
	Carbon steel	0.08 ~ 0.10 ~ 0.15	-	★ 80 ~ 120 ~ 150
	Alloy steel	0.08 ~ 0.10 ~ 0.15	-	★ 80 ~ 120 ~ 150
	Austenitic stainless steel	0.08 ~ 0.10 ~ 0.15	-	★ 60 ~ 100 ~ 130
	Martensitic stainless steel	0.08 ~ 0.10 ~ 0.15	-	★ 60 ~ 100 ~ 130
	Precipitation hardened stainless steel	0.08 ~ 0.10 ~ 0.15	-	★ 50 ~ 80 ~ 100

The values in **bold** are the recommended starting condition. Adjust the cutting speed and the feed rate within the above conditions according to the actual machining situation. Machining with coolant is recommended for Ni-base heat-resistant alloys and titanium alloys. When choosing wet machining for other workpieces, reduce the cutting speed to 70% or less. For long types and modular types, use approximately 80% of the recommended cutting speed.

Cutting performance

Shouldering (Vc = 40 m/min., fz = 0.1 mm/t. Wet, Ti-6Al-4V, BT50)



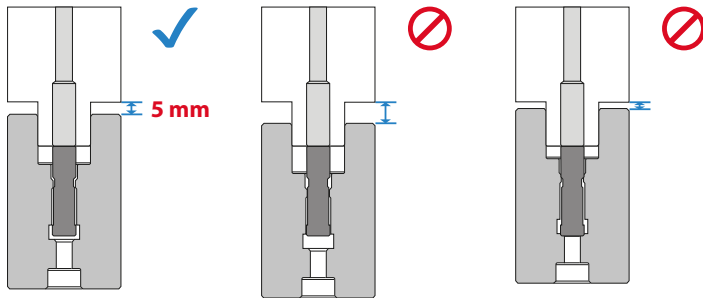
When machining work materials other than titanium alloys, keep the axial depth of cut (ap) or radial width of cut (ae) to 50% or less for the standard type, and 20% or less for the long type.

Slotting

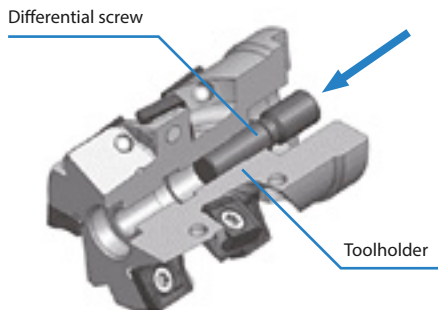
Workpiece material	Machining type	ap / ae (mm)		fz (mm/t)	Vc (m/min)
		ap	ae		
Titanium alloys	Slotting	-0.5 DC	1 DC	0.06 ~ 0.08 ~ 0.1	30 ~ 40 ~ 50

Holder clamping method

Maintain a **5 mm** clearance between the holder and arbor before tightening.



- 1 Insert the differential screw into the holder, then turn it until it is fully seated.



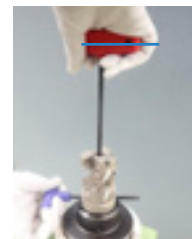
- 2 To ensure proper engagement between the holder and the arbor, provide a clearance of approximately 5 mm between the holder and the arbor before tightening the differential screw.

The insert clamping wrench TTP-20 (20IP) has a shaft diameter of $\varnothing 5$ mm.

While holding the TTP-20 wrench between the holder and the arbor, tighten the differential screw to maintain the proper clearance.

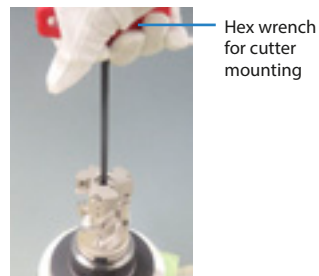
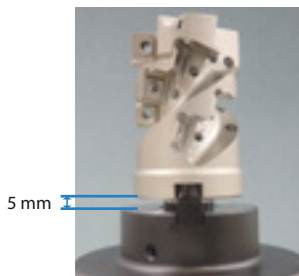


Insert clamping wrench TTP-20 (20IP)



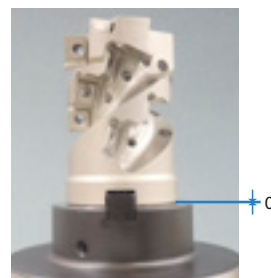
Hex wrench for cutter mounting

- 3 As the differential screw is tightened, the TTP-20 wrench becomes clamped between the holder and the arbor, preventing further tightening. At this point, remove the TTP-20 wrench to obtain a 5 mm clearance. Then continue tightening using the hex wrench for cutter mounting.



Hex wrench for cutter mounting

- 4 Tighten the differential screw until the clearance is eliminated. Confirm that the holder is securely mounted to the arbor. Refer to the parts list (page 8) for the recommended tightening torque.



Precautions

How to replace an insert

- 1. Be sure to completely remove dust and chips from the insert mounting pocket.
- 2. It is recommended to apply an anti-seize compound to the tapered and threaded portions of the clamp screw.
- 3. Attach the clamp screw to the wrench, then tighten it while lightly pressing the insert against the seating surface of the toolholder.
- 4. Tighten the wrench in a direction parallel to the clamp screw. Recommended tightening torque: 4.5 N·m
- 5. After tightening, ensure that there are no gaps between the insert seating surface and the holder's support and seating surfaces.



When using inserts with a large corner radius (RE ≥ 4.0)

When using inserts with a corner radius (RE) of 4.0 or greater, additional modification of the cutter body is required.

Modify the corner of the tool body using the dimensions shown in the table on the right as a guide.

(No modification is required for inserts with a corner radius (RE) of 3.2 or less.)

Insert corner radius (RE) (mm)	Tool body corner modification dimensions (mm)
4.00	R2.0
5.00	R3.0
6.00	R4.0
6.35	R4.5

*An R (radius) modification is recommended for the corners of the cutter body. If chamfering is used, care should be taken to avoid over-cutting.

