High Performance Milling

MEV

New Generation of High Performance, Economical, Multi-functional Milling Cutters

Newly Developed Triangle Inserts Provide Numerous Solutions to Machining Challenges

- High Performance - Low cutting forces and Higher Rigidity for Excellent Chatter Resistance
- Economical - Longer Insert and Holder Tool Life
- Multi-functional - Can be Used in Shouldering, Slotting, and Ramping Applications

NEW End Mill (Long Shank Type), Face Mill Added to Lineup

New Triangular Insert Design

High Performance Milling

MEV

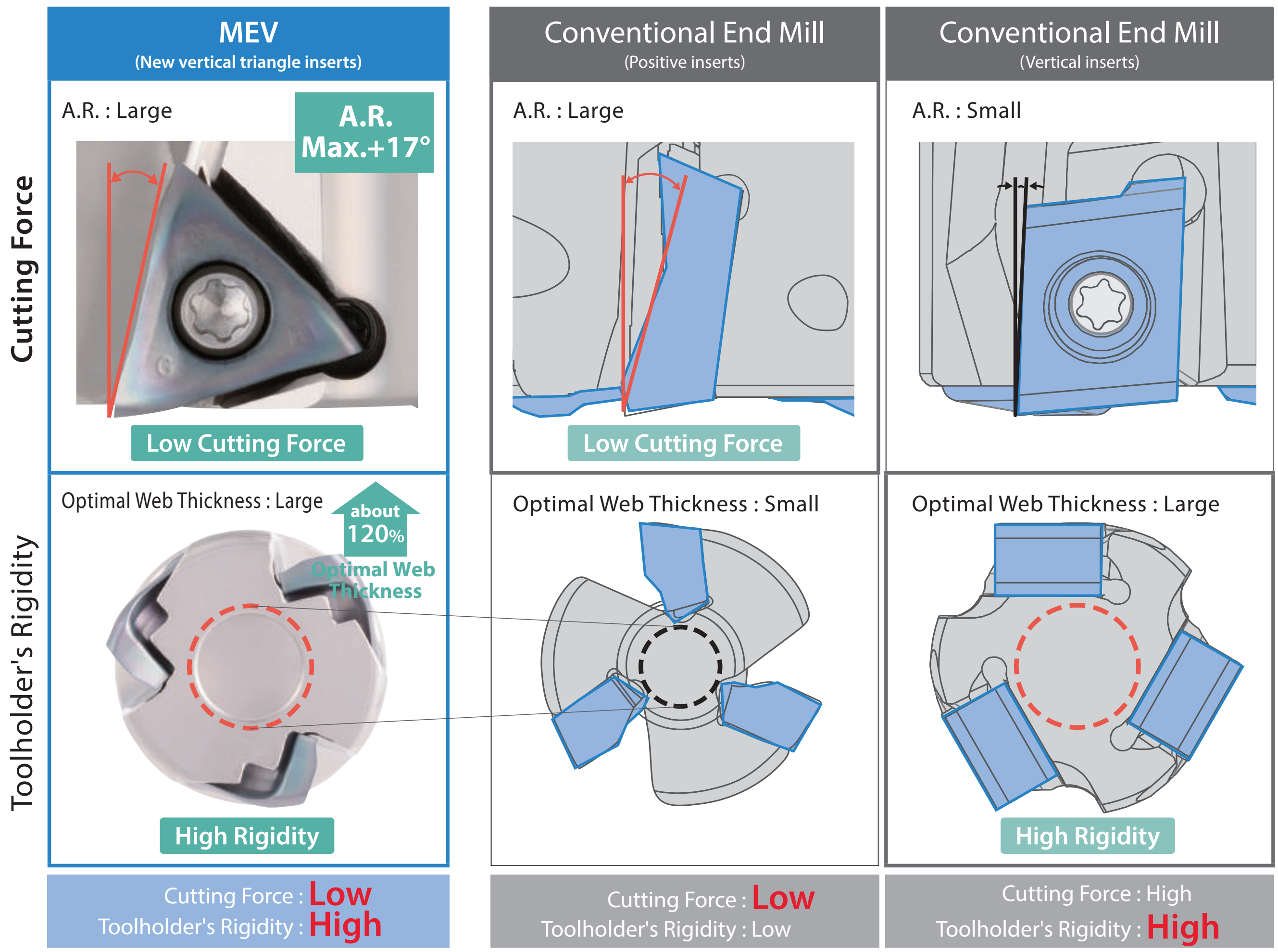
Newly Developed Triangular Inserts for Provide Low Cutting Forces and Increased Rigidity
High Performance, Economical, and Multi-functional Milling Solutions

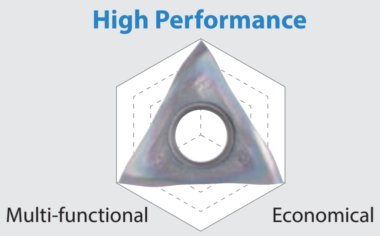
1 High Performance: Low Cutting Force and High Rigidity

Newly developed vertical triangle inserts with 3 cutting edges

Achieve stable machining with reduced chattering

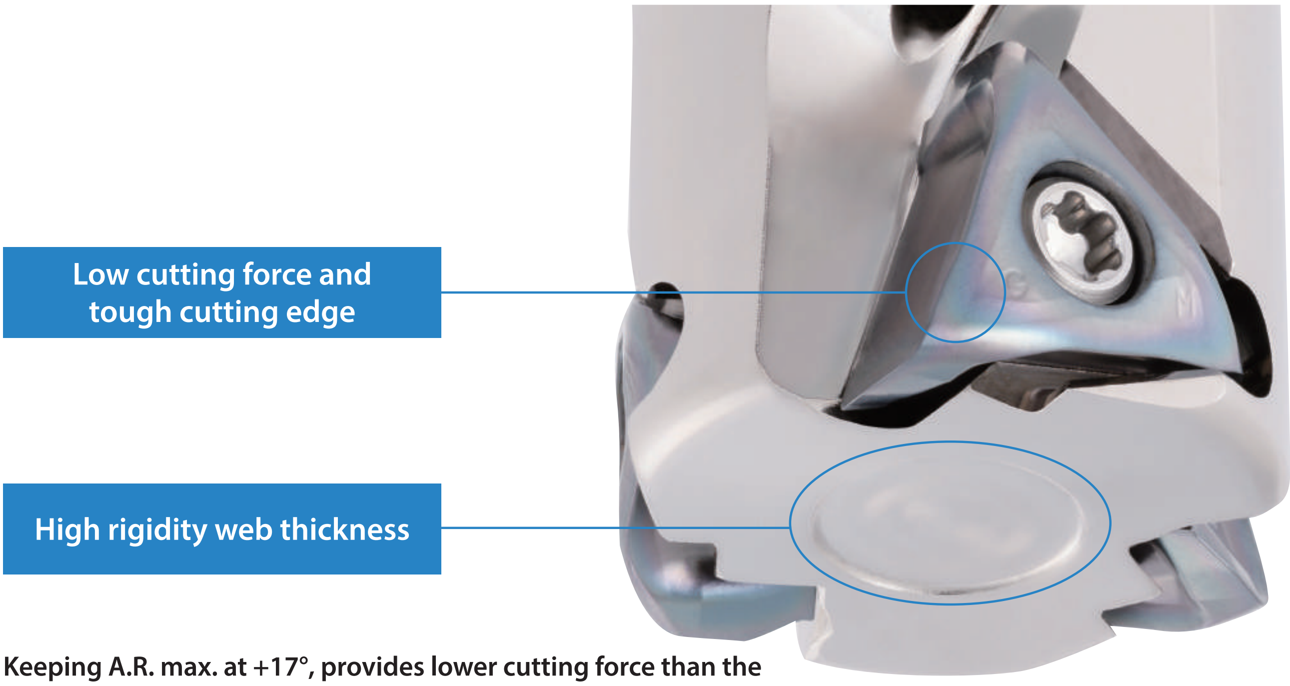
MEV vs Competitor





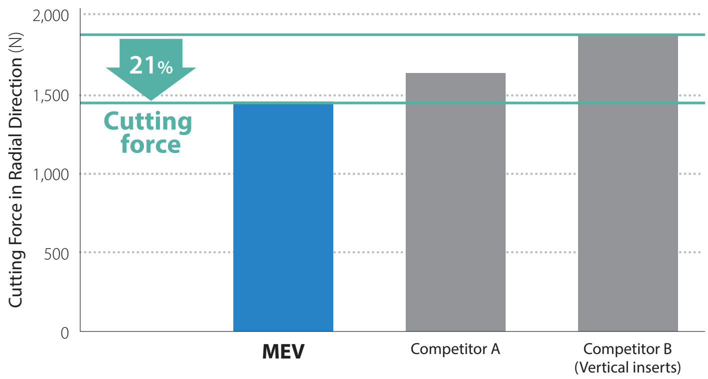
The MEV's large A.R. produces lower cutting forces and the vertical triangle inserts provide a higher rigidity.

The great performance of the multi-purpose MEV triangle inserts combines both advantages of conventional positive and negative type inserts.



Keeping A.R. max. at +17°, provides lower cutting force than the positive insert types of competitors

Cutting Force Comparison (Internal evaluation)

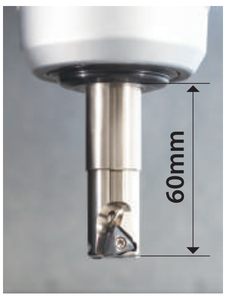


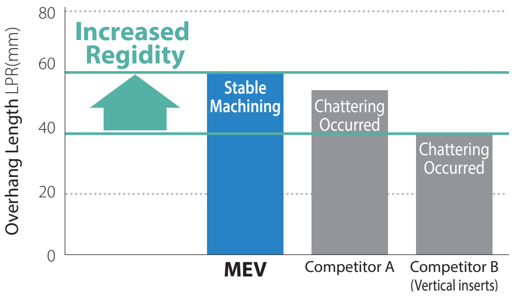
Cutting conditions : Vc = 200 m/min, ap × ae = 3 × 18 mm, fz = 0.10 mm/t, ø20 (3 inserts), Dry Workpiece : SCM440 Ⓗ

Low cutting force and large optimal web thickness provides excellent chattering resistance

Chattering Resistance Comparison (Internal evaluation)

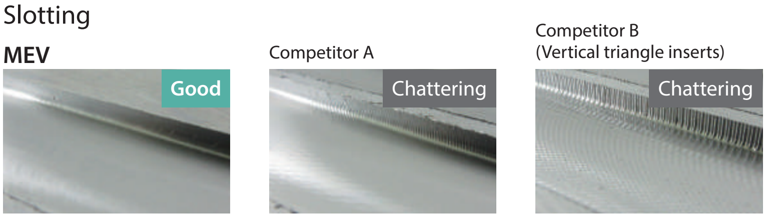
Shouldering





Cutting conditions : Vc = 200 m/min, ap × ae = 3 × 18 mm, fz = 0.10 mm/t, ø20 (3 inserts), Dry Workpiece : SCM440 Ⓗ

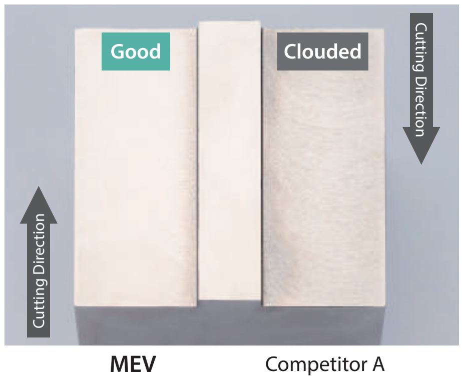
Slotting



Cutting conditions : Vc = 220 m/min, ap = 3 mm (Slotting), fz = 0.10 mm/t, ø20 (3 inserts), Dry Workpiece : SCM440 Ⓗ

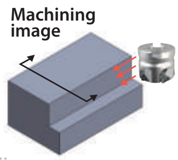
Provides excellent surface finish and superior cutting accuracy of the wall

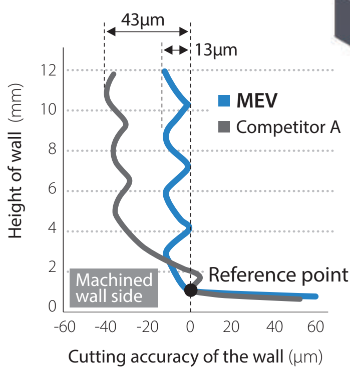
Surface Finish Comparison (Internal evaluation)



Cutting conditions : Vc = 180 m/min, ap × ae=3 × 40mm, fz = 0.1 mm/t, ø50 (5 inserts), Dry Workpiece : S50C

Cutting accuracy of wall example (Internal evaluation)



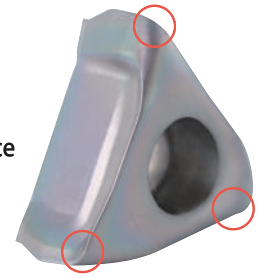


Cutting conditions : Vc = 200 m/min, ap × ae=3 × 10mm (4 pass), fz = 0.15 mm/t, ø50 (5 inserts), Dry Workpiece : S50C

*Accuracy of the wall surface varies depending on cutting conditions, machining environment, and insert combination.

2 The Economical Choice: Lengthened Insert Life with 3 Usable Cutting Edges

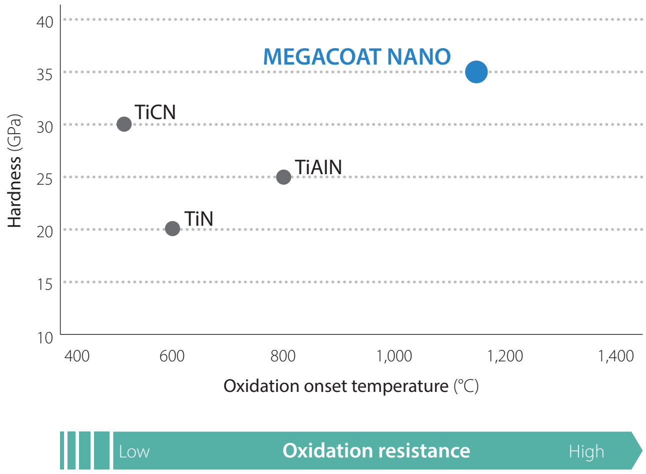
Insert



Unique triangle inserts with 3 cutting edges

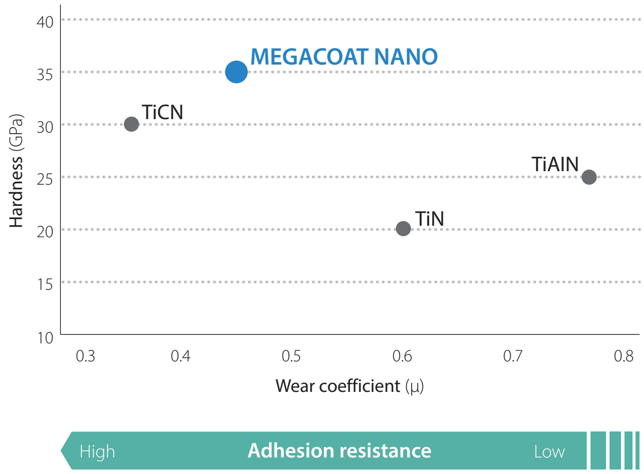
PR15 series utilizes excellent MEGACOAT NANO coating technology with wear and adhesion resistance

Coating Properties (Abrasion resistance)



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

Coating Properties (Adhesion resistance)



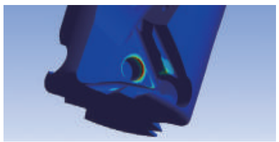
Stable Machining with Excellent Wear Resistance

Toolholder

Engineered with state-of-the-art simulation and analysis technology, the MEV is built to reduce cutting stress on the cutter body

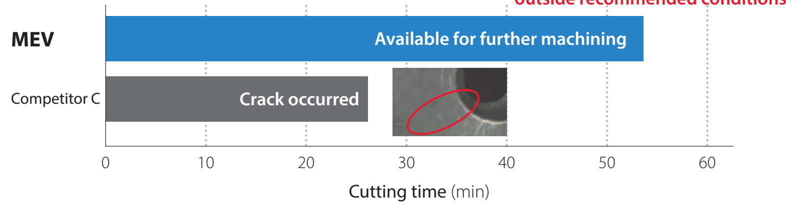
Increased hardness and wide contact surface for improved durability

Simulation and analysis (image)

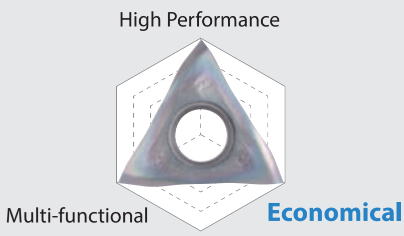


Prevents breakage from toolholder with decreased max. cutting stress

Toolholder Durability Comparison (Internal evaluation) *Comparison at high feed rate outside recommended conditions



Cutting conditions : Vc = 120 m/min, ap × ae = 5 × 7.5 mm, fz = 0.25 mm/t, ø20 (1 insert), Dry Workpiece : SCM440 Ⓗ

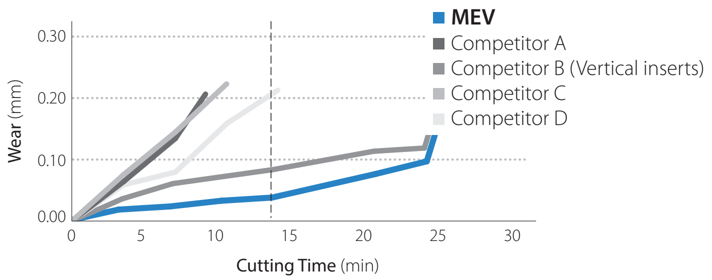


3 cutting edges combined with PR15 series MEGACOAT NANO coating technology maintains long tool life

Improved toolholder toughness and durability

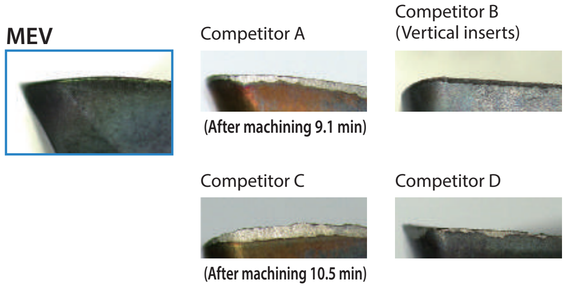
Long Tool Life with Excellent Wear Resistance

Wear Resistance Comparison (Internal evaluation)



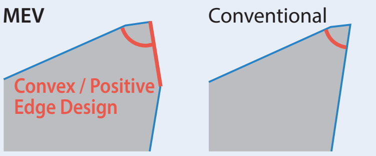
Cutting conditions : Vc = 180 m/min, ap x ae = 3 x 10 mm, fz = 0.1 mm/t, ø20, Dry Workpiece : SKD11 (30~35HS)

Cutting Edge (After machining 14 min)



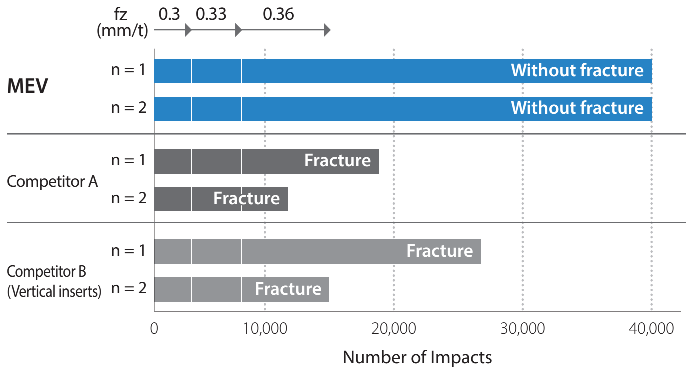
Improved Stability with Superior Fracture Resistance

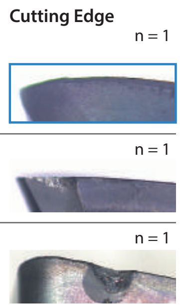
Cutting edge cross-section



The MEV features a larger cutting edge to increase strength

Wear Resistance Comparison (Internal evaluation)





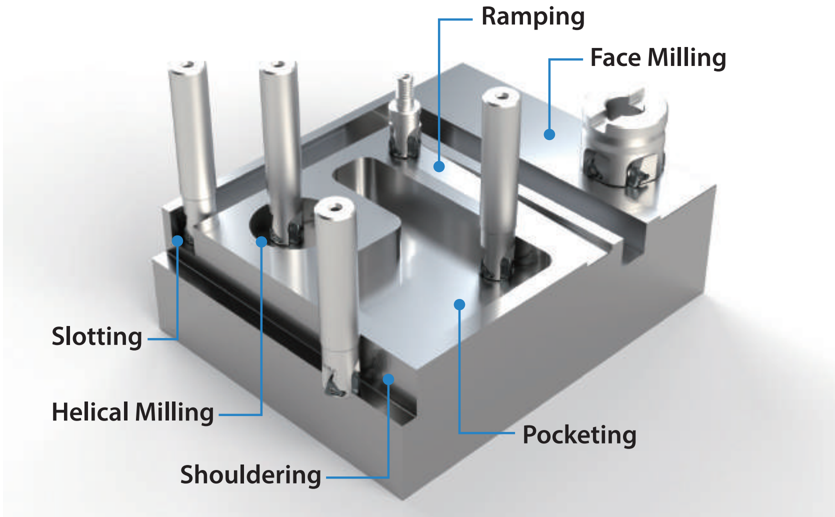
Cutting conditions : Vc = 120 m/min, ap x ae = 2 x 10 mm, fz = 0.3 - 0.36 mm/t, ø20 (1 insert), Dry Workpiece : SCM440 Ⓗ (37~39HS)

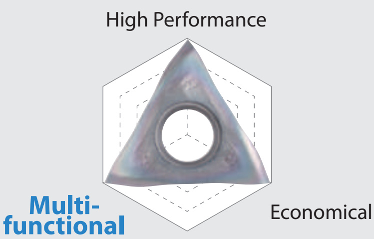
3 Multi-functional: The MEV can perform a wide variety of machining processes

Great performance in shouldering, slotting, and ramping applications (D.O.C. 6 mm or less)

Chip Example (Slotting)

Cutting conditions : Vc = 150 m/min, ap = 6 mm (Slotting)
fz = 0.2 mm/t, ø20 (3 insert), Dry Workpice : SS400





Good chip evacuation with a unique insert chipbreaker design

Stable machining in applications like slotting and ramping where chip recutting issues are common

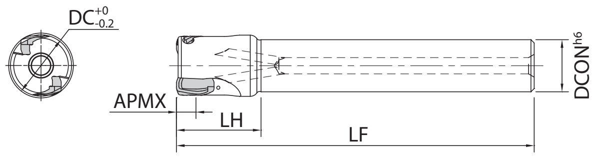


Fig.1

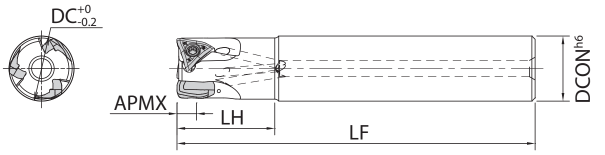


Fig.2

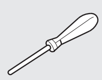
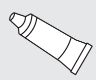
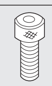
Toolholder Dimensions

Description				Stock	No. of Inserts	Dimensions (mm)					Rake Angle		Coolant Hole	Weight (kg)	Drawing	Max. Revolution (min^{-1})
						DC	DCON	LF	LH	APMX	A.R.(MAX.)	R.R.				
Straight Shank	Standard (Straight)	MEV	20-S16-06-2T	●	2	20	16	110	26	6	+17°	-38°	Yes	0.2	Fig.1	32,000
			22-S20-06-3T	●	3	22	20					-37°				29,000
			25-S20-06-3T	●		25		120	29					0.3		25,000
			28-S25-06-3T	●		28	25					-36°		0.4		23,000
			30-S25-06-4T	●	4	30		130	32					0.5		21,500
			32-S25-06-4T	●		32						-35°				20,000
			40-S32-06-5T	●	5	40	32	150	50					1.0		16,000
			50-S32-06-5T	●		50		120	40		+16°			0.9		13,000
	Same Size Shank	MEV	20-S20-06-2T	●	2	20	20	110	30	6	+17°	-38°	Yes	0.2	Fig.2	32,000
			20-S20-06-3T	●	3											
			25-S25-06-2T	●	2	25	25	120	32			-37°		0.4		25,000
			25-S25-06-3T	●	3											
			32-S32-06-3T	●		32	32	130	40			-36°		0.7		20,000
			32-S32-06-4T	●	4											
	Long Shank	MEV	20-S18-06-150-2T	●	2	20	18	150	30	6	+17°	-38°	Yes	0.3	Fig.1	32,000
			20-S20-06-150-2T	●			20		40						Fig.2	
			25-S25-06-170-2T	●		25	25	170	50			-37°		0.6		25,000
			32-S32-06-200-2T	●		32	32	200	65			-35°		1.1		20,000
NEW	Long Shank (Fine pitch)	MEV	20-S18-06-150-3T	●	3	20	18	150	30	6	+17°	-38°	Yes	0.3	Fig.1	32,000
			20-S20-06-150-3T	●			20		40						Fig.2	
			25-S25-06-170-3T	●		25	25	170	50			-37°		0.6		25,000
			32-S32-06-200-3T	●		32	32	200	65			-35°		1.1		20,000

● : Standard Stock

Caution with Max. Revolution
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on page P9.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause inserts and parts to scatter even under no load.
Coat anti-seize compound thinly on portion of taper and thread prior to installation.

Spare Parts and Applicable Inserts

Description			Parts				Applicable Inserts	
			Clamp Screw 	Wrench 	Anti-Seize Compound 	Arbor Bolt 	 General Purpose	 Low Cutting Force
End Mills	MEV	...-06-...T	SB-3076TRP	DTPM-10	P-37	-	TOMT06...-GM	TOMT06...-SM
Face Mills	MEV	032R-06-4T-M				HH8X25		
		040R-06-5T-M						
		050R-06-5T-M				HH10X30		
		063R-06-6T-M				HH10X30		
		080R-06-7T(-M)				HH12X35		
		100R-06-9T(-M)				-		
Modular Heads	MEV	20-M10-06-2T				-		
		20-M10-06-3T				-		
		25-M12-06-3T				-		
		32-M16-06-4T				-		

Recommended torque for insert screw
2.0 N·m

MEV (Face Mills)

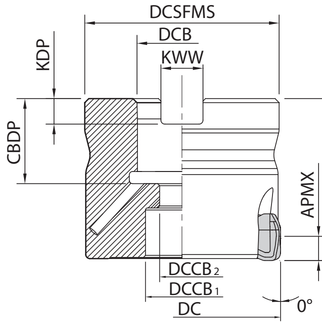


Fig.1

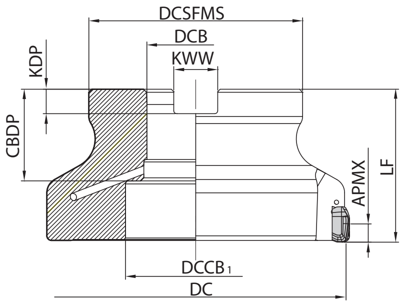


Fig.2

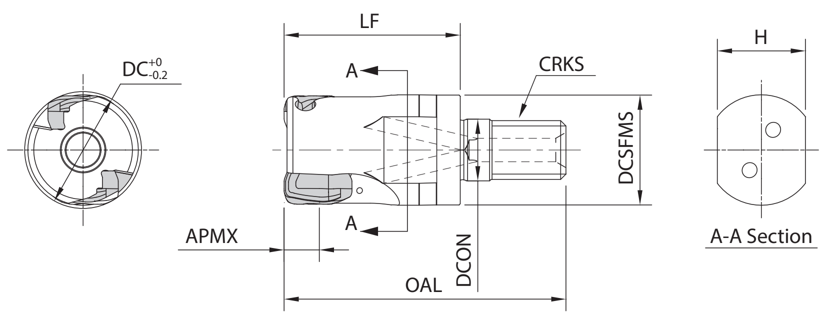
Toolholder Dimensions

Description			Stock	No. of Inserts	Dimensions (mm)										Rake Angle		Coolant Hole	Drawing	Weight (kg)	Max. Revolution (min^{-1})
					DC	DCSFMS	DCB	DCCB1	DCCB2	LF	CBDP	KDP	KWW	APMX	A.R. (MAX.)	R.R.				
Coarse pitch	Bore Dia. Metric spec	MEV 032R-06-4T-M	●	4	32	30	16	13.5	9	35	19	5.6	8.4	*6	+17°	-35°	Yes	Fig.1	0.1	20,000
		040R-06-5T-M	●	5	40	38		15		40									0.2	16,000
		050R-06-5T-M	●	5	50	48	22	18	11		21	6.3	10.4		+16°				0.4	13,000
		NEW 063R-06-6T-M	●	6	63	48	22	18	11	40	21	6.3	10.4		+16°				0.6	10,000
		NEW 080R-06-7T-M	●	7	80	60	27	20	13	50	24	7	12.4		+15°				1.1	7,900
		NEW 100R-06-9T-M	●	9	100	70	32	46	-	50	30	8	14.4					Fig.2	1.4	6,300
NEW	Bore Dia. Inch spec	MEV 080R-06-7T	●	7	80	60	25.4	20	13	50	27	6	9.5	*6	+15°	-35°	Yes	Fig.1	1.1	7,900
		100R-06-9T	●	9	100	70	31.75	46	-	63	34	8	12.7					Fig.2	1.4	6,300

●: Standard Stock

Caution with Max. Revolution
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on page P9.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause inserts and parts to scatter even under no load.
Coat anti-seize compound thinly on portion of taper and thread prior to installation.
*For cutting depth of shouldering with cutter diameter DCø63 or more (Width of cut ae ≥ DC/4) and slotting, refer to the recommended chipbreaker range on P8.

MEV (Modular Heads)

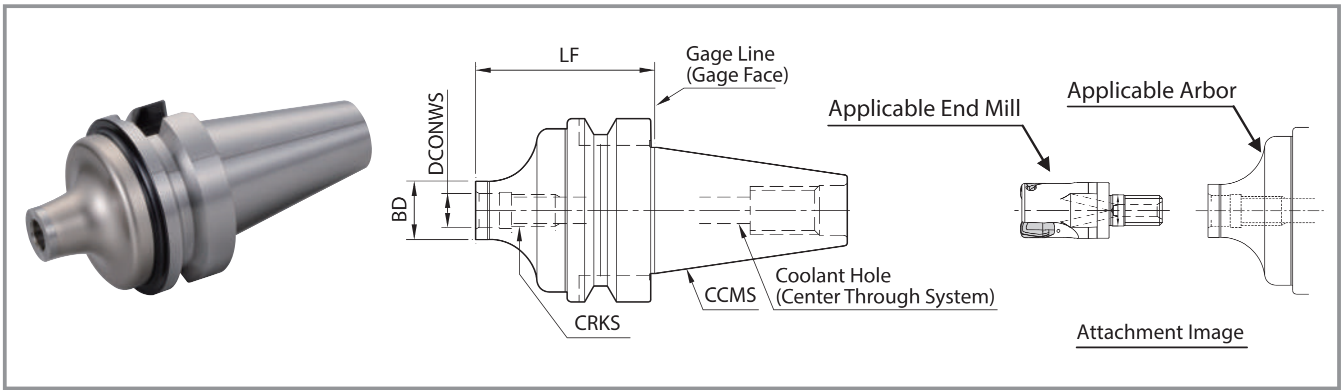


Toolholder Dimensions

Description	Stock	No. of Inserts	Dimensions (mm)								Rake Angle		Coolant Hole	Max. Revolution (min^{-1})
			DC	DCSFMS	DCON	OAL	LF	CRKS	H	APMX	A.R. (MAX.)	R.R.		
MEV 20-M10-06-2T	●	2	20	18.7	10.5	48	30	M10×P1.5	15	6	+17°	-38°	Yes	32,000
20-M10-06-3T	●	3												
25-M12-06-3T	●		25	23	12.5	56	35	M12×P1.75	19			-37°		25,000
32-M16-06-4T	●	4	32	30	17	62	40	M16×P2.0	24			-35°		20,000

●: Standard Stock

Caution with Max. Revolution
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on page P9.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause inserts and parts to scatter even under no load.
Coat anti-seize compound thinly on portion of taper and thread prior to installation.

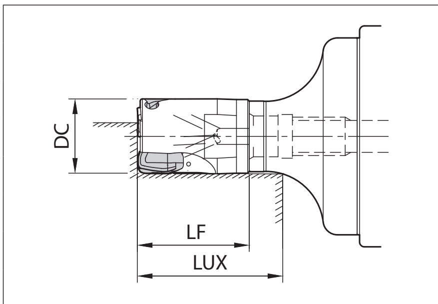


Dimensions

Description		Stock	Dimensions (mm)				Coolant Hole	Arbor (Double-face clamping spindle)	Applicable End Mill
			LF	BD	DCONWS	CRKS		CCMS	
BT30K-	M10-45	●	45	18.7	10.5	M10×P1.5	Yes	BT30	MEV20-M10··
	M12-45	●		23	12.5	M12×P1.75			MEV25-M12··
BT40K-	M10-60	●	60	18.7	10.5	M10×P1.5	Yes	BT40	MEV20-M10··
	M12-55	●	55	23	12.5	M12×P1.75			MEV25-M12··
	M16-65	●	65	30	17	M16×P2.0			MEV32-M16··

● : Standard Stock

Actual End Mill Depth

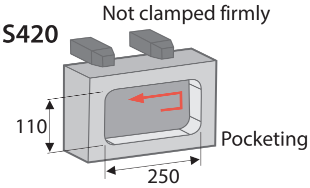


Arbor Description		Applicable End Mill			Actual End Mill Depth (mm)
		Description	Cutting Dia.	Dimensions	LUX
			DC	LF	
BT30K-	M10-45	MEV20-M10··	20	30	36.8
	M12-45	MEV25-M12··	25	35	42.8
BT40K-	M10-60	MEV20-M10··	20	30	38.7
	M12-55	MEV25-M12··	25	35	44.6
	M16-65	MEV32-M16··	32	40	51.2

Case study

Parts for machinary SUS420

Vc = 180 m/min
ap × ae = 1 × ~50 mm
fz = 0.1 mm/t Dry
MEV50-S32-06-5T (5 inserts)
TOMT060508ER-GM PR1535



Cutting time

MEV Vf=575 mm/min

Competitor E Vf=350 mm/min

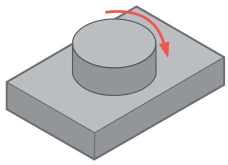
Machining Efficiency x1.6

Quiet machining even when cutting speed increased.
The MEV shows 1.6 times machining efficiency and good bottom surface finish.

(User evaluation)

Plate SS400

Vc = 180 m/min
ap = 3 mm
fz = 0.14 mm/t Dry
MEV22-S20-06-3T (ø22-3 inserts)
TOMT060508ER-GM PR1525



Number of parts produced

MEV 160 pcs/corner

Competitor F 65 pcs/corner

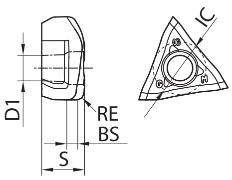
Tool life x2.4

The MEV achieved 2.4 times longer tool life than competitor F.
Quieter machining with excellent surface finish.

(User evaluation)

Applicable Inserts

Classification of usage			PR1535	PR1525	PR1510	CA6535
Classification of usage	P	Carbon Steel • Alloy Steel	☆	★		
		Mold Steel	☆	★		
★ : Roughing / 1st Choice ☆ : Roughing / 2nd Choice ■ : Finishing / 1st Choice □ : Finishing / 2nd Choice (In Case Hardness is Under 45HRC)	M	Austenitic Stainless Steel	★	☆		
		Martensitic Stainless Steel	☆			★
		Precipitation Hardened Stainless Steel	★			
	K	Gray Cast Iron		☆	★	
		Nodular Cast Iron		☆	★	
	N	Non-ferrous Material				
	S	Heat Resistant Alloy	☆			★
		Titanium Alloy	★		☆	
	H	Hard Materials		□		

Insert		Description	Dimensions (mm)					MEGACOAT NANO			CVD Coated Carbide
			IC	S	D1	BS	RE	PR1535	PR1525	PR1510	CA6535
 General Purpose		TOMT 060504ER-GM	7.2	5.7	3.4	1.9	0.4	●	●	●	●
		060508ER-GM	7.2	5.7	3.4	1.5	0.8	●	●	●	●
 Low Cutting Force		TOMT 060508ER-SM	7.2	5.7	3.4	1.5	0.8	●	●		●

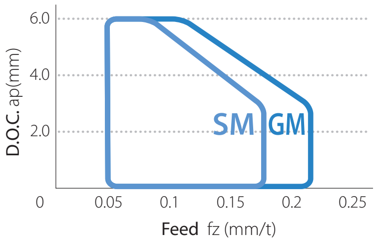
● : Standard Stock

Recommended Chipbreaker Range

GM type for General Purpose : Edge Shape Optimized for Various Machining Applications
SM type with Low Cutting Force Design : Sharp Cutting and Large Rake Angle

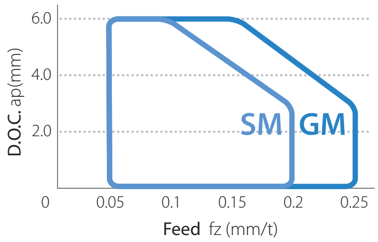
Cutter Dia. : ø20~ø50

Shouldering



Cutting conditions : Vc = 150 m/min, ae = DC/2 mm, Workpiece : S50C

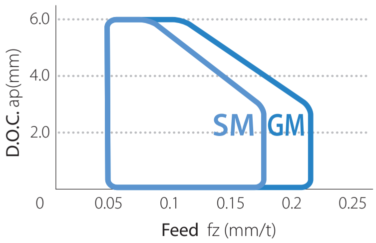
Slotting



Cutting conditions : Vc = 150 m/min, ae = DC mm, Workpiece : S50C

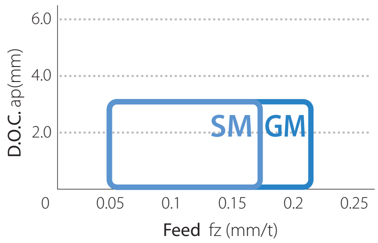
Cutter Dia. : ø63~ø100

Shouldering (Width of cut ae ≤ DC/4)



Cutting conditions : Vc = 150 m/min, ae = DC/4 mm, Workpiece : S50C

Shouldering (Width of cut ae ≥ DC/4), Slotting



Cutting conditions : Vc = 150 m/min, ae = DC mm, Workpiece : S50C

Recommended Cutting Conditions ★ : 1st Recommendation ☆ : 2nd Recommendation

Chipbreaker	Workpiece	Feed (fz : mm/t)	Recommended Insert Grade (Cutting Speed Vc : m/min)		
			MEGACOAT NANO		CVD Coated Carbide
			PR1535	PR1525	CA6535
GM	Carbon Steel	0.08 – **0.15** – 0.25	☆ 120 – **180** – 250	★ 120 – **180** – 250	—
	Alloy Steel	0.08 – **0.15** – 0.2	☆ 100 – **160** – 220	★ 100 – **160** – 220	—
	Mold Steel	0.08 – **0.12** – 0.2	☆ 80 – **140** – 180	★ 80 – **140** – 180	—
	Austenitic Stainless Steel	0.08 – **0.12** – 0.15	☆ 100 – **160** – 200	☆ 100 – **160** – 200	—
	Martensitic Stainless Steel	0.08 – **0.12** – 0.2	☆ 150 – **200** – 250	—	★ 180 – **24**0 – 300
	Precipitation Hardened Stainless Steel	0.08 – **0.12** – 0.2	★ 90 – **120** – 150	—	—
	Gray Cast Iron	0.08 – **0.18** – 0.25	—	☆ 120 – **180** – 250	—
	Nodular Cast Iron	0.08 – **0.15** – 0.2	—	☆ 100 – **150** – 200	—
	Ni-base Heat-Resistant Alloy	0.08 – **0.12** – 0.15	☆ 20 – **30** – 50	—	★ 20 – **30** – 50
	Titanium Alloy	0.08 – **0.15** – 0.2	☆ 40 – **60** – 80	—	—
SM	Carbon Steel	0.08 – **0.15** – 0.2	☆ 120 – **180** – 250	★ 120 – **180** – 250	—
	Alloy Steel	0.08 – **0.12** – 0.18	☆ 100 – **160** – 220	★ 100 – **160** – 220	—
	Mold Steel	0.08 – **0.1** – 0.15	☆ 80 – **140** – 180	★ 80 – **140** – 180	—
	Austenitic Stainless Steel	0.08 – **0.1** – 0.15	★ 100 – **160** – 200	☆ 100 – **160** – 200	—
	Martensitic Stainless Steel	0.08 – **0.1** – 0.15	☆ 150 – **200** – 250	—	★ 180 – **240** – 300
	Precipitation Hardened Stainless Steel	0.08 – **0.1** – 0.15	☆ 90 – **120** – 150	—	—
	Ni-base Heat-Resistant Alloy	0.08 – **0.1** – 0.12	☆ 20 – **30** – 50	—	★ 20 – **30** – 50
	Titanium Alloy	0.08 – **0.12** – 0.15	★ 40 – **60** – 80	—	—

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.
Set the cutting speed and feed rate for wet machining to 70% in the table above.
For high-speed machining, set the feed rate in the table above to 70% (When the cutting speed increases more than the center value of the recommended condition).
Cutting with coolant is recommended for Precipitation Hardening Stainless Steel, Ni-base Heat Resistant Alloy and Titanium Alloy.
Cutting with coolant is recommended for finishing.
Regularly changing the clamp screw is recommended. This is because the clamp screw may be damaged by long-term use or machining under high cutting conditions as shown in the table above.

Ramping Reference Data

Description	Cutter Dia. DC (mm)	20	22	25	28	30	32	40	50	63~
MEV… -06- …	Max. Ramping Angle RMPX	1.00°	0.80°	0.65°	0.60°	0.55°	0.50°	0.40°	0.30°	Not recommended
	tan RMPX	0.017	0.014	0.011	0.010	0.010	0.009	0.007	0.005	

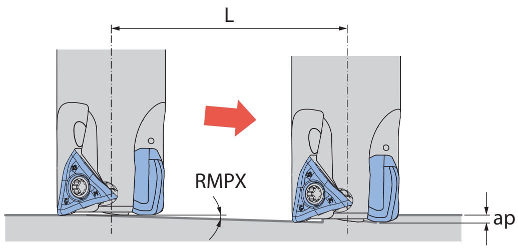
• Make ramping angle smaller if chips are too long.

Ramping Tips

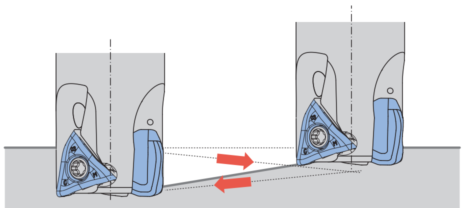
• Ramping angle should be under α max (maximum ramping angle) in the above cutting conditions.

• Reduce recommended feed rate in cutting conditions less than 70%.

Formula for Max. Cutting Length (L) at Max. Ramping Angle $L = \frac{ap}{\tan RMPX}$



• For two-way ramping, the ramping angle should be half of RMPX.

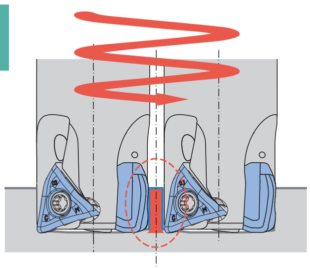


Helical Milling Tips

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

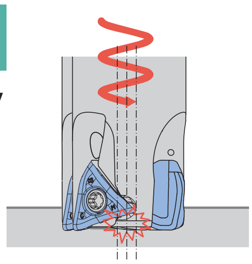
Exceeding max. machining dia.

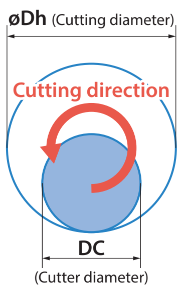
Center core remains after machining



Under min. machining dia.

Center core hits holder body



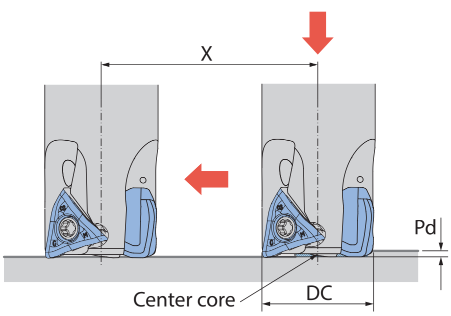


Unit : mm

Description	Min. Cutting Dia.	Max. Cutting Dia.
MEV… -06- …	2×DC−5	2×DC−2

For helical milling, use between min. drilling dia. and max. drilling dia.
Keep machine depth (h) per rotation less than max. ap (S) in the cutter dimensions chart.
Use caution to eliminate incidences caused by producing long chips.
Cutter dia. ø63 and above are not recommended for helical milling.

Drilling Tips

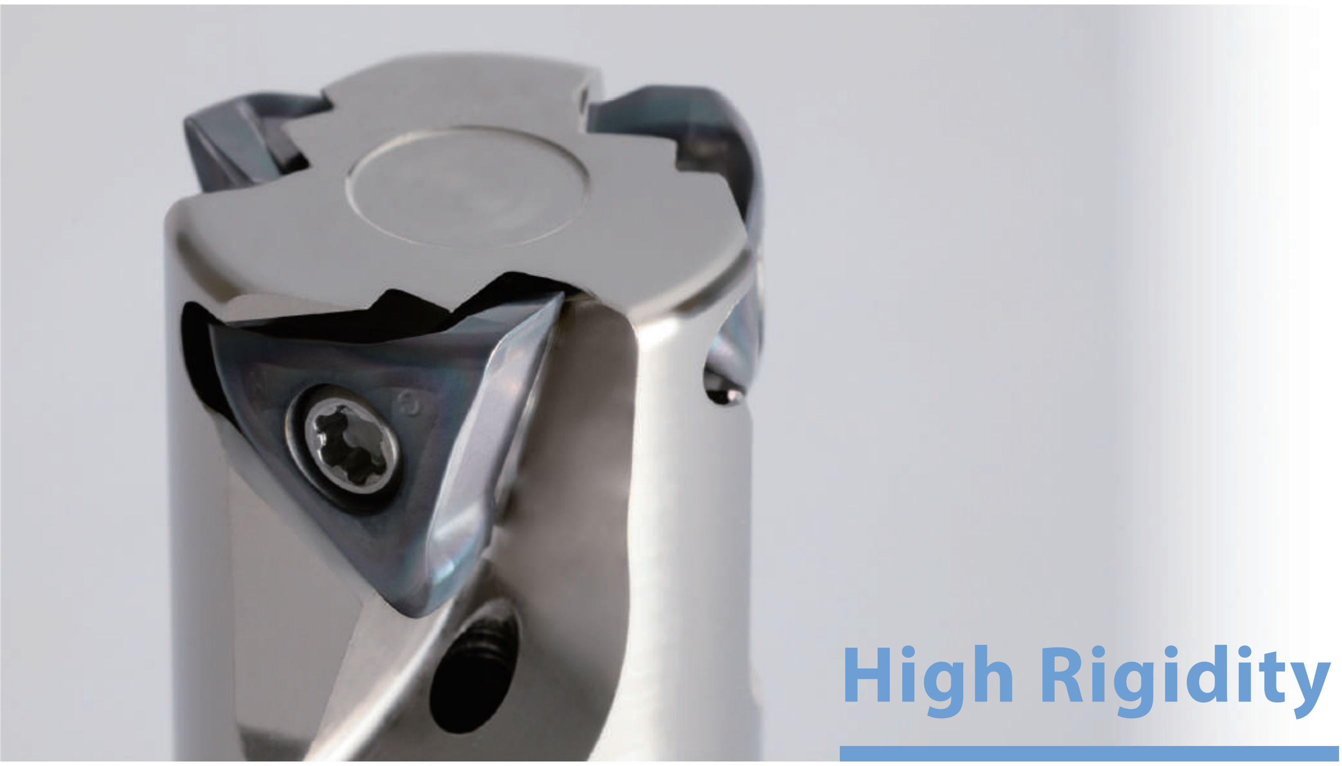


Unit : mm

Description	Max. Drilling Depth Pd	Min. Cutting Length X for Flat Bottom Surface
MEV… -06- …	0.25	DC−3

It is recommended to reduce feed by 25% of recommendation until the center core is removed when traversing after drilling.

Axial feed rate recommendation per revolution is f < 0.1mm/rev.



CP455-2