KYOCERA

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M-THREE (MEV)

High Performance Milling

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

Newly Developed Triangle Inserts Provide Numerous Solutions to Machining Challenges

- Low Cutting Forces and Higher Rigidity for Excellent Chatter Resistance
- Longer Insert and Holder Tool Life
- Can be Used in Shouldering, Slotting, and Ramping Applications

End Mills, Face Mills, and Modular Heads Available

New Triangular Insert Design

M-THREE (MEV)

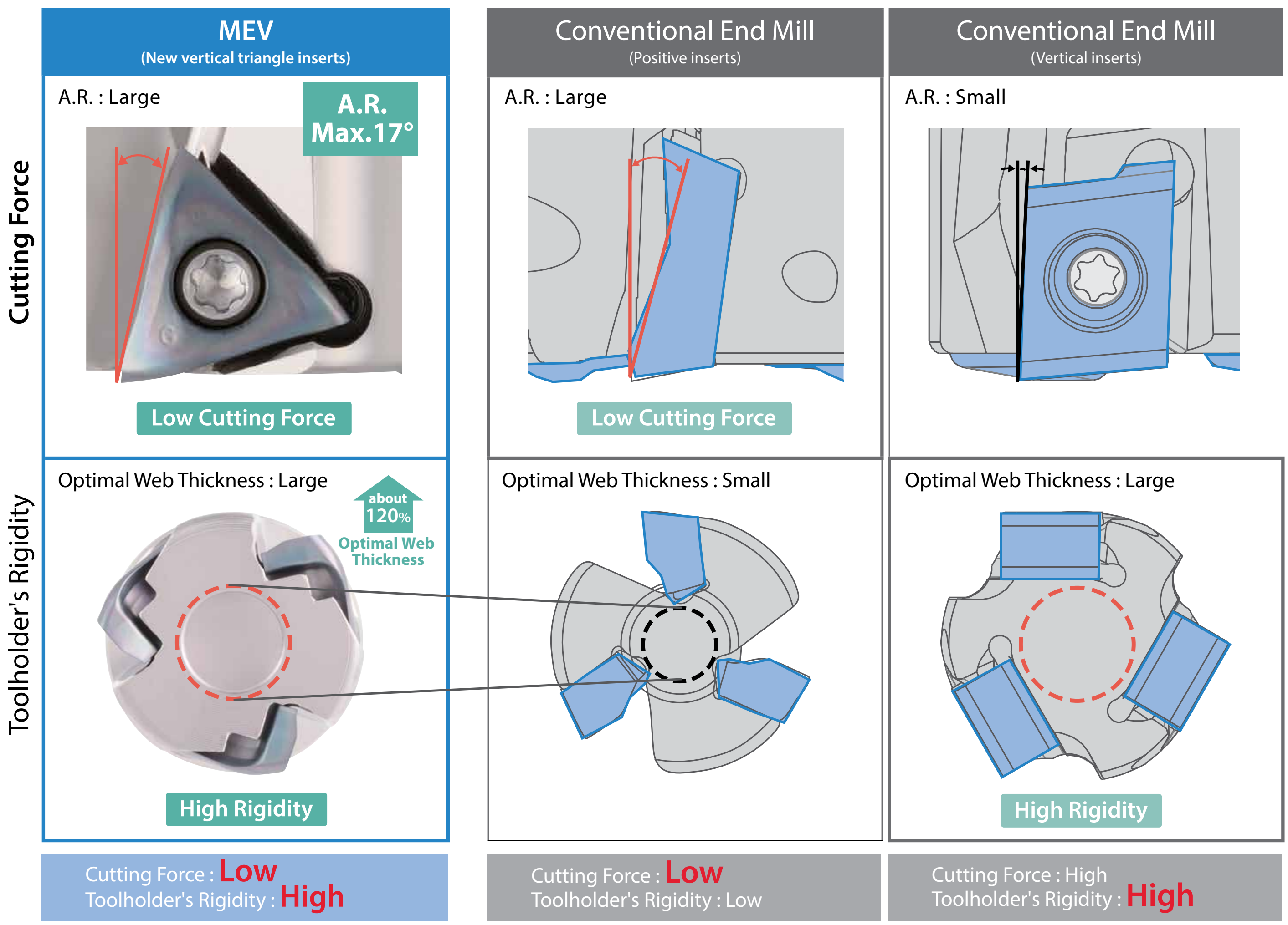
High Performance Milling

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

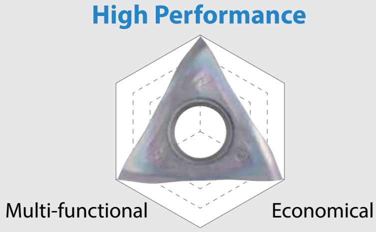
1 High Performance: Low Cutting Force and High Rigidity

Newly developed vertical triangle inserts with 3 cutting edges
Acheive stable machining with reduced chattering

MEV vs Competitor

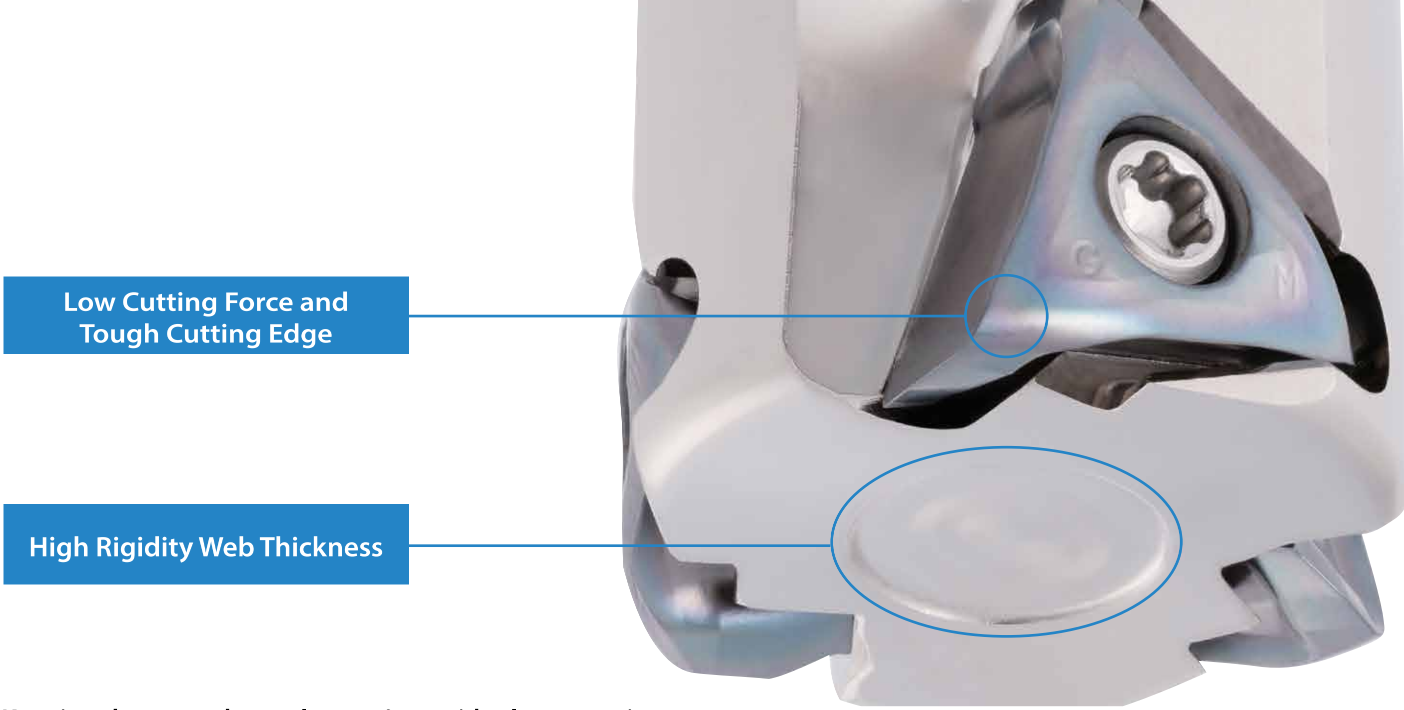


High Performance



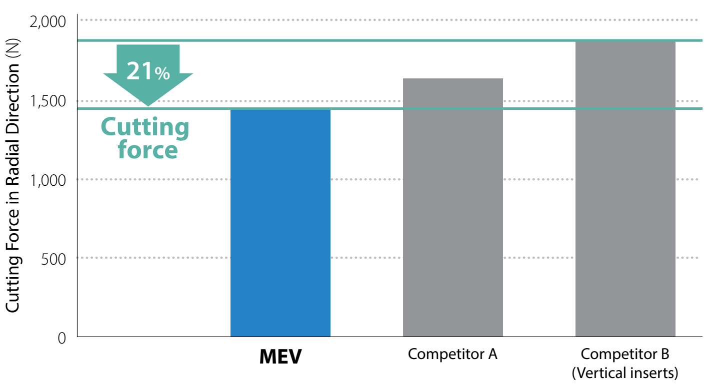
The MEV's large Rake Angle produces lower cutting forces and the vertical triangle inserts provide a higher rigidity.

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



Keeping the max rake angle at 17°, provides lower cutting forces than the positive insert types of competitors

Cutting Force Comparison (Internal Evaluation)

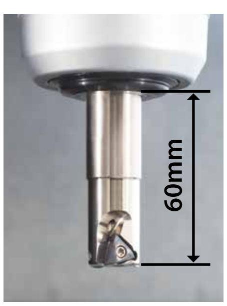


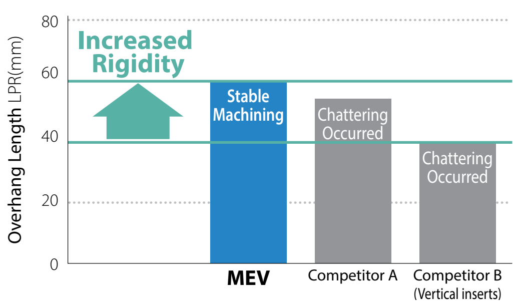
Cutting Conditions: Vc = 655 sfm, D.O.C. × ae = 0.118" × 0.709", fz = 0.004 ipt, Ø0.750" (3 flutes), Dry Workpiece : 4140

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

Chatter Resistance Comparison (Internal Evaluation)

Shouldering





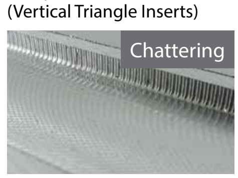
Cutting Conditions: Vc = 655 sfm, D.O.C. × ae = 0.118" × 0.71", fz = 0.004 ipt, Ø0.750" (3 flutes), Dry Workpiece : 4140 Ⓗ

Slotting

MEV

Competitor A

Competitor B (Vertical Triangle Inserts)



Cutting Conditions: Vc = 655 SFM, D.O.C. = 0.118" (Slotting), fz = 0.004 ipt, Ø0.750" (3 flutes), Dry Workpiece : 4140 Ⓗ

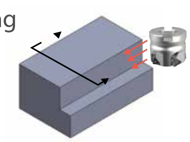
Provides excellent surface finish and perfect 90° shouldering

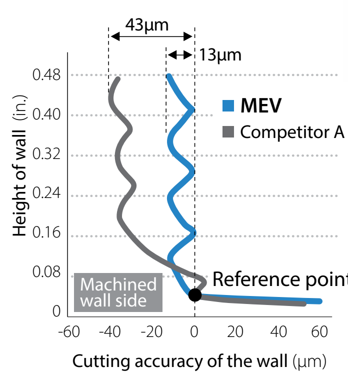
Surface Finish Comparison (Internal Evaluation)

MEV Conventional A

Cutting Conditions: Vc = 590 sfm, D.O.C. × ae=0.118" × 1.570", fz = 0.004 ipt, Ø2.000" (5 flutes), Dry Workpiece : 1049

Wall Accuracy when Step-Milling
(Internal Evaluation)





Cutting Conditions: Vc = 655 sfm, D.O.C. × ae=0.118" × 0.394" (4 pass), fz = 0.006 ipt, Ø2.000" (5 inserts), Dry Workpiece : 1049

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

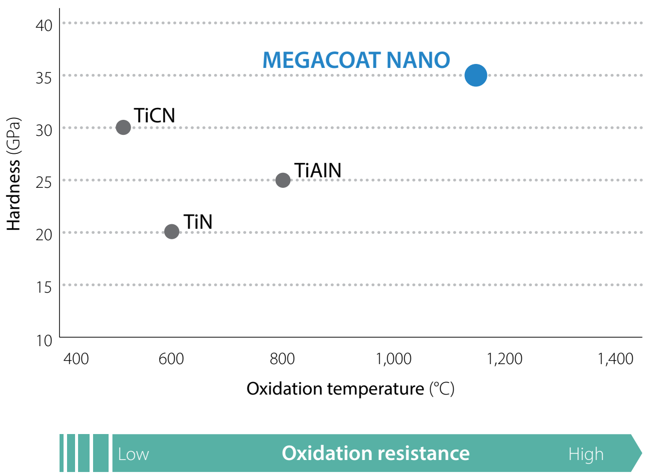
2 The Economical Choice: Improved Insert Life with 3 Cutting Edges

Insert

Unique triangle inserts with 3 cutting edges

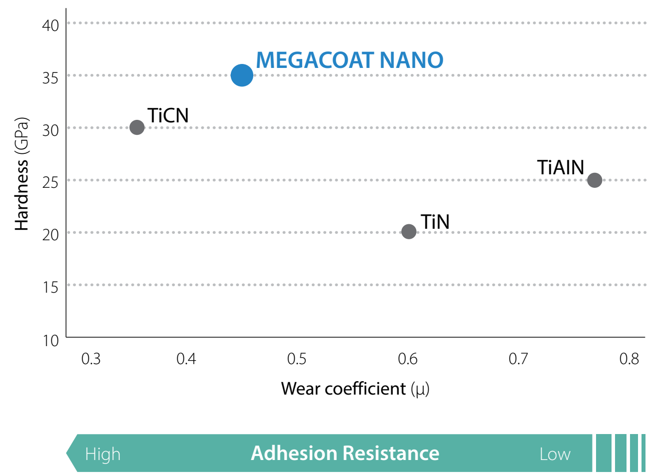
PR15-series utilizes excellent MEGACOAT NANO coating technology with wear and adhesion resistance

Coating Properties (Oxidation Resistance)



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

Coating Properties (Adhesion Resistance)



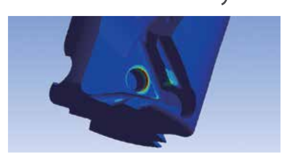
Stable Machining with Excellent Wear Resistance

Toolholder

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

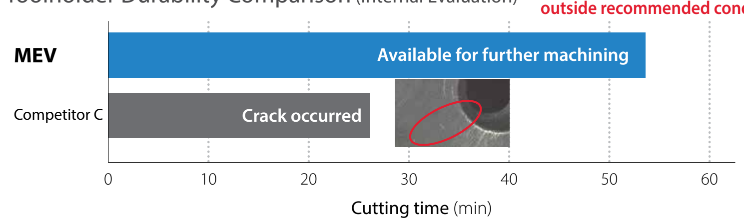
Increased hardness and wide contact surface for improved durability

Simulation and Analysis

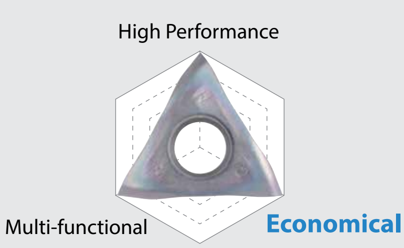


Prevents breakage from toolholder with decreased max. cutting stress

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



Cutting conditions : Vc = 390 sfm, D.O.C. × ae = 0.197" × 0.295", fz = 0.010 ipt, Ø0.750" (1 Flute), Dry Workpiece : 4140 Ⓗ

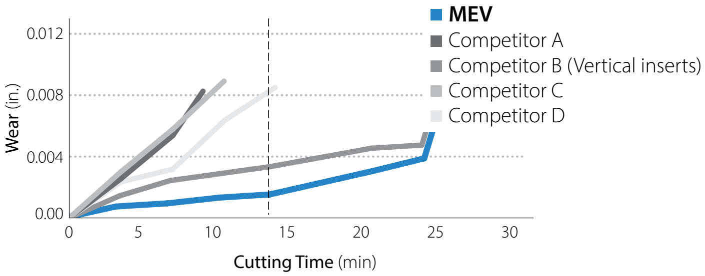


3 cutting edges combined with PR15 series MEGACOAT NANO coating technology maintains long tool life

Improved toolholder toughness and durability

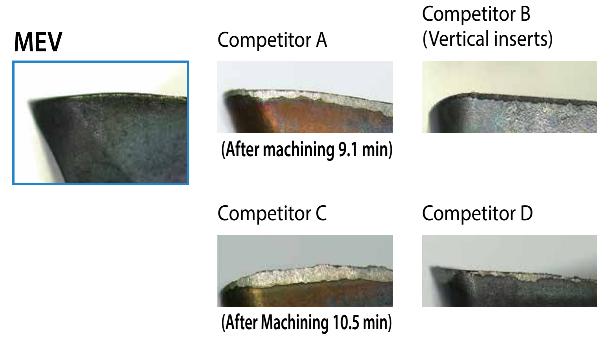
Long Tool Life with Excellent Wear Resistance

Wear Resistance Comparison (Internal Evaluation)



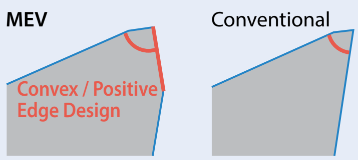
Cutting conditions : Vc = 590 sfm, D.O.C. × ae = 0.118" × 0.394", fz = 0.004 ipt, Ø0.750", Dry Workpiece : D2 (30~35HS)

Cutting Edge (After Machining 14 min)



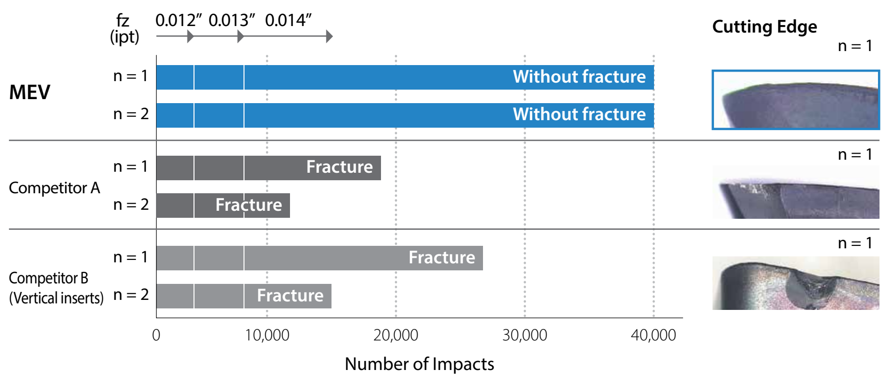
Improved Stability with Superior Fracture Resistance

Cutting Edge Cross-Section



The MEV features a convex cutting edge to increase strength

Fracture Resistance Comparison (Internal Evaluation)



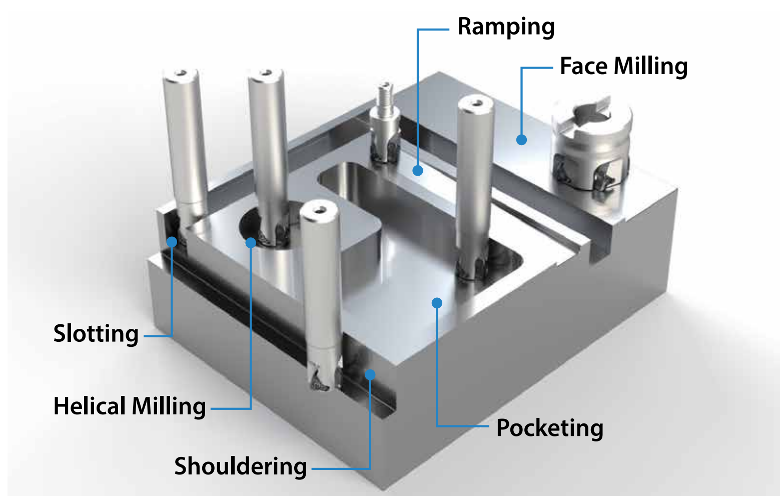
Cutting conditions : Vc = 394 sfm, D.O.C. × ae = 0.079" × 0.393", fz = 0.012" - 0.014" ipt, Ø0.750" (1 Flute), Dry Workpiece : 4140 Ⓗ

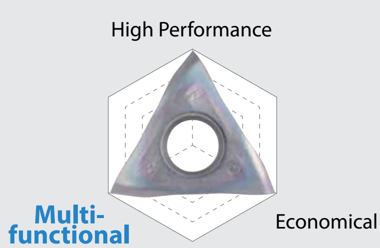
3 Multi-functional: The MEV Can Perform a Wide Variety of Machining Processes

Great performance in shouldering, slotting, and ramping applications (D.O.C. 0.236" or less)

Chip Example (Slotting)

Cutting conditions : Vc = 490 sfm, D.O.C. = 0.236" (Slotting)
fz = 0.008 ipt, Ø0.750" (3 Flute), Dry Workpice : SS400





Unique insert chipbreaker design provides excellent chip evacuation

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

MEV (End Mills)

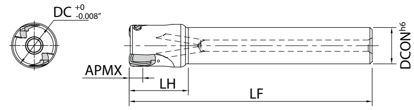


Fig.1

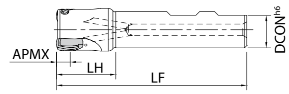


Fig.2

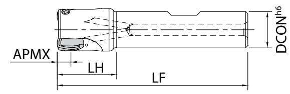


Fig.3

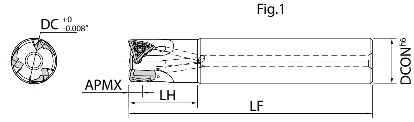


Fig.4

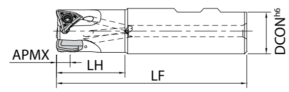


Fig.5

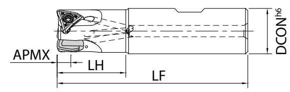


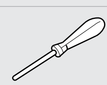
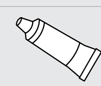
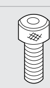
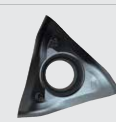
Fig.6

Toolholder Dimensions

Part Number			Stock	Unit	No. of Inserts	Dimensions DC	DCON	LF	LH	APMX	Rake Angle A.R. (MAX.)	R.R.	Coolant Hole	Drawing	Weight (kg)	Max. Revolution (RPM)
Weldon	Standard Shank	MEV 0750-W625-06-2T	●	inch	2	0.750	0.625	3.056	1.150	0.236	+17°	-38°	Yes	Fig.3	0.1	32,000
		0750-W750-06-2T	●		2	0.750	0.750	3.229	1.150					Fig.6	0.2	32,000
		1000-W750-06-3T	●		3	1.000	0.750	3.231	1.200			-37°		Fig.3	0.2	25,000
		1000-W100-06-3T	●		3	1.000	1.000	3.737	1.400					Fig.5	0.3	25,000
		1250-W100-06-4T	●		4	1.250	1.000	3.731	1.450			-35°		Fig.2	0.4	20,000
		1250-W125-06-4T	●		4	1.250	1.250	3.987	1.650					Fig.5	0.5	20,000
		1500-W125-06-5T	●		5	1.500	1.250	4.331	2.050					Fig.2	0.7	16,000
Cylindrical	Long Shank	MEV 0750-S750-6-06-2T	●		2	0.750	0.750	6.000	1.600	0.236	+17°	-38°	Yes	Fig.4	0.3	32,000
		1000-S100-7-06-2T	●		2	1.000	1.000	7.000	2.000			-37°		Fig.4	0.6	25,000
		1000-S100-7-06-3T	●		3	1.000	1.000	7.000	2.000					Fig.4	0.6	25,000
		1250-S125-8-06-4T	●		4	1.250	1.250	8.000	2.600			-35°		Fig.4	1.1	20,000
Cylindrical	Standard Shank	MEV 20-S16-06-2T	●	mm	2	20	16	110	26	6	+17°	-38°	Yes	Fig.1	0.2	32,000
		20-S20-06-2T	●		2	20	20	110	30					Fig.4	0.2	32,000
		20-S20-06-3T	●		3	20	20	110	30					Fig.4	0.2	32,000
		22-S20-06-3T	●		3	22	20	110	26			-37°		Fig.1	0.2	29,000
		25-S20-06-3T	●		3	25	20	120	29					Fig.1	0.3	25,000
		25-S25-06-2T	●		2	25	25	120	32					Fig.4	0.4	25,000
		25-S25-06-3T	●		3	25	25	120	32					Fig.4	0.4	25,000
		28-S25-06-3T	●		3	28	25	120	29			-36°		Fig.1	0.4	23,000
		30-S25-06-4T	●		4	30	25	130	32					Fig.1	0.5	21,500
		32-S25-06-4T	●		4	32	25	130	32					Fig.1	0.5	20,000
		32-S32-06-3T	●		3	32	32	130	40					Fig.4	0.7	20,000
		32-S32-06-4T	●		4	32	32	130	40					Fig.4	0.7	20,000
		40-S32-06-5T	●		5	40	32	150	50					Fig.1	1.0	16,000
		50-S32-06-5T	●		5	50	32	120	40		+16°			Fig.1	0.9	13,000
	Long Shank	MEV 20-S18-06-150-2T	●	mm	2	20	18	150	30	6	+17°	-38°	Yes	Fig.1	0.3	32,000
		20-S20-06-150-2T	●		2	20	20	150	40					Fig.4	0.3	32,000
		25-S25-06-170-2T	●		2	25	25	170	50			-37°		Fig.4	0.6	25,000
		32-S32-06-200-2T	●		2	32	32	200	65			-36°		Fig.4	1.1	20,000

●: Standard Item

Spare Parts and Applicable Inserts

Part Number		Spare Parts: Insert Screw	Wrench	Anti-Seize Compound	Arbor Bolt	Applicable Inserts: General Purpose	Low Cutting Force
							
End Mills	MEV ...-06-...T	SB-3076TRP	DTPM-10	P-37	-	TOMT06...-GM	TOMT06...-SM
Face Mills	MEV 1500R-06-5T				HH3/8-1.25		
	2000R-06-6T						
	2500R-06-6T						
	MEV 032R-06-4T-M				HH8X25		
	040R-06-5T-M						
	050R-06-5T-M				HH10X30		
Modular Heads	MEV 20-M10-06-2T				-		
	20-M10-06-3T				-		
	25-M12-06-3T				-		
	32-M16-06-4T				-		

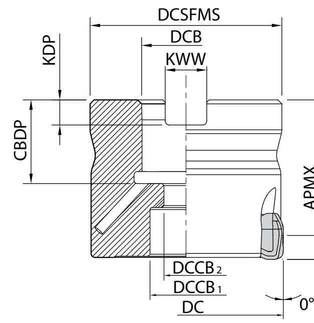
Recommended torque for insert screw 2.0 Nm

Caution with Max. Revolution

When running an end mill or a cutter at the maximum revolution, the insert or the cutter may be damaged by centrifugal force.

Coat anti-seize compound thinly on portion of taper and thread prior to installation.

MEV (Face Mills)

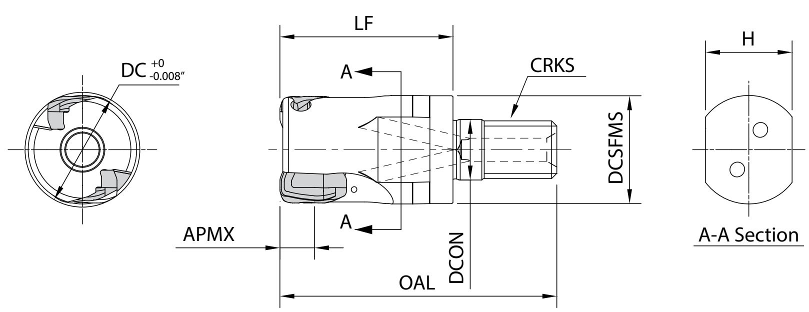


Toolholder Dimensions

Part Number	Stock	Unit	No. of Inserts	Dimensions										Rake Angle		Coolant Hole	Weight (lbs)	Max. Revolution (RPM)
				DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX	A.R. (MAX.)	R.R.			
MEV 1500R-06-5T	●		5	1.500	1.457									+17°			0.2	16,000
2000R-06-6T	●	inch	6	2.000	1.811	0.750	0.669	0.433	1.575	0.750	0.187	0.312	0.236	+16°	-35°	Yes	0.4	12,500
2500R-06-6T	●		6	2.500	1.969												0.6	10,000
MEV 032R-06-4T-M	●		4	32	30	16	13.5	9	35	19	5.6	8.4		+17°			0.1	20,000
040R-06-5T-M	●	mm	5	40	38		15		40				6		-36°	Yes	0.2	16,000
050R-06-5T-M	●		5	50	48	22	18	11		21	6.3	10.4		+16°			0.4	13,000

●: Standard Item

MEV (Modular Heads)

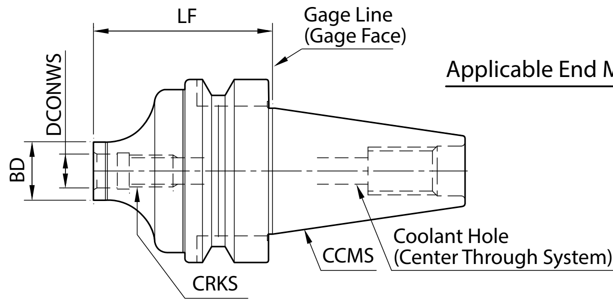


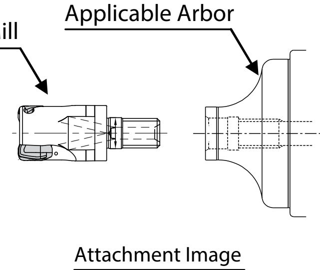
Toolholder Dimensions

Part Number	Stock	No. of Inserts	Dimensions (mm)								Rake Angle		Coolant Hole	Max. Revolution (RPM)
			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			-38°		32,000
20-M10-06-3T	●	3								6	+17°		Yes	
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			-36°		20,000

●: Standard Item

BT Arbor for Exchangeable Head / Double-face Clamping Spindle



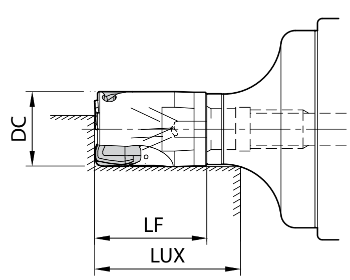


Dimensions

Part Number		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	●	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 Item

Actual End Mill Depth

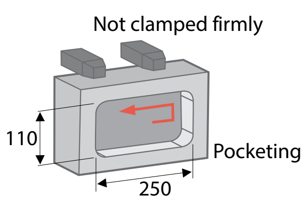


Arbor Part Number		Applicable End Mill			Actual End Mill Depth (mm)
		Part Number	Cutting Dia. DC (mm)	Dimensions LF (mm)	LUX
BT30K-	**M10-45**	MEV20-M10··	20	30	36.8
	M12-45	MEV25-M12··	25	35	42.8
BT40K-	**M10-60**	MEV20-M10··	20	30	38.7
	M12-55	MEV25-M12··	25	35	44.6
	M16-65	MEV32-M16··	32	40	51.2

Case study

Parts for machinary: 420

Vc = 590 sfm
D.O.C. × ae = 0.040" × ~1.97"
fz = 0.004 ipt Dry
MEV50-S32-06-5T (5 Flutes)
TOMT060508ER-GM PR1535



Cutting time

MEV Vf=22.50 ipm

Competitor E Vf=13.75 ipm

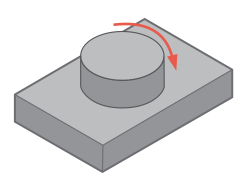
Machining Efficiency x1.6

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 = 590 sfm
D.O.C. = 0.118"
fz = 0.005 ipt Dry
MEV22-S20-06-3T (Ø22 - 3 Flutes)
TOMT060508ER-GM PR1525



Number of parts produced

MEV 160 pcs/corner

Competitor F 65 pcs/corner

Tool life x2.4

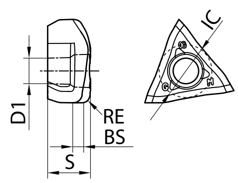
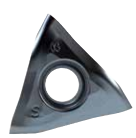
The MEV achieved 2.4 times longer tool life than competitor F.
Quieter machining with excellent surface finish

(User Evaluation)

Applicable Inserts

Usage Classification			PR1535	PR1525	PR1510	CA6535
	P	Carbon Steel • Alloy Steel	☆	★		
		Mold Steel	☆	★		
	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		□		

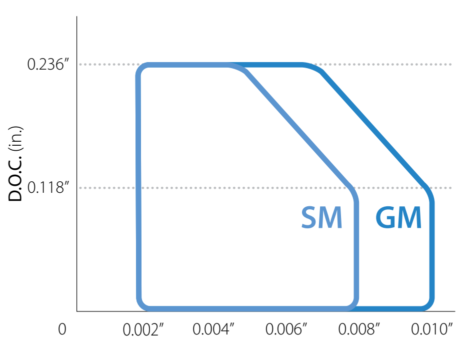
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In Case Hardness is Under 45HRC)

Insert		Part Number		Dimensions (in)					MEGACOAT NANO			CVD Coating
				IC	S	D1	BS	RE	PR1535	PR1525	PR1510	CA6535
 General Purpose		TOMT	060504ER-GM	0.283	0.224	0.134	0.075	1/64	●	●	●	●
			060508ER-GM				0.059	1/32	●	●	●	●
 Low Cutting Force		TOMT	060508ER-SM	0.283	0.224	0.134	0.059	1/32	●	●		●

● : Standard Item

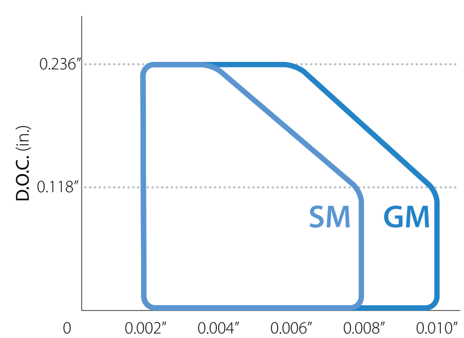
Recommended Chipbreaker Range

Shouldering



Cutting Conditions : Vc = 490 sfm, ae = DC/2, Workpiece : 1049

Slotting



Cutting Conditions : Vc = 490 sfm, ae = DC, Workpiece : 1049

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

Chipbreaker	Workpiece	Feed (fz : ipt)	Recommended Insert Grade (Cutting Speed Vc : sfm)		
			MEGACOAT NANO		CVD Coating
			PR1535	PR1525	CA6535
GM	Carbon Steel	0.003 – **0.006** – 0.010	☆ 390 – **590** – 820	★ 390 – **590** – 820	—
	Alloy Steel	0.003 – **0.006** – 0.008	☆ 330 – **520** – 720	★ 330 – **520** – 720	—
	Mold Steel	0.003 – **0.005** – 0.008	☆ 260 – **560**– 590	★ 260 – **460** – 590	—
	Austenitic Stainless Steel	0.003 – **0.005** – 0.006	☆ 330 – **520** – 660	☆ 330 – **520** – 660	—
	Martensitic Stainless Steel	0.003 – **0.005** – 0.008	☆ 490 – **660** – 820	—	★ 590 – **790** – 980
	Precipitation Hardened Stainless Steel	0.003 – **0.005** – 0.008	★ 290 – **390** – 490	—	—
	Gray Cast Iron	0.003 – **0.007** – 0.010	—	☆ 390 – **590** – 820	—
	Nodular Cast Iron	0.003 – **0.006** – 0.008	—	☆ 330 – **490** – 660	—
	Ni-base Heat-Resistant Alloy	0.003 – **0.005** – 0.006	☆ 60 – **100** – 160	—	★ 60 – **100** – 160
	Titanium Alloy	0.003 – **0.006** – 0.008	☆ 130 – **200** – 260	—	—
SM	Carbon Steel	0.003 – **0.006** – 0.008	☆ 390 – **590** – 820	★ 390 – **590** – 820	—
	Alloy Steel	0.003 – **0.005** – 0.18	☆ 330 – **520**– 720	★ 330 – **520** – 720	—
	Mold Steel	0.003 – **0.004** – 0.006	☆ 260 – **460** – 590	★ 260 – **460** – 590	—
	Austenitic Stainless Steel	0.003 – **0.004** – 0.006	★ 330 – **520** – 660	☆ 330 – **520** – 660	—
	Martensitic Stainless Steel	0.003 – **0.004** – 0.006	☆ 490 – **660** – 820	—	★ 590 – **790** – 980
	Precipitation Hardened Stainless Steel	0.003 – **0.004** – 0.006	☆ 300 – **390** – 490	—	—
	Ni-base Heat-Resistant Alloy	0.003 – **0.004** – 0.005	☆ 60– **100** – 160	—	★ 60 – **100** – 160
	Titanium Alloy	0.003 – **0.005** – 0.006	★ 130 – **200** – 260	—	—

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.
Cutting with coolant is recommended for Ni-base Heat Resistant Alloy and Titanium Alloy.
Cutting with coolant is recommended for finishing.

Ramping Reference Data

Part Number	Cutter Dia. DC (in)	0.750"	-	1.000"	-	-	1.250"	1.500"	2.000"	2.000"
	Cutter Dia. DC (mm)	20mm	22mm	25mm	28mm	30mm	32mm	40mm	50mm	-
MEV… -06- …	Max. Ramping Angle α max (°)	1.00	0.80	0.65	0.60	0.55	0.50	0.40	0.30	0.20
	tan RMPX	0.017	0.014	0.011	0.010	0.010	0.009	0.007	0.005	0.003

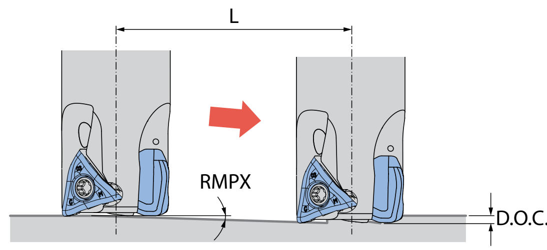
• Reduce ramping angle if chips are too long

Ramping Tips

Ramping angle should not exceedmaximum ramping angle in the above cutting conditions

Reduce recommended feed rate in cutting conditions less than 70%

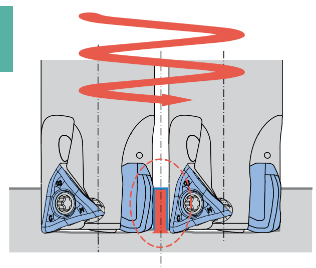
Formula for Max. Cutting Length (L) at Max. Ramping Angle $L = \frac{D.O.C.}{tan\ RMPX}$



Helical Milling Tips

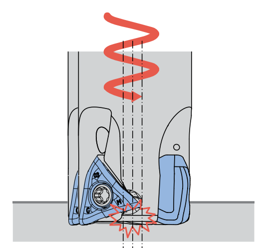
Exceeding max. machining dia.

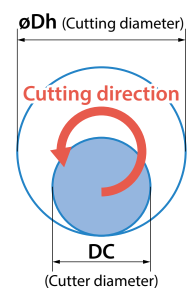
Center core remains after machining



Under min. machining dia.

Center core hits holder body



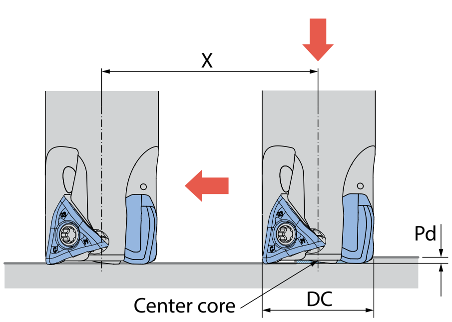


Unit : inch

Part Number	Min. Cutting Dia.	Max. Cutting Dia.
MEV… -06- …	2×DC−0.197"	2×DC−0.079"

For helical milling, stay within the reccommended min. and max. drilling dia.
Keep machine depth (h) per rotation less than max. D.O.C. (APMX) in the cutter dimensions chart
Use caution to eliminate incidences caused by producing long chips

Drilling Tips



Unit : inch

Part Number	Max. Drilling Depth Pd	Min. Cutting Length X for Flat Bottom Surface
MEV… -06- …	0.010"	DC−0.118"

Reduce feed by 25% of recommendation until the center core is removed when traversing after drilling

Reccommended Axial feed rate per revolution is f < 0.004 ipr

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