KYOCERA

AHB TOOLING & MACHINERY

COMPLETE METALWORKING SOLUTIONS

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MA90

Tangential 90° Milling with 4-Edge Inserts

Reliable, Stable, High Quality Machining with Extended Tool Life

- Unique tangential 90° end mill design provides a large variety of machining operations
- Newly designed inserts with grade PR18 series coating technology
- High quality surface finish and excellent wall accuracy
- Supports multi-functional machining

MA90

Tangential 90° Milling with 4-Edge Inserts

Product Video

Original tangential 90° end mill with economical 4-edge inserts

New grade PR18 Series and unique insert cutting edge design creates high-quality machining with longer tool life

1 The MA90 tangential end mills provide a large variety of machining operations

Challenges

Conventional end mill
- Sudden fractures can cause damage to the holder
- Insert defects preventing use of all four edges

Tangential end mill
- Premature tool wear can quickly deteriorate the surface finish quality
- Poor wall accuracy

SOLUTION

Kyocera's MA90 tangential end mill solves these problems with a unique insert shape and PR18 Series grade coating technology.

Large web thickness
High rigidity

Peripheral grinding specifications
Excellent wall accuracy

Special wiper edge
Large relief angle suppresses wear
High-quality surface finish

Multi-functional (G-class insert)

Supports three-dimensional machining

Unique cutting edge design

Excellent fracture resistance and low cutting force design

Newly developed insert grade

MEGACOAT NANO EX

PR18 Series delivers longer tool life

2 New insert grades PR18 Series provides significantly longer tool life

PR18 Series

NEW

Next-generation insert grade for milling

Kyocera's Nano Layer Coating Technology

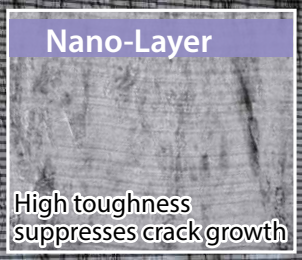
Longer Tool Life with Next-generation Coating for Milling

MEGACOAT NANO EX | Milling |

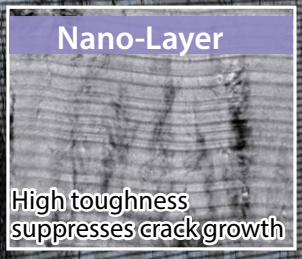
Double Lamination Technology Maintains Longer Tool Life

Multi-layer structure with two unique nano layers
Superior abrasion resistance and fracture resistance

Special Nano Layer x Multilayer Lamination



AlCr-based coating
with excellent abrasion resistance



AlTi-based coating
with excellent heat resistance

Multi-layering of high-performance nano layers

Increases toughness with suppression of crack growth and optimization of internal stress

CG Image

Extensive lineup of insert grades covers a variety of machining materials and applications

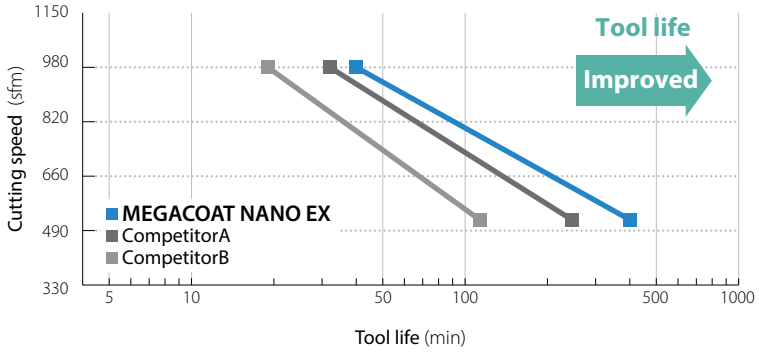
Workpiece material	P Steel					M Stainless steel					K Cast iron				
ISO	01	10	20	30	40	01	10	20	30	40	01	10	20	30	40
Lineup		1st recommendation PR1825					1st recommendation PR1835					1st recommendation PR1810			
		Wet PR1835					High-speed machining CA6535								

H Hardened material	PR015S (GH)	S Heat-resistant alloy	CA6535 (PR1835)	Titanium alloy	PR1835

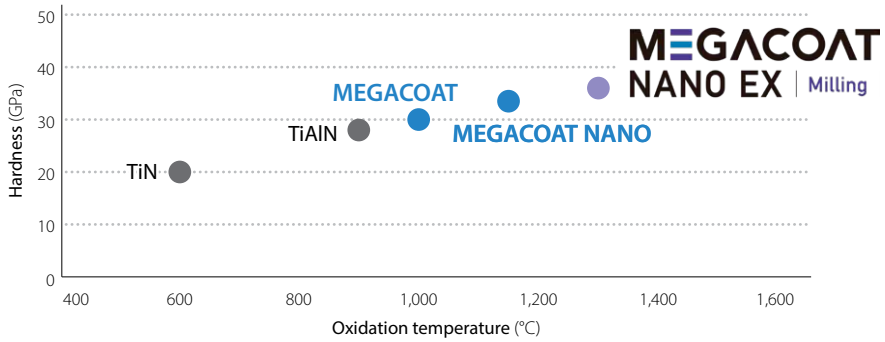
PR1825 Wear resistance comparison (Internal evaluation)
V-T graph

Life criteria:
Flank face wear = 0.004"

Cutting conditions:
Vc = **520** / **980** sfm
D.O.C. = 0.079" × 4.331", fz = 0.005 ipt
4140 Dry
PNMU1205ANER-GM (MFPN)

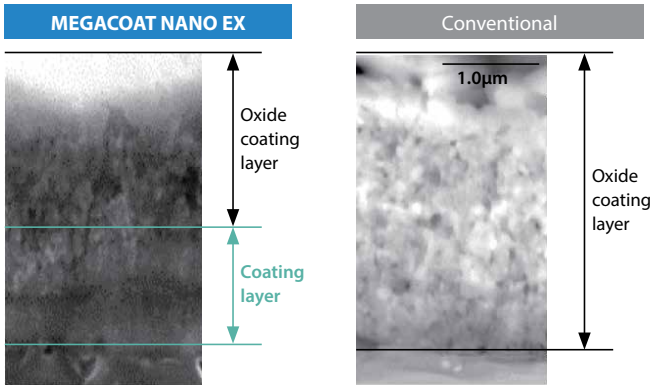


Coating characteristics (Internal evaluation)



Oxidation progression comparison (Internal evaluation)

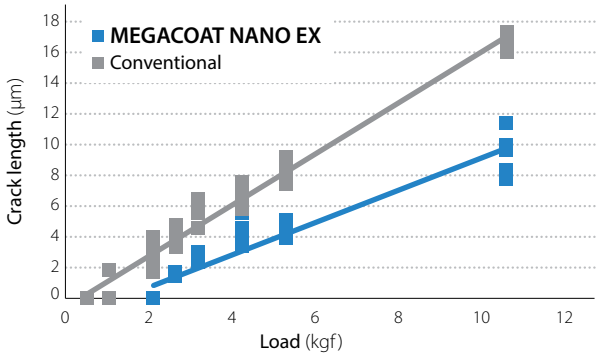
Suppresses oxidation progression with excellent oxidation resistance



*Section after holding at 1,200 degrees for 30 minutes in air

Coating layer toughness evaluation (Internal evaluation)

Excellent coating toughness with small crack length



*Micro-Vickers measurement

3 Achieve reliable results with an insert shape designed for high quality machining and long tool life

Unique cutting edge design delivers high fracture resistance and low cutting forces

Special wiper edge and peripheral grinding specifications provide high quality finish and long tool life

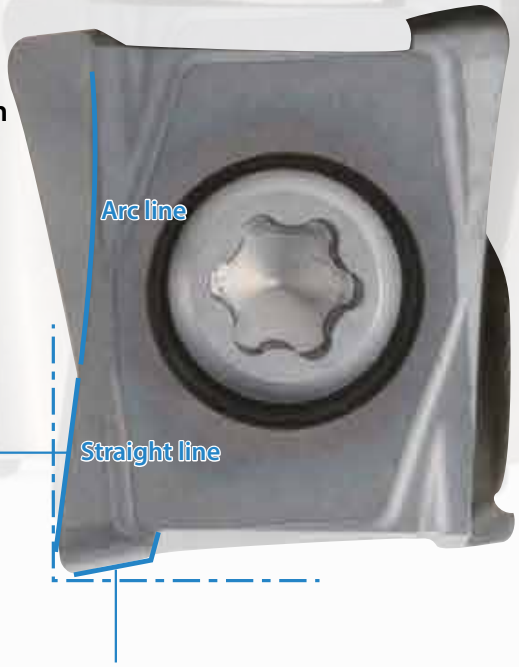
Advantage

The large A.R. and relief angle of wiper edge create lower resistance and excellent surface finish.

MA90

Conventional tangential type

Unique cutting edge design
Superior fracture resistance and low cutting force



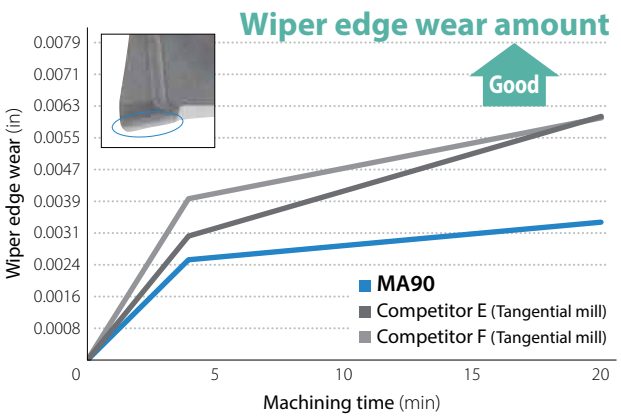
Special wiper edge
Large relief angle: Excellent surface finish and wear suppression
Stepped corners: Designed to prevent pocket damage

Excellent Surface Finish

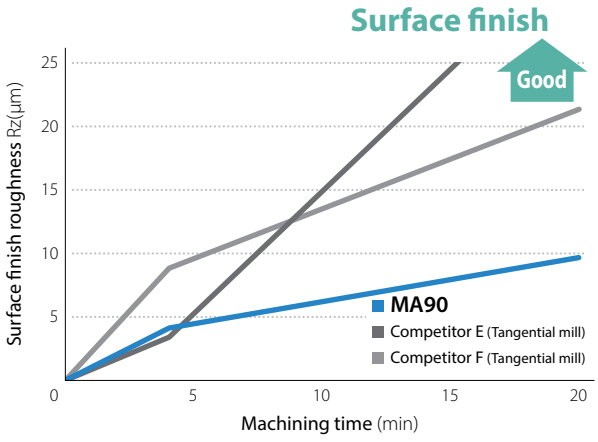
Special wiper edge design suppresses abrasion progress of the edge and maintains high-quality finished surface

Wear and Surface Finish Comparison (Internal evaluation)

Wiper edge wear



Surface finish roughness (Bottom surface)

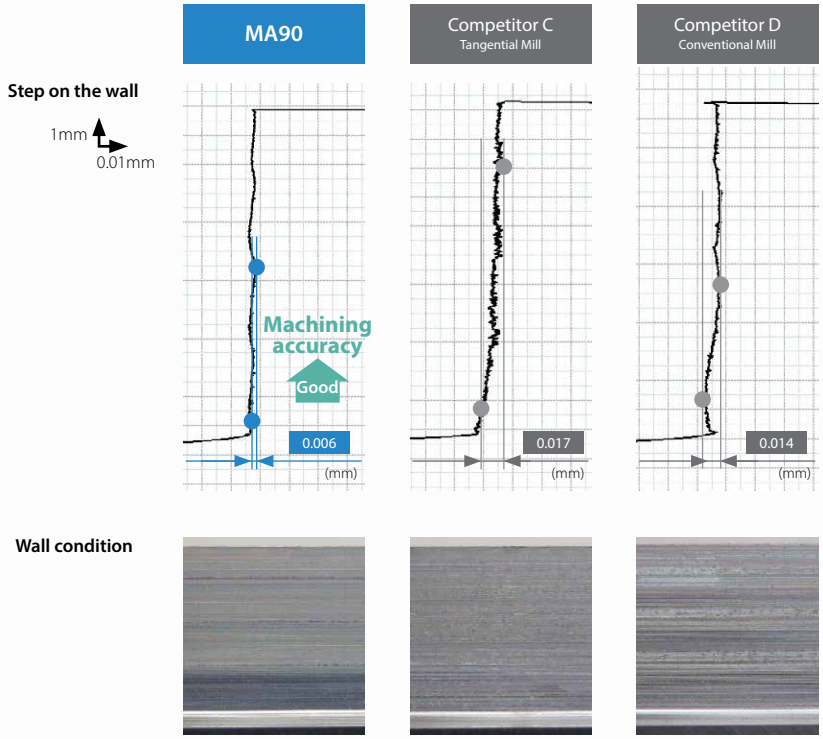


Cutting conditions: Vc = 660 sfm, D.O.C. x a.e. = 0.039" x 37.50", fz = 0.004/0.005 ipt, Dry 1049 Φ50mm (6/7 flute) BT50

Peripheral grinding specifications

Unique, sloped, edge shape
Grounded peripheral provides higher precision

Wall accuracy comparison (Internal evaluation)



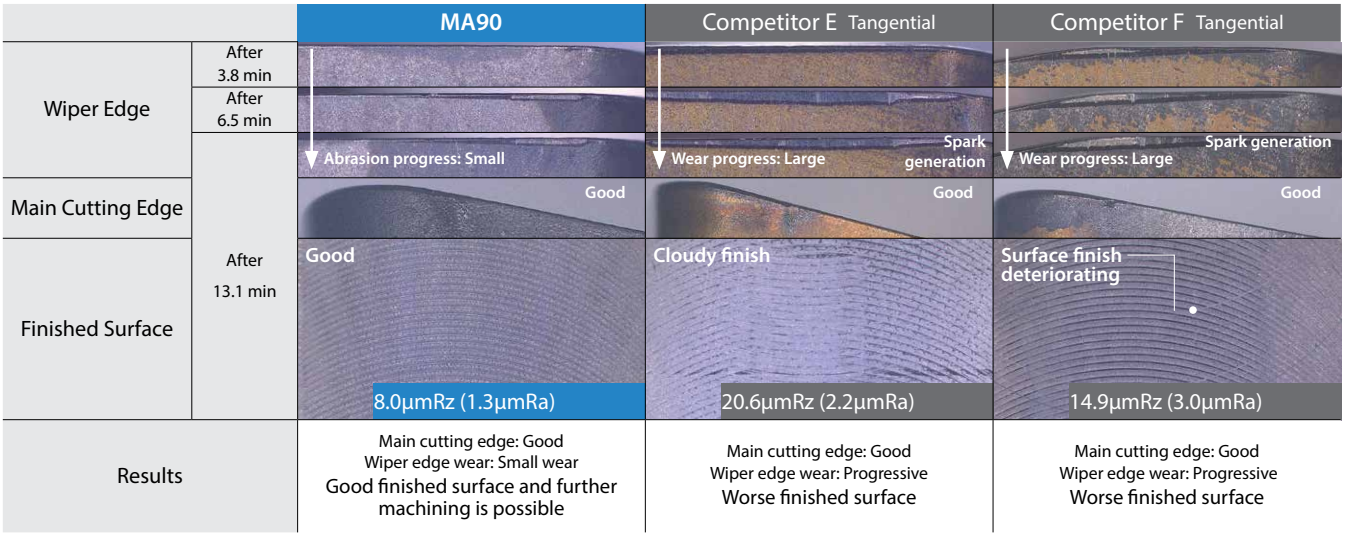
Cutting conditions: Vc = 490 sfm, D.O.C. x ae = 0.118" x 0.197" 4 passes, fz = 0.004 ipt, Dry 1049 Dia. 20mm (3 flute) BT50

Long tool life and high-speed machining

Test 1 Even if the main cutting edge is in good condition, the tool reached the end of life due to deterioration of the finished surface. MA90 ✓

Test 2 Machined with reduced cutting speed because the surface finish deteriorated early. MA90 ✓

Edge condition and finished surface



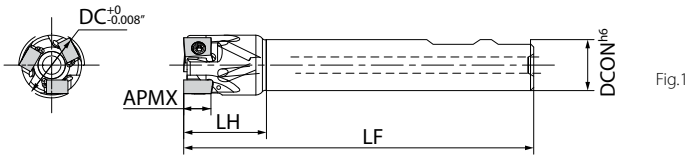


Fig.1

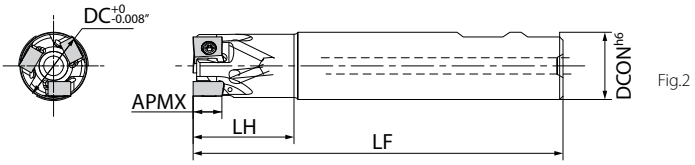


Fig.2

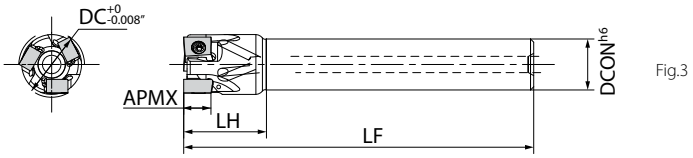


Fig.3

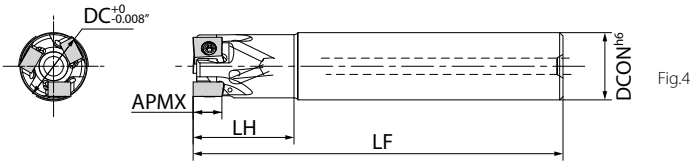


Fig.4

Toolholder Dimensions 09 Size (LOGU09 ...)

Description			Stock	Number of Inserts	Dimensions (in)					Coolant Hole	Drawing	Maximum RPM
					DC	DCON	LF	LH	APMX			
Weldon	Standard Shank	MA90 0625W625-09T2C	●	2	0.625	0.625	3.000	1.024	0.315	Yes	Fig.2	29,700
		0750W750-09T3C	●	3	0.750	0.750	3.250	1.160				27,300
		1000W100-09T4C	●	4	1.000	1.000	3.750	1.400				27,300
		1250W100-09T4C	●	4	1.250	1.000	4.000	1.700			Fig.1	21,300
		1250W100-09T5C	●	5	1.250	1.000	4.000	1.700				21,300
		1250W125-09T5C	●	5	1.250	1.250	4.000	1.650			Fig.2	21,300
		1500W125-09T5C	●	5	1.500	1.250	4.350	2.050			Fig.1	19,400
		1500W125-09T6C	●	6	1.500	1.250	4.350	2.050				19,400
Straight	Standard Shank	MA90 0625S625-09T2C	●	2	0.625	0.625	3.000	1.024	0.315	Yes	Fig.4	29,700
		0750S750-09T3C	●	3	0.750	0.750	3.250	1.160				27,300
		1000S100-09T4C	●	4	1.000	1.000	3.750	1.400				27,300
		1250S100-09T5C	●	5	1.250	1.000	4.000	1.700			Fig.3	21,300
		1500S125-09T5C	●	5	1.500	1.250	4.350	2.050				19,400
	Long Shank	MA90 0750S750-09T3CL	●	3	0.750	0.750	7.000	1.590	0.315	Yes	Fig.4	27,300
		1000S100-09T3CL	●	3	1.000	1.000	7.000	2.100				27,300
		1500S125-09T3CL	●	3	1.500	1.250	9.500	2.661			Fig.3	19,400

●:Standard Stock

Maximum number of revolutions
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

Toolholder Dimensions 12 Size (LOGU12 ...)

Description				Stock	Number of Inserts	Dimensions (in)					Coolant Hole	Drawing	Maximum RPM
						DC	DCON	LF	LH	APMX			
Weldon	Standard Shank	MA90	1000W100-12T2C	●	2	1.000	1.000	3.750	1.400	0.472	Yes	Fig.2	18,100
			1250W100-12T2C	●	2	1.250	1.000	4.000	1.700			Fig.1	16,300
			1250W100-12T3C	●	3	1.250	1.000	4.000	1.700				16,300
			1250W125-12T3C	●	3	1.250	1.250	4.000	1.650			Fig.2	16,300
			1500W125-12T3C	●	3	1.500	1.250	4.350	2.050			Fig.1	15,000
			1500W125-12T4C	●	4	1.500	1.250	4.350	2.050				15,000
Straight	Straight Standard	MA90	1000S100-12T2C	●	2	1.000	1.000	3.750	1.400	0.472	Yes	Fig.4	18,100
			1250S100-12T3C	●	3	1.250	1.000	4.000	1.700			Fig.3	16,300
			1500S125-12T4C	●	4	1.500	1.250	4.350	2.050				15,000
	Long Shank	MA90	1000S100-12T2CL	●	2	1.000	1.000	7.000	2.100	0.472	Yes	Fig.4	18,100
			1500S125-12T3CL	●	3	1.500	1.250	9.500	2.661			Fig.3	15,000

● : Standard Stock

Maximum number of revolutions

Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.

Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

Spare Parts / Applicable Inserts (Inch)

Description			Insert Screw	Wrench	Anti-seize Compound	Arbor Bolt
						
09 Size (LOGU09...)	End Mills	MA900625...-09...	SB-44865UTRP	DTPM-8	P-37	-
			Insert Tightening Torque 1.2 Nm			
		MA900750...-09... MA901000...-09... MA901250...-09... MA901500...-09... MA902000...-09...	SB-44880UTRP	DTPM-8		-
	Modular End Mills	MA90...-09...	Insert Tightening Torque 1.2 Nm			-
	Face Mills	MA901500R-09...				HH1/4-0.75
		MA902000R-09... MA902500R-09...				HH3/8-1.25
12 Size (LOGU12...)	End Mills	MA90...-12...	SB-40104TRP	DTPM-15	P-37	-
	Modular End Mills	MA90...-12...	Insert Tightening Torque 3.5 Nm			-
	Face Mills	MA901500R-12...				HH1/4-0.75
		MA902000R-12... MA902500R-12...				HH3/8-1.25
		MA903000R-12...				HH1/2-1.25

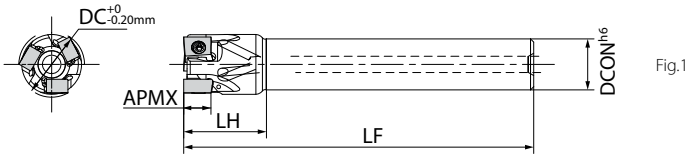


Fig.1

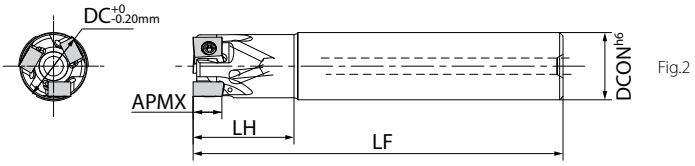


Fig.2

Toolholder Dimensions 09 Size (LOGU09 ...)

Description			Stock	Number of Inserts	Dimensions (mm)					Coolant Hole	Drawing	Weight (kg)	Maximum RPM
					DC	DCON	LF	LH	APMX				
Standard Shank	MA90	16S12-09T2C	●	2	16	12	100	23	8	Yes	Fig.1	0.1	29,500
		18S16-09T2C	●		18	16							27,900
		20S16-09T2C	●		20		110	26				0.2	26,600
		20S16-09T3C	●	3									
		22S20-09T3C	●		22	20							25,400
		25S20-09T3C	●		25		120	29				0.3	23,900
		25S20-09T4C	●	4									
		28S25-09T3C	●	3	28	25							22,600
		30S25-09T4C	●	4	30		130	32				0.5	21,900
		32S25-09T4C	●		32								21,200
		32S25-09T5C	●	5									
		35S32-09T4C	●	4	35	32	150	50				0.9	20,300
		35S32-09T5C	●	5									
		40S32-09T4C	●	4	40							1.0	19,000
		40S32-09T6C	●	6									
		50S32-09T5C	●	5	50		120	40				0.9	17,000
		50S32-09T7C	●	7									
Same size Shank	MA90	16S16-09T2C	●	2	16	16	100	26	8	Yes	Fig.2	0.1	29,500
		20S20-09T2C	●		20	20	110	30				0.2	26,600
		20S20-09T3C	●	3									
		25S25-09T3C	●		25	25	120	32				0.4	23,900
		25S25-09T4C	●	4									
		32S32-09T4C	●		32	32	130	40				0.7	21,200
		32S32-09T5C	●	5									
Long Shank	MA90	20S18-09T2CL	●	2	20	18	150	30	8	Yes	Fig.1	0.3	26,600
		20S20-09T2CL	●			20		40			Fig.2		
		25S25-09T2CL	●		25	25	170	50				0.6	23,900
		32S32-09T2CL	●		32	32	200	65				1.1	21,200

Maximum number of revolutions

Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.

Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

●: Standard Stock

Toolholder Dimensions 12 Size (LOGU12 ...)

Description			Stock	Number of Inserts	Dimensions (mm)					Coolant Hole	Drawing	Weight (kg)	Maximum RPM
					DC	DCON	LF	LH	APMX				
Standard shank	MA90	25S20-12T2C	●	2	25	20	120	29	12	Yes	Fig.1	0.3	18,300
		28S25-12T2C	●		28	25						0.4	17,300
		30S25-12T2C	●		30		130	32				0.5	16,800
		30S25-12T3C	●	3									
		32S25-12T2C	●	2	32								16,300
		32S25-12T3C	●	3									
		35S32-12T3C	●		35	32	150	50				0.9	15,600
		40S32-12T3C	●		40								14,600
		40S32-12T4C	●	4									
		50S32-12T4C	●		50		120	40					13,100
		50S32-12T6C	●	6								0.8	
Same size shank	MA90	25S25-12T2C	●	2	25	25	120	32	12	Yes	Fig.2	0.4	18,300
		32S32-12T2C	●		32	32	130	40				0.7	16,300
		32S32-12T3C	●	3									
Long shank	MA90	25S25-12T2CL	●	2	25	25	170	50	12	Yes	Fig.2	0.6	18,300
		32S32-12T2CL	●		32	32	200	65				1.1	16,300

Maximum number of revolutions

● : Standard Stock

Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.

Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

Spare Parts / Applicable Inserts (Metric)

Description			Insert Screw	Wrench	Anti-seize Compound	Arbor Bolt
						
09 Size (LOGU09...)	End Mills	MA9016...-09... MA9018...-09...	SB-44865UTRP Insert Tightening Torque 1.2 Nm	DTPM-8	P-37	-
		MA9020...-09... ~ MA9050...-09...	SB-44880UTRP Insert Tightening Torque 1.2 Nm	DTPM-8		-
	Modular End Mills	MA90...-09...				-
	Face Mills	MA90040R-09...				HH1/4-0.75
		MA90050R-09... MA90063R-09...				HH3/8-1.25
12 Size (LOGU12...)	End Mills	MA90...-12...	SB-40104TRP Insert Tightening Torque 3.5 Nm	DTPM-15	P-37	-
	Modular End Mills	MA90...-12...				-
	Face Mills	MA90040R-12...-M				HH8×25
		MA90050R-12...-M MA90063R-12...-M				HH10×30
		MA90080R-12...-M				HH12×35
		MA90100R-12...-M MA90125R-12...-M				-
		MA90080R-12...				HH12×35
		MA90100R-12... MA90125R-12...				-

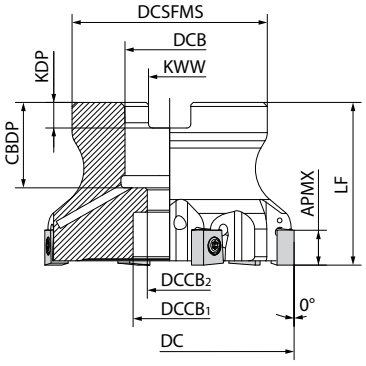


Fig.1

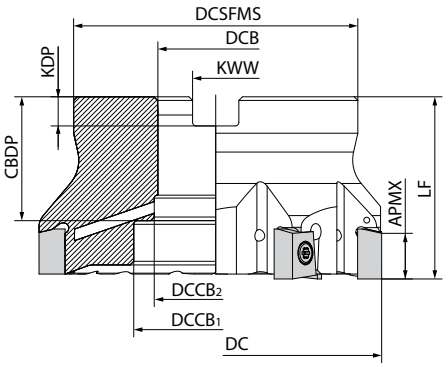


Fig.2

Toolholder Dimensions 09 size (LOGU09...)

Description		Stock	Number of Inserts	Dimensions (in)										Coolant Hole	Maximum RPM
				DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX		
MA90	1500R-09T5C	●	4	1.500	1.400	0.750	0.669	0.433	1.575	0.750	0.187	0.313	0.315	Yes	19,400
	1500R-09T6C	●	6												
	2000R-09T6C	●	5	2.000	1.750										16,800
	2000R-09T7C	●	7												
	2500R-09T7C	●	6	2.500											15,100
	2500R-09T9C	●	9												

Maximum number of revolutions
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

●: Standard Stock
Spare Parts and Applicable Inserts
see **page 9**

Toolholder Dimensions 12 size (LOGU12...)

Description		Stock	Number of Inserts	Dimensions (in)										Coolant Hole	Maximum RPM
				DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX		
MA90	1500R-12T3C	●	3	1.500	1.400	0.500	0.433	0.276	1.575	0.709	0.156	0.250	0.472	Yes	15,000
	1500R-12T4C	●	4												
	2000R-12T4C	●	4	2.000	1.750	0.750	0.669	0.433		0.750	0.187	0.313			13,000
	2000R-12T6C	●	6												
	2500R-12T6C	●	6	2.500											11,600
	2500R-12T8C	●	8												
	3000R-12T8C	●	8	3.000	2.250	1.000	0.866	0.551	1.969	1.063	0.236	0.382			10,600
	3000R-12T10C	●	10												

Maximum number of revolutions
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

●: Standard Stock
Spare Parts and Applicable Inserts
see **page 9**

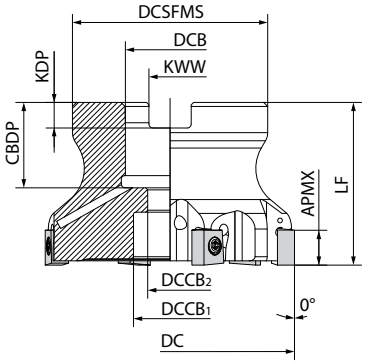


Fig.1

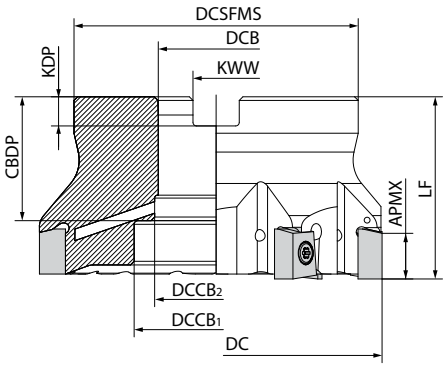


Fig.2

Toolholder Dimensions 09 size (LOGU09...)

Description			Stock	Number of Inserts	Dimensions (mm)										Coolant Hole	Drawing	Weight (kg)	Maximum RPM
					DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX				
Metric Bore Dia.	MA90	040R-09T4C-M	●	4	40	38	16	15	9	40	19	5.6	8.4	8	Yes	Fig.1	0.2	26,600
		040R-09T6C-M	●	6														
		050R-09T5C-M	●	5	50	48	22	18	11		21	6.3	10.4				0.4	23,900
		050R-09T7C-M	●	7														
		063R-09T6C-M	●	6	63												0.5	21,200
		063R-09T9C-M	●	9													0.4	

Maximum number of revolutions
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Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

● : Standard Stock

Spare Parts and Applicable Inserts
see **page 11**

Toolholder Dimensions 12 size (LOGU12...)

Description			Stock	Number of Inserts	Dimensions (mm)										Coolant Hole	Drawing	Weight (kg)	Maximum RPM
					DC	DCSFMS	DCB	$DCCB_1$	$DCCB_2$	LF	CBDP	KDP	KWW	APMX				
Inch Bore Dia.	MA90	080R-12T7C	●	7	80	70	1.00"	20	13	50	1.063"	0.236"	0.375"	12	Yes	Fig.1	1.2	10,400
		080R-12T10C	●	10														
		100R-12T9C	●	9	100	78	1.25"	45	-		1.339"	0.315"	0.500"			Fig.2	1.5	9,300
		100R-12T13C	●	13														
		125R-12T12C	●	12	125	89	1.50"	55		63	1.496"	0.394"	0.625"				2.6	8,300
		125R-12T16C	●	16														
Metric Bore Dia.	MA90	040R-12T3C-M	●	3	40	38	16	14	9	40	19	5.6	8.4	12	Yes	Fig.1	0.2	14,600
		040R-12T4C-M	●	4														
		050R-12T4C-M	●		50	48	22	18	11		21	6.3	10.4				0.3	13,100
		050R-12T6C-M	●	6														
		063R-12T6C-M	●		63												0.4	11,700
		063R-12T8C-M	●	8														
		080R-12T7C-M	●	7	80	70	27	20	13	50	24	7	12.4				1.2	10,400
		080R-12T10C-M	●	10														
		100R-12T9C-M	●	9	100	78	32	45	-		30	8	14.4			Fig.2	1.5	9,300
		100R-12T13C-M	●	13														
		125R-12T12C-M	●	12	125	89	40	55		63	33	9	16.4				2.5	8,300
		125R-12T16C-M	●	16														

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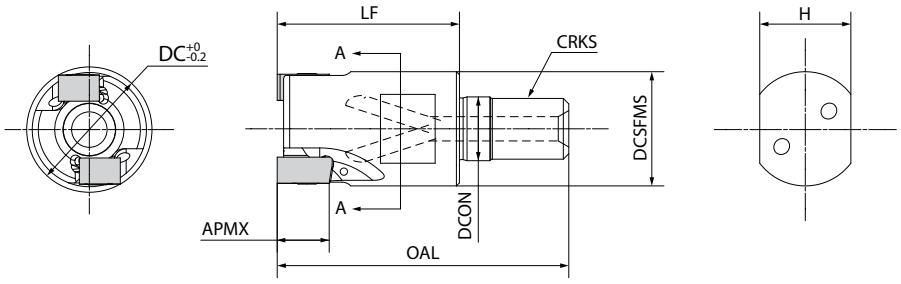
● : Standard Stock

Spare Parts and Applicable Inserts
see **page 11**



Toolholder Dimensions 09 size (LOGU09...)

Description		Stock	Number of Inserts	Dimensions (in)							Coolant Hole	Maximum RPM
				DC	DCSFMS	DCON	OAL	LF	CRKS	H		
MA90	0750M10-09T3C	●	3	0.750	0.711	0.413	1.890	1.181	M10xP1.50	0.591	Yes	27,300
	1000M12-09T4C	●	4	1.000	0.906	0.492	2.205	1.378	M12xP1.75	0.748	Yes	18,300
	1250M16-09T5C	●	5	1.250	1.181	0.669	2.441	1.575	M16xP2.00	0.945	Yes	16,300

Toolholder Dimensions 12 size (LOGU12...)

Description		Stock	Number of Inserts	Dimensions (in)							Coolant Hole	Maximum RPM
				DC	DCSFMS	DCON	OAL	LF	CRKS	H		
MA90	1000M12-12T2C	●	2	1.000	0.906	0.492	2.205	1.378	M12xP1.75	0.748	Yes	18,300
	1250M16-12T3C	●	3	1.250	1.181	0.669	2.441	1.575	M16xP2.00	0.945	Yes	16,300

Maximum number of revolutions
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

● : Standard Stock
Spare Parts and Applicable Inserts
see **page 9**

Toolholder Dimensions 09 size (LOGU09...)

Description		Stock	Number of Inserts	Dimensions (mm)								Coolant Hole	Maximum RPM
				DC	DCSFMS	DCON	OAL	LF	CRKS	H	APMX		
MA90	20M10-09T2C	●	2	20	18.8	10.5	48	30	M10×P1.5	15	8	Yes	19,000
	20M10-09T3C	●	3										
	25M12-09T3C	●		25	23	12.5	56	35	M12×P1.75	19			17,000
	25M12-09T4C	●	4										
	32M16-09T4C	●		32	30	17	62	40	M16×P2.0	24			15,100
	32M16-09T5C	●	5										

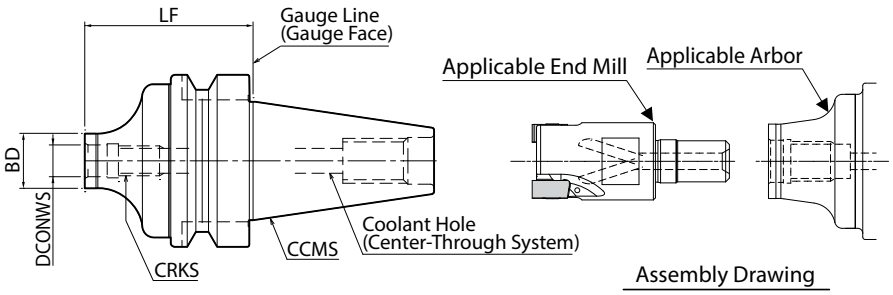
Toolholder Dimensions 12 size (LOGU12...)

Description		Stock	Number of Inserts	Dimensions (mm)								Coolant Hole	Maximum RPM
				DC	DCSFMS	DCON	OAL	LF	CRKS	H	APMX		
MA90	25M12-12T2C	●	2	25	23	12.5	56	35	M12×P1.75	19	12	Yes	18,300
	32M16-12T2C	●		32	30	17	62	40	M16×P2.0	24			16,300
	32M16-12T3C	●	3										

Maximum number of revolutions
Set the number of revolutions per minute within the recommended cutting speed specified by the workpiece on Page 17.
Do not use the end mill or cutter at the maximum revolution or higher since the centrifugal force may cause chips and parts to scatter even under no load.

● : Standard Stock
Spare Parts and Applicable Inserts
see **page 11**

BT Arbor for Modular (for exchangeable head/two face contact)



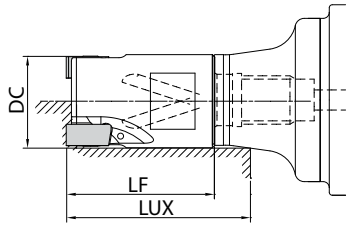
Dimensions

Description		Stock	Dimensions (mm)				Coolant Hole	Arbor (Two-face clamping)	Applicable End Mill (Head)
			LF	BD	DCONWS	CRKS		CCMS	
BT30K	M10-45	●	45	18.7	10.5	M10×P1.5	Yes	BT30	MA90-...M10-..
	M12-45	●	45	23	12.5	M12×P1.75			MA90-...M12-..
BT40K	M10-60	●	60	18.7	10.5	M10×P1.5	Yes	BT40	MA90-...M10-..
	M12-55	●	55	23	12.5	M12×P1.75			MA90-...M12-..
	M16-65	●	65	30	17	M16×P2.0			MA90-...M16-..

● : Standard Stock

BT Arbor for Modular (for exchangeable head/two face contact)

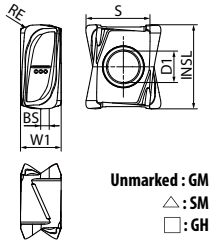
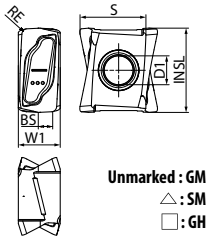
Actual End Mill Depth



Arbor Description		Applicable End Mill (Head)			Actual End Mill Depth (mm)
		Description	Cutting Dia. (mm)	Dimensions (mm)	LUX
			DC	LF	
BT30K	M10-45	MA90-20M10-...	20	30	36.8
	M12-45	MA90-25M12-...	25	35	42.8
BT40K	M10-60	MA90-20M10-...	20	30	38.7
	M12-55	MA90-25M12-...	25	35	44.6
	M16-65	MA90-32M16-...	32	40	51.2

Applicable Inserts

Usage Classification								
	P	Carbon/Alloy Steel	★	☆			
		Mold Steel	★	☆			
	M	Austenitic		★	☆		
		Martensitic		☆			★
		Precipitation Hardened		★			
★: 1st recommendation ☆: 2nd recommendation	K	Gray Cast Iron			★		
		Nodular Cast Iron			★		
	S	Heat-resistant Alloys		☆			★
		Titanium Alloy		★			
	H	Hardened Material				★	

Shape		Description		Dimensions (in)						MEGACOAT (PVD coating)				CVD Coating
				W1	S	D1	INSL	BS	RE	PR1825	PR1835	PR1810	PR015S	CA6535
 General Purpose (G-class)	 Unmarked : GM △ : SM □ : GH	LOGU	090404ER-GM	0.169	0.267	0.131	0.350	0.051	0.016	●	●	●	–	●
			090408ER-GM		0.264			0.035	0.031	●	●	●	–	●
			090412ER-GM		0.262			0.019	0.047	●	●	●	–	●
			090416ER-GM		0.259			0.004	0.063	●	●	●	–	●
 Low Cutting Force (G-class)		LOGU	090404ER-SM	0.169	0.267	0.131	0.350	0.051	0.016	●	●	–	–	●
			090408ER-SM		0.264			0.035	0.031	●	●	–	–	●
			090412ER-SM		0.262			0.019	0.047	●	●	–	–	●
			090416ER-SM		0.259			0.004	0.063	●	●	–	–	●
 Tough Edge (G-class)		LOGU	090408ER-GH	0.169	0.264	0.131	0.350	0.035	0.031	●	●	●	●	–
 General Purpose (G-class)	 Unmarked : GM △ : SM □ : GH	LOGU	120604ER-GM	0.260	0.398	0.179	0.523	0.098	0.016	●	●	●	–	●
			120608ER-GM		0.395		0.523	0.084	0.031	●	●	●	–	●
			120612ER-GM		0.393		0.523	0.070	0.047	●	●	●	–	●
			120616ER-GM		0.391		0.523	0.057	0.063	●	●	●	–	●
			120620ER-GM		0.388		0.523	0.043	0.079	●	●	●	–	●
			120624ER-GM		0.385		0.523	0.028	0.094	●	●	●	–	●
			120630ER-GM		0.381		0.523	0.008	0.118	●	●	●	–	●
 Low Cutting Force (G-class)		LOGU	120604ER-SM	0.260	0.398	0.179	0.523	0.098	0.016	●	●	–	–	●
			120608ER-SM		0.395		0.523	0.084	0.031	●	●	–	–	●
			120612ER-SM		0.393		0.523	0.070	0.047	●	●	–	–	●
			120616ER-SM		0.391		0.523	0.057	0.063	●	●	–	–	●
			120620ER-SM		0.388		0.523	0.043	0.079	●	●	–	–	●
			120624ER-SM		0.385		0.523	0.028	0.094	●	●	–	–	●
			120630ER-SM		0.381		0.523	0.008	0.118	●	●	–	–	●
 Tough Edge (G-class)		LOGU	120608ER-GH	0.260	0.400	0.179	0.522	0.089	0.031	●	●	●	●	–

● : Standard Stock

Recommended Cutting Conditions ★1st Recommendation ☆2nd Recommendation

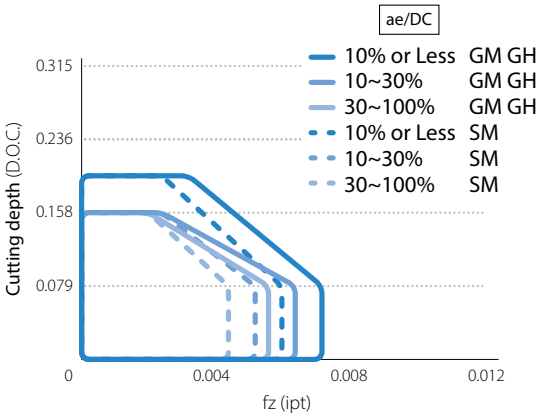
Chipbreaker	Workpiece Material	Cutter Diameter and Feed Rate (fz: ipt)				Recommended Insert Grade (Cutting Speed Vc: sfm)				
		09 Size Insert (LOGU09...)		12 Size Insert (LOGU12...)		MEGACOAT NANO EX			MEGACOAT HARD	CVD Coating
		ø0.625" ø16mm ~ ø18mm	ø0.750" ~ ø2.500" ø20mm ~ ø63mm	ø1.000" ø25mm ~ ø30mm	ø1.250" ~ ø3.000" ø32mm ~ ø125mm	PR1825	PR1835	PR1810	PR015S	CA6535
General GM	Carbon Steel	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.007	0.002 – 0.006 – 0.009	★ 390 – 590 – 820	☆ 390 – 590 – 820	–	–	–
	Alloy Steel	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.008	★ 330 – 520 – 720	☆ 330 – 520 – 720	–	–	–
	Mold Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	★ 260 – 460 – 590	☆ 260 – 460 – 590	–	–	–
	Austenitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	☆ 330 – 520 – 660	★ 330 – 520 – 660	–	–	–
	Martensitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	☆ 490 – 660 – 820	–	–	★ 590 – 790 – 980
	Precipitation Hardened Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	★ 300 – 390 – 490	–	–	–
	Gray Cast Iron	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.007	0.002 – 0.006 – 0.009	–	–	☆ 390 – 590 – 820	–	–
	Nodular Cast Iron	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	–	☆ 330 – 490 – 660	–	–
	Ni-based Heat-Resistant Alloy	0.002 – 0.002 – 0.003	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	–	–	–	–	★ 70 – 100 – 160
	Titanium Alloy	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	–	☆ 100 – 160 – 230	–	–	–
Low Cutting Force SM	Carbon Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.007	★ 390 – 590 – 820	☆ 390 – 590 – 820	–	–	–
	Alloy Steel	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	★ 330 – 520 – 720	☆ 330 – 520 – 720	–	–	–
	Mold Steel	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	★ 260 – 460 – 590	☆ 260 – 460 – 590	–	–	–
	Austenitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	☆ 330 – 520 – 660	★ 330 – 520 – 660	–	–	–
	Martensitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	–	☆ 490 – 660 – 820	–	–	★ 590 – 790 – 980
	Precipitation Hardened Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	–	★ 300 – 390 – 490	–	–	–
	Ni-based Heat-Resistant Alloy	0.002 – 0.002 – 0.003	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	–	–	–	–	★ 70 – 100 – 160
	Titanium Alloy	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.005	–	★ 100 – 160 – 230	–	–	–
Tough Edge GH	Carbon Steel	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.007	0.002 – 0.006 – 0.009	★ 390 – 590 – 820	☆ 390 – 590 – 820	–	–	–
	Alloy Steel	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.008	★ 330 – 520 – 720	☆ 330 – 520 – 720	–	–	–
	Mold Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	★ 260 – 460 – 590	☆ 260 – 460 – 590	–	–	–
	Austenitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	☆ 330 – 520 – 660	☆ 330 – 520 – 660	–	–	–
	Martensitic Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	☆ 490 – 660 – 820	–	–	–
	Precipitation Hardened Stainless Steel	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	☆ 300 – 390 – 490	–	–	–
	Gray Cast Iron	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.006	0.002 – 0.004 – 0.007	0.002 – 0.006 – 0.009	–	–	★ 390 – 590 – 820	–	–
	Nodular Cast Iron	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	0.002 – 0.005 – 0.007	–	–	★ 330 – 490 – 660	–	–
	Ni-based Heat-Resistant Alloy	0.002 – 0.002 – 0.003	0.002 – 0.003 – 0.004	0.002 – 0.003 – 0.005	0.002 – 0.004 – 0.006	–	–	–	–	–
	Titanium Alloy	0.002 – 0.003 – 0.004	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.005	0.002 – 0.004 – 0.006	–	☆ 100 – 160 – 230	–	–	–

The middle values 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.
Face milling are not recommended for slotting or pocketing. Recommended ae is 75% of the cutting diameter or less. We recommendcoarse pitch cutters when ae is 30% of the cutting diameter or more.
Working above recommended conditions or long-term use can damage the screws. It is recommended to replace the screws regularly.

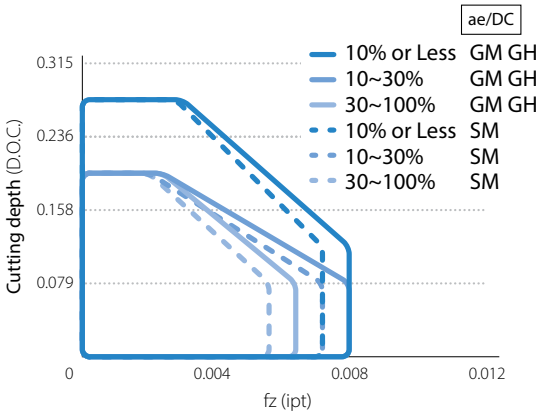
Cutting Performance

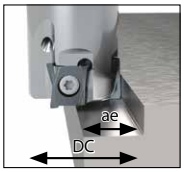
09 Size (LOGU09...) Machining for Steel (Dry)

Cutting Dia. DC : ø0.625", ø16mm ~ ø18mm



Cutting Dia. DC : ø0.750" ~ ø2.500", ø20mm ~ ø63mm

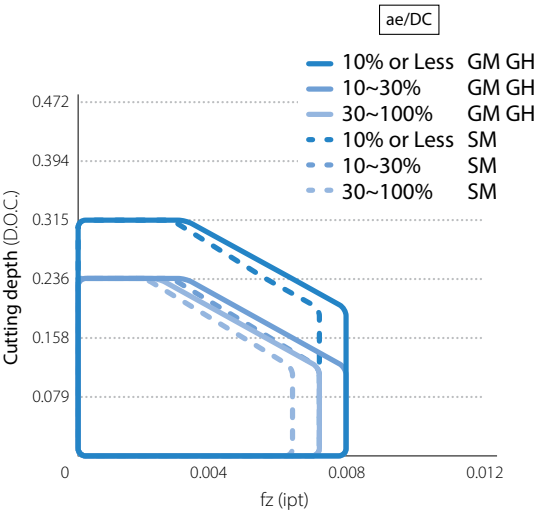




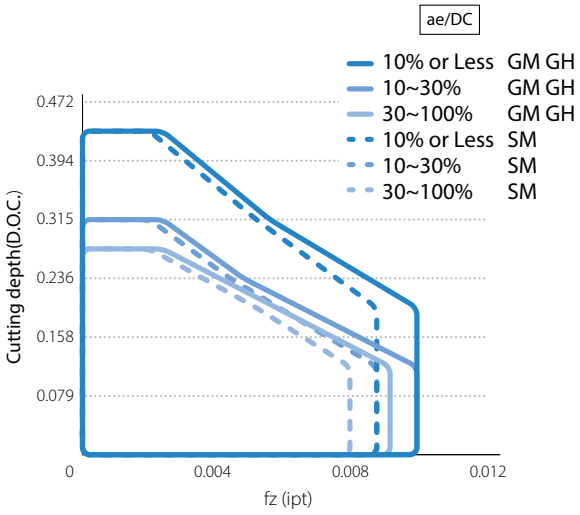
For other workpiece material, set D.O.C. and fz appropriately for each ae.

12 Size (LOGU12...) Machining for Steel (Dry)

Cutting Dia. DC : ø1.000", ø25mm ~ ø30mm



Cutting Dia. DC : ø1.250" ~ ø3.000", ø32mm ~ ø125mm

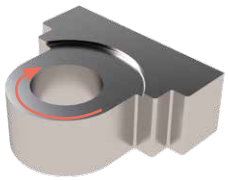


For other workpiece material, set D.O.C. and fz appropriately for each ae.

Case Studies

Brake parts 70-50-05

Vc = 440 sfm
n = 535 RPM
D.O.C. x ae = 0.134" x 0.984"
fz = 0.006 ipt
Vf = 22.04 ipm
Wet
MA90-080R-12T7C-M
LOGU120616ER-GM (PR1810)



Number of Workpieces

MA90 (7 flute) **1,000 pcs**

Competitor G (7 flute) **600 pcs**

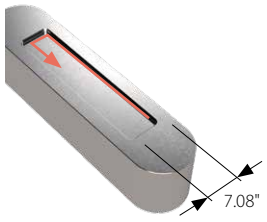
Tool life x1.6

MA90showed good cutting edge condition and stable machining.
Achieved 1.6 times longer tool life.

(User evaluation)

Mold parts Stainless steel

Vc = 410 sfm
n = 1,600 RPM
D.O.C x ae = 0.039" x 0.984"
fz = 0.005 ipt
Vf = 22.44 ipm
Dry
MA90-25S20-09T3C
LOGU090408ER-GM (PR1835)



Machining efficiency

MA90 (3 flute) **Q = 14.5 cc/min**

Competitor H (3 flute) **Q = 9.5 cc/min**

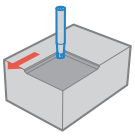
x1.5 Machining efficiency

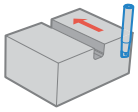
MA90showed 1.5 times higher machining efficiency than its competitors.
Improved tool life (3 to 4 pcs)

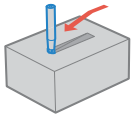
(User evaluation)

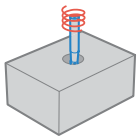
Notes

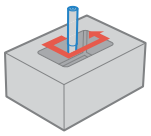
Applications

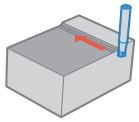

Face Milling & Shouldering

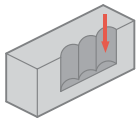

Slotting


Ramping


Helical Milling


Pocketing


Contouring


Plunging

Ramping Reference Table

Description	Cutter Diameter DC	0.625" / 16mm	0.750" / 20mm	1.000" / 25mm	1.250" / 32mm	1.500" / 40mm	2.000" / 50mm
MA… - 09 - …	Max. Ramping Angle RMPX	1.16°	0.97°	0.64°	0.4°	0.23°	0.11°
	tan RMPX	0.020	0.017	0.011	0.007	0.004	0.002
Description	Cutter Diameter DC	1.000" / 25mm	28	30	1.250" / 32mm	35	40
MA… - 12 - …	Max. Ramping Angle RMPX	2°	1.7°	1.6°	1.5°	1.2°	1°
	tan RMPX	0.034	0.030	0.027	0.026	0.021	0.017

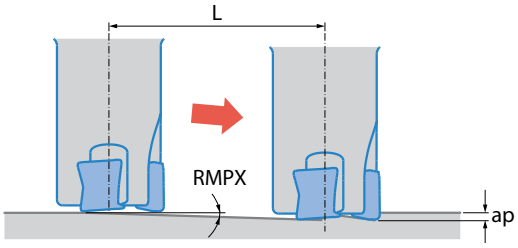
Decrease Ramping Angle if Chips Become Excessively Long

Ramping Tips

Ramping angle should be under RMPX.
Reduce recommended feed rate by 70%

Formula for Min. Cutting Length (L) at Max. Ramping Angle

$$L = \frac{D.O.C.}{\tan RMPX}$$

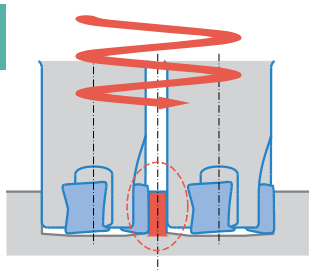


Helical Milling Tips

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

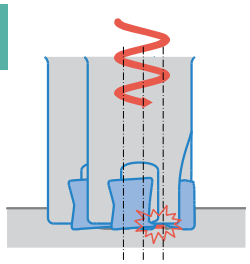
Exceeding max. cutting dia.

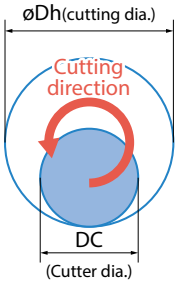
Center core remains after machining



Less than min. cutting dia.

Center core hits holder body



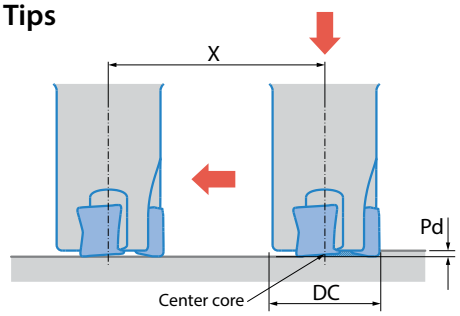


Units: inch

Description	Minimum cutting diameter øDh1	Maximum cutting diameter øDh2
MA… - 09 - …	2XDC-0.157"	2XDC-0.079"
MA… - 12 - …	2XDC-0.236"	2XDC-0.079"

For helical milling, use between min. cutting dia. and max. cutting dia..
The cutter direction should be counterclockwise (down cut) (see above).
Please machine in a safe environment as long chips may be produced.

Drilling Tips

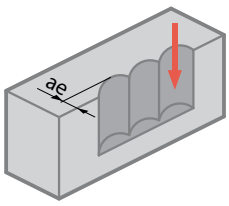


Units: inch

Description	Maximum drilling depth (Pd)	Min. cutting length (X) for flat bottom surface
MA… - 09 - …	0.010"	DC-0.118"
MA… - 12 - …	0.020"	DC-0.197"

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 = 0.004 ipt or less when drilling.

Plunging Tips



Available for vertical milling (plunging)
Feed should be set within fz = 0.004 (ipt) when plunging.

Units: inch

Description	Maximum width of cut (ae)
09 Size (LOGU09...)	0.079
12 Size (LOGU12...)	0.118

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