MITSUBISHI MATERIALS

AXD4000A

FOR CONTINUOUS HIGH-SPEED AND ULTRA-HIGH-SPEED MACHINING OF ALUMINUM ALLOYS





TOOL NEWS **B268A**

For Continuous High-Speed and Ultra-High-Speed Machining of Aluminum Alloys

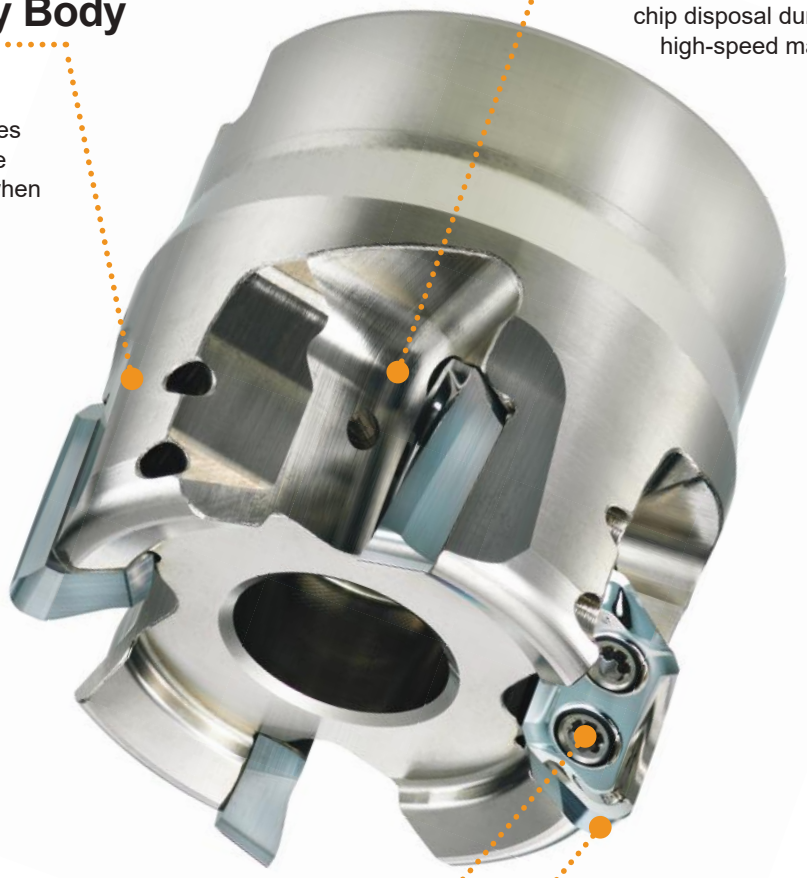
AXD4000A

Optimal Designed Chip Pocket

Chip pocket specifically designed for optimal chip disposal during high-speed and ultra-high-speed machining operations.

High Rigidity Body

High rigidity body with modified insert seat withstands high stresses caused by cutting force and centrifugal force when performing high speed machining.



High Reliability

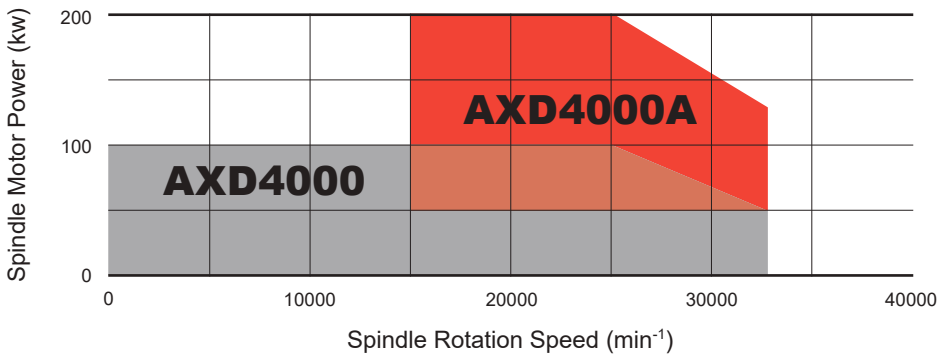
Improved anti-fly screw design ensures 100% contact with insert hole and 2x torque specifications compared to AXD4000 to ensure tightness and prevent loosening of screw during continuous high-speed machining operations.

Stable Machining

Standard and proven AXD4000 insert with sharp edge and tough carbide grade effectuates lower cutting force and substantial fracture resistance.

How to Choose AXD4000A or AXD4000

AXD4000A is specifically engineered for continuous high-speed and ultra-high-speed machining of aluminum alloys, especially over 80kW motor power.



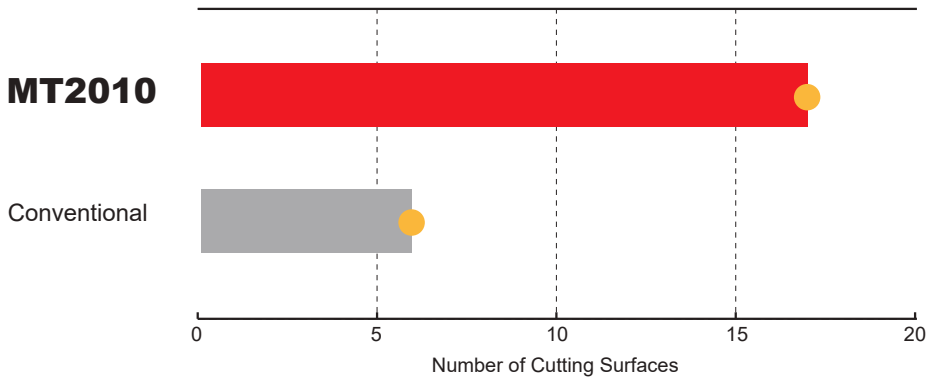
Cemented Carbide for High-speed Processing of Extra Super Duralumin and Aluminum / Lithium alloy

MT2010 NEW

High-grade cemented carbide grade suitable for ultra-high speed machining at cutting speeds up to 16,500 SFM combined with excellent wear-resistance and toughness.

Cutting Performance

Al-Li Alloy : Comparison of Wear Resistance

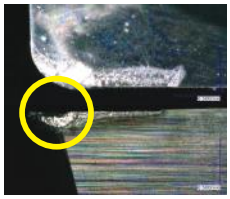


Photographed after 17-side machining.



MT2010
Can be used continuously.

Photographed after 6-side machining.



Conventional
Fractured from wear.

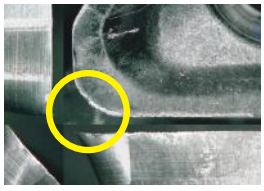
<Cutting Conditions>
Workpiece
Material : Al-Li Alloy
Tool : AXD4000A-050A04RD
Inserts (Grade): XDGX175004PDFR-GM MT2010
Cutting Speed : vc=17000 SFM
Feed per Tooth: fz= .006 IPT
Depth of Cut : ap= .059 inch
Width of Cut : ae= 1.535 inch
Cutting Mode : Wet Cutting
Single Insert

A7050 : Comparison of Fracture Resistance

After machining 90 seconds.



MT2010
Can be used continuously.



Conventional
Chipping occurred.

<Cutting Conditions>
Workpiece
Material : A7050
Tool : AXD4000A-050A04RD
Inserts (Grade): XDGX175004PDFR-GM MT2010
Cutting Speed : vc=17000 SFM
Feed per Tooth: fz= .008 IPT
Depth of Cut : ap= .197 inch
Width of Cut : ae= 1.969 inch
Cutting Mode : Wet Cutting

MULTI FUNCTIONAL MILLING

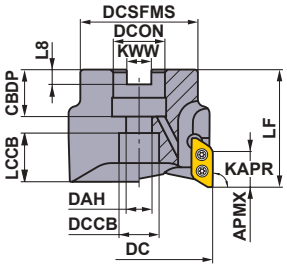
<ALUMINUM ALLOY MATERIAL CUTTING>

AXD4000A

NEW

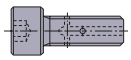
P M K **N** S H





Right hand tool holder only.

(inch)

DC	Set Bolt	Geometry
ϕ2.000"	HSCU37513H	

■Arbor Type

KAPR : 90°
GAMP : +10° GAMF : +21°
DCON = inch size, With Coolant Hole

(inch)

DC	Type	Insert Corner Radius RE	Order Number	Stock R	* No.T	LF	DCON	WT (kg)	APMX	RPMX (min^{-1})	Insert Type
2.000	D	.016-.126	**AXD4000AUR2.0004AAD**	●	4	2.000	.750	.9	.610	34000	XDGX1750
2.000	E	.157-.197	**AXD4000AUR2.0004AAE**	●	4	2.000	.750	.9	.583	34000	XDGX1750

⋆ Number of Teeth
Note 1) The maximum allowable revolutions are set to ensure tool and insert stability.
RPMX (max. rev/min) for holders must also be considered.
Note 2) Tool should be set with balancing quality of G6.3 (ISO1940) or ISO16084, in case over 6000 min^{-1} spindle rotation.
Note 3) When using the tool at high spindle speeds, ensure that the tool and chuck are correctly balanced.
Note 4) Note for inserts with a corner radius of .063 and above, as corner radius increases the LF dimensions decrease.

Mounting Dimensions

(inch)

DC	Order Number	DCON	CBDP	DAH	DCCB	LCCB	DCSFMS	KWW	L8
2.000	**AXD4000AUR2.0004AAD**	.750	.748	.413	.630	.560	1.750	.313	.187
2.000	**AXD4000AUR2.0004AAE**	.750	.748	.413	.630	.527	1.750	.313	.187

Spare Parts

* 		
Clamp Screw	Wrench	Anti-seize Lubricant
TPS3SB	TIP10D	MK1KS

⋆ Clamp Torque (lbf-in) : TPS3SB = 26.6

Note 1) Clamp screw and wrench of AXD4000A are different from AXD4000.

Dimensions and Symbols (ISO 13399 Compliance)

DC = Cutting Diameter
LF = Functional Length
DCON = Connection Diameter
WT = Weight of Item
APMX = Depth of Cut Max.
RPMX = Rotational Speed Max.
CBDP = Connection Bore Depth
DAH = Diameter Access Hole
DCCB = Counterbore Diameter Connection Bore
LCCB = Counterbore Depth Connection Bore
DCSFMS = Contact Surface Diameter Machine Side
KWW = Keyway Width

● : USA Stock ★ : Stocked in Japan (10 inserts in one case)

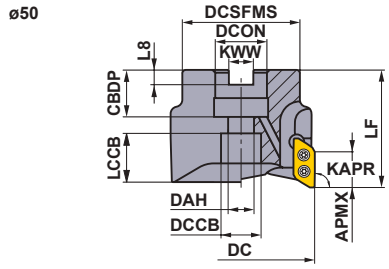
MULTI FUNCTIONAL MILLING
<ALUMINUM ALLOY MATERIAL CUTTING>

AXD4000A

NEW

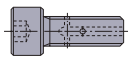
P M K N S H





Right hand tool holder only.

(mm)

DC	Set Bolt	Geometry
ϕ50	HSC10030H	

Metric Standard

■Arbor Type

KAPR : 90°
GAMP : +10° GAMF : +21°
DCON = inch size, With Coolant Hole

(mm)

DC	Type	Insert Corner Radius RE	Order Number	Stock R	* No.T	LF	DCON	WT (kg)	APMX	RPMX (min^{-1})	Insert Type
50	D	0.4—3.2	**AXD4000A-050A04RD**	★	4	50	22	0.4	15.5	34000	XDGX1750
50	E	4.0—5.0	**AXD4000A-050A04RE**	★	4	50	22	0.4	14.8	34000	XDGX1750

* Number of Teeth
Note 1) The maximum allowable revolutions are set to ensure tool and insert stability.
RPMX (max. rev/min) for holders must also be considered.
Note 2) Tool should be set with balancing quality of G6.3 (ISO1940) or ISO16084, in case over 6000 min^{-1} spindle rotation.
Note 3) When using the tool at high spindle speeds, ensure that the tool and chuck are correctly balanced.
Note 4) Note for inserts with a corner radius of 1.6 and above, as corner radius increases the LF dimensions decrease.

Mounting Dimensions

(mm)

DC	Order Number	DCON	CBDP	DAH	DCCB	LCCB	DCSFMS	KWW	L8
50	**AXD4000A-050A04RD**	22	20	11	17	15.4	45	10.4	6.3
50	**AXD4000A-050A04RE**	22	20	11	17	14.6	45	10.4	6.3

Spare Parts

* 		
Clamp Screw	Wrench	Anti-seize Lubricant
TPS3SB	TIP10D	MK1KS

* Clamp Torque (lbf-in) : TPS3SB = 26.6

Note 1) Clamp screw and wrench of AXD4000A are different from AXD4000.

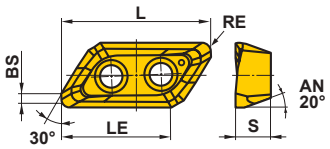
Dimensions and Symbols (ISO 13399 Compliance)

DC = Cutting Diameter
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APMX = Depth of Cut Max.
RPMX = Rotational Speed Max.
CBDP = Connection Bore Depth
DAH = Diameter Access Hole
DCCB = Counterbore Diameter Connection Bore
LCCB = Counterbore Depth Connection Bore
DCSFMS = Contact Surface Diameter Machine Side
KWW = Keyway Width

Inserts

(inch)

Workpiece Material		Cutting Conditions (Guide): ● :Stable Cutting ◐ :General Cutting ✲ :Unstable Cutting Edge Preparation: F :Sharp E :Round
	N Aluminum Alloys	

Shape	Order Number	Class	Edge Preparation	Stock: Coated LC15TF	Stock: Coated MP9120	Stock: Carbide MT2010	Stock: Carbide TF15	Dimensions L	LE	S	BS	RE*	Geometry
Strong Cutting Edge **GM** Breaker 	**XDGX175004PDFR-GM**	G	F			●	●	.906	.689	.197	.066	.016	
	XDGX175008PDFR-GM	G	F			●	●	.906	.689	.197	.047	.031	
	XDGX175012PDFR-GM	G	F			●	●	.906	.689	.197	.035	.047	
	XDGX175016PDFR-GM	G	F			●	●	.866	.689	.197	.054	.063	
	XDGX175020PDFR-GM	G	F			●	●	.866	.689	.197	.033	.079	
	XDGX175024PDFR-GM	G	F			●	●	.866	.689	.197	.017	.094	
	XDGX175030PDFR-GM	G	F			●	●	.831	.689	.197	.023	.118	
	XDGX175032PDFR-GM	G	F			●	●	.831	.689	.197	.015	.126	
	XDGX175040PDFR-GM	G	F			●	●	.787	.689	.197	.020	.157	
	XDGX175050PDFR-GM	G	F			●	●	.764	.689	.197	.014	.197	
Strong Cutting Edge Fracture Resistance Type **GM** Breaker 	**XDGX175004PDER-GM**	G	E		●			.906	.689	.197	.066	.016	
	XDGX175008PDER-GM	G	E		●			.906	.689	.197	.047	.031	
	XDGX175012PDER-GM	G	E		●			.906	.689	.197	.035	.047	
	XDGX175016PDER-GM	G	E		●			.866	.689	.197	.054	.063	
	XDGX175020PDER-GM	G	E		●			.866	.689	.197	.033	.079	
	XDGX175024PDER-GM	G	E		●			.866	.689	.197	.017	.094	
	XDGX175030PDER-GM	G	E		●			.831	.689	.197	.023	.118	
	XDGX175032PDER-GM	G	E		●			.831	.689	.197	.015	.126	
	XDGX175040PDER-GM	G	E		●			.787	.689	.197	.020	.157	
	XDGX175050PDER-GM	G	E		●			.764	.689	.197	.014	.197	
Low Cutting Resistance **GL** Breaker 	**XDGX175004PDFR-GL**	G	F	★		●		.906	.689	.197	.067	.016	
	XDGX175008PDFR-GL	G	F	★		●		.906	.689	.197	.052	.031	
	XDGX175012PDFR-GL	G	F	★		●		.906	.689	.197	.037	.047	
	XDGX175016PDFR-GL	G	F	★		●		.866	.689	.197	.056	.063	
	XDGX175020PDFR-GL	G	F	★		●		.866	.689	.197	.041	.079	
	XDGX175024PDFR-GL	G	F	★		●		.866	.689	.197	.026	.094	
	XDGX175030PDFR-GL	G	F	★		●		.831	.689	.197	.033	.118	
	XDGX175032PDFR-GL	G	F	★		●		.831	.689	.197	.026	.126	
	XDGX175040PDFR-GL	G	F	★		●		.787	.689	.197	.033	.157	
	XDGX175050PDFR-GL	G	F	★		●		.764	.689	.197	.016	.197	

● = NEW

* The insert nose R differs from radius form which is remains on workpiece material after machining due to the effects of the axial rake angle at the time of setting.
GM breaker is recommended if stress the dimensional precision of the workpiece shape.

■ Holder And Insert Corner Radius Combination

Holder	**D** Type Holder								**B** Type Holder	
	AXD4000AUR2.0004AAD, AXD4000A–050A04RD								**AXD40000AUR2.0004AAE AXD4000A–050A04RE**	
Applicable Insert Corner R (**RE**)	R.016"	R.031"	R.047"	R.063"	R.079"	R.094"	R.118"	R.126"	R.157"	R.197"
	XDGX 175004PD□R-□□	XDGX 175008PD□R-□□	XDGX 175012PD□R-□□	XDGX 175016PD□R-□□	XDGX 175020PD□R-□□	XDGX 175024PD□R-□□	XDGX 175030PD□R-□□	XDGX 175032PD□R-□□	XDGX 175040PD□R-□□	XDGX 175050PD□R-□□

Note 1) Other combinations of holder and insert corner R are not acceptable.

● : USA Stock ★ : Stocked in Japan (10 inserts in one case)

Inserts to be used with the AXD4000A ,which include clamping screws, must be ordered via Kit-order numbers referenced below.

Insert Kit

Package contents of insert kit (10 inserts and 20 clamp screws)

Workpiece Material	N	Aluminum Alloys								Cutting Conditions (Guide): ● :Stable Cutting ◐ :General Cutting ✣ :Unstable Cutting

Shape	Order Number	Stock						Inserts		Clamp Screw		Use
		Coated				Carbide		Order Number	Pieces	Order Number	Pieces	
		LC15TF	MP9120			MT2010	TF15					
Strong Cutting Edge **GM** Breaker 	**K-XDGX175004PDFR-GM**					□	□	XDGX175004PDFR-GM	10	TPS3SB	20	First Recommendation High Speed, High Efficiency and High Load Machining
	K-XDGX175008PDFR-GM					□	□	XDGX175008PDFR-GM	10	TPS3SB	20	
	K-XDGX175012PDFR-GM					□	□	XDGX175012PDFR-GM	10	TPS3SB	20	
	K-XDGX175016PDFR-GM					□	□	XDGX175016PDFR-GM	10	TPS3SB	20	
	K-XDGX175020PDFR-GM					□	□	XDGX175020PDFR-GM	10	TPS3SB	20	
	K-XDGX175024PDFR-GM					□	□	XDGX175024PDFR-GM	10	TPS3SB	20	
	K-XDGX175030PDFR-GM					□	□	XDGX175030PDFR-GM	10	TPS3SB	20	
	K-XDGX175032PDFR-GM					□	□	XDGX175032PDFR-GM	10	TPS3SB	20	
	K-XDGX175040PDFR-GM					□	□	XDGX175040PDFR-GM	10	TPS3SB	20	
	K-XDGX175050PDFR-GM					□	□	XDGX175050PDFR-GM	10	TPS3SB	20	
Strong Cutting Edge Fracture Resistance Type **GM** Breaker 	**K-XDGX175004PDER-GM**		□					XDGX175004PDER-GM	10	TPS3SB	20	
	K-XDGX175008PDER-GM		□					XDGX175008PDER-GM	10	TPS3SB	20	
	K-XDGX175012PDER-GM		□					XDGX175012PDER-GM	10	TPS3SB	20	
	K-XDGX175016PDER-GM		□					XDGX175016PDER-GM	10	TPS3SB	20	
	K-XDGX175020PDER-GM		□					XDGX175020PDER-GM	10	TPS3SB	20	
	K-XDGX175024PDER-GM		□					XDGX175024PDER-GM	10	TPS3SB	20	
	K-XDGX175030PDER-GM		□					XDGX175030PDER-GM	10	TPS3SB	20	
	K-XDGX175032PDER-GM		□					XDGX175032PDER-GM	10	TPS3SB	20	
	K-XDGX175040PDER-GM		□					XDGX175040PDER-GM	10	TPS3SB	20	
	K-XDGX175050PDER-GM		□					XDGX175050PDER-GM	10	TPS3SB	20	
Low Cutting Resistance **GL** Breaker 	**K-XDGX175004PDFR-GL**	□					□	XDGX175004PDFR-GL	10	TPS3SB	20	General Machining
	K-XDGX175008PDFR-GL	□					□	XDGX175008PDFR-GL	10	TPS3SB	20	
	K-XDGX175012PDFR-GL	□					□	XDGX175012PDFR-GL	10	TPS3SB	20	
	K-XDGX175016PDFR-GL	□					□	XDGX175016PDFR-GL	10	TPS3SB	20	
	K-XDGX175020PDFR-GL	□					□	XDGX175020PDFR-GL	10	TPS3SB	20	
	K-XDGX175024PDFR-GL	□					□	XDGX175024PDFR-GL	10	TPS3SB	20	
	K-XDGX175030PDFR-GL	□					□	XDGX175030PDFR-GL	10	TPS3SB	20	
	K-XDGX175032PDFR-GL	□					□	XDGX175032PDFR-GL	10	TPS3SB	20	
	K-XDGX175040PDFR-GL	□					□	XDGX175040PDFR-GL	10	TPS3SB	20	
	K-XDGX175050PDFR-GL	□					□	XDGX175050PDFR-GL	10	TPS3SB	20	

● = NEW

For safety reasons, clamping screws must be replaced at the same time as inserts.

Note 1) Use the GM type insert when using with a high-speed, high-power spindle machine that is the ideal choice for AXD4000A (spindle RPM of 20000 min^{-1} or more, motor power of 80 kw or more).

Note 2) Clamp screw and wrench of AXD4000A are different from AXD4000.

Note 3) For insert dimensions, refer to page 7.

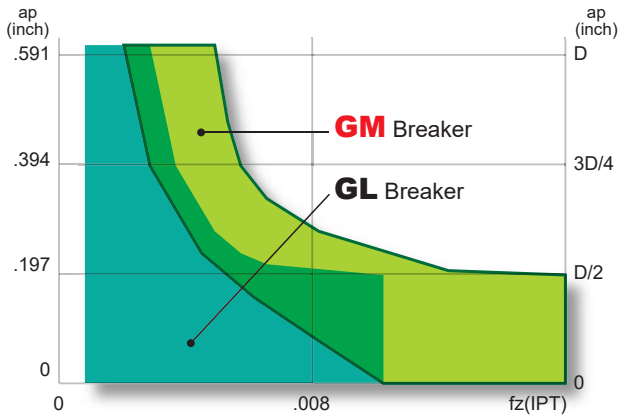
□ : **Non stock, produced to order only.**

Please order in the ① insert kit order number and ② insert grades.

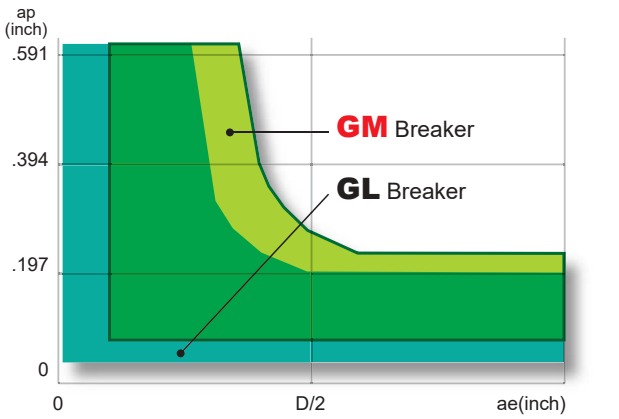
Selection of Insert

It is necessary to choose the best insert according to the cutting conditions. Please select an insert from the tables below.
1st recommendation for High Efficiency and High Load Machining on High-speed Spindles is the GM breaker with a strong cutting edge.

Selection of insert according to the feed per tooth and the required cutting depth



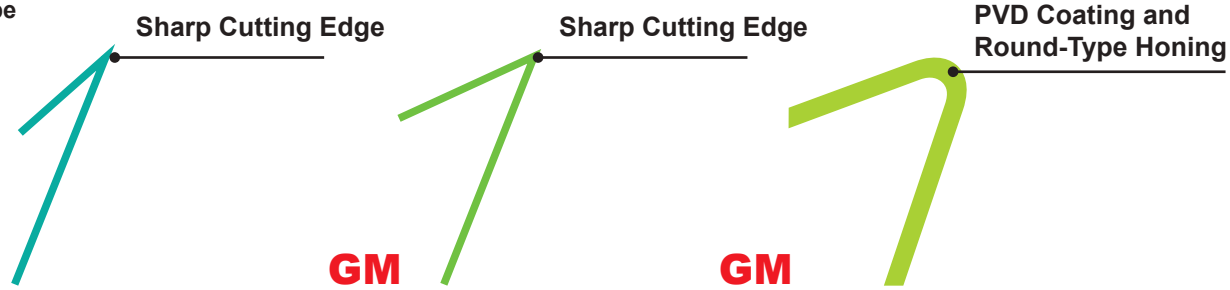
Selection of insert according to the width of cut and the required cutting depth



1st recommendation for machining aluminum alloys is GL breaker.
Under high-load conditions such as deep or high feed cutting, it is advisable to use the GM breaker.

Selection of Insert According to Cutting Edge

Insert Type

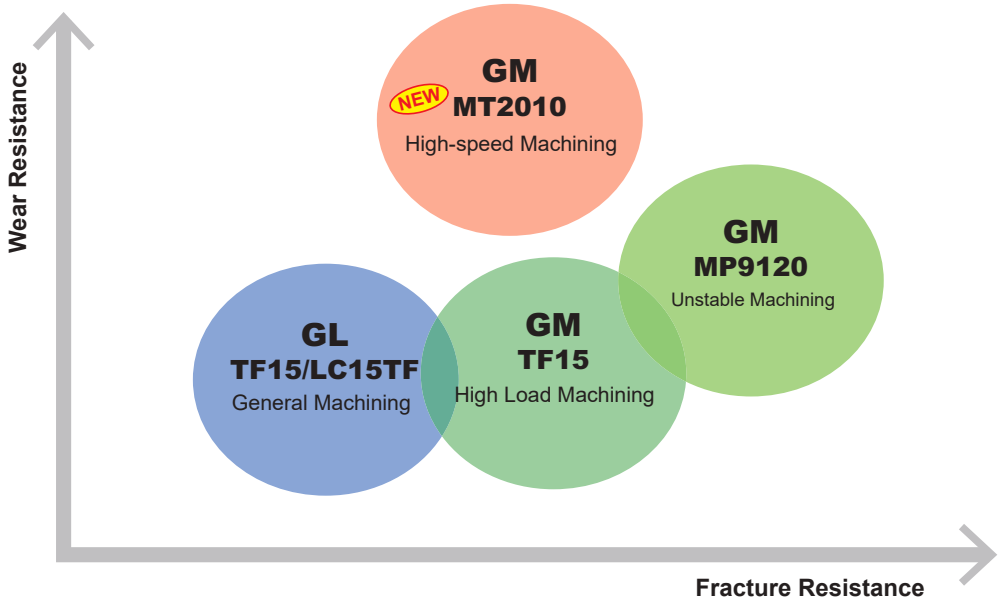


GL
TF15/LC15TF
Low Cutting Resistance
LC15TF : Excellent welding resistance.

GM
MT2010/TF15
Tougher Cutting Edge

GM
MP9120
Strong Fracture Resistant Cutting Edge

Selection of insert according to wear resistance



Recommended Cutting Conditions

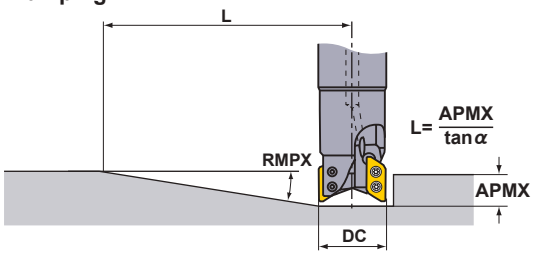
(inch)

	Workpiece Material	Properties	Grade	Breaker	Cutting Speed **vc** (SFM)	Cutting Width **ae**	Depth of Cut **ap**	Feed per Tooth (IPT)
N	Aluminum Alloys	Content Si<5%	MT2010 TF15 MP9120	**GM**	13120(6560—16500)	≤.5 DC	≤ .197	≤ .014
							≤ .394	≤ .012
							≤ .571	≤ .010
						≤.75 DC	≤ .197	≤ .012
							≤ .394	≤ .010
							≤ .571	≤ .008
						DC (Slot)	≤ .197	≤ .012
			TF15 LC15TF	**GL**	13120(6560—16500)	≤.75 DC	≤ .197	≤ .008
							≤ .394	≤ .006
							≤ .571	≤ .004
						DC (Slot)	≤ .197	≤ .008

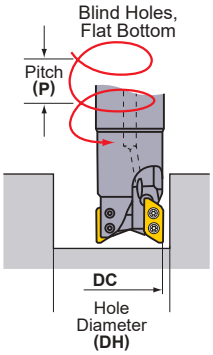
Note 1) The above cutting conditions are determined based on high workpiece materials and machine rigidity, where no vibration occurred. If vibrations occur make adjustments according to the machining conditions.
Note 2) Note, vibrations may occur in the following conditions.
- When using long tool overhang.
- When pocket machining corner radii.
- When the workpiece materials has poor clamping rigidity or when the machine rigidity or workpiece materials rigidity is low, vibrations can occur easily, if so, reduce cutting conditions such as width and depth of cut and feed per tooth.

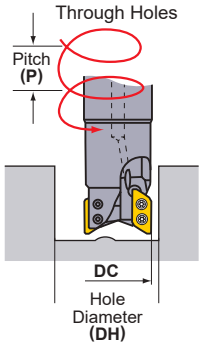
■ Ramping / Helical Milling / Drilling

● **Ramping**



● **Helical Milling**





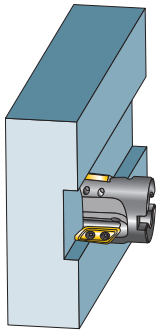
Refer to the table below for cutting conditions. For feed per tooth and cutting speed, follow the cutting conditions for slot milling.

(inch)

DC inch	DC mm	Type	Insert Corner R **RE**	Ramping: Max. Ramping Angle **RMPX**	Ramping: Min. Distance *1 **L**	Helical Milling (Blind Hole, Flat Bottom): Max. Hole Diameter **DH max.**	Helical Milling (Blind Hole, Flat Bottom): Max. Pitch **P max.**	Helical Milling (Blind Hole, Flat Bottom): Min. Hole Diameter **DH min.**	Helical Milling (Blind Hole, Flat Bottom): Max. Pitch **P max.**	Helical Milling (Through Hole): Min. Hole Diameter **DH min.**	Helical Milling (Through Hole): Max. Pitch **P max.**	Drilling
1.969	50.0	D	.016–.047	8.2°	4.252	3.811 *2	.551	3.756	.551	3.197	.551	.217
			.063–.094	7.6°	4.606	3.717 *3	.512	3.685	.512	3.197	.512	.197
			.118–.126	6.9°	5.079	3.654 *4	.472	3.622	.472	3.197	.472	.177
		E	.157	6.3°	5.314	3.591	.394	3.543	.394	3.197	.394	.154
			.197	5.8°	5.748	3.512	.354	3.496	.354	3.197	.354	.142
2.000	50.8	D	.016–.047	8.7°	4.016	3.874 *2	.551	3.819	.551	3.260	.551	.217
			.063–.094	8.2°	4.252	3.780 *3	.512	3.748	.512	3.260	.512	.197
			.118–.126	7.6°	4.606	3.717 *4	.472	3.685	.472	3.260	.472	.177
		E	.157	6.9°	4.843	3.654	.394	3.606	.394	3.260	.394	.154
			.197	6.5°	5.118	3.575	.354	3.559	.354	3.260	.354	.142

*1 Using the maximum ramping angle, the distance to reach the maximum depth of cut is as follows: L= (maximum depth of cut APMX/tan α). Maximum depth of cut D type is .610", E type is .583".
*2 Corner radius of .047". For other corner radii, use the following formula. {(cutting edge diameter DC)–(corner radius RE)–.022"}×2
*3 Corner radius of .094". For other corner radii, use the following formula. {(cutting edge diameter DC)–(corner radius RE)–.022"}×2
*4 Corner radius of .126". For other corner radii, use the following formula. {(cutting edge diameter DC)–(corner radius RE)–.022"}×2
Note 1) The recommended ramping feed is .002 IPT or under.

Application Examples

Tool		Conventional	AXD4000A-050A04RD
Insert (Grade)			XDGX175030PDER-GM(MT2010)
Workpiece			
Components		Aircraft Fuselage Parts	
Cutting Conditions	Spindle Speed **n** (min^{-1})	30000	32000
	Cutting Speed **vc** (SFM)	15420	16405
	Feed per Tooth **fz** (IPT)	.006	.010
	Depth of Cut **ap** (inch)	.197	.197
	Width of Cut **ae** (inch)	1.969	1.969
	Metal Removal Rate **M.R.R** (in^3/min)	275	490
Cutting Mode		Wet Cutting	Wet Cutting
Machine Spindle Type		High Speed and High Power 5-axis MC	
Result		Compared to conventional grade; MT2010 achieved 1.8 times greater M.R.R while maintaining good machining stability.	

Memo

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FOR YOUR SAFETY

- Don't handle inserts and chips without gloves.
- Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage.
- Please use safety covers and wear safety glasses.
- When using compounded cutting oils, please take fire precautions.
- When attaching inserts or spare parts, please use only the correct wrench or driver.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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Tools specifications subject to change without notice.

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