Recommended Cutting Conditions

Cutting Speed

(inch)

	Work Material		Grade	Breaker	vc (SFM)
P	Mild Steel	≤180HB	MP6120	GLA	655 (490—720)
	Carbon Steel Alloy Steel	180—280HB	MP6120	GLA	655 (490—720)
N	Aluminum Alloy	Si<5%	LC15TF	GL	3280 (655—9840)
			TF15	GL	3280 (655—9840)
		5%≤Si≤10% Si>10%	LC15TF	GL	3280 (655—9840)
S	Titanium Alloy	—	MP9120	GLA	130 (100—195)

Feed per Tooth

(inch)

	Work Material		Breaker	ae	ap	Feed per Tooth (IPT) Cutting Edge Diameter DC 1.250" 32mm	1.500" 40mm	2.000"—3.000" 50—80mm	4.000",5.000" 100,125mm
P	Mild Steel	≤180HB	GLA	≤ .25 DC	≤ .197	≤ .007	≤ .008	≤ .008	≤ .008
					≤ .394	≤ .006	≤ .007	≤ .007	≤ .007
					≤ .591	≤ .005	≤ .006	≤ .006	≤ .006
					≤ .987	≤ .004	≤ .005	≤ .005	—
				≤ .5 DC	≤ .197	≤ .007	≤ .008	≤ .008	≤ .008
					≤ .394	≤ .006	≤ .007	≤ .007	≤ .007
					≤ .591	≤ .005	≤ .006	≤ .006	≤ .006
					≤ .987	≤ .004	≤ .005	≤ .005	—
				≤ .75 DC	≤ .197	≤ .006	≤ .006	≤ .007	≤ .007
					≤ .394	≤ .005	≤ .005	≤ .006	≤ .006
					≤ .591	≤ .004	≤ .004	≤ .005	≤ .005
				DC (Slot)	≤ .197	≤ .005	≤ .006	≤ .007	≤ .007
					≤ .394	≤ .004	≤ .005	≤ .006	≤ .006
	Carbon Steel Alloy Steel	180—280HB	GLA	≤ .25 DC	≤ .197	≤ .007	≤ .008	≤ .008	≤ .008
					≤ .394	≤ .006	≤ .007	≤ .007	≤ .007
					≤ .591	≤ .005	≤ .006	≤ .006	≤ .006
					≤ .987	≤ .004	≤ .005	≤ .005	—
				≤ .5 DC	≤ .197	≤ .007	≤ .008	≤ .008	≤ .008
					≤ .394	≤ .006	≤ .007	≤ .007	≤ .007
					≤ .591	≤ .005	≤ .006	≤ .006	≤ .006
					≤ .987	≤ .004	≤ .005	≤ .005	—
				≤ .75 DC	≤ .197	≤ .006	≤ .006	≤ .007	≤ .007
					≤ .394	≤ .005	≤ .005	≤ .006	≤ .006
					≤ .591	≤ .004	≤ .004	≤ .005	≤ .005
				DC (Slot)	≤ .197	≤ .005	≤ .006	≤ .007	≤ .007
					≤ .394	≤ .004	≤ .005	≤ .006	≤ .006

(Note 1) The above cutting conditions are determined based on high workpiece 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 the workpiece has poor clamping rigidity or when the machine rigidity or workpiece rigidity is low,vibrations can occur easily, if so, reduce the cutting conditions.
- When pocket machining corner radii.

Feed per Tooth

(inch)

Work Material			Breaker	ae	ap	Feed per Tooth (IPT)			
						Cutting Edge Diameter **DC**			
						1.250"	**1.500"**	**2.000"—3.000"**	**4.000",5.000"**
						32mm	**40mm**	**50—80mm**	**100,125mm**
N	Aluminum Alloy	**Si<5%**	**GL**	≤ .25 DC	≤ .197	≤ .014	≤ .016	≤ .016	≤ .016
					≤ .394	≤ .012	≤ .014	≤ .014	≤ .014
					≤ .591	≤ .010	≤ .012	≤ .012	≤ .012
					≤ .987	≤ .008	≤ .010	≤ .010	≤ .010
				≤ .5 DC	≤ .197	≤ .014	≤ .014	≤ .016	≤ .016
					≤ .394	≤ .012	≤ .012	≤ .014	≤ .014
					≤ .591	≤ .010	≤ .010	≤ .012	≤ .012
					≤ .987	≤ .008	≤ .008	≤ .010	≤ .010
				≤ .75 DC	≤ .197	≤ .012	≤ .012	≤ .014	≤ .014
					≤ .394	≤ .010	≤ .010	≤ .012	≤ .012
					≤ .591	≤ .008	≤ .008	≤ .010	≤ .010
					≤ .987	≤ .006	≤ .006	≤ .008	≤ .008
				DC (Slot)	≤ .197	≤ .010	≤ .012	≤ .014	≤ .014
					≤ .394	≤ .008	≤ .010	≤ .012	≤ .012
					≤ .591	≤ .006	≤ .008	≤ .010	≤ .010
					≤ .987	≤ .004	≤ .006	≤ .008	≤ .008
		5%≤Si≤10% Si>10%	**GL**	≤ .25 DC	≤ .197	≤ .014	≤ .016	≤ .016	≤ .016
					≤ .394	≤ .012	≤ .014	≤ .014	≤ .014
					≤ .591	≤ .010	≤ .012	≤ .012	≤ .012
					≤ .987	≤ .008	≤ .010	≤ .010	≤ .010
				≤ .5 DC	≤ .197	≤ .014	≤ .014	≤ .016	≤ .016
					≤ .394	≤ .012	≤ .012	≤ .014	≤ .014
					≤ .591	≤ .010	≤ .010	≤ .012	≤ .012
					≤ .987	≤ .008	≤ .008	≤ .010	≤ .010
				≤ .75 DC	≤ .197	≤ .012	≤ .012	≤ .014	≤ .014
					≤ .394	≤ .010	≤ .010	≤ .012	≤ .012
					≤ .591	≤ .008	≤ .008	≤ .010	≤ .010
					≤ .987	≤ .006	≤ .006	≤ .008	≤ .008
				DC (Slot)	≤ .197	≤ .010	≤ .012	≤ .014	≤ .014
					≤ .394	≤ .008	≤ .010	≤ .012	≤ .012
					≤ .591	≤ .006	≤ .008	≤ .010	≤ .010
					≤ .987	≤ .004	≤ .006	≤ .008	≤ .008
S	Titanium Alloy	—	**GLA**	≤ .25 DC	≤ .197	≤ .004	≤ .005	≤ .005	—
					≤ .394	≤ .004	≤ .005	≤ .005	—
					≤ .591	≤ .004	≤ .005	≤ .005	—
					≤ .987	≤ .004	≤ .005	≤ .005	—
				≤ .5 DC	≤ .197	≤ .004	≤ .005	≤ .005	—
					≤ .394	≤ .004	≤ .005	≤ .005	—
					≤ .591	≤ .004	≤ .005	≤ .005	—
					≤ .987	—	≤ .004	≤ .004	—
				≤ .75 DC	≤ .197	≤ .004	≤ .005	≤ .005	—
					≤ .394	≤ .004	≤ .005	≤ .005	—
					≤ .591	≤ .004	≤ .005	≤ .005	—
					≤ .987	—	≤ .004	≤ .004	—
				DC (Slot)	≤ .197	≤ .003	≤ .003	≤ .003	—
					≤ .394	≤ .002	≤ .003	≤ .003	—

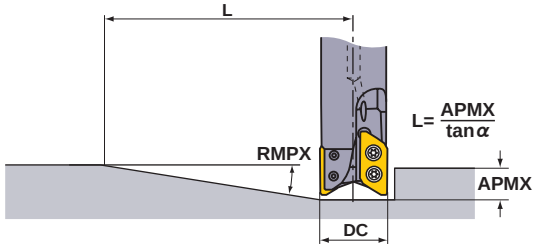
(Note 1) The above cutting conditions are determined based on high workpiece and machine rigidity, where no vibration occurred. If vibrations occur make adjustments according to the machining conditions.

(Note 2) Note, vibrations may occur in the following conditions.

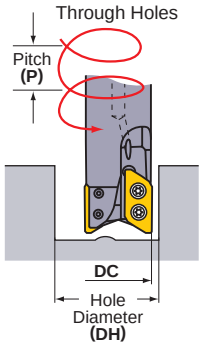
- When using long tool overhang.
- When the workpiece has poor clamping rigidity or when the machine rigidity or workpiece rigidity is low,vibrations can occur easily, if so, reduce the cutting conditions.
- When pocket machining corner radii.

Ramping / Helical Cutting (Aluminum Alloy)

Ramping



Helical Cutting



(inch)

Type	DC	RE	Ramping	
			RMPX	L ⁎1
A Type	1.250	.031—.094	20º	2.272
		.118,.125	19.3º	2.362
	1.500	.031—.094	14.1º	3.292
		.118,.125	13.3º	3.498
	2.000	.031—.094	9.8º	4.788
		.118,.125	9.1º	5.163
	3.000	.031—.094	5.3º	8.915
		.118,.125	4.9º	9.647
	4.000	.031—.094	4.2º	11.262
		.118,.125	3.8º	12.451
	5.000	.031—.094	2.5º	18.941
		.118,.125	2.2º	21.527
B Type	1.250	.157, .197	18º	2.471
	1.500	.157, .197	11º	4.131
	2.000	.157, .197	8º	5.714
	3.000	.157, .197	4º	11.483
	4.000	.157, .197	3º	15.322
	5.000	.157, .197	2º	22.995

(inch)

Type	DC	RE	Helical Cutting	
			DH min.	P max.
A Type	1.250	.031—.094	1.535	.315
		.118,.125	1.535	.315
	1.500	.031—.094	2.047	.394
		.118,.125	2.047	.394
	2.000	.031—.094	3.031	.551
		.118,.125	3.031	.472
	3.000	.031—.094	5.000	.551
		.118,.125	5.000	.512
	4.000	.031—.094	6.969	.669
		.118,.125	6.969	.591
	5.000	.031—.094	9.016	.512
		.118,.125	9.016	.472
B Type	1.250	.157	1.535	.276
		.197	1.535	.276
	1.500	.157	2.047	.315
		.197	2.047	.315
	2.000	.157	3.031	.433
		.197	3.031	.433
	3.000	.157	5.000	.433
		.197	5.000	.433
	4.000	.157	6.969	.472
		.197	6.969	.472
	5.000	.157	9.016	.433
		.197	9.016	.433

(Note) The recommended ramping feed is .002 IPT or under.

⁎1 L (Max. Depth of Cut =.591" / tan α). Cutters' moving distance until depth of cut reaches APMX at a maximum ramping angle.
Maximum depth of cut A type is .827", B type is .803".

⁎2 The maximum diameter when machining a blind hole with a flat face using a corner radius of .031" for A type and .157" for B type.
Other than that, find with the below formula.
{(cutting edge diameter DC)—(corner radius)—0.3)}×2

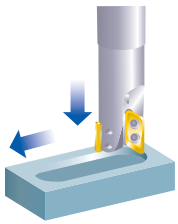
⁎3 The minimum diameter when machining a blind hole with a flat face using a corner radius of .031" for A type and .157" for B type.
Other than that, find with the below formula.
{(cutting edge diameter DC)—(corner radius)—(Width of wiper edge BS)—0.1)}×2

Max. Drilling Depth (Aluminum Alloy)

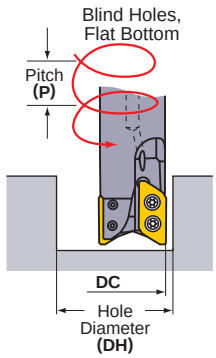
(inch)

Type	RE	Max. Drilling Depth
A Type	.031—.094	.197
	.118, .125	.177
B Type	.157	.157
	.197	.138

AXD7000 can be effectively used for pocket machining without the need for a prepared hole.



Helical Cutting



(inch)

Type	DC	RE	BS	Helical Cutting (Blind Hole, Flat Bottom)			
				DH max. ∗2	P max.	DH min. ∗3	P max.
A Type	1.250"	.031	.079	2.417	.787	2.276	.787
		.063	.047	2.354	.748	2.276	.748
		.079	.031	2.323	.709	2.276	.748
		.094	.016	2.291	.709	2.276	.748
		.118	.031	2.244	.669	2.193	.669
		.125	.024	2.228	.669	2.193	.669
	1.500"	.031	.079	2.902	.787	2.776	.787
		.063	.047	2.839	.748	2.776	.748
		.079	.031	2.807	.709	2.776	.748
		.094	.016	2.776	.709	2.776	.748
		.118	.031	2.728	.669	2.693	.669
		.125	.024	2.713	.669	2.693	.669
	2.000"	.031	.079	3.902	.787	3.768	.787
		.063	.047	3.839	.748	3.768	.748
		.079	.031	3.807	.709	3.768	.748
		.094	.016	3.776	.709	3.768	.748
		.118	.031	3.728	.669	3.768	.669
		.125	.024	3.713	.669	3.687	.669
	3.000"	.031	.079	5.902	.787	5.768	.787
		.063	.047	5.839	.748	5.768	.748
		.079	.031	5.807	.709	5.768	.748
		.094	.016	5.776	.709	5.768	.748
		.118	.031	5.728	.669	5.686	.669
		.125	.024	5.713	.669	5.686	.669
	4.000"	.031	.079	7.902	.787	7.768	.787
		.063	.047	7.839	.748	7.768	.748
		.079	.031	7.807	.709	7.768	.748
		.094	.016	7.776	.709	7.768	.748
		.118	.031	7.728	.669	7.686	.669
		.125	.024	7.713	.669	7.686	.669
	5.000"	.031	.079	9.902	.669	9.767	.630
		.063	.047	9.839	.630	9.767	.630
		.079	.031	9.807	.630	9.767	.630
		.094	.016	9.776	.630	9.767	.630
		.118	.031	9.728	.551	9.685	.551
		.125	.024	9.713	.551	9.685	.551
B Type	1.250"	.157	.035	2.165	.630	2.106	.630
		.197	.016	2.087	.591	2.070	.591
	1.500"	.157	.035	2.650	.630	2.605	.630
		.197	.016	2.571	.591	2.569	.591
	2.000"	.157	.035	3.650	.630	3.599	.630
		.197	.016	3.571	.591	3.563	.591
	3.000"	.157	.035	5.650	.551	5.597	.551
		.197	.016	5.571	.551	5.561	.551
	4.000"	.157	.035	7.650	.591	7.597	.591
		.197	.016	7.571	.591	7.561	.591
	5.000"	.157	.035	9.650	.472	9.597	.472
		.197	.016	9.571	.472	9.560	.472

(Note) The recommended ramping feed is .002 IPT or under.

∗1 L (Max. Depth of Cut =.591" / tan α). Cutters' moving distance until depth of cut reaches APMX at a maximum ramping angle. Maximum depth of cut A type is .827", B type is .803".

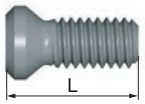
∗2 The maximum diameter when machining a blind hole with a flat face using a corner radius of .031" for A type and .157" for B type. Other than that, find with the below formula.
{(cutting edge diameter DC)−(corner radius)−0.3)}×2

∗3 The minimum diameter when machining a blind hole with a flat face using a corner radius of .031" for A type and .157" for B type. Other than that, find with the below formula.
{(cutting edge diameter DC)−(corner radius)−(Width of wiper edge BS)−0.1)}×2

Operation Guidance

Only use the inserts and parts provided by Mitsubishi Materials with this tool. Use of the correct insert clamp screws is especially important to ensure overall tool safety. Do not use damaged or worn clamp screws.

Type	AXD4000		AXD7000	
Cutting Edge Diameter **DC**(inch)	ø.787"	ø1.000"–ø5.000"	ø1.250"	ø1.500"–ø5.000"
Clamp Screw Number	TS3SBS	TS3SB	TS4SB	TS4SBL
Overall Length **L**(inch)	.256	.315	.353	.413
Clamp Torque (lbf-in)	13	13	31	31



When tightening the clamp screws, follow the order in Figure 1.
The maximum allowable spindle speeds are shown in Table 1.
Ensure that the cutter operates under the maximum allowable spindle speed.
The maximum allowable spindle speeds for safety purposes are determined in accordance with ISO15641 (Milling Cutters for high speed machining–Safety requirements).

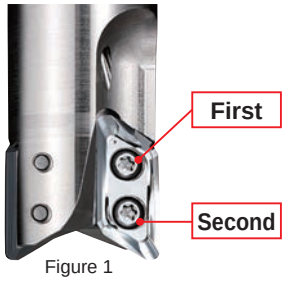


Figure 1

(Table 1) Maximum allowable spindle speed

AXD4000

Cutting Edge Diameter **DC**(inch)	ø.787"	ø1.000"	ø1.250"	ø1.500"	ø2.000"	ø2.500"	ø3.000"	ø4.000"	ø5.000"
Max. Allowable Spindle Speed (min^{-1})	15000	49000	48000	41000	35000	30000	27000	23000	20000

AXD7000

Cutting Edge Diameter **DC**(inch)	ø1.250"	ø1.500"	ø2.000"	ø2.500"	ø3.000"	ø4.000"	ø5.000"
Max. Allowable Spindle Speed (min^{-1})	41000	36000	30000	25000	23000	19000	16000

Even when operating under the maximum allowable spindle speed, if the spindle speed is equal to or higher than the values shown in table 2, it is recommended that the balance quality (with the arbor or milling chuck) conforms to G6.3 or better based on ISO1940. It is also recommended to replace the clamp screws with new ones when changing inserts. Furthermore, ensure to use machines that are provided with safety measures in case of cutter breakage.
* The balance quality of the holder (without inserts and clamp screws) is G6.3 or better at 10000min^{-1}.

(Table 2) Maximum spindle speed when balancing with the arbor or milling chuck has not been achieved

AXD4000

Cutting Edge Diameter **DC**(inch)	ø.787"	ø1.000"	ø1.250"	ø1.500"	ø2.000"	ø2.500"	ø3.000"	ø4.000"	ø5.000"
Max. Spindle Speed (min^{-1})	15000	12000	9500	7600	6000	4800	3800	3000	2400

AXD7000

Cutting Edge Diameter **DC**(inch)	ø1.250"	ø1.500"	ø2.000"	ø2.500"	ø3.000"	ø4.000"	ø5.000"
Max. Spindle Speed (min^{-1})	9500	7600	6000	4800	3800	3000	2400

When setting the spindle speed, take into consideration the maximum allowable spindle speed of the arbor or milling chuck.
Use the specified set bolt when using the arbor type with through coolant.
The inserts have sharp cutting edges and handling them with bare hands may cause injuries. Always wear safety gloves when handling the indexable inserts.