CAUTION FOR USE

Procedure for attaching inserts

1) Use an air blower or brush to clean the insert seats before attaching the inserts.
2) Holding the inserts firmly against the insert seat, tighten the clamp screws using the wrench provided.
3) Tighten the clamp screws in the order shown in Figure 1.
4) Apply anti-seize lubricant to the clamp screws and tighten them with the torque specified.
   The specified torque is as follows.
   AXD7000 3.5N•m(2.58ft•lb)
   AXD4000 1.5N•m(1.11ft•lb)
5) Clamp screws are important parts from the viewpoint of safety. Use clamp screws with the correct part number.
   If the spindle speed is equal to or higher than the values shown in Table 2, it is recommended to replace the clamp screws with new ones when changing inserts.

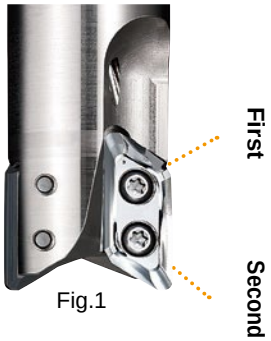
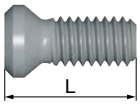


Fig.1

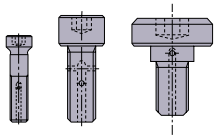
Type	AXD4000		AXD7000		
D1(mm)	ø20	ø25−ø125	ø32	ø40−ø125	
Clamp Screw	TS3SBS	TS3SB	TS4SB	TS4SBL	
Length **L**(mm)	6.5	8	9	10.5	

6) Check that there are no gaps between the insert and the seat before use.

Procedure for attaching the cutter to an arbor

1) Before attaching the cutter to the arbor, carefully clean the socket and end of the cutter and the end of the arbor.
2) Place the cutter on the arbor and tighten the attachment bolt provided. See the table below for the tightening torque.
3) The attachment bolt provided with the AXD is a special bolt for through coolant. Take care not to lose it.

AXD4000

Geometry	Set Bolt	(N•m)	**D1**(mm)	Fig
	HFF08043H	11	ø40	1
	HSC10030H	40	ø50, ø63	2
	HSC12035H	80	ø80	2
	HSC16040H	150	ø100	2
	MBA20040H	320	ø120	3

AXD7000

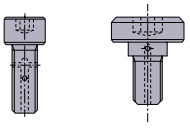
Geometry	Set Bolt	(N•m)	**D1**(mm)	Fig
	HSC10030H	40	ø50, ø63	1
	HSC12035H	80	ø80	1
	HSC16040H	150	ø100	1
	MBA20040H	320	ø120	2

Table 1 Max. Allowable Revolution

AXD4000

Diameter **D1**(mm)	ø25	ø32	ø40	ø50	ø63	ø80	ø100	ø125
Max. Revolution (min^{-1})	49000	48000	41000	35000	30000	27000	23000	20000

AXD7000

Diameter **D1**(mm)	ø32	ø40	ø50	ø63	ø80	ø100	ø125
Max. Revolution (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 betterbased 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.
(Note) The balance quality of the holder (without inserts and clamp screws) is G6.3 or better at 10,000min^{-1}.

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

AXD4000

Diameter **D1**(mm)	ø25	ø32	ø40	ø50	ø63	ø80	ø100	ø125
Max. Revolution (min^{-1})	12000	9500	7600	6000	4800	3800	3000	2400

AXD7000

Diameter **D1**(mm)	ø32	ø40	ø50	ø63	ø80	ø100	ø125
Max. Revolution (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.

RECOMMENDED CUTTING CONDITIONS

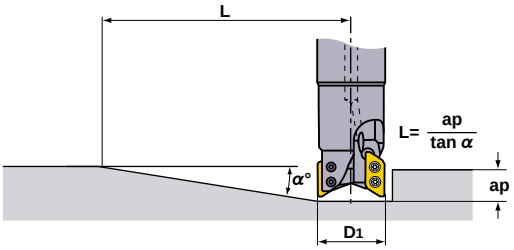
	Work Material		Grade	Breaker	Cutting Speed **vc** (m/min)	Cutting Width **ae** (mm)	Depth of Cut **ap** (mm)	Feed per Tooth (mm/tooth)				
								Cutting Edge Diameter **D1**				
								ϕ20	**ϕ25—ϕ28**	**ϕ32—ϕ35**	**ϕ40**	**ϕ50—ϕ125**
N	Aluminium Alloy (A6061, A7075)	**Si<5%**	**TF15 LC15TF**	**GL**	1000 (200—3000)	<0.25 D1	<5	<0.05	<0.25			
							<10	<0.05	<0.2			
							<14.5	<0.05	<0.15			
						<0.5 D1	<5	<0.05	<0.25			
							<10	—	<0.2			
							<14.5	—	<0.15			
						<0.75 D1	<5	<0.05	<0.25			
							<10	—	<0.2			
							<14.5	—	<0.15			
						D1	<5	<0.05	<0.25			
							<10	—	—			
							<14.5	—	—			
	Aluminium Alloy (A6061, A7075)	**Si<5%**	**TF15 MP9120**	**GM**	1000 (200—3000)	<0.25 D1	<5	<0.05	<0.35	<0.35	<0.4	<0.4
							<10	<0.05	<0.3	<0.3	<0.35	<0.35
							<14.5	<0.05	<0.25	<0.25	<0.3	<0.3
						<0.5 D1	<5	<0.05	<0.35	<0.35	<0.35	<0.4
							<10	—	<0.3	<0.3	<0.3	<0.35
							<14.5	—	<0.2	<0.25	<0.25	<0.3
						<0.75 D1	<5	<0.05	<0.3	<0.3	<0.3	<0.35
							<10	—	<0.25	<0.25	<0.25	<0.3
							<14.5	—	<0.2	<0.2	<0.2	<0.25
						D1	<5	<0.05	<0.25	<0.25	<0.3	<0.35
							<10	—	—	—	—	—
							<14.5	—	—	—	—	—
	Aluminium Alloy (AC4B) Aluminium Alloy (ADC12, A390)	5%≤Si≤10% **Si>10%**	**MP9120**	**GM**	200 (200—3000)	<0.25 D1	<5	<0.05	<0.35	<0.35	<0.4	<0.4
							<10	<0.05	<0.3	<0.3	<0.35	<0.35
							<14.5	<0.05	<0.25	<0.25	<0.3	<0.3
						<0.5 D1	<5	<0.05	<0.35	<0.35	<0.35	<0.4
							<10	—	<0.3	<0.3	<0.3	<0.35
							<14.5	—	<0.2	<0.25	<0.25	<0.3
						<0.75 D1	<5	<0.05	<0.3	<0.3	<0.3	<0.35
							<10	—	<0.25	<0.25	<0.25	<0.3
							<14.5	—	<0.2	<0.2	<0.2	<0.25
						D1	<5	<0.05	<0.25	<0.25	<0.3	<0.35
							<10	—	—	—	—	—
							<14.5	—	—	—	—	—
S	Titanium Alloy (Ti6Al4V)	—	**MP9120**	**GM**	40 (30—60)	<0.25 D1	<5	<0.05	<0.1			
							<10	<0.05	<0.1			
							<14.5	<0.05	<0.1			
						<0.5 D1	<5	<0.05	<0.08	<0.1	<0.1	<0.1
							<10	—	<0.08	<0.1	<0.1	<0.1
							<14.5	—	<0.08	<0.1	<0.1	<0.1
						<0.75 D1	<5	<0.05	<0.05	<0.08	<0.1	<0.1
							<10	—	<0.05	<0.08	<0.1	<0.1
							<14.5	—	<0.05	<0.08	<0.1	<0.1
						D1	<5	<0.05	<0.05	<0.05	<0.05	<0.05
							<10	—	—	—	—	—
							<14.5	—	—	—	—	—

(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.

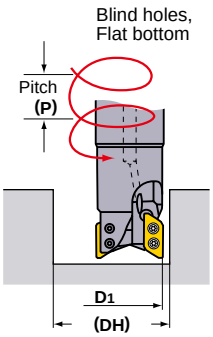
(Note 2) Note, vibrations may occur in the following conditions.
When using long tool overhang.
When pocket machining corner radii.
When the workpiece has poor clamping rigidity or when the machine rigidity or workpiece rigidity is low, vibrations can occur easily, if so, reduce cutting conditions such as width and depth of cut and feed per tooth.

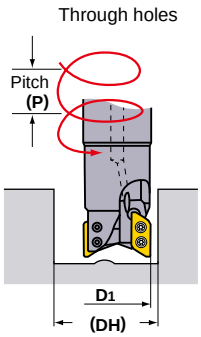
RAMPING/HELICAL MILLING

RAMPING



HELICAL MILLING





RAMPING/HELICAL CUTTING

Holder Type	Diameter D1 (mm)	Insert Corner Radius Re (mm)	Ramping		Helical Milling (Blind Hole, Flat Bottom)				Helical Milling	
			Maximum Ramping Angle α°	Minimum Distance L (mm) ✶1	Maximum Hole Diameter DH max. (mm)	Maximum Pitch P max. (mm)	Minimum Hole Diameter DH min. (mm)	Maximum Pitch P max. (mm)	Minimum Hole Diameter DH min. (mm)	Maximum Pitch P max. (mm)
A type	20	0.4–1.2	20.7	42	37.1 ✶2	14	36.1	14	22	2
		1.6–2.4	19.9	43	34.7 ✶3	13	34.6	13	22	2
		3.0–3.2	18.9	46	33.1 ✶4	12	33.3	12	22	1
	25	0.4–1.2	23.1	37	47.1 ✶2	14	46	14	32	8
		1.6–2.4	22.0	39	44.7 ✶3	13	44.4	13	32	8
		3.0–3.2	18.7	46	43.1 ✶4	12	43	12	32	7
	28	0.4–1.2	19.2	45	53.1 ✶2	14	52	14	36	8
		1.6–2.4	18.5	47	50.7 ✶3	13	50.4	13	36	8
		3.0–3.2	16.7	52	49.1 ✶4	12	48.9	12	36	7
	32	0.4–1.2	15.4	57	61.1 ✶2	14	59.9	14	46	11
		1.6–2.4	14.7	60	58.7 ✶3	13	58.3	13	46	11
		3.0–3.2	13.8	64	57.1 ✶4	12	56.8	12	46	10
	35	0.4–1.2	13.4	66	67.1 ✶2	14	65.8	14	50	11
		1.6–2.4	12.7	69	64.7 ✶3	13	64.3	13	50	10
		3.0–3.2	11.8	75	63.1 ✶4	12	62.8	12	50	9
	40	0.4–1.2	11.1	80	76.7 ✶2	14	75.9	14	62	13
		1.6–2.4	10.4	85	74.3 ✶3	13	74.2	13	62	12
		3.0–3.2	9.7	91	72.7 ✶4	12	72.7	12	62	11
	50	0.4–1.2	8.2	108	96.7 ✶2	14	95.6	14	81	14
		1.6–2.4	7.6	117	94.3 ✶3	13	94	13	81	13
		3.0–3.2	6.9	129	92.7 ✶4	12	92.4	12	81	11
	63	0.4–1.2	6.1	146	122.7 ✶2	14	121.6	14	107	14
		1.6–2.4	5.6	159	120.3 ✶3	13	119.9	13	107	13
		3.0–3.2	5.2	171	118.7 ✶4	12	118.4	12	107	12
	80	0.4–1.2	4.6	193	156.7 ✶2	14	155.6	14	141	14
		1.6–2.4	4.2	212	154.3 ✶3	13	153.9	13	141	13
		3.0–3.2	3.8	234	152.7 ✶4	12	152.4	12	141	12
	100	0.4–1.2	3.5	254	196.7 ✶2	14	195.5	14	181	14
		1.6–2.4	3.2	278	194.3 ✶3	13	193.9	13	181	13
		3.0–3.2	2.9	306	192.7 ✶4	12	192.3	12	181	12
	125	0.4–1.2	2.7	329	246.7 ✶2	14	245.5	14	231	14
		1.6–2.4	2.5	356	244.3 ✶3	13	243.8	13	231	13
		3.0–3.2	2.3	386	242.7 ✶4	12	242.3	12	231	12

(Note) The recommended ramping feed is 0.05mm/tooth or under.

✶1) Using the maximum ramping angle, the distance to reach the maximum depth of cut is as follows:
L= (maximum depth of cut ap/tan %). Maximum depth of cut A type is 15.5mm, B type is 14.8mm.

✶2) Corner radius of 1.2mm. For other corner radii, use the following formula. {(cutting edge diameter D1)–(corner radius Re)–0.25}×2

✶3) Corner radius of 2.4mm. For other corner radii, use the following formula. {(cutting edge diameter D1)–(corner radius Re)–0.25}×2

✶4) Corner radius of 3.2mm. For other corner radii, use the following formula. {(cutting edge diameter D1)–(corner radius Re)–0.25}×2

Holder Type	Diameter **D1** (mm)	Insert Corner Radius **Re** (mm)	Ramping		Helical Milling (Blind Hole, Flat Bottom)				Helical Milling	
			Maximum Ramping Angle **α**°	Minimum Distance **L** (mm) ✶1	Maximum Hole Diameter **DH max.** (mm)	Maximum Pitch **P max.** (mm)	Minimum Hole Diameter **DH min.** (mm)	Maximum Pitch **P max.** (mm)	Minimum Hole Diameter **DH min.** (mm)	Maximum Pitch **P max.** (mm)
B type	20	4	17.5	47	31.5	10	31.8	10	22	1
		5	16.6	71	29.5	6	31.1	7	22	1
	25	4	15.1	55	41.5	10	41.4	10	32	5
		5	13.7	61	39.5	9	40.6	9	32	5
	28	4	14.1	59	47.5	10	47.2	10	36	6
		5	13	65	45.5	9	46.4	9	36	5
	32	4	12.7	66	55.5	10	55.1	10	46	9
		5	12	70	53.5	9	54.3	9	46	8
	35	4	10.8	78	61.5	10	61	10	50	8
		5	10.2	83	59.5	9	60.2	9	50	8
	40	4	8.8	96	71.1	10	70.9	10	62	10
		5	8.2	103	69.1	9	70.1	9	62	9
	50	4	6.3	135	91.1	10	90.6	10	81	10
		5	5.8	146	89.1	9	89.8	9	81	9
	63	4	4.6	184	117.1	10	116.6	10	107	10
		5	4.2	202	115.1	9	115.7	9	107	9
	80	4	3.4	250	151.1	10	150.5	10	141	10
		5	3.1	274	149.1	9	149.6	9	141	9
	100	4	2.6	326	191.1	10	190.5	10	181	10
		5	2.4	354	189.1	9	189.6	9	181	9
	125	4	2	424	241.1	10	240.5	10	231	10
		5	1.8	471	239.1	9	239.6	9	231	9

(Note) The recommended ramping feed is 0.05mm/tooth or under.

✶1) Using the maximum ramping angle, the distance to reach the maximum depth of cut is as follows:
L= (maximum depth of cut ap/tan %). Maximum depth of cut A type is 15.5mm, B type is 14.8mm.

✶2) Corner radius of 1.2mm. For other corner radii, use the following formula. {(cutting edge diameter D_1)−(corner radius Re)−0.25}×2

✶3) Corner radius of 2.4mm. For other corner radii, use the following formula. {(cutting edge diameter D_1)−(corner radius Re)−0.25}×2

✶4) Corner radius of 3.2mm. For other corner radii, use the following formula. {(cutting edge diameter D_1)−(corner radius Re)−0.25}×2

MAX.DRILLING DEPTH

Type	Insert Corner Radius **Re** (mm)	Max.Drilling Depth (mm)					
		Cutting Edge Diameter **D1**					
		ϕ20	**ϕ25**	**ϕ28**	**ϕ32**	**ϕ35**	**ϕ40−ϕ125**
A type	0.4	5.3	5.2	5.2	5.2	5.3	5.3
	0.8	5.3	5.2	5.2	5.2	5.3	5.3
	1.2	5.3	5.2	5.2	5.2	5.3	5.3
	1.6	4.8	4.6	4.7	4.7	4.9	4.8
	2.0	4.8	4.6	4.7	4.7	4.9	4.8
	2.4	4.8	4.6	4.7	4.7	4.9	4.8
	3.0	4.3	3.7	4.2	4.2	4.4	4.4
	3.2	4.3	3.7	4.2	4.2	4.4	4.4
B type	4.0	3.7	2.7	3.7	3.6	3.8	3.8
	5.0	3.4	2.3	3.3	3.3	3.5	3.5

AXD4000 can be effectively used for pocket machining without the need for a prepared hole.