

Inserts
&
Shell type
Expansion

Multi-functional Indexable Cutter

APX3000/4000

A new generation of high performance cutters



M Breaker



H Breaker



GM Breaker



MC5020
H Breaker



APX3000

APX4000

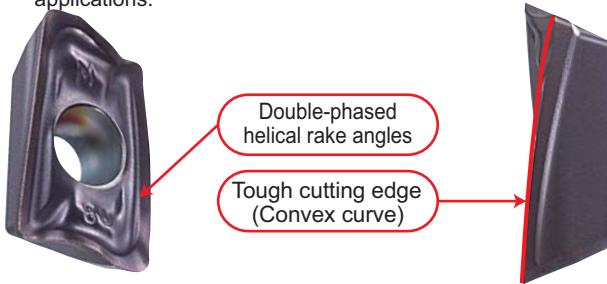
Multi-functional Indexable Cutter

APX3000/4000

Features

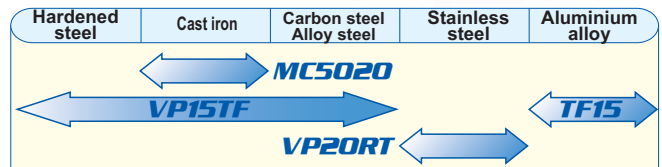
Low Cutting Resistance Inserts

- Advanced simulation technology has been utilised to develop the inserts.
- Efficient machining on low rigidity machines and workpieces is now possible and is ideal for thin wall or extended reach applications.

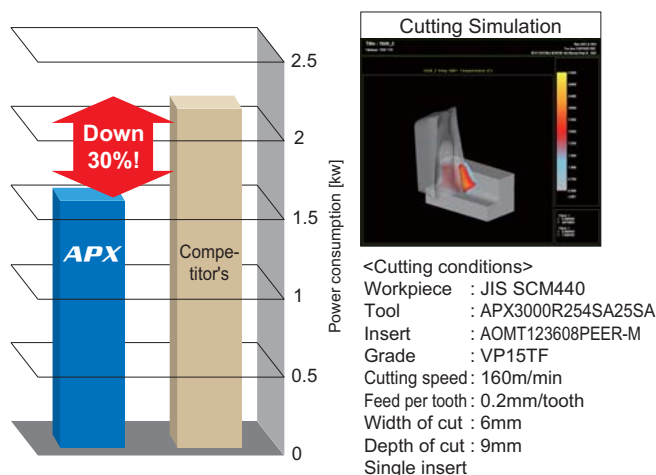


Long Life Insert Grade

MIRACLE coated **VP15TF** has a good balance of wear and fracture resistance. MIRACLE coated **VP20RT** exhibits excellent performance for stainless steel machining. **TF15** is ideal for aluminium alloy machining. **MC5020** achieves to high wear resistance and excellent fracture toughness in the high-speed cutting for the cast iron. These grades are suitable for a variety of work materials.



Power consumption comparison

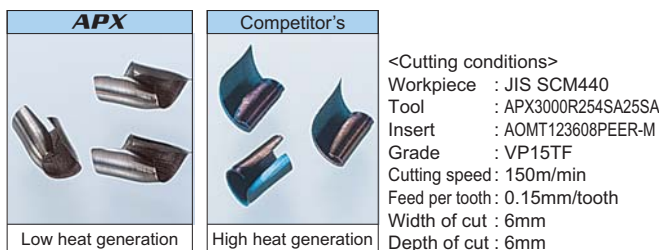


Insert Size

APX4000	APX3000
Max. Depth of Cut 15mm	Max. Depth of Cut 10mm

Ideal Heat Disposal and Chip Control

- Heat generated during cutting has been reduced due to the APX's special geometry.
- Ideal chip shape formed by the insert for easy disposal.



Insert Chip Breaker

New H breaker type inserts are available for the APX4000. The GM breaker type inserts for aluminium alloy machining are now included in the APX3000 range.

General Use M breaker (APX3000, APX4000)	Strong Cutting Edge Type H breaker (APX3000, APX4000)	Aluminium alloy machining GM breaker (APX3000)
Rake angle: 25° 	Rake angle: 7° 	Rake angle: 25°

Note) Rake angle when the insert is set in the cutter body.

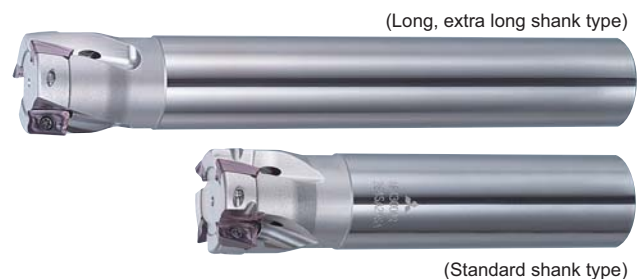
High Rigidity Cutter Bodies

- Rigidity has been increased by using a larger amount of backing metal behind the insert.
- Resistance to corrosion and abrasion on the cutter bodies made possible by using a superior high heat resistant alloy and a special surface treatment.
- The cutter bodies are designed with through coolant holes to improve cooling and chip disposal.



Effective Deep Hole Machining

- APX3000/4000, an extra long shank type is now available for difficult to reach applications.



Cutting Performance

Wall Surface Accuracy

The unique insert geometry allows a consistent and accurate vertical wall to be produced.

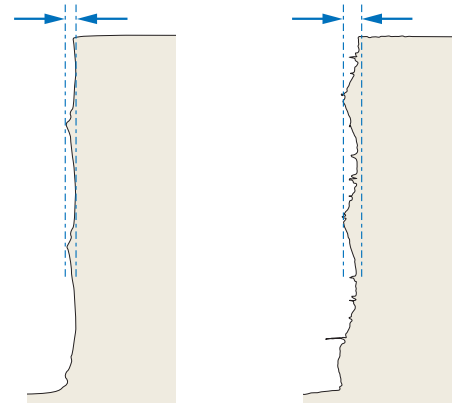
<Cutting conditions>

Workpiece : JIS SCM440
 Tool : APX3000R253SA25SA
 Insert : AOMT123608PEER-M
 Grade : VP15TF
 Cutting speed : 160m/min
 Feed per tooth : 0.15mm/tooth
 Width of cut : 2mm
 Depth of cut : 6mm

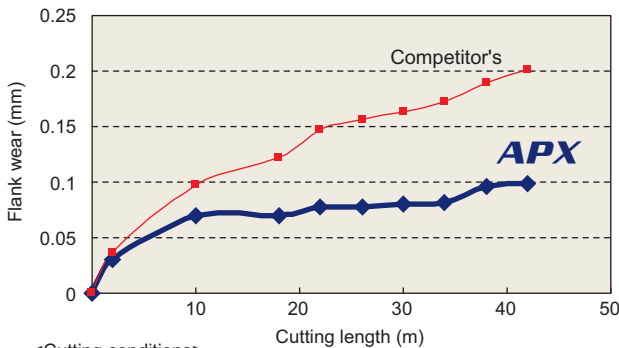


APX
0.021mm

Competitor's
0.032mm



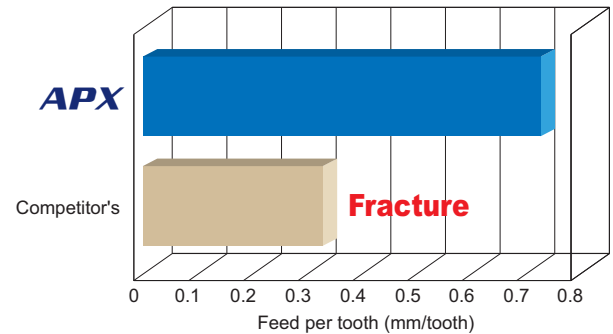
Wear Resistance



<Cutting conditions>

Workpiece : JIS SCM440
 Tool : APX3000R253SA25SA
 Insert : AOMT123608PEER-M
 Grade : VP15TF
 Cutting speed : 200m/min
 Feed per tooth : 0.2mm/tooth
 Width of cut : 3mm
 Depth of cut : 5mm
 Air blow

Fracture Resistance

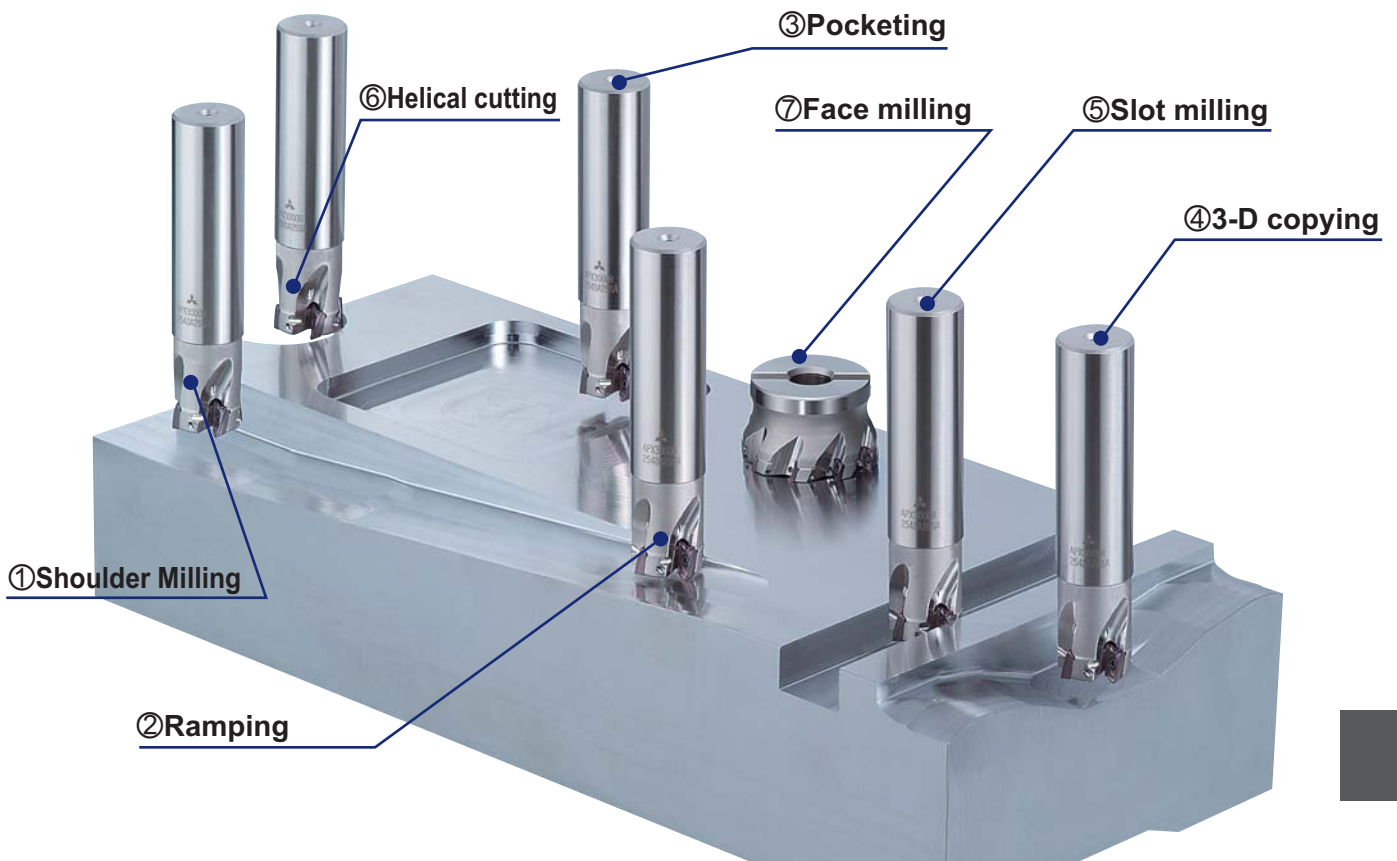


<Cutting conditions>

Workpiece : JIS S55C
 Tool : APX3000R253SA25SA
 Insert : AOMT123608PEER-M
 Grade : VP15TF
 Cutting speed : 160m/min
 Width of cut : 5mm
 Depth of cut : 5mm
 Air blow

Effective Multi-functional Machining

● The APX is highly effective in various 3-D machining operations, including steep ramping angle capabilities.



APX3000

Shank Type



Fig. 1

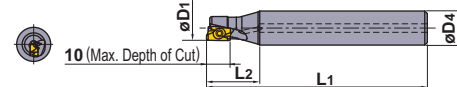


Fig. 2

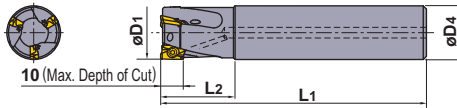
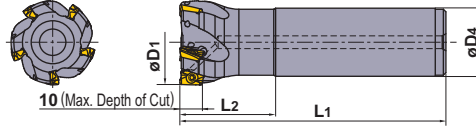


Fig. 3



Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel

Right hand tool holder only.

Type	Order Number	Stock R	Number of Teeth	Dimensions (mm)				Max. Ramping Angle $\alpha(^{\circ})$	Max. Allowable Spindle Speed (min^{-1})	Type (Fig.)				
				D1	D4	L1	L2				Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
Standard	APX3000R121SA16SA	●	1	12	16	85	25	6	10500	1	TPS25	TIP07F	MK1KS	AOMT1236 ○○PEER ○ AOGT1236 ○○PEFR -GM
	141SA16SA	●	1	14	16	85	25	6	9000	1	TPS25	TIP07F	MK1KS	
	162SA16SA	●	2	16	16	85	25	15	20900	2	TPS25	TIP07F	MK1KS	
	182SA16SA	●	2	18	16	85	25	11	19600	3	TPS25	TIP07F	MK1KS	
	202SA20SA	●	2	20	20	100	30	9	18500	2	TPS25	TIP07F	MK1KS	
	203SA20SA	●	3	20	20	100	30	9	18500	2	TPS25	TIP07F	MK1KS	
	223SA20SA	●	3	22	20	115	30	7	17600	3	TPS25-1	TIP07F	MK1KS	
	252SA25SA	●	2	25	25	115	35	6	16400	2	TPS25-1	TIP07F	MK1KS	
	253SA25SA	●	3	25	25	115	35	6	16400	2	TPS25-1	TIP07F	MK1KS	
	254SA25SA	●	4	25	25	115	35	6	16400	2	TPS25-1	TIP07F	MK1KS	
	284SA25SA	●	4	28	25	115	35	4	15500	3	TPS25-1	TIP07F	MK1KS	
	304SA32SA	●	4	30	32	125	45	4	14900	2	TPS25-1	TIP07F	MK1KS	
	323SA32SA	●	3	32	32	125	45	3	14400	2	TPS25-1	TIP07F	MK1KS	
	324SA32SA	●	4	32	32	125	45	3	14400	2	TPS25-1	TIP07F	MK1KS	
	325SA32SA	●	5	32	32	125	45	3	14400	2	TPS25-1	TIP07F	MK1KS	
	403SA32SA	●	3	40	32	125	45	2	12800	3	TPS25-1	TIP07F	MK1KS	
405SA32SA	●	5	40	32	125	45	2	12800	3	TPS25-1	TIP07F	MK1KS		
406SA32SA	●	6	40	32	125	45	2	12800	3	TPS25-1	TIP07F	MK1KS		
507SA32SA	●	7	50	32	125	45	1	11300	3	TPS25-1	TIP07F	MK1KS		
638SA32SA	●	8	63	32	125	45	1	10000	3	TPS25-1	TIP07F	MK1KS		
Long Shank	APX3000R182SA16LA	●	2	18	16	120	25	11	19600	3	TPS25	TIP07F	MK1KS	
	202SA20LA	●	2	20	20	150	60	9	18500	2	TPS25	TIP07F	MK1KS	
	222SA20LA	●	2	22	20	150	30	7	17600	3	TPS25-1	TIP07F	MK1KS	
	252SA25LA	●	2	25	25	170	70	6	16400	2	TPS25-1	TIP07F	MK1KS	
	253SA25LA	●	3	25	25	170	70	6	16400	2	TPS25-1	TIP07F	MK1KS	
	282SA25LA	●	2	28	25	170	35	4	15500	3	TPS25-1	TIP07F	MK1KS	
	283SA25LA	●	3	28	25	170	35	4	15500	3	TPS25-1	TIP07F	MK1KS	
	322SA32LA	●	2	32	32	190	90	3	14400	2	TPS25-1	TIP07F	MK1KS	
	323SA32LA	●	3	32	32	190	90	3	14400	2	TPS25-1	TIP07F	MK1KS	
	352SA32LA	●	2	35	32	190	45	3	13700	3	TPS25-1	TIP07F	MK1KS	
353SA32LA	●	3	35	32	190	45	3	13700	3	TPS25-1	TIP07F	MK1KS		
Extra Long Shank	APX3000R182SA16ELA	●	2	18	16	180	25	11	19600	3	TPS25	TIP07F	MK1KS	
	202SA20ELA	●	2	20	20	200	70	9	18500	2	TPS25	TIP07F	MK1KS	
	222SA20ELA	●	2	22	20	200	30	7	17600	3	TPS25-1	TIP07F	MK1KS	
	252SA25ELA	●	2	25	25	220	80	6	16400	2	TPS25-1	TIP07F	MK1KS	
	253SA25ELA	●	3	25	25	220	80	6	16400	2	TPS25-1	TIP07F	MK1KS	
	282SA25ELA	●	2	28	25	220	35	4	15500	3	TPS25-1	TIP07F	MK1KS	
	283SA25ELA	●	3	28	25	220	35	4	15500	3	TPS25-1	TIP07F	MK1KS	
	322SA32ELA	●	2	32	32	260	100	3	14400	2	TPS25-1	TIP07F	MK1KS	
	323SA32ELA	●	3	32	32	260	100	3	14400	2	TPS25-1	TIP07F	MK1KS	
	352SA32ELA	●	2	35	32	260	45	3	13700	3	TPS25-1	TIP07F	MK1KS	
353SA32ELA	●	3	35	32	260	45	3	13700	3	TPS25-1	TIP07F	MK1KS		

(Note 1) When using inserts with corner radius $Re \geq 2.4$, machining of the holder is required as shown on page 6.

(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

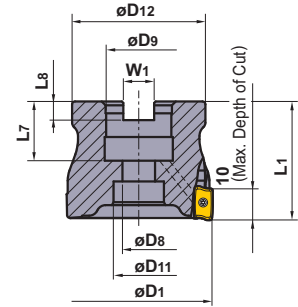
* Clamp Torque (N · m) : TPS25=1.0, TPS25-1=1.0

● : Inventory maintained.

Arbor Type



CH:0°
A.R.:+7°-+21° T:+15°-+27°
R.R.:+15°-+27° I:+7°-+21°



Right hand tool holder only.

D1	Clamping Bolt Order Number	Geometry
$\phi 32, \phi 40$	HSC08030H	
$\phi 50, \phi 63$	10030H	
$\phi 80$	12035H	
$\phi 100$	16040H	

Order Number	Stock	Number of Teeth	Dimensions (mm)									Mass (kg)	Max. Ramping Angle α°	Max. Allowable Spindle Speed (min ⁻¹)	*2			
			D1	L1	D9	L7	D8	D12	W1	L8	D11				Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
APX3000-032A05RA	●	5	32	40	16	18	9	30	8.4	5.6	14	0.2	3	14400	TPS25-1	TIP07F	MK1KS	AOMT
-040A06RA	●	6	40	40	16	18	9	34	8.4	5.6	14	0.3	2	12800	TPS25-1	TIP07F	MK1KS	1236
-050A07RA	●	7	50	40	22	20	11	45	10.4	6.3	17	0.4	2	11300	TPS25-1	TIP07F	MK1KS	PEER
-063A08RA	●	8	63	40	22	20	11	55	10.4	6.3	17	0.7	1	10000	TPS25-1	TIP07F	MK1KS	AOGT
R08009CA	●	9	80	50	25.4	26	13	70	9.5	6	20	1.3	1	8800	TPS25-1	TIP07F	MK1KS	1236
R10011DA	●	11	100	63	31.75	32	17	80	12.7	8	26	2.2	0.5	7800	TPS25-1	TIP07F	MK1KS	PEFR-GM

(Note 1) When using inserts with corner radius $Re \geq 2.4$, machining of the holder is required as shown on page 6.

(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

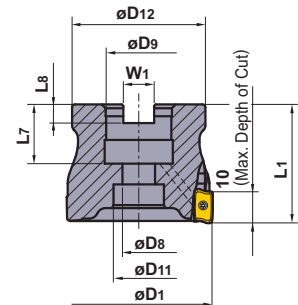
(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

* Clamp Torque (N · m) : TPS25-1=1.0

Arbor Type



CH:0°
A.R.:+7°-+21° T:+15°-+27°
R.R.:+15°-+27° I:+7°-+21°



Right hand tool holder only.

D1	Clamping Bolt Order Number	Geometry
$\phi 32, \phi 40$	HSC08030H	
$\phi 50, \phi 63$	10030H	
$\phi 80$	12035H	
$\phi 100$	16040H	

For metric arbors

The bore diameter (D9) is equivalent to a metric size.

Order Number	Stock	Number of Teeth	Dimensions (mm)									Mass (kg)	Max. Ramping Angle α°	Max. Allowable Spindle Speed (min ⁻¹)	*			
			D1	L1	D9	L7	D8	D12	W1	L8	D11				Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
APX3000-032A05RA	●	5	32	40	16	18	9	30	8.4	5.6	14	0.2	3	14400	TPS25-1	TIP07F	MK1KS	AOMT
-040A06RA	●	6	40	40	16	18	9	34	8.4	5.6	14	0.3	2	12800	TPS25-1	TIP07F	MK1KS	1236
-050A07RA	●	7	50	40	22	20	11	45	10.4	6.3	17	0.4	2	11300	TPS25-1	TIP07F	MK1KS	PEER
-063A08RA	●	8	63	40	22	20	11	55	10.4	6.3	17	0.7	1	10000	TPS25-1	TIP07F	MK1KS	AOGT
-080A09RA	●	9	80	50	27	23	13	70	12.4	7	20	1.3	1	8800	TPS25-1	TIP07F	MK1KS	1236
-100A11RA	●	11	100	63	32	26	17	80	14.4	8	26	2.2	0.5	7800	TPS25-1	TIP07F	MK1KS	PEFR-GM

(Note 1) When using inserts with corner radius $Re \geq 2.4$, machining of the holder is required as shown on page 6.

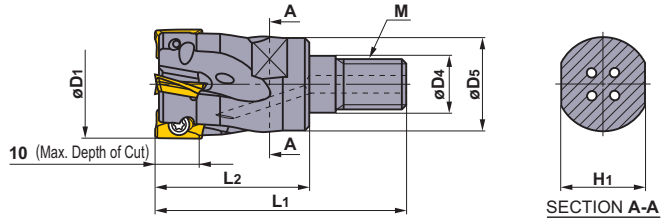
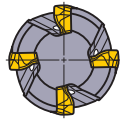
(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

* Clamp Torque (N · m) : TPS25-1=1.0

APX3000

Screw-in Type



SECTION A-A

Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel
➔				

Right hand tool holder only.


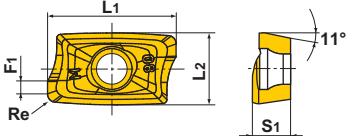

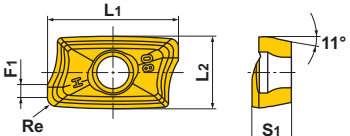

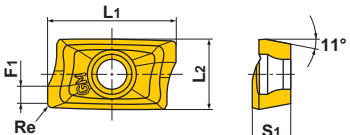
Order Number	Stock	Coolant Hole	Number of Teeth	Dimensions (mm)								Mass (kg)	Clamp Screw *	Wrench	Anti-seizure Lubricant	Insert
				D1	D4	D5	L1	L2	L11	H1	M					
APX3000R162M08A30	●	○	2	16	8.5	13	48	30	6	10	M8	0.1	TPS25	TIP07F	MK1KS	AOMT1236 ○PEER ○ AOGT1236 ○PEFR -GM
182M08A30	●	○	2	18	8.5	13	48	30	6	10	M8	0.1	TPS25	TIP07F	MK1KS	
203M10A30	●	○	3	20	10.5	18	49	30	6	14	M10	0.1	TPS25	TIP07F	MK1KS	
223M10A30	●	○	3	22	10.5	18	49	30	6	14	M10	0.1	TPS25	TIP07F	MK1KS	
254M12A35	●	○	4	25	12.5	21	57	35	6	19	M12	0.2	TPS25-1	TIP07F	MK1KS	
284M12A35	●	○	4	28	12.5	21	57	35	6	19	M12	0.2	TPS25-1	TIP07F	MK1KS	
304M16A40	●	○	4	30	17	29	63	40	6	24	M16	0.3	TPS25-1	TIP07F	MK1KS	
325M16A40	●	○	5	32	17	29	63	40	6	24	M16	0.3	TPS25-1	TIP07F	MK1KS	
355M16A40	●	○	5	35	17	29	63	40	6	24	M16	0.3	TPS25-1	TIP07F	MK1KS	
406M16A40	●	○	6	40	17	29	63	40	6	24	M16	0.3	TPS25-1	TIP07F	MK1KS	

(Note 1) When using inserts with corner radius $Re \geq 2.4$, machining of the holder is required as shown on page 6.

(Note 2) For screw-in type arbors, refer to page 16.

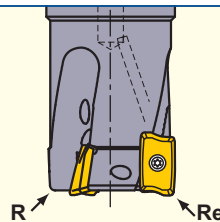
* Clamp Torque (N · m) : TPS25=1.0, TPS25-1=1.0

Inserts

Shape	Order Number	Stock				Dimensions (mm)					Geometry
		Coated		Carbide		L1	L2	S1	F1	Re	
		MC5020	VP15TF	VP20RT	TF15						
General Use M breaker 	AOMT123602PEER-M	●	●			12	6.6	3.6	1.8	0.2	
	123604PEER-M	●	●			12	6.6	3.6	1.6	0.4	
	123608PEER-M	●	●			12	6.6	3.6	1.2	0.8	
	123610PEER-M	●	●			12	6.6	3.6	1.0	1.0	
	123612PEER-M	●	●			12	6.6	3.6	0.8	1.2	
	123616PEER-M	●	●			12	6.6	3.6	0.4	1.6	
	123620PEER-M	●	●			12	6.6	3.6	0.4	2.0	
	123624PEER-M	●	●			12	6.6	3.6	0.4	2.4	
	123630PEER-M	●	●			12	6.6	3.6	0.4	3.0	
123632PEER-M	●	●			12	6.6	3.6	0.4	3.2		
Strong Cutting Edge Type H breaker 	AOMT123604PEER-H	●	●	●		12	6.6	3.6	1.6	0.4	
	123608PEER-H	●	●	●		12	6.6	3.6	1.2	0.8	
	123616PEER-H	●	●	●		12	6.6	3.6	0.4	1.6	
Aluminium Alloy Machining GM breaker 	AOGT123602PEFR-GM				●	12	6.6	3.6	1.8	0.2	
	123604PEFR-GM				●	12	6.6	3.6	1.6	0.4	
	123608PEFR-GM				●	12	6.6	3.6	1.2	0.8	

APX3000: Use of inserts with large corner radii

When using inserts with corner radius $Re \geq 2.4$, please machine the holder with a radius form as shown on the right.



Re (mm)	R (mm)
2.4	1.9
3.0	2.5
3.2	2.7

R : Holder end radius
Re : Insert corner radius

Recommended Cutting Conditions (APX3000)

Cutting Conditions for Shoulder Milling

Work Material	Hardness	Insert Grade/Breaker	Cutting Speed vc (m/min)	Width of Cut ae (mm)	φ12-φ16		φ18-φ25		φ28-φ100	
					Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)
P Mild Steel	≤180HB	VP15TF M Breaker	230 (180-270)	-0.25D1	- 4	0.15	- 5	0.25	- 5	0.20
					4 - 7	0.10	5 - 7	0.20	5 - 7	0.15
							7 - 8.5	0.15	7 - 8.5	0.10
			220 (170-260)	-0.5D1	- 2	0.15	- 3	0.25	- 3	0.20
					2 - 5	0.10	3 - 5.5	0.20	3 - 5.5	0.15
							5.5- 8	0.15	5.5- 8	0.10
			180 (140-210)	-0.75D1	- 4	0.10	- 4	0.15	- 3	0.10
							4 - 10	0.10	3 - 7	0.07
Carbon Steel Alloy Steel	180-350HB	VP15TF M Breaker	180 (140-210)	-0.25D1	- 4	0.15	- 5	0.25	- 5	0.20
					4 - 7	0.10	5 - 7	0.20	5 - 7	0.15
							7 - 8.5	0.15	7 - 8.5	0.10
			170 (130-200)	-0.5D1	- 2	0.15	- 3	0.25	- 3	0.20
					2 - 5	0.10	3 - 5.5	0.20	3 - 5.5	0.15
							5.5- 8	0.15	5.5- 8	0.10
			140 (110-160)	-0.75D1	- 4	0.10	- 4	0.15	- 3	0.10
							4 - 10	0.10	3 - 7	0.07
M Stainless Steel	≤270HB	VP20RT M Breaker	180 (140-210)	-0.25D1	- 4	0.15	- 5	0.20	- 5	0.20
					4 - 7	0.10	5 - 7	0.15	5 - 7	0.15
							7 - 8.5	0.10	7 - 8.5	0.10
			170 (130-200)	-0.5D1	- 2	0.15	- 3	0.20	- 3	0.20
					2 - 5	0.10	3 - 5.5	0.15	3 - 5.5	0.15
							5.5- 8	0.10	5.5- 8	0.10
			140 (110-160)	-0.75D1	- 4	0.10	- 4	0.10	- 3	0.10
							4 - 10	0.07	3 - 7	0.07
K Cast Iron	Tensile Strength ≤350MPa	MC5020 H Breaker	250 (200-300)	-0.25D1	- 4	0.15	- 5	0.25	- 5	0.20
					4 - 7	0.10	5 - 7	0.20	5 - 7	0.15
							7 - 8.5	0.15	7 - 8.5	0.10
			240 (190-290)	-0.5D1	- 2	0.15	- 3	0.25	- 3	0.20
					2 - 5	0.10	3 - 5.5	0.20	3 - 5.5	0.15
							5.5- 8	0.15	5.5- 8	0.10
			210 (160-260)	-0.75D1	- 4	0.10	- 4	0.15	- 3	0.10
							4 - 10	0.10	3 - 7	0.07
Ductile Cast Iron	Tensile Strength ≤800MPa	MC5020 H Breaker	200 (150-250)	-0.25D1	- 4	0.10	- 5	0.20	- 5	0.20
					4 - 7	0.07	5 - 7	0.15	5 - 7	0.15
							7 - 8.5	0.10	7 - 8.5	0.10
			190 (140-240)	-0.5D1	- 2	0.10	- 3	0.20	- 3	0.20
					2 - 5	0.07	3 - 5.5	0.15	3 - 5.5	0.15
							5.5- 8	0.10	5.5- 8	0.10
			170 (120-220)	-0.75D1	- 4	0.07	- 4	0.10	- 3	0.10
							4 - 10	0.07	3 - 7	0.07
N Aluminium Alloy	-	TF15 GM Breaker	500 (200-1000)	-0.25D1	- 4	0.15	- 4	0.25	- 4	0.20
					4 - 7	0.10	4 - 7	0.15	4 - 7	0.10
			500 (200-1000)	-0.5D1	- 4	0.15	- 4	0.20	- 4	0.20
					4 - 7	0.10	4 - 7	0.10	4 - 7	0.10
			500 (200-1000)	-0.75D1	- 5	0.10	- 5	0.15	- 5	0.10
H Hardened Steel	40-55HRC	VP15TF H Breaker	90 (70-100)	-0.25D1	- 4	0.10	- 5	0.15	- 5	0.15
					4 - 7	0.07	5 - 7	0.10	5 - 7	0.10
			85 (60-100)	-0.5D1	- 2	0.10	- 3	0.15	- 3	0.15
					2 - 5	0.07	3 - 5.5	0.10		
			70 (50-80)	-0.75D1	- 4	0.07	- 4	0.07	- 3	0.07

(Note 1) These cutting conditions are a guide to the standard shank type and the arbor type.

Please make adjustments according to the machining conditions.

(Note 2) Vibration is liable to occur in certain cases. Please reduce the depth of cut and / or reduce cutting conditions in the following cases.

- When using the long shank type and extra long shank type.
- When using long tool overhang with the standard or arbor type.
- When the application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) In case of coarse and fine pitch cutters, the coarse pitch type is recommended to prevent vibration.

(Note 4) For heavy interrupted and unstable cutting, the H breaker insert is the first recommendation.

Cutting Conditions for Slot Milling

Work Material	Hardness	Insert Grade/Breaker	Cutting Speed v_c (m/min)	Width of Cut a_e (mm)	$\phi 12-\phi 16$		$\phi 18-\phi 25$		$\phi 28-\phi 100$	
					Depth of Cut a_p (mm)	Feed per Tooth f_z (mm/tooth)	Depth of Cut a_p (mm)	Feed per Tooth f_z (mm/tooth)	Depth of Cut a_p (mm)	Feed per Tooth f_z (mm/tooth)
P Mild Steel	$\leq 180\text{HB}$	VP15TF M Breaker	180 (140-210)	D1	-3	0.10	- 4	0.10	- 3	0.10
							4 - 7	0.07	3 - 5	0.07
Carbon Steel Alloy Steel	180-350HB	VP15TF M Breaker	140 (110-160)	D1	-3	0.10	- 4	0.10	- 3	0.10
							4 - 7	0.07	3 - 5	0.07
M Stainless Steel	$\leq 270\text{HB}$	VP20RT M Breaker	140 (110-160)	D1	-3	0.10	- 4	0.10	- 3	0.10
K Cast Iron	Tensile Strength $\leq 350\text{MPa}$	MC5020 H Breaker	210 (160-260)	D1	-3	0.10	- 4	0.10	- 3	0.10
							4 - 7	0.07	3 - 5	0.07
Ductile Cast Iron	Tensile Strength $\leq 800\text{MPa}$	MC5020 H Breaker	170 (120-220)	D1	-3	0.07	- 4	0.10	- 3	0.10
							4 - 7	0.07	3 - 5	0.07
N Aluminium Alloy	-	TF15 GM Breaker	500 (200-1000)	D1	-5	0.10	- 5	0.20	- 5	0.15
H Hardened Steel	40-55HRC	VP15TF H Breaker	70 (50-80)	D1	-3	0.07	- 4	0.07	- 3	0.07

(Note 1) These cutting conditions are a guide to the standard shank type and the arbor type.

Please make adjustments according to the machining conditions.

(Note 2) Vibration is liable to occur in certain cases. Please reduce the depth of cut and / or reduce cutting conditions in the following cases.

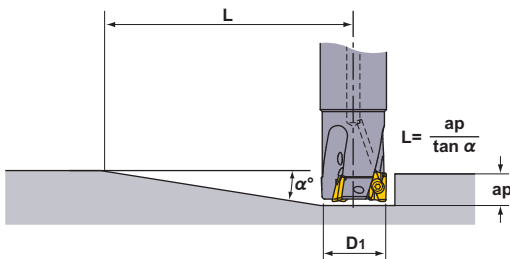
- When using the long shank type and extra long shank type.
- When using long tool overhang with the standard or arbor type.
- When the application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) In case of coarse and fine pitch cutters, the coarse pitch type is recommended to prevent vibration.

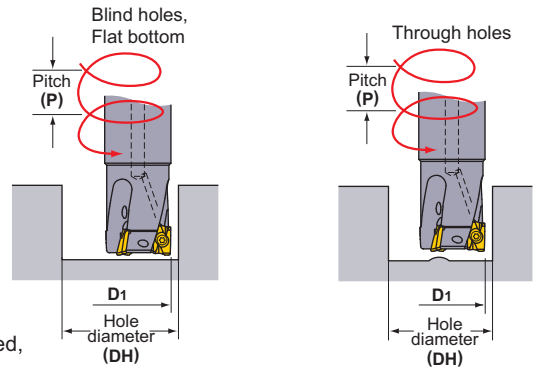
(Note 4) For heavy interrupted and unstable cutting, the H breaker insert is the first recommendation.

Ramping/Helical Cutting

Ramping



Helical Cutting



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

Cutting Edge Diameter D_1 (mm)	Ramping		Helical Cutting (Blind Hole, Flat Bottom)				Helical Cutting (Through Hole)	
	Maximum Ramping Angle α°	Minimum $\star 1$ Distance L (mm)	Maximum $\star 2$ 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)
12	6	95	DH max.	P max.	20.5	2	14	0.5
14	6	95	26	2.5	24.5	2	18	1
16	15	37	30	9	28	7	21	2
18	11	51	34	5	32	4.5	25	2
20	9	63	38	5	36	4.5	29	2
22	7	81	42	5	40	4.5	33	2
25	6	95	48	6	46	5	39	3
28	4	143	54	4.5	52	4	45	2
30	4	143	58	4.5	56	4	49	2
32	3	190	62	4.5	60	4	53	2
35	3	190	68	4	66	3.5	59	2
40	2	286	78	4	76	3.5	69	2
50	1	572	98	2	96	2	89	2
63	1	572	124	2	122	2	115	2
80	1	572	158	2	156	2	149	2
100	0.5	1145	198	1	196	1	189	1

$\star 1$) $L = (10 / \tan \alpha)$. Cutters' moving distance until depth of cut reaches 10mm at a maximum ramping angle.

$\star 2$) In case corner radius of 0.8mm. Other corner that, find with the below formula.

$\{(\text{cutting edge diameter } D_1) - (\text{corner radius}) - 0.2\} \times 2$

(Note) When machining highly ductile materials with ramping angles above, chips could be continuous.

In this case, decrease the ramping angle or feed per tooth.

APX4000

Shank Type



Fig. 1

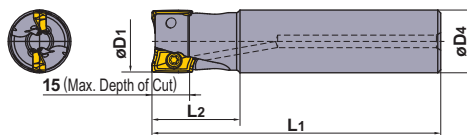
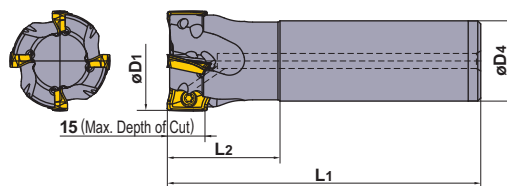


Fig. 2



Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel
➔				

Right hand tool holder only.

Type	Order Number	Stock R	Number of Teeth	Dimensions (mm)				Max. Ramping Angle α°	Max. Allowable Spindle Speed (min ⁻¹)	Type (Fig.)	Tools & Accessories			
				D1	D4	L1	L2				Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
Standard	APX4000R252SA25SA	●	2	25	25	115	35	11	18900	1	TPS4	TIP15W	MK1KS	AOMT1848 PEER
	322SA32SA	●	2	32	32	125	45	7	16300	1	TPS4	TIP15W	MK1KS	
	323SA32SA	●	3	32	32	125	45	7	16300	1	TPS4	TIP15W	MK1KS	
	403SA32SA	●	3	40	32	125	45	6	14200	2	TPS43	TIP15W	MK1KS	
	404SA32SA	●	4	40	32	125	45	6	14200	2	TPS43	TIP15W	MK1KS	
	504SA32SA	●	4	50	32	125	45	4	12400	2	TPS43	TIP15W	MK1KS	
	505SA32SA	●	5	50	32	125	45	4	12400	2	TPS43	TIP15W	MK1KS	
	634SA32SA	●	4	63	32	125	45	3	10800	2	TPS43	TIP15W	MK1KS	
Long Shank	636SA32SA	●	6	63	32	125	45	3	10800	2	TPS43	TIP15W	MK1KS	
	APX4000R252SA25LA	●	2	25	25	170	35	11	18900	1	TPS4	TIP15W	MK1KS	
	282SA25LA	●	2	28	25	170	35	9	17700	2	TPS4	TIP15W	MK1KS	
	322SA32LA	●	2	32	32	190	45	7	16300	1	TPS4	TIP15W	MK1KS	
	323SA32LA	●	3	32	32	190	45	7	16300	1	TPS4	TIP15W	MK1KS	
	352SA32LA	●	2	35	32	190	45	6	15400	2	TPS4	TIP15W	MK1KS	
	353SA32LA	●	3	35	32	190	45	6	15400	2	TPS4	TIP15W	MK1KS	
	402SA32LA	●	2	40	32	190	45	6	14200	2	TPS43	TIP15W	MK1KS	
Extra Long Shank	403SA32LA	●	3	40	32	190	45	6	14200	2	TPS43	TIP15W	MK1KS	
	404SA32LA	●	4	40	32	190	45	6	14200	2	TPS43	TIP15W	MK1KS	
	APX4000R252SA25ELA	●	2	25	25	220	80	11	18900	1	TPS4	TIP15W	MK1KS	
	282SA25ELA	●	2	28	25	220	35	9	17700	2	TPS4	TIP15W	MK1KS	
	322SA32ELA	●	2	32	32	260	100	7	16300	1	TPS4	TIP15W	MK1KS	
	323SA32ELA	●	3	32	32	260	100	7	16300	1	TPS4	TIP15W	MK1KS	
	352SA32ELA	●	2	35	32	260	45	6	15400	2	TPS4	TIP15W	MK1KS	
	353SA32ELA	●	3	35	32	260	45	6	15400	2	TPS4	TIP15W	MK1KS	
402SA32ELA	●	2	40	32	260	45	6	14200	2	TPS43	TIP15W	MK1KS		
403SA32ELA	●	3	40	32	260	45	6	14200	2	TPS43	TIP15W	MK1KS		
404SA32ELA	●	4	40	32	260	45	6	14200	2	TPS43	TIP15W	MK1KS		

(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

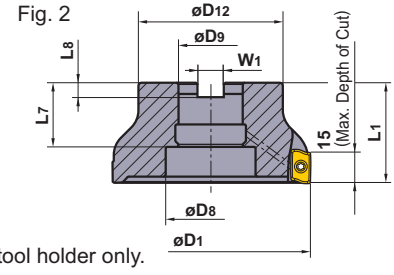
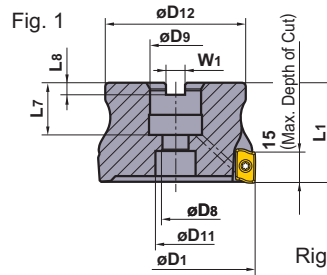
(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

* Clamp Torque (N · m) : TPS4=3.5, TPS43=3.5

Arbor Type



C H:0°
A.R:+15°--+22° T:+21°--+28°
R.R:+21°--+28° I :+15°--+22°



Right hand tool holder only.

D1	Clamping Bolt Order Number	Geometry	
$\phi 40$	HSC08030H	①	
$\phi 50, \phi 63$	10030H		
$\phi 80$	12035H		
$\phi 100$	16040H	②	
$\phi 125$	MBA20040H		
$\phi 160$	24045H		

Order Number	Stock	Number of Teeth	Dimensions (mm)								Mass (kg)	Max. Ramping Angle α°	Max. Allowable Spindle Speed (min ⁻¹)	Type (Fig.)	*2				
			D1	L1	D9	L7	D8	D12	W1	L8					D11	Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
APX4000-040A04RA	●	4	40	40	16	18	9	34	8.4	5.6	14	0.2	6	14200	1	TPS43	TIP15W	MK1KS	AOMT 1848 PEER
-050A05RA	●	5	50	40	22	20	11	45	10.4	6.3	17	0.3	4	12400	1	TPS43	TIP15W	MK1KS	
-063A06RA	●	6	63	40	22	20	11	50	10.4	6.3	17	0.5	3	10800	1	TPS43	TIP15W	MK1KS	
R08007CA	●	7	80	50	25.4	26	13	70	9.5	6	20	1.2	2	9300	1	TPS43	TIP15W	MK1KS	
R10008DA	●	8	100	63	31.75	32	17	80	12.7	8	26	2.1	1.5	8100	1	TPS43	TIP15W	MK1KS	
R12509EA	●	9	125	63	38.1	40	56	100	15.9	10	—	3.3	1	7100	2	TPS43	TIP15W	MK1KS	
R16010FA	●	10	160	63	50.8	40	72	100	19.1	11	—	4.8	1	6100	2	TPS43	TIP15W	MK1KS	

(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

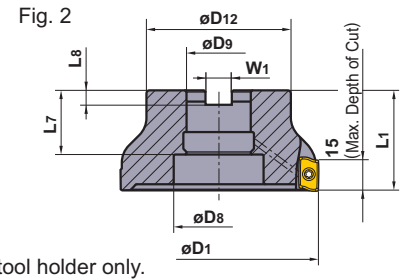
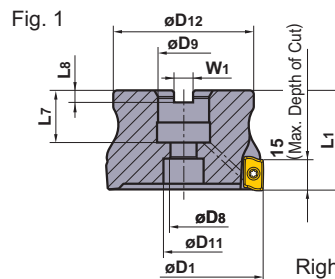
(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

* Clamp Torque (N • m) : TPS43=3.5

Arbor Type



C H:0°
A.R:+15°--+22° T:+21°--+28°
R.R:+21°--+28° I :+15°--+22°



Right hand tool holder only.

D1	Clamping Bolt Order Number	Geometry	
$\phi 40$	HSC08030H	①	
$\phi 50, \phi 63$	10030H		
$\phi 80$	12035H		
$\phi 100$	16040H	②	
$\phi 125$	MBA20040H		
$\phi 160$	24045H		

For metric arbors

The bore diameter (D9) is equivalent to a metric size.

Order Number	Stock	Number of Teeth	Dimensions (mm)								Mass (kg)	Max. Ramping Angle α°	Max. Allowable Spindle Speed (min ⁻¹)	Type (Fig.)	*				
			D1	L1	D9	L7	D8	D12	W1	L8					D11	Clamp Screw	Wrench	Anti-seizure Lubricant	Insert
APX4000-040A04RA	●	4	40	40	16	18	9	34	8.4	5.6	14	0.2	6	14200	1	TPS43	TIP15W	MK1KS	AOMT 1848 PEER
-050A05RA	●	5	50	40	22	20	11	45	10.4	6.3	17	0.3	4	12400	1	TPS43	TIP15W	MK1KS	
-063A06RA	●	6	63	40	22	20	11	50	10.4	6.3	17	0.5	3	10800	1	TPS43	TIP15W	MK1KS	
-080A07RA	●	7	80	50	27	23	13	60	12.4	7	20	1.2	2	9300	1	TPS43	TIP15W	MK1KS	
-100A08RA	●	8	100	50	32	25	17	70	14.4	8	27	2.1	1.5	8100	1	TPS43	TIP15W	MK1KS	
-125A09RA	●	9	125	63	40	40	56	90	16.4	9	—	3.3	1	7100	2	TPS43	TIP15W	MK1KS	
-160A10RA	●	10	160	63	40	40	72	100	16.4	9	—	4.8	1	6100	2	TPS43	TIP15W	MK1KS	

(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

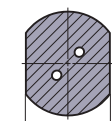
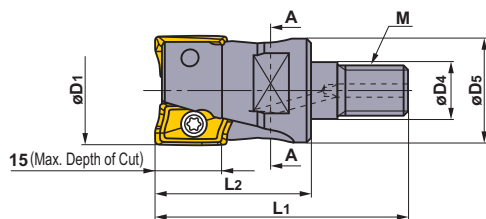
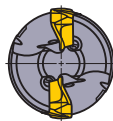
(Note 2) The maximum allowable spindle speeds are set to ensure tool and insert stability.

(Note 3) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

* Clamp Torque (N • m) : TPS43=3.5

APX4000

Screw-in Type



SECTION A-A

Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel
	➔			

Right hand tool holder only.

Order Number	Stock	Coolant Hole	Number of Teeth	Dimensions (mm)							Mass (kg)	Clamp Screw	Wrench	Anti-seizure Lubricant	Insert	
				D1	D4	D5	L1	L2	L11	H1						M
APX4000R252M12A35	●	○	2	25	12.5	23.5	57	35	6	19	M12	0.2	TPS4	TIP15W	MK1KS	AOMT1848 PEER
282M12A35	●	○	2	28	12.5	23.5	57	35	6	19	M12	0.2	TPS4	TIP15W	MK1KS	
322M16A40	●	○	2	32	17	28.5	63	40	6	24	M16	0.3	TPS4	TIP15W	MK1KS	
323M16A40	●	○	3	32	17	28.5	63	40	6	24	M16	0.3	TPS4	TIP15W	MK1KS	
352M16A40	●	○	2	35	17	28.5	63	40	6	24	M16	0.3	TPS4	TIP15W	MK1KS	
353M16A40	●	○	3	35	17	28.5	63	40	6	24	M16	0.3	TPS4	TIP15W	MK1KS	
403M16A40	●	○	3	40	17	28.5	63	40	6	24	M16	0.3	TPS43	TIP15W	MK1KS	
404M16A40	●	○	4	40	17	28.5	63	40	6	24	M16	0.3	TPS43	TIP15W	MK1KS	

(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

(Note 2) For screw-in type arbors, refer to page 16.

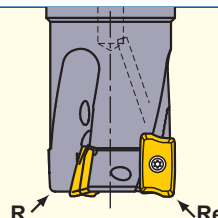
* Clamp Torque (N · m) : TPS4=3.5, TPS43=3.5

Inserts

Shape	Order Number	Stock			Dimensions (mm)					Geometry
		Coated			L1	L2	S1	F1	Re	
		MC5020	VP15TF	VP20RT						
General Use M breaker	AOMT184804PEER-M	●	●		18	9	4.8	1.8	0.4	
	184808PEER-M	●	●		18	9	4.8	1.4	0.8	
	184810PEER-M	●			18	9	4.8	1.0	1.0	
	184812PEER-M	●			18	9	4.8	0.8	1.2	
	184816PEER-M	●			18	9	4.8	0.4	1.6	
	184820PEER-M	●			18	9	4.8	0.4	2.0	
Strong Cutting Edge Type H breaker	AOMT184804PEER-H	●	●	●	18	9	4.8	1.8	0.4	
	184808PEER-H	●	●	●	18	9	4.8	1.4	0.8	
	184816PEER-H	●	●	●	18	9	4.8	0.4	1.6	
	184832PEER-H		●		18	9	4.8	0.4	3.2	
	184840PEER-H		●		18	9	4.8	0.4	4.0	
	184850PEER-H		●		18	9	4.8	—	5.0	
	184864PEER-H		●		18	9	4.8	—	6.35	

APX4000: Use of inserts with large corner radii

When using inserts with corner radius $Re \geq 3.2$, please machine the holder with a radius form as shown on the right.



Re (mm)	R (mm)
3.2	2.0
4.0	2.5
5.0	3.5
6.35	5.0

R : Holder end radius
Re : Insert corner radius

● : Inventory maintained.(10 inserts in a case)

Recommended Cutting Conditions (APX4000)

Cutting Conditions for Shoulder Milling

Work Material	Hardness	Insert Grade/Breaker	Cutting Speed vc (m/min)	Width of Cut ae (mm)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)					
						$\phi 25-\phi 40$	$\phi 50-\phi 80$	$\phi 100-\phi 160$			
P Mild Steel	$\leq 180\text{HB}$	VP15TF H Breaker	230 (180-270)	-0.25D1	-5	0.3	0.3	0.25			
					5-7.5	0.25	0.25	0.2			
					7.5-10	0.2	0.2	0.15			
					10-12.5	0.15	0.15	0.1			
			220 (170-260)	-0.5D1	12.5-15	0.1	0.1	0.07			
					-5	0.3	0.3	0.25			
					5-7.5	0.25	0.25	0.2			
					7.5-10	0.2	0.2	0.15			
			180 (140-210)	-0.75D1	10-12.5	0.15	0.15	0.1			
					12.5-15	0.1	0.1	0.07			
					-5	0.2	0.2	0.15			
					5-10	0.15	0.15	0.1			
	Carbon Steel Alloy Steel	180-350HB	VP15TF M Breaker	180 (140-210)	-0.25D1	10-15	0.1	0.1	0.07		
						-5	0.3	0.3	0.25		
						5-7.5	0.25	0.25	0.2		
						7.5-10	0.2	0.2	0.15		
				170 (130-200)	-0.5D1	10-12.5	0.15	0.15	0.1		
						12.5-15	0.1	0.1	0.07		
						-5	0.3	0.3	0.25		
						5-7.5	0.25	0.25	0.2		
				140 (110-160)	-0.75D1	7.5-10	0.2	0.2	0.15		
						10-12.5	0.15	0.15	0.1		
						12.5-15	0.1	0.1	0.07		
						-5	0.2	0.2	0.15		
M Stainless Steel	$\leq 270\text{HB}$	VP20RT M Breaker	180 (140-210)	-0.25D1	5-10	0.15	0.15	0.1			
					10-15	0.1	0.1	0.07			
					-5	0.3	0.3	0.25			
					5-7.5	0.25	0.25	0.2			
			170 (130-200)	-0.5D1	7.5-10	0.2	0.15	0.15			
					10-12.5	0.15	0.1	0.1			
					12.5-15	0.1	0.07	0.07			
					-5	0.3	0.25	0.25			
			140 (110-160)	-0.75D1	5-7.5	0.25	0.2	0.2			
					7.5-10	0.2	0.15	0.15			
					10-12.5	0.15	0.1	0.1			
					12.5-15	0.1	0.07	0.07			
	K Cast Iron	Tensile Strength $\leq 350\text{MPa}$	MC5020 H Breaker	250 (200-300)	-0.25D1	5-10	0.15	0.15	0.1		
						10-15	0.1	0.1	0.07		
						-5	0.3	0.3	0.25		
						5-7.5	0.25	0.25	0.2		
				240 (190-290)	-0.5D1	7.5-10	0.2	0.2	0.15		
						10-12.5	0.15	0.15	0.1		
						12.5-15	0.1	0.1	0.07		
						-5	0.3	0.3	0.25		
				210 (160-260)	-0.75D1	5-7.5	0.25	0.25	0.2		
						7.5-10	0.2	0.2	0.15		
						10-12.5	0.15	0.15	0.1		
						12.5-15	0.1	0.1	0.07		
Ductile Cast Iron		Tensile Strength $\leq 800\text{MPa}$	MC5020 H Breaker	200 (150-250)	-0.25D1	5-10	0.15	0.15	0.1		
						10-15	0.1	0.1	0.07		
						-5	0.25	0.25	0.25		
						5-7.5	0.2	0.2	0.2		
				190 (140-140)	-0.5D1	7.5-10	0.15	0.15	0.15		
						10-12.5	0.1	0.1	0.1		
						12.5-15	0.07	0.07	0.07		
						-5	0.25	0.25	0.25		
				170 (120-220)	-0.75D1	5-7.5	0.2	0.2	0.2		
						7.5-10	0.15	0.15	0.15		
						10-12.5	0.1	0.1	0.1		
						12.5-15	0.07	0.07	0.07		
S Ti Alloy	$\leq 350\text{HB}$	VP20RT H Breaker	40 (30-60)	-0.25D1	5-10	0.15	0.1	0.1			
					10-15	0.1	0.05	0.05			
					7.5-10	0.05	-	-			
			Heat Resistant Alloy	-	VP20RT H Breaker	30 (20-40)	-0.25D1	-2	0.1	0.05	0.05
H Hardened Steel	40-55HRC	VP15TF H Breaker	90 (70-100)	-0.25D1	5-10	0.15	0.15	0.15			
					10-15	0.1	0.1	0.1			
					7.5-10	0.07	0.07	0.07			
			85 (60-100)	-0.5D1	-5	0.1	0.1	0.1			
					5-7.5	0.07	0.07	0.07			
					7.5-10	0.07	0.07	0.07			
70	-0.75D1	-5	0.07	0.07	0.07						

(Note 1) These cutting conditions are a guide to the standard shank type and the arbor type.

Please make adjustments according to the machining conditions.

(Note 2) Vibration is liable to occur in certain cases. Please reduce the depth of cut and / or reduce cutting conditions in the following cases.

- When using the long shank type and extra long shank type.
- When using long tool overhang with the standard or arbor type.
- When the application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) In case of coarse and fine pitch cutters, the coarse pitch type is recommended to prevent vibration.

(Note 4) For heavy interrupted and unstable cutting, the H breaker insert is the first recommendation.

Cutting Conditions for Slot Milling

Work Material	Hardness	Insert Grade/Breaker	Cutting Speed vc (m/min)	Width of Cut ae (mm)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)		
						$\phi 25-\phi 40$	$\phi 50-\phi 80$	$\phi 100-\phi 160$
P Mild Steel	≤180HB	VP15TF M Breaker	180 (140-210)	D1	-5	0.15	0.15	0.15
					5-7.5	0.1	0.1	0.1
					7.5-10	0.07	0.07	0.07
Carbon Steel Alloy Steel	180-350HB	VP15TF M Breaker	140 (110-160)	D1	-5	0.15	0.15	0.15
					5-7.5	0.1	0.1	0.1
					7.5-10	0.07	0.07	0.07
M Stainless Steel	≤270HB	VP20RT M Breaker	140 (110-160)	D1	-5	0.15	0.15	0.15
					5-7.5	0.1	0.1	0.1
					7.5-10	0.07	0.07	0.07
K Cast Iron	Tensile Strength ≤350MPa	MC5020 H Breaker	210 (160-260)	D1	-5	0.15	0.15	0.15
					5-7.5	0.1	0.1	0.1
					7.5-10	0.07	0.07	0.07
Ductile Cast Iron	Tensile Strength ≤800MPa	MC5020 H Breaker	170 (120-220)	D1	-5	0.15	0.15	0.15
					5-7.5	0.1	0.1	0.1
					7.5-10	0.07	0.07	0.07
S Ti Alloy	≤350HB	VP20RT H Breaker	40 (30-60)	D1	-5	0.05	0.05	0.05
					Heat Resistant Alloy	-	VP20RT H Breaker	30 (20-40)
H Hardened Steel	40-55HRC	VP15TF H Breaker	70 (50-80)	D1	-5	0.07	0.07	0.07

(Note 1) These cutting conditions are a guide to the standard shank type and the arbor type.

Please make adjustments according to the machining conditions.

(Note 2) Vibration is liable to occur in certain cases. Please reduce the depth of cut and / or reduce cutting conditions in the following cases.

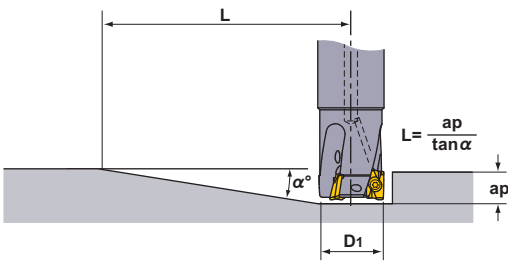
- When using the long shank type and extra long shank type.
- When using long tool overhang with the standard or arbor type.
- When the application has poor clamping rigidity or when using a low rigidity machine.

(Note 3) In case of coarse and fine pitch cutters, the coarse pitch type is recommended to prevent vibration.

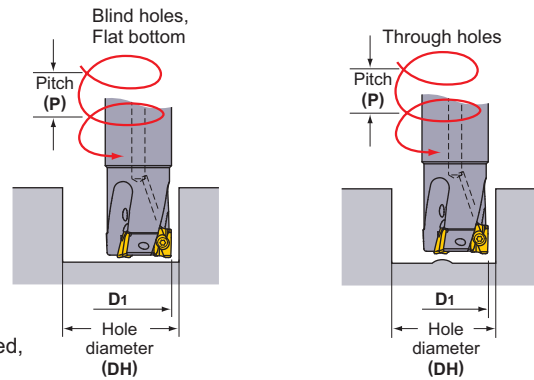
(Note 4) For heavy interrupted and unstable cutting, the H breaker insert is the first recommendation.

Ramping/Helical Cutting

Ramping



Helical Cutting



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

Cutting Edge Diameter D1 (mm)	Ramping		Helical Cutting (Blind Hole, Flat Bottom)				Helical Cutting (Through Hole)	
	Maximum Ramping Angle α (°)	Minimum Distance L (mm) *1	Maximum Hole Diameter DH max. (mm) *2	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)
25	11	85	48	14	45	12	32	4
28	9	105	54	12	51	11	38	4
32	7	135	62	11	59	10	46	5
35	6	158	68	10	65	9	52	5
40	6	158	78	12	75	11	62	7
50	4	238	98	10	95	9	82	7
63	3	318	124	10	121	9	108	7
80	2	477	158	8	155	8	142	6
100	1.5	636	198	8	195	7	182	6
125	1	954	248	6	245	6	232	5
160	1	954	318	8	315	8	302	7

*1) $L = (15/\tan\alpha)$. Cutters' moving distance until depth of cut reaches 15mm at a maximum ramping angle.

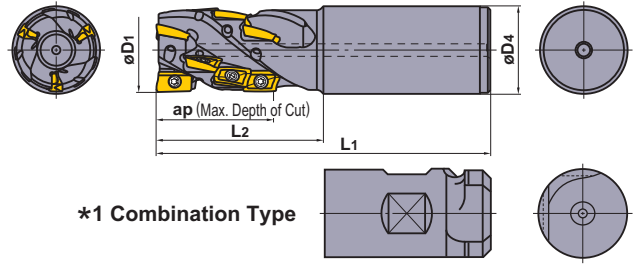
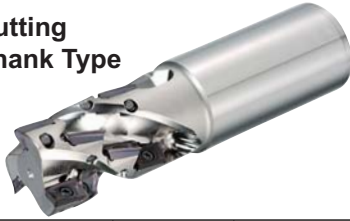
*2) In case corner radius of 0.8mm. Other corner that, find with the below formula.

$\{(cutting\ edge\ diameter\ D1) - (corner\ radius) - 0.2\} \times 2$

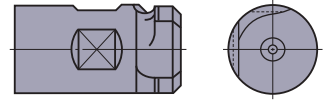
(Note) When machining highly ductile materials with ramping angles above, chips could be continuous. In this case, decrease the ramping angle or feed per tooth.

APX4000 Long Cutting Edge Type

Long Cutting Edge Shank Type



*1 Combination Type



Right hand tool holder only.

Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel
	➔			

Order Number	Stock R	Number of Flutes	Total	Dimensions (mm)					*2	Wrench	Anti-seizure Lubricant	Insert
				D1	D4	L1	L2	ap				
APX4KR4008SA42S056A	●	2	8	40	42	160	80	56	TPS43	TIP15W	MK1KS	AOMT1848 ○PEER○
4012SA42S056A	●	3	12	40	42	160	80	56	TPS43	TIP15W	MK1KS	
*1 5012WA508S056A	●	3	12	50	50.8	160	80	56	TPS43	TIP15W	MK1KS	
*1 5018WA508M084A	●	3	18	50	50.8	190	110	84	TPS43	TIP15W	MK1KS	

*2 Clamp Torque (N · m) : TPS43=3.5

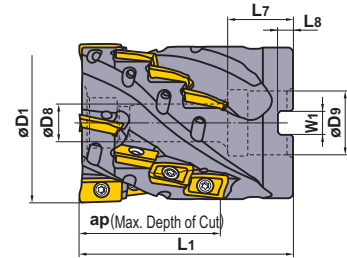
(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

(Note 2) Only corner radius Re 0.4mm and 0.8mm can be used for the peripheral cutting edges expect the bottom cutting edge (the end cutting edge).

(Note 3) For recommended cutting conditions, please refer to page 15.

(Note 4) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

Long Cutting Edge Shell Type



Right hand tool holder only.

Light Alloy	Cast Iron	Carbon Steel Alloy Steel	Stainless Steel	Hardened Steel
	➔			

D1	Clamping Bolt Order Number	Geometry
$\phi 50$	HSC10050	
$\phi 63$	12070	

Order Number	Stock R	Number of Flutes	Total	Dimensions (mm)							* Clamp Screw	Wrench	Anti-seizure Lubricant	Insert	
				D1	L1	D9	L7	D8	W1	L8					ap
APX4K-050A09A042RA	●	3	9	50	65	22	22	11	10.4	6.3	42	TPS43	TIP15W	MK1KS	AOMT1848
R06316CA056A	●	4	16	63	85	25.4	26	13	9.5	6	56	TPS43	TIP15W	MK1KS	○PEER○

* Clamp Torque (N · m) : TPS43=3.5

For metric arbors

The bore diameter (D9) is equivalent to a metric size.

Order Number	Stock R	Number of Flutes	Total	Dimensions (mm)							* Clamp Screw	Wrench	Anti-seizure Lubricant	Insert	
				D1	L1	D9	L7	D8	W1	L8					ap
APX4K-050A09A042RA	●	3	9	50	65	22	22	11	10.4	6.3	42	TPS43	TIP15W	MK1KS	AOMT1848
NEW -063A16A056RA	●	4	16	63	85	27	28	13	12.4	7	56	TPS43	TIP15W	MK1KS	○PEER○

* Clamp Torque (N · m) : TPS43=3.5

(Note 1) When using inserts with corner radius $Re \geq 3.2$, machining of the holder is required as shown on page 11.

(Note 2) Only corner radius Re 0.4mm and 0.8mm can be used for the peripheral cutting edges expect the bottom cutting edge (the end cutting edge).

(Note 3) For recommended cutting conditions, please refer to page 15.

(Note 4) When using the tool at high spindle speeds, ensure that the tool and arbor are correctly balanced.

(Note 5) The coolant supply from the inside is also possible by the combination with the arbor for an internal refueling.

● : Inventory maintained.

Recommended Cutting Conditions (Long Cutting edge Shank and Shell Type)

Cutting Conditions for Shoulder Milling

Work Material	Hardness	Insert Grade/Breaker	Cutting Speed vc (m/min)	Width of Cut ae (mm)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)		
						φ40(Max.ap=56mm) φ50(Max.ap=42mm)	φ50(Max.ap=56mm) φ63(Max.ap=56mm)	φ50(Max.ap=84mm)
P Mild Steel	≤180HB	VP15TF M Breaker	200 (160–250)	–0.15D ₁	–20	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
			160 (120–200)	–0.3D ₁	–20	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
Carbon Steel Alloy Steel	180–350HB	VP15TF M Breaker	160 (120–200)	–0.15D ₁	–20	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
			120 (100–140)	–0.3D ₁	–20	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
M Stainless Steel	≤270HB	VP20RT M Breaker	160 (120–200)	–0.15D ₁	–10	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
			120 (100–140)	–0.3D ₁	–10	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
K Cast Iron	Tensile Strength ≤350MPa	MC5020 H Breaker	230 (180–200)	–0.15D ₁	–10	0.3	0.3	0.25
					–50	0.25	0.25	0.2
					–80	–	–	0.15
			190 (140–240)	–0.3D ₁	–10	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
Ductile Cast Iron	Tensile Strength ≤800MPa	MC5020 H Breaker	190 (140–220)	–0.15D ₁	–10	0.25	0.25	0.2
					–50	0.2	0.2	0.15
					–80	–	–	0.1
			170 (120–220)	–0.3D ₁	–10	0.2	0.2	0.15
					–50	0.15	0.15	0.1
					–80	–	–	0.07
S Ti Alloy	≤350HB	VP20RT H Breaker	40 (30–60)	–0.15D ₁	–20	0.1	0.1	–
					–50	0.1	0.1	–
Heat Resistant Alloy	–	VP20RT H Breaker	30 (20–40)	–0.15D ₁	–10	0.07	0.07	–

(Note 1) The above cutting conditions are determined based on high rigidity machine and workpiece, where no vibration occurred. Please adjust processing conditions if the vibration is generated.

Cutting Conditions for Slot Milling

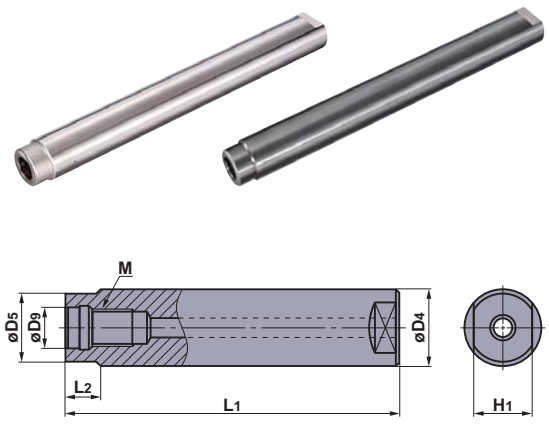
Work Material	Hardness	Insert Grade/Breaker	Cutting Speed vc (m/min)	Width of Cut ae (mm)	Depth of Cut ap (mm)	Feed per Tooth fz (mm/tooth)		
						φ40(Max.ap=56mm) φ50(Max.ap=42mm)	φ50(Max.ap=56mm) φ63(Max.ap=56mm)	φ50(Max.ap=84mm)
P Mild Steel	≤180HB	VP15TF M Breaker	140 (120–160)	D ₁	–20	0.2	0.2	0.15
					–50	0.15	0.15	–
Carbon Steel Alloy Steel	180–350HB	VP15TF M Breaker	100 (80–120)	D ₁	–20	0.15	0.15	0.1
					–50	0.1	0.1	–
M Stainless Steel	≤270HB	VP20RT M Breaker	100 (80–120)	D ₁	–10	0.1	0.1	0.07
K Cast Iron	Tensile Strength ≤350MPa	MC5020 H Breaker	190 (140–240)	D ₁	–10	0.25	0.25	0.2
					–50	0.2	0.2	0.15
Ductile Cast Iron	Tensile Strength ≤800MPa	MC5020 H Breaker	170 (120–220)	D ₁	–10	0.15	0.15	0.1
					–50	0.1	0.1	–
S Ti Alloy	≤350HB	VP20RT H Breaker	40 (30–60)	D ₁	–50	0.08	0.08	–
					Heat Resistant Alloy	–	VP20RT H Breaker	30 (20–40)

(Note 1) The above cutting conditions are determined based on high rigidity machine and workpiece, where no vibration occurred. Please adjust processing conditions if the vibration is generated.

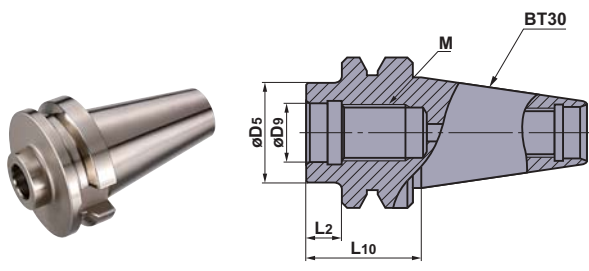
APX3000/4000

■ Screw-in arbor

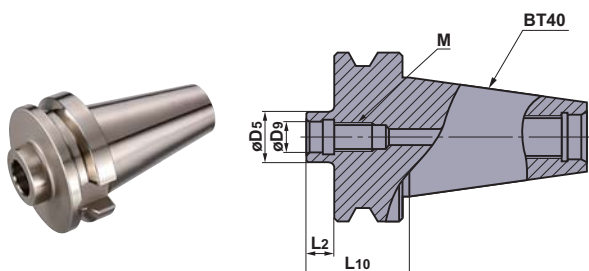
● Straight Shank Arbor

Type	Order Number	Stock	Dimensions (mm)						
			D9	D4	D5	L1	L2	H1	M
									
Steel Shank	SC16M08S100S	●	8.5	16	14.5	100	10	10	M8
	08S200L	●	8.5	16	14.5	200	10	10	M8
	SC20M10S120S	●	10.5	20	18.5	120	10	14	M10
	10S220L	●	10.5	20	18.5	220	10	14	M10
	SC25M12S125S	●	12.5	25	23.5	125	10	19	M12
	12S245L	●	12.5	25	23.5	245	10	19	M12
Carbide Shank	SC32M16S140S	●	17	32	28.5	140	15	24	M16
	16S280L	●	17	32	28.5	280	15	24	M16
	SC16M08S100SW	●	8.5	16	14.5	100	10	10	M8
	08S200LW	●	8.5	16	14.5	200	10	10	M8
	SC20M10S120SW	●	10.5	20	18.5	120	10	14	M10
	10S220LW	●	10.5	20	18.5	220	10	14	M10
	SC25M12S125SW	●	12.5	25	23.5	125	10	19	M12
	12S245LW	●	12.5	25	23.5	245	10	19	M12
	SC32M16S140SW	●	17	32	28.5	140	15	24	M16
	16S280LW	●	17	32	28.5	280	15	24	M16

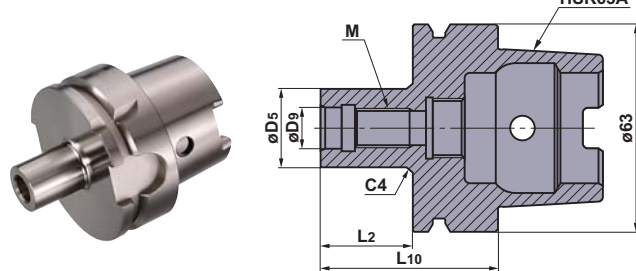
● BT30 Shank Arbor

Order Number	Stock	Dimensions (mm)				
		D9	D5	L10	L2	M
						
SC16M08S10-BT30	●	8.5	14.5	32	10	M8
20M10S10-BT30	●	10.5	18.5	32	10	M10
25M12S10-BT30	●	12.5	23.5	32	10	M12
32M16S10-BT30	●	17.0	28.5	32	10	M16

● BT40 Shank Arbor

Order Number	Stock	Dimensions (mm)				
		D9	D5	L10	L2	M
						
SC16M08S10-BT40	●	8.5	14.5	37	10	M8
20M10S10-BT40	●	10.5	18.5	37	10	M10
25M12S10-BT40	●	12.5	23.5	37	10	M12
32M16S10-BT40	●	17.0	28.5	37	10	M16

● HSK63A Shank Arbor

Order Number	Stock	Dimensions (mm)				
		D9	D5	L10	L2	M
						
SC16M08S22-HSK63A	●	8.5	14.5	48	22	M8
20M10S24-HSK63A	●	10.5	18.5	50	24	M10
25M12S27-HSK63A	●	12.5	23.5	53	27	M12
32M16S28-HSK63A	●	17.0	28.5	54	28	M16

● : Inventory maintained.

APX3000/4000

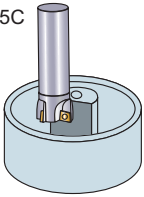
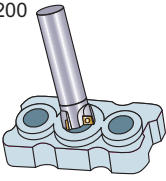
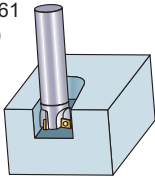
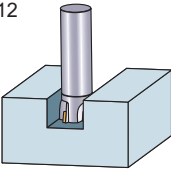
How to Install the Screw-in Head

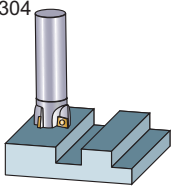
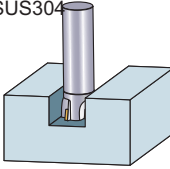
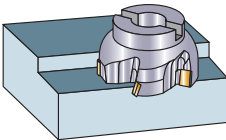
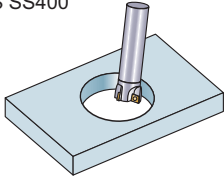
- ① Thoroughly clean the clamp section of the head and the arbor with an air blower or brush before installation.
- ② Tighten the head at the recommended torque and ensure that there is no gap between the head and arbor.

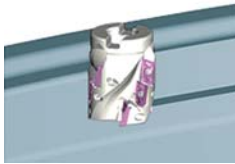
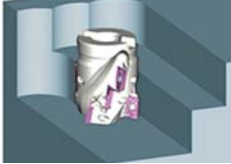
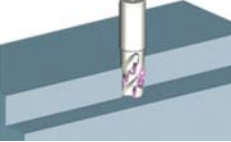
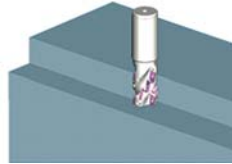
Screw Size	Recommended Torque (N • m)	Wrench Size (mm)
M8	23	10
M10	46	14
M12	80	19
M16	90	24

- Cutting tools become extremely hot during cutting. Never touch them with bare hands after operation as this may produce risk of injuries or burns.
- Do not handle the cutting tools with bare hands as this may cause injuries.

Application Examples

Tool		APX3000R162SA16SA	APX3000R405SA32SA	APX3000R254SA25SA	APX3000R203SA20SA
Insert (Grade)		AOMT123616PEER-M(VP15TF)	AOMT123608PEER-M(VP15TF)	AOMT123608PEER-M(VP15TF)	AOMT123608PEER-H(VP15TF)
Work Material		JIS S45C 	JIS FC200 	JIS SKD61 (45HRC) 	SKD12 
Cutting Conditions	Cutting Speed (m/min)	150	150	150	244
	Feed per Tooth (mm/tooth)	0.05	0.15	0.12	0.13
	Depth of Cut (mm)	1.5	5	3	3
	Width of Cut (mm)	1.5	30	10–25	20
Coolant		Wet	Dry	Dry	Wet
Machine Shank Type		M/C-BT30	M/C-BT50	M/C-BT50	M/C-BT50
Result		Lower cutting noise and double tool life compared to a competitor's products.	Reduced cutting noise, better surface finish and double the tool life compared to a competitor's product.	Improved cutting performance and lower cutting resistance.	Tool life has been improved by 30% compared to a competitor's product.

Tool		APX3000R325SA32SA	APX3000R325SA32SA	APX4000R08007CA	APX4000R404SA32SA
Insert (Grade)		AOMT123608PEER-M(VP20RT)	AOMT123608PEER-H(VP20RT)	AOMT184808PEER-M(VP15TF)	AOMT184808PEER-M(VP15TF)
Work Material		JISSUS304 	JIS SUS304 	JIS S55C 	JIS SS400 
Cutting Conditions	Cutting Speed (m/min)	130	160	165	190
	Feed per Tooth (mm/tooth)	0.2	0.06	0.15	0.25
	Depth of Cut (mm)	0.25	2	3	10
	Width of Cut (mm)	28	25	50	5
Coolant		Wet	Dry	Wet	Wet
Machine Shank Type		M/C-BT50	M/C-BT50	M/C-BT50	M/C-BT50
Result		Lower cutting resistance enabled stable machining even at 6 times higher cutting conditions. 12 times longer tool life.	Double tool life compared to a competitor's product.	Better cutting performance and lower cutting resistance compared to a competitor's product.	Cutting resistance is lower than the competitor's product, thus allowing a stable machining performance.

Tool		APX4K-050A09A042RA	APX4K-050A09A042RA	APX4KR4012SA42S056A	APX4KR4012SA42S056A
Insert (Grade)	Bottom	AOMT184832PEER-H(VP20RT)	AOMT184832PEER-H(VP20RT)	AOMT184832PEER-H(VP20RT)	AOMT184832PEER-H(VP20RT)
	Peripheral	AOMT184808PEER-H(VP20RT)	AOMT184808PEER-H(VP20RT)	AOMT184808PEER-H(VP20RT)	AOMT184808PEER-H(VP20RT)
Work Material		JIS Ti-6Al-4V 	15-5 PH STAINLESS 	JIS FC250 	SX105V 
Cutting Conditions	Cutting Speed (m/min)	35	80	125	100
	Feed per Tooth (mm/tooth)	0.08	0.1	0.3	0.25
	Depth of Cut (mm)	12-40	35	52	45
	Width of Cut (mm)	10-15	35	8	5
Coolant		Wet	Wet	Dry	Dry
Machine Shank Type		M/C-BT50	M/C-BT50	M/C-BT50	M/C-BT50
Result		3 times toolife compared to a conventional tool. It got a serious tool cost reduction.	2.5 times machining efficiency compared to a conventional tool. It largely enabled shortening in processing time.	3 times processing efficiency compared to a conventional tool. It largely enabled shortening in processing time.	For the deep shoulder milling, it is possible stable cutting without vibration.

● Please note that the machining performed in the application examples is dependent on the rigidity of the machine used and the rigidity of the workpiece and clamping.

Operational Guidance

- Use only specified inserts and parts.
- Clamp the inserts at a specified torque of only.
- 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).

(Table 1) Maximum allowable spindle speed

Cutting Edge Diameter D ₁ (mm)	ø12	ø14	ø16	ø18	ø20	ø22	ø25	ø28	ø30
Max. Allowable Spindle Speed (min ⁻¹)	—	—	19500	17000	15000	14000	12000	11000	10000

Cutting Edge Diameter D ₁ (mm)	ø32	ø35	ø40	ø50	ø63	ø80	ø100	ø125	ø160
Max. Allowable Spindle Speed (min ⁻¹)	9500	9000	7500	6000	5000	3500	3000	2500	1500

- It is recommended that flank wear does not exceed 0.3mm.

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 spanner.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

MITSUBISHI MATERIALS CORPORATION

MITSUBISHI MATERIALS CORPORATION

Area Marketing & Operations Dept.

KFC bldg., 8F, 1-6-1, Yokoami, Sumida-ku, Tokyo 130-0015, Japan
TEL +81-3-5819-8772 FAX +81-3-5819-8774