MITSUBISHI
MITSUBISHI MATERIALS

TOOLS NEWS

B176G

Indexable end mill for under-cutting

PMC

Ideal for automisation when machining undercuts on blanking and trimming dies and moulds.

- Reduced costs, enhanced efficiency and safety with unmanned machining.
- Stable surface finishes and increase in overall machining quality.
- Efficient long overhang machining when using a solid carbide shank.

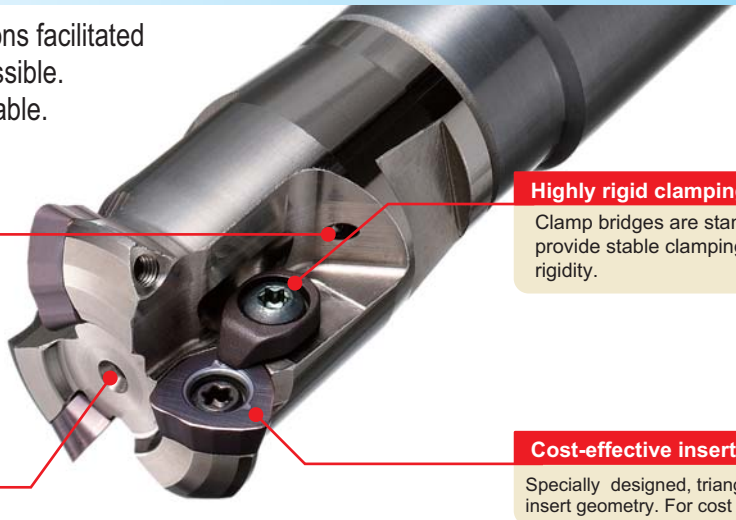
Indexable end mill for under-cutting

PMC

Features

High rigidity cutter body for superior reliability

- High efficiency on varied applications facilitated with both plunge and up cutting possible.
- Ø25, Ø32 and Ø40mm sizes available.



Through coolant holes as standard

PMC bodies are supplied with through coolant holes for smooth chip discharge, cutting edge cooling and lubrication.

Highly rigid clamping

Clamp bridges are standard and provide stable clamping and tool rigidity.

Durable tool body

PMC bodies are made from a heat resistant alloy.
The special surface treatment applied to the body increases corrosion and friction resistance.

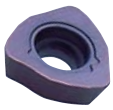
Cost-effective insert

Specially designed, triangular type 3 corner insert geometry. For cost effective milling.

Wide Selection of Inserts

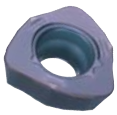
FT General Use Type *Breaker*

First recommended chipbreaker



- An optimum balance of sharpness and fracture resistance.

ST Strong Cutting Edge Type Breaker



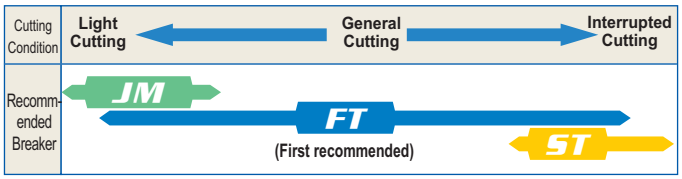
- With increased fracture resistance during interrupted cutting due to the tougher cutting edges.

JM Sharp Cutting Edge Type Breaker

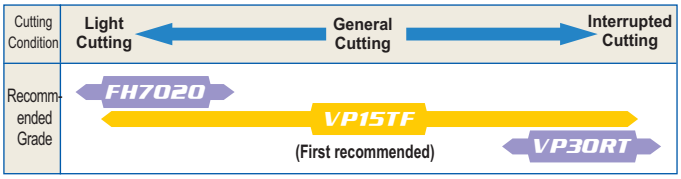
Suitable for use on BT40 and HSK63 machines

- Boosts cutting performance with a large rake angle.
- Effective for anti-vibration machining for long overhang applications at higher than normal feeds.

Application of Breakers



Application of Insert Grades



Cutting Performance

Streamlining of under cut machining.

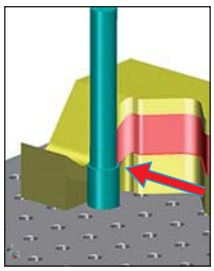
Conventional Machining Method

Tool

HSS / Brazed type special end mill / Indexable type end mill

Machining method

- Reduced feed and efficiency with HSS tools.
- Manned operation necessary to check for tool breakage.



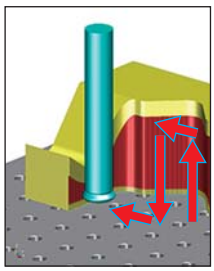
New Machining method

Tool

PMC screw-in type holder + Carbide shank type arbor

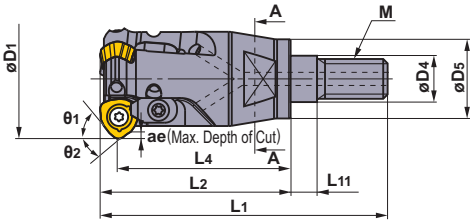
Machining method

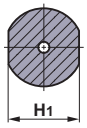
- **Three axis programming and bi-directional cutting.**
- Reliable un-manned operation possible.



PMC

Holder





SECTION A-A

Right hand tool holder only.

Order Number	Stock	Coolant Hole	Number of Teeth	Dimensions (mm)											Mass	Insert	Shank Arbor
	R			D1	D4	D5	L1	L2	L4	L11	H1	M	ae	θ1	θ2	(kg)		
PMC08R252AM1035	●	○	2	25	10.5	18	58.7	39.7	35	6	14	M10	1.5	35°	40.5°	0.1	JOM□080320 ZZSR-□□	SC20M10S □□□□W
09R323AM1245	●	○	3	32	12.5	21	72.5	50.5	45	6	19	M12	3	35°	40.5°	0.2	JDM□09T320 ZDSR-□□	SC25M12S □□□□W
12R403AM1645	●	○	3	40	17	29	74.4	51.4	45	6	24	M16	3.5	35°	40.5°	0.3	JDM□120420 ZDSR-□□	SC32M16S □□□□W

Spare Parts

Order Number	Clamp Bridge Screw *	Clamp Bridge	Clamp Screw *	Spring	Wrench	Anti-seizure Lubricant
PMC08R252AM1035	TS33	AMS3	AJS3010T10	ASS2	②TKY08D ①TKY10R	MK1KS
09R323AM1245	TS351	AMS3	AJS3010T10	ASS2	②TKY10D	MK1KS
12R403AM1645	TS43	AMS4	AJS4012T15	ASS2	②TKY15D	MK1KS

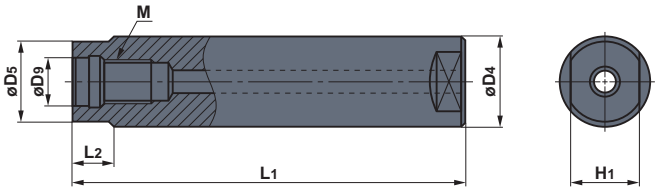
* Clamp Torque (N • m) :TS33=1.0, TS351=2.5, TS43=3.5, AJS3010T10=2.5, AJS4012T15=3.5

Inserts

Shape	Order Number	Class	Coated				Dimensions (mm)					PMC holder	Geometry
			FH7020	VP15TF	VP30RT		B3°	D1	S1	F1	Re		
FT Breaker	**JOMW080320ZZSR-FT**	M	●	●	●		13°	8	3.18	1.4	2	PMC08R252AM1035	
	JDMW09T320ZDSR-FT	M	●	●	●		15°	9.525	3.97	1.8	2	PMC09R323AM1245	
	120420ZDSR-FT	M	●	●	●		15°	12	4.76	2.5	2	PMC12R403AM1645	
ST Breaker	**JDMT120420ZDSR-ST**	M	●	●	●		15°	12	4.76	2.5	2	PMC12R403AM1645	
JM Breaker	**JOMT080320ZZSR-JM**	M	●	●	●		13°	8	3.18	1.4	2	PMC08R252AM1035	
	JDMT09T320ZDSR-JM	M	●	●	●		15°	9.525	3.97	1.8	2	PMC09R323AM1245	
	120420ZDSR-JM	M	●	●	●		15°	12	4.76	2.5	2	PMC12R403AM1645	

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

Carbide shank arbor



Type	Order Number	Stock	Coolant Hole	Dimensions (mm)							Mass (kg)	PMC Order Number
				D9	D4	D5	L1	L2	H1	M		
Carbide Shank	**SC20M10S120SW**	●	○	10.5	20	18.5	120	10	14	M10	0.5	PMC08R252AM1035
	10S220LW	●	○	10.5	20	18.5	220	10	14	M10	0.9	PMC08R252AM1035
	SC25M12S125SW	●	○	12.5	25	23.5	125	10	19	M12	0.8	PMC09R323AM1245
	12S245LW	●	○	12.5	25	23.5	245	10	19	M12	1.5	PMC09R323AM1245
	SC32M16S140SW	●	○	17	32	28.5	140	15	24	M16	1.4	PMC12R403AM1645
	16S280LW	●	○	17	32	28.5	280	15	24	M16	2.8	PMC12R403AM1645

●: Inventory maintained.

Recommended Cutting Conditions

	Work Material	Hardness	Insert Grade	Insert Breaker	Cutting Dia. (mm)	Number of Teeth	Cutting Speed (m/min)	Feed per Tooth (mm/tooth)	Width of Cut (mm)	Pick Feed (mm)
P	Carbon Steel Alloy Steel (JIS S55C etc.)	≤180HB	**VP15TF**	**FT**	ø40	3	250 (200—300)	—0.6	—1.5	—6
					ø32	3	200 (150—220)	—0.55	—1.2	—5
					ø25	2	200 (150—220)	—0.55	—1.0	—5
	Air Cooled Flame Hardening Tool Steel for Cold Work Dies	≤300HB	**VP15TF**	**FT**	ø40	3	250 (200—300)	—0.55	—1.5	—5
					ø32	3	180 (150—200)	—0.5	—1.2	—3
					ø25	2	180 (150—200)	—0.5	—1.0	—3
	Alloy Tool Steel (JIS SKD11 etc.)	≤300HB	**VP15TF**	**FT**	ø40	3	200 (100—300)	—0.55	—1.5	—5
					ø32	3	150 (80—200)	—0.5	—1.2	—3
					ø25	2	150 (80—200)	—0.5	—1.0	—3
K	Cast Iron (JIS FC300 etc.)	Tensile Strength ≤350MPa	**VP15TF**	**FT**	ø40	3	250 (200—300)	—0.6	—1.5	—6
					ø32	3	200 (150—220)	—0.55	—1.2	—5
					ø25	2	200 (150—220)	—0.55	—1.0	—5
	Ductile Cast Iron (JIS FCD750 etc.)	Tensile Strength ≤800MPa	**VP15TF**	**FT**	ø40	3	250 (200—300)	—0.6	—1.5	—6
					ø32	3	200 (150—220)	—0.55	—1.2	—5
					ø25	2	200 (150—220)	—0.55	—1.0	—5

● Revolution (min^{-1}) = (1000 × Cutting speed) ÷ (3.14 × Cutting diameter)
● Table feed (mm/min) = Feed per tooth × Number of teeth × Cutter revolution

(Note 1) The above cutting conditions are general guide lines. Adjustments maybe necessary depending on machine rigidity, workpiece geometry and clamping.
(Note 2) The carbide shank arbor is recommended for preventing vibrations.

How to Install the Screw-in Head

①Thoroughly clean the clamp section of the head and the arbor with an air blower or brush before installation.

②Tighten the head at the recommended torque and ensure that there is no gap between the head and arbor.

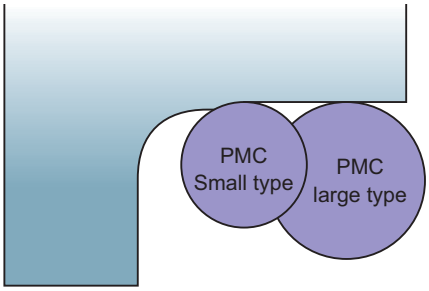
Screw Size	Recommended Torque (N • m)	Wrench Size (mm)
M10	46	14
M12	80	19
M16	90	24

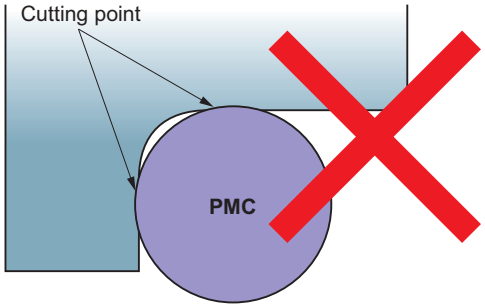
- Cutting tools become extremely hot during cutting. Never touch them with bare hands after operation as this may produce risk of injuries or burns.
- Do not handle the cutting tools with bare hands as this may cause injuries.

Notes on machining methods

How to choose an appropriate diameter tool.

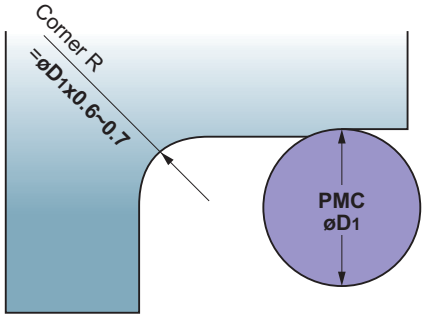
Machine plane surfaces with a larger tool and corner radii with smaller diameter cutters.





Relation of the cutter diameter and corner R size of work piece

A guide for the smallest possible workpiece radius that can be machined is from 0.6 - 0.7 x diameter of the tool.



PMC diameter **D1**(mm)	Recommended corner R (mm)
ø25	R≥17.5
ø32	R≥22
ø40	R≥24

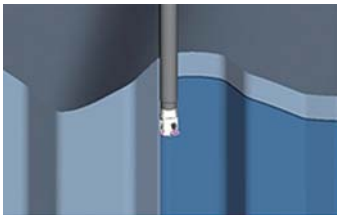
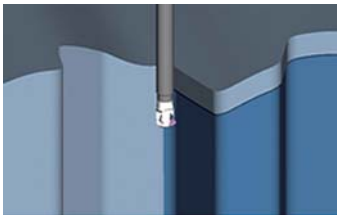
* Adjust cutting conditions according to the set up.

* Smaller workpiece corner radii (only >0.5 x cutter Ø) may be possible by reducing the width of cut, speed and pick feed.

Indexable end mill for under-cutting

PMC

Application Examples

Tool			PMC09R323AM1245	PMC12R403AM1645
Screw-in Arbor			SC25M12S245LW	SC32M16S280LW
Insert Grade (Breaker)			VP15TF (FT Breaker)	VP15TF (FT Breaker)
Work Material			JIS SKD11 	SX105V 
Component			Press mould	Press mould
Cutting Conditions	Cutting Speed	(m/min)	200	300
	Table Feed	(mm/min)	2000	3940
	Feed per Tooth	(mm/tooth)	0.33	0.55
	Depth of Cut	(mm)	1.2	1.5
	Pick Feed	(mm)	3.0	3.0
	Overhang Length	(mm)	200	220
Coolant			Dry	Dry
Results			Machining times greatly reduced compared to conventional methods.	

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.

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(Tools specifications subject to change without notice.)

EXP-09-N114
2009.12.(-)