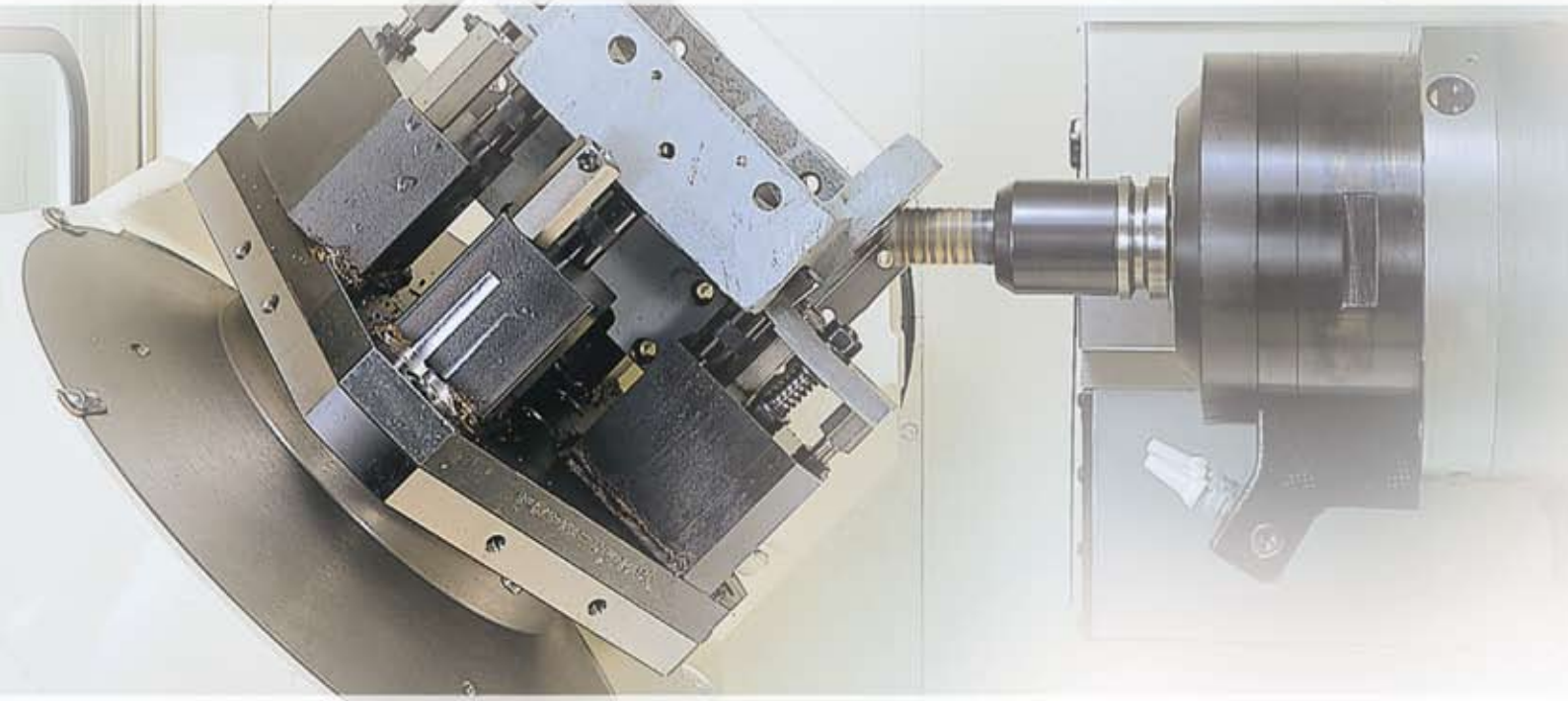
PRECISION TSUGAMI

High Speed Precision Horizontal Machining Center

FMA3-Ⅲ/FMA5-Ⅲ



Minimized Machine Function Time
Selection of Machine Variations
Designed for Unattended Machining

Unique Original Design, High Performance Machining Center Brings You; Reduced Floor Space, Unattended Parts Machining

ATC (Tool-To-Tool)・・・・・・・・・・・・1.0sec.
Chip-To-Chip (FMA3-Ⅲ)・・・・・・・・5.0sec.
(FMA5-Ⅲ)・・・・・・・・5.5sec.
Pallet Change Time
(FMA3-Ⅲ)・・・・・・・・9.0sec.
(FMA5-Ⅲ 8P)・・・・40.0sec.
(FMA5-Ⅲ 5F 10P)・・・17.0sec.
Spindle Speed (Max.)・・・・・10,000min^{-1}
Rapid Traverse Rate (X, Y, Z-axis)
・・・・・・・・・・・・24m/min
FMA5-Ⅲ (X, Y-axis)・・・・・・・・・20m/min
X, Y, Z-axis Repeatability・・・±0.002mm
Pallet Positioning Repeatability
・・・・・・・・・・±0.002mm

FMA3-Ⅲ

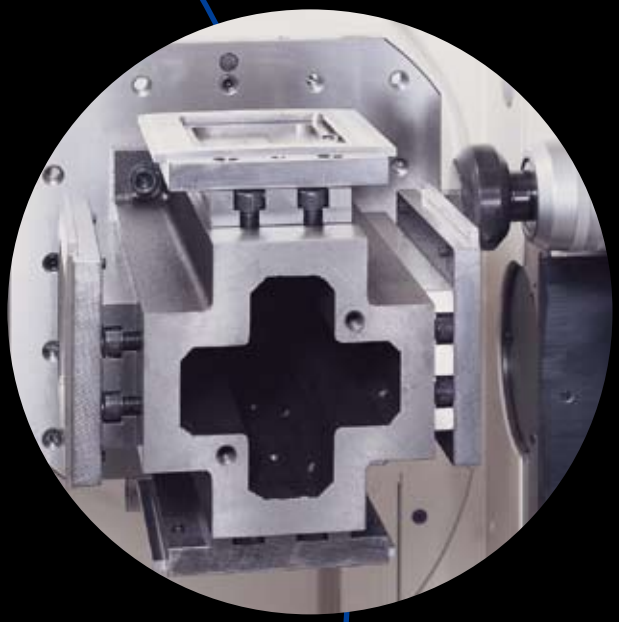
FMA5-Ⅲ

FMA

Flexible Unattended operation with resident multi-pallet pool
Complete part machining with five-face machine
Speed/Power for aluminum to steel machining

Fine Free-chip- flow machine structure
Integrated control unit, hydraulics, pneumatics, pallet magazine Space saving

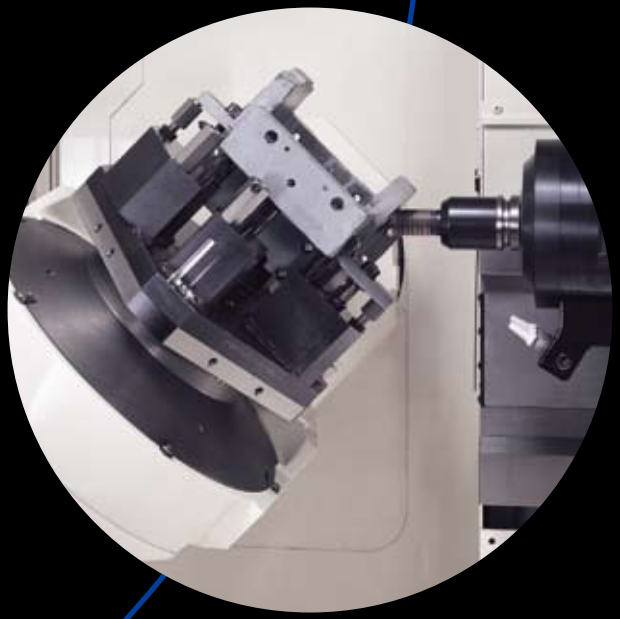
Fast High speed traverse, feed and spindle Complete machining of small batch and large variety of workpieces 32-bit NC unit



Pallet Working Machine

FMA3-Ⅲ and FMA5-Ⅲ basic model machines with "Free-Chip-Flow" structure, solving the difficult issue of chip disposal in unattended machine operation.
All are equipped with a space saving vertically oriented pallet magazine.10-pallet (FMA3-Ⅲ) and 8-pallet (FMA5-Ⅲ) machines come with a vertical-loop pallet magazine and are capable of four-face machining of a variety of work for long term unattended operation.
20-pallet magazine(Optional for FMA3-Ⅲ) is also available.
2-pallet machine (FMA3-Ⅲ) is available-intended as a custom design pallet pool system for connecting multiple 2-pallet machines

FMA3-Ⅲ □300mmPallet
FMA5-Ⅲ □450mmPallet



Five-face, Pallet Working Machine (FMA5-Ⅲ)

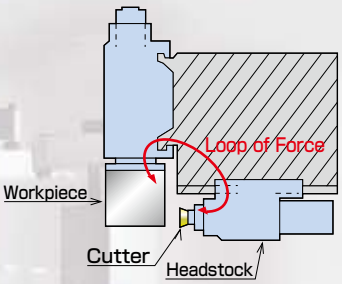
With 1˚increment A and B-axis indexing, FMA5-Ⅲ five-face machine is capable of machining work from any direction at 1˚increments except for the work locating surface.
Five-face, 10-pallet magazine machine is equipped with the vertical-loop pallet magazine and is capable of machining a variety of work for long term unattended operation.
20-pallet magazine (Optional) is also available.

FMA5-Ⅲ □300mmPallet

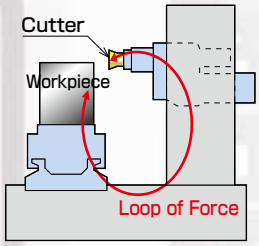
Developed in Pursuit of Accuracy
ORIGINAL MACHINING-

Basic Machine Structure

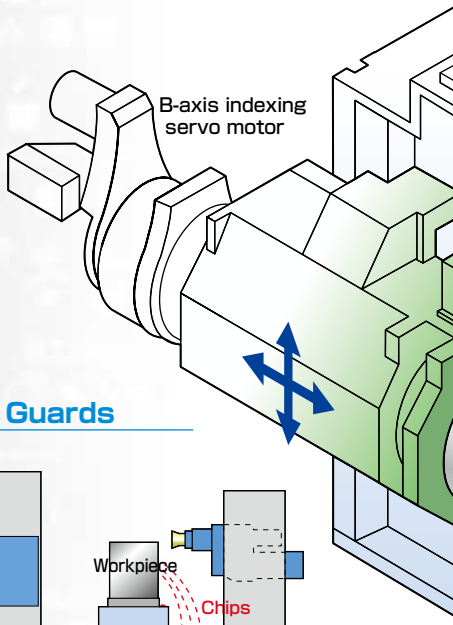
Headstock(Tool spindle) slide is installed on one of the two adjacent vertical planes of square column unit and X axis slide on the other, creating an extremely small loop of force between the tool and work that assures optimum structural rigidity. Further, chips and coolant are isolated from the bed unit to minimize thermal growth of machine, assuring stable and uniform machining. Each of the X, Y, Z-axis slides is driven by a powerful AC servo motor directly connected to the large diameter ball screw for optimum system rigidity. X, Z-axis slides are square-shaped ways based on the narrow guide principle, while Y axis is a cylinder-shaped slide way with long moment preload. One of the mating surfaces of all X, Y and Z-axis is hardened and precision ground while the opposing surface is lined with low-friction special fluoric plastic to achieve high rigidity, smooth slide movement without stick-slip.



FMA(Top view)

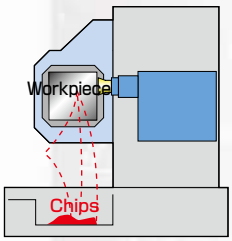


Other Horizontal Machining Center
(Front View)



Free-Chip-Flow & Full Enclosure Splash Guards

Vertical layout of bed and pallet permits all the chips to drop freely to chip pan or chip conveyor(Optional).
Chip control, one of the most difficult issues in achieving unattended operation has solved in with this design.
Full enclosure splash guards keep large volume and high pressure coolant within the machining area. Flood coolant nozzle as well as target-jet coolant nozzles are standard.



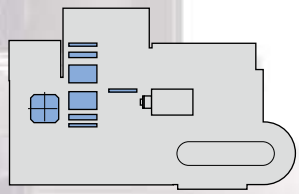
FMA(Front view)

Other Horizontal Machining Center
(Front View)

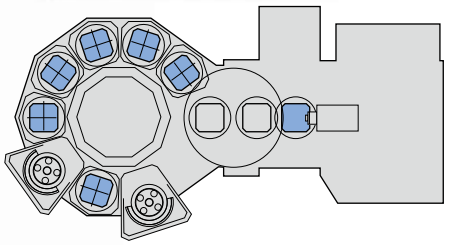
Space Saving Vertical-loop Pallet Magazine

Vertical-loop pallet magazine saves floor space. A number of different workpieces on each pallet and stored in the pallet magazine can be continuously machined without operator attendance. Identifying pallet number and identification dog on each pallet automatically calls and executes corresponding programs in the control memory. It is also possible to call for a required pallet directly from the NC program using M code commands

FMA Pallet Layout



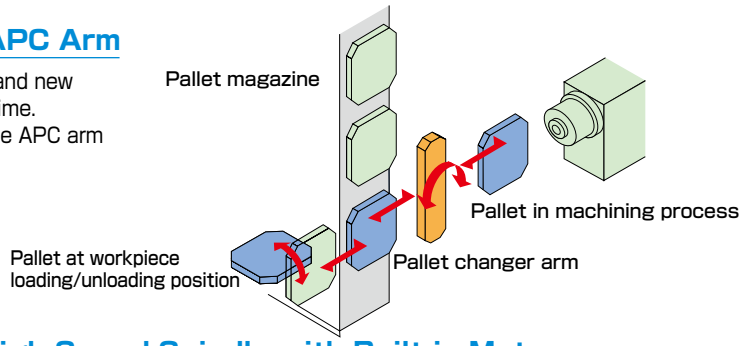
Other Horizontal Machining Center
Pallet Layout

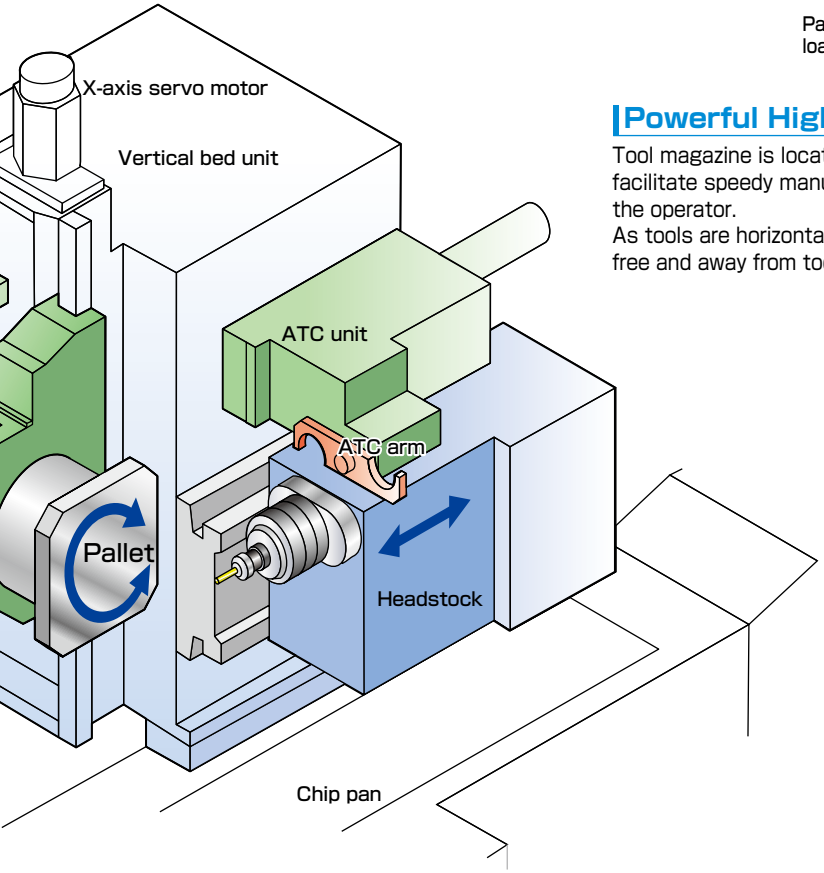


and Productivity; ARCHITECTURE

Exchange Pallets by 180 degree Swing of APC Arm

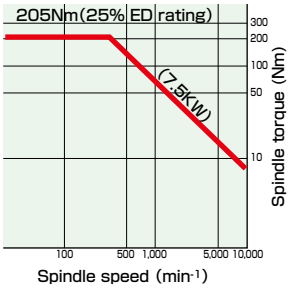
Built-in vertical pallet changer takes finished pallet from the machine and new pallet from the magazine simultaneously to minimize pallet-changing time.
Air blasts clean pallet locating V-grooves and pallet rotating table. The APC arm and Y axis unit ensures exact pallet positioning.
(FMA5-Ⅲ's APC is not one-swing type)





Powerful High Speed Spindle with Built-in Motor

Tool magazine is located at the front of the machine to facilitate speedy manual tool change and monitoring by the operator.
As tools are horizontally pocketed, coolant and chips fall free and away from tool shanks.



Horizontal Tool Magazine with Specifically Addressed Tools

The tool magazine is arranged at the front of the machine so that a operator can perform replacing or monitoring a tool easily.
Since the tool is held horizontally, coolant or chips from the tool nose do not come into the tool shank.

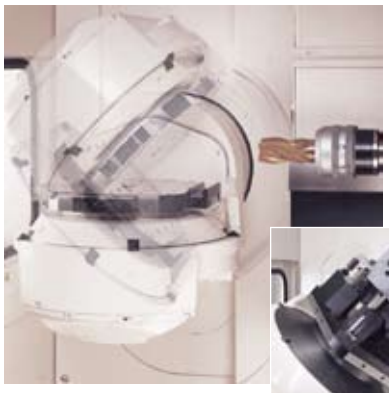
Tool Change in 1.0 Second (Tool-to-Tool)

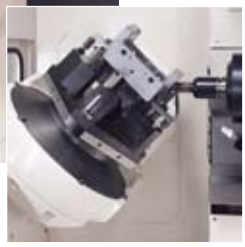
Cam operated ATC changes tools in 1.0 sec. (Tool-to-Tool). Mechanical tool locking device in the ATC arm firmly locks tools in and prevents them from coming free during high speed indexing.

Excellent Operability

All control elements are incorporated in the operating panel built into the thin NC unit located adjacent to operator for simplified operation.
Pallet numbers or program numbers can be called out via cursor on an original screen while in automatic operation. (MDI setting was required previously)
Sheet type keys are used on the operating panel for operability and reliability.

Five-face Machine (FMA5-Ⅲ)





Machining from Any Directions by 1 Degree Increment Except Locating Surface

Equipped with right-angle A axis index table on B axis index unit, 360-position/1 degree increment indexing of both A and B-axis permits indexing and machining work from any direction at 1 degree increments
(Except for the work locating surface).

Advantages of 5-face Machining

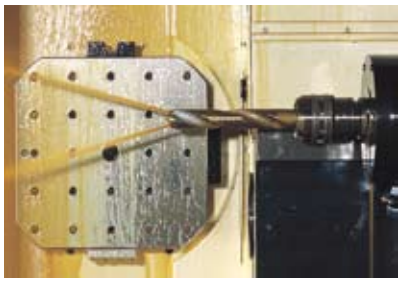
Two separate machining processes required on standard machining centers can be completed in one process on the 5-face machine. Elimination of repeated work clamping means no positioning errors in between the processes and higher work accuracy, reduced fixture expenses and long term unattended operation.

Wide Selection of Optional Accessories Allowing You to Build the Best Machining System for Your Application


Tool magazine for 62, 126 & 190 tools


20-pallet magazine


Chip conveyor


Through-spindle coolant

Machine Optional Accessories

	Name	Remarks		Name	Remarks
Tool magazine	62 tool magazine		Detection/ Measurement	Touch-the-tool type drill breakage detection	
	126 tool magazine			Automatic centering function	Probe
	190 tool magazine		Spindle	15,000 min^{-1} spindle	
Pallet magazine	20 pallet magazine	For FMA3-Ⅲ:10P,FMA5-Ⅲ:5F10P		Through-spindle	Flange-through type
Table indexing	B axis 1° indexing	For FMA3-Ⅲ:FMA5-Ⅲ:8P	Safety/Others	Positioning block	For BIG,NIKKEN
Chip disposal	Scraper type chip			Signal tower	3-stage
	Chip carrier			Air gun	For working table
	Oil mist collector			Special machine body color	
Coolant	High pressure coolant for through-spindle	2 MPa, 7 MPa			
	High pressure coolant for oil-hole holder	1.5MPa (Need positioning block)			
Automatic operation/ Unattended operation	Automatic power shut-off A+C				
	Pallet automatic return function	For pallet magazine machine			
	2-pallet automatic operation function	For pallet magazine machine			

NC Optional Accessories

	Item	Remarks		Item	Remarks			
Machine operation	Program restart		Tool function/ Tool offset function	Tool offset memory	99/200/400			
Interpolation	Single direction positioning			Tool offset memory C	Tool geometry,wear,length & diameter offset			
	Helical interpolation		Program editing	Part Program storage	256 KB	512 KB	1 M	2 M
Programming	Additional optional block skip	Total 9 units		Number of registrable programs	500	1000	1000	1000
	Additional sets of work coordinate	48 sets						
	Custom macro							
	Additional common valiables for custom macro							
	Scaling							
	Coordinate system rotation							

Standard Accessories

Name	FMA3-Ⅲ 10P	FMA3-Ⅲ 2P	FMA5-Ⅲ 8P	FMA5-Ⅲ 5F 10P	Name	FMA3-Ⅲ 10P	FMA3-Ⅲ 2P	FMA5-Ⅲ 8P	FMA5-Ⅲ 5F 10P
Spindle cooling unit	○	○	○	○	Pallet changer	○	○	○	○
Coolant splash guard/ATC shutter	○	○	○	○	Pallet tilting table	○	○	○	○
Illuminator	○	○	○	○	Pallet automatic drawer	○	–	○	○
Coolant unit	○	○	○	○	Hydraulic/pneumatic/lubricating unit	○	○	○	○
Tool cleaning air blower (Spindle ID)	○	○	○	○	Tool mis-clamp detection	○	○	○	○
Chip pan & coolant tank	○	○	○	○	Pallet magazine (No. of pallets)	10	–	8	10
Work table & safety guard	○	○	○	○	A axis indexing	–	–	–	1°
Coolant returning pump	○	–	○	○	B axis indexing	5°	5°	5°	1°

Standard Machine Specifications

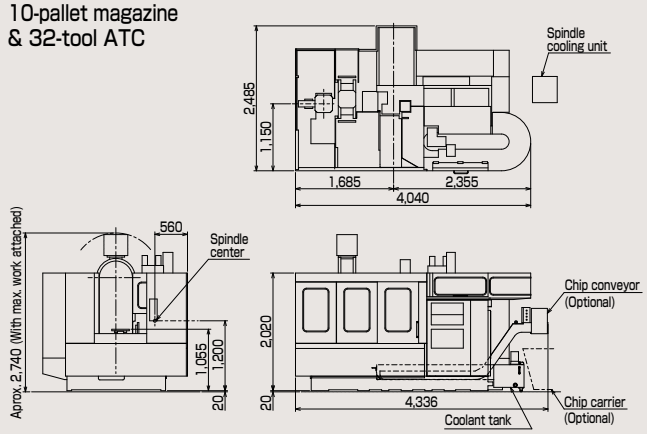
Item		FMA3-Ⅲ 10P,2P	FMA5-Ⅲ 8P	FMA5-Ⅲ 5F10P
Slide travel	Table virtical travel (X axis)	360 mm	560 mm	
	Table back-and-forth travel (Y axis)	330 mm	350 mm	
	Spindle longitudinal travel (Z axis)	400 mm	500 mm	
	Distance between spindle face and B axis center	100 to 500 mm	150 to 650 mm	
Pallet	Pallet size	300 x 300 mm	450 x 450 mm	300 x 300 mm
	Max. allowable weight on pallet	80 kg	250 kg	80 kg
	Pallet indexing angle	B axis: NC command in 5° increment	B axis: NC command in 5°increment	A ,B-axis: NC command in 1° increment
Spindle	ID taper	7/24 taper No.40	7/24 taper No.40	
	Retention knob	MAS 403-1982 P40T-2	MAS 403-1982 P40T-2	
	Speeds	40 to 10,000 min^{-1} (S5-digit command)	40 to 10,000 min^{-1} (S5-digit command)	
ATC	Tool storage capacity	32 tools	32 tools	
	Standard tool size & weight	ϕ90 mm (dia.) x 300 mm (length) x 8 kg	ϕ90 mm (dia.) x 330 mm (length) x 9 kg	
	Max. tool dia. when adjacent tool dia. is small.	Face mill: ϕ135, Boring tool: ϕ150	Face mill: ϕ135, Boring tool: ϕ150	
Motors	Spindle drive motor	7.5/5.5 kW	7.5/5.5 kW	
	Hydraulic pump motor	3.7 kW	5.5 kW	
Required air pressure		More than 0.5 MPa	More than 0.5 MPa	
Required air volume		300 NL/min	300 NL/min	
Required power source		30 KVA	32 KVA	
Machine net weight		10,500 kg (10P 32T) / 10,000 kg (2P 32T)	11,000 kg (8P, 32T) / 10,500 kg (10P, 32T)	

Standard NC Specifications

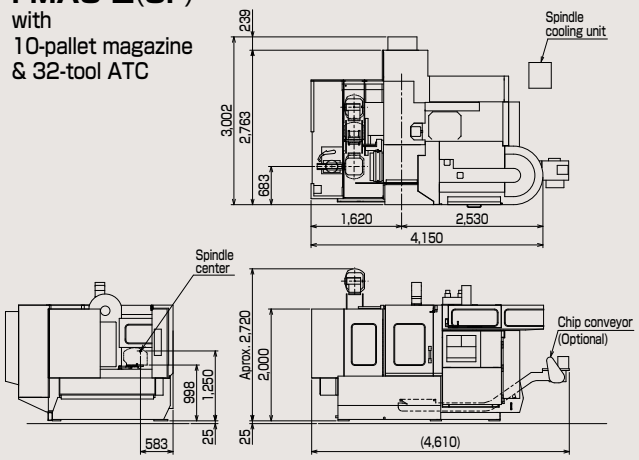
Function	Item	Description
Control unit	Basic NC unit	FANUC series 32i-B
	Simultaneously controlled axes	3 axes
	Interpolation function	Linear & circular interpolation
Data unit	MDI & CRT unit	Manual data input, Programming & editing, Data & program display on CRT, etc.
	Part program storage size	128 KB
	Back ground editing	Preparation of a new program while machine is running with the other program
Programming	Tape code	EIA, ISO, Automatic recognition
	Command method	Incremental/absolute switch-over by G code (G90/G91)
	Least input increment	0.001mm
	Max. programmable value	±99999.999 mm (±8-digit)
	Circular interpolation by radius designation	Radius value command by address R
Feed function	Rapid traverse rate	FMA3-Ⅲ X,Y,Z: 24 m/min, FMA5-Ⅲ X,Y: 20 m/min, Z:24 m/min
	Cutting feed rate	F 4-digit command, 1 to 6,000 mm/min
	Feed rate override	Cutting feed: 0 to 200%, at 10% increment (Max. speed: 6,000 mm/min) Rapid feed: 100, 50, 25% and 8 mm/min
	Jog feed	1 to 2,000 mm/min, 24 kinds
	Manual pulse generator	0.001 mm/div x 1 x 10 x 100
Spindle function	Spindle speed command	S 5-digit direct command, 0 to 120% override available
	Tool number command	T 3-digit command
	Cutter and tool nose radius conpensation	Tool diameter compensation by G39 to G42 commands
	Tool length compensation	Tool Z-axis independent offset by G43 to G44 commands
	Tool offset memory	64
Various other functions	Command of various functions	M 3-digit, G 2-digit, B 3-digit (Table indexing)
Canned cycle	Canned cycles	G73, G74, G76, G80 to G89 (Total 12 kinds)
Data I/O	I/O interface	Memory card, USB memory, RS232C
Other functions	Sequence number search & display	N 4-digit, Sequence number search
	Program number search & display	O 4-digit, Program number search
	Number of registrable programs	250
	Spindle function	Rigid tapping
	Programmable offset value input	G10
	Tool life control	
	Run time & parts number display	
	Display language	Japanese or English

Appearance

FMA3-Ⅲ
with
10-pallet magazine
& 32-tool ATC

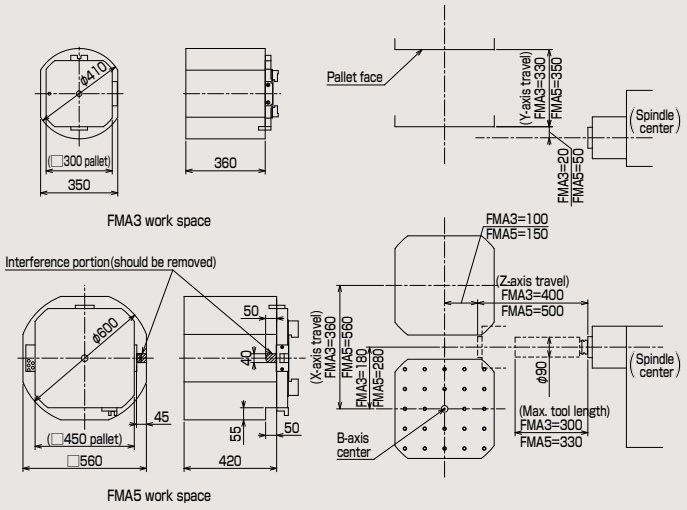


FMA5-Ⅲ(5F)
with
10-pallet magazine
& 32-tool ATC

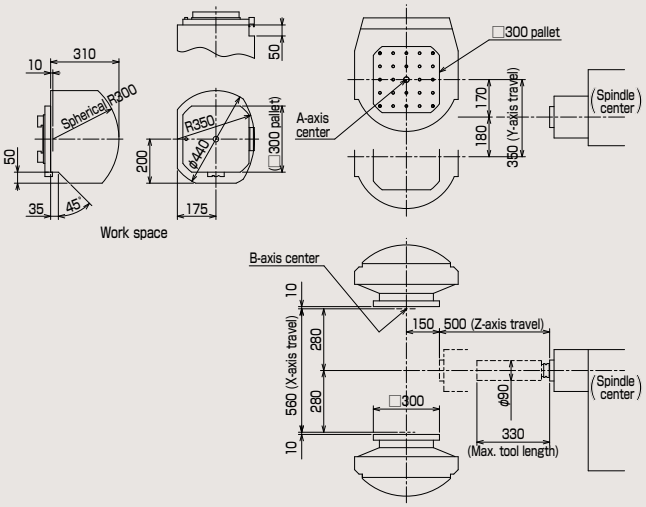


Tooling Zone

FMA3/5(8P)-Ⅲ Tooling Zone



FMA5-Ⅲ(5F) Tooling Zone



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PTW **TSUGAMI CORPORATION**

12-20, TOMIZAWA-CHO, NIHONBASHI,
CHUO-KU, TOKYO 103-0006, JAPAN
Phone : 03-3808-1172
Facsimile : 03-3808-1175

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