

SMOOTH
T E C H N O L O G Y



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VARIAXIS J

S E R I E S



500

500/5X

600

600/5X

Advanced features of the MAZATROL Smooth CNC

Touch screen operation similar to your smartphone/tablet

PC with Windows® 8 embedded OS

Fastest CNC in the world with latest hardware and software for unprecedented speed and precision

Easy conversational programming of multiple-surface machining

Smooth graphical user interface and support functions for unsurpassed ease of operation

MTConnect® ready for convenient networking

Easily configure machine parameters for different workpiece materials and application requirements

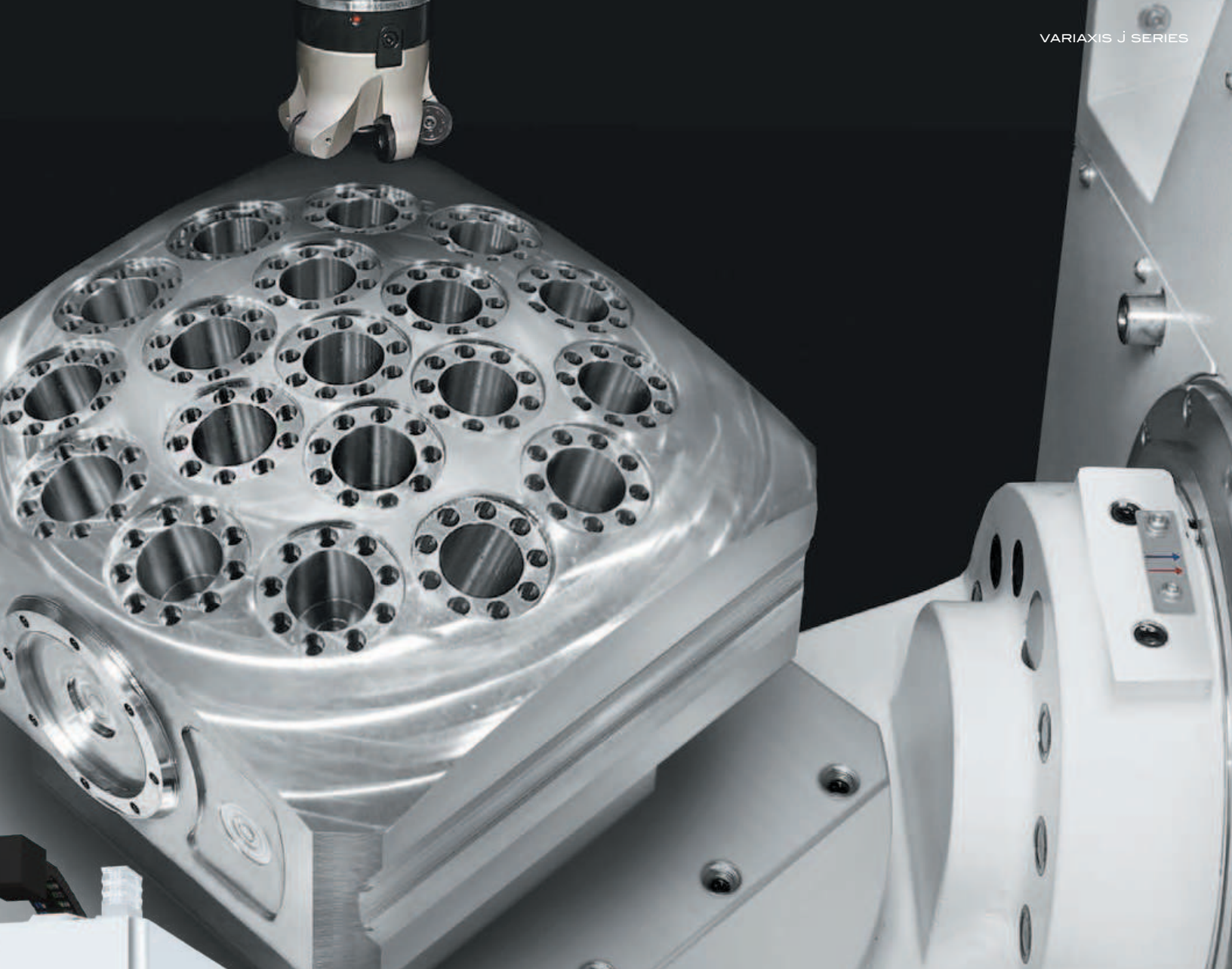
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MTConnect is a registered trademark of AMT in the United States and other countries.



MAZATROL
SMOOTHX
MAZATROL
SMOOTHG





High-accuracy multiple-surface machining center

VARIAXIS J SERIES

- Rigid trunnion table design supports table on both sides for heavy-duty machining
- 0.0001° indexing increment for varied multiple-surface machining (simultaneous 4-axis + A axis (B-axis) indexing) (j-500, 600)
- Machining of complex contours thanks to simultaneous 5-axis control (500/5X, 600/5X)
- Linear roller guides on linear axes and roller gear cams on the rotary table axes ensure stable machining accuracy over long periods of operation
- Ease of operation thanks to excellent access to table and magazine in front of machine

VARIAXIS j-600/5X
Shown with optional status light and 30-tool magazine

Machine Design

Designed to provide you with the maximum value



VARIAXIS j-500 shown

Linear roller guides utilized on the X, Y and Z axes

The linear roller guides on the X, Y and Z axes utilized by the VARIAXIS j Series provide high-accuracy positioning. Additionally, with their high rigidity and considerably lower friction, high-speed feedrates can be used over a wide range of machining, from heavy-duty to high-speed cutting.

High-rigidity table

High-rigidity tilting rotary table for high-speed, high-accuracy machining.

Rotary axes equipped with roller gear cams

Elimination of backlash ensures high accuracy and high-efficiency machining.

Extensive Series Range

Two table sizes and multi-surface machining/
Simultaneous 5-axis machining

VARIAXIS j-500 series

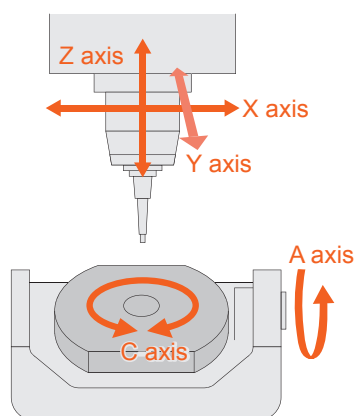


Table size: $\phi 500$ mm x 400 mm ($\phi 19.69$ " x 15.75")
Max. workpiece: $\phi 500$ mm x 400 mm ($\phi 19.69$ " x 15.75")

Spindle: 12000 rpm
Output: 11kW (15 HP) (40% ED/30-min. rating) Torque: 65 N • m (48 ft • lbs) (40% ED/30-min. rating)
: 18000 rpm **OPTION**
Output: 11kW (15 HP) (40% ED/30-min. rating) Torque: 65 N • m (48 ft • lbs) (40% ED/30-min. rating)



Multi-surface machining

VARIAXIS j-500
(CNC: MAZATROL SmoothG)



Simultaneous 5-axis machining

VARIAXIS j-500/5X
(CNC: MAZATROL SmoothX)



VARIAXIS j-600 series

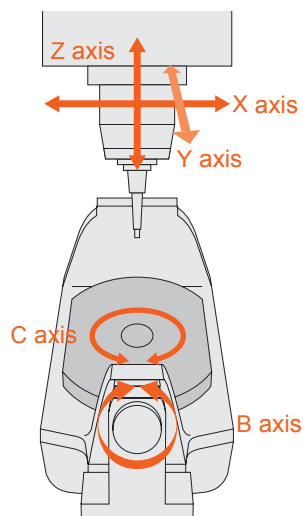


Table size: $\phi 600$ mm x 500 mm ($\phi 23.62$ " x 19.69")
Max. workpiece: $\phi 730$ mm x 450 mm ($\phi 28.74$ " x 17.72")

Spindle: 12000 rpm
Output: 11kW (15 HP) (40% ED/30-min. rating) Torque: 65 N • m (48 ft • lbs) (40% ED/30-min. rating)
: 18000 rpm **OPTION**
Output: 11kW (15 HP) (40% ED/30-min. rating) Torque: 65 N • m (48 ft • lbs) (40% ED/30-min. rating)



Multi-surface machining

VARIAXIS j-600
(CNC: MAZATROL SmoothG)



Simultaneous 5-axis machining

VARIAXIS j-600/5X
(CNC: MAZATROL SmoothX)

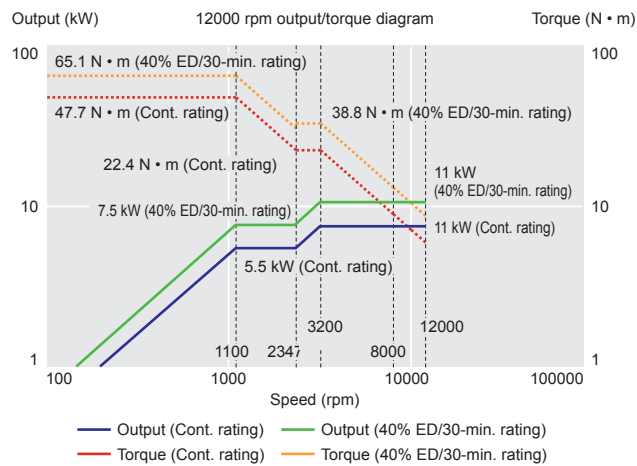


Higher Productivity

Spindle

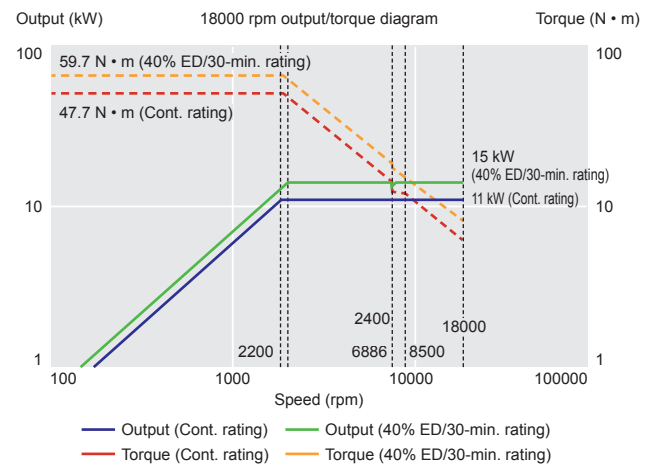
12000 rpm 11 kW
#40 taper spindle

Max. spindle speed	12000 rpm
Spindle output	11 kW (15 HP) (40% ED/30-min. rating)
Max. torque	65 N • m (48 ft • lbs) (40% ED/30-min. rating)



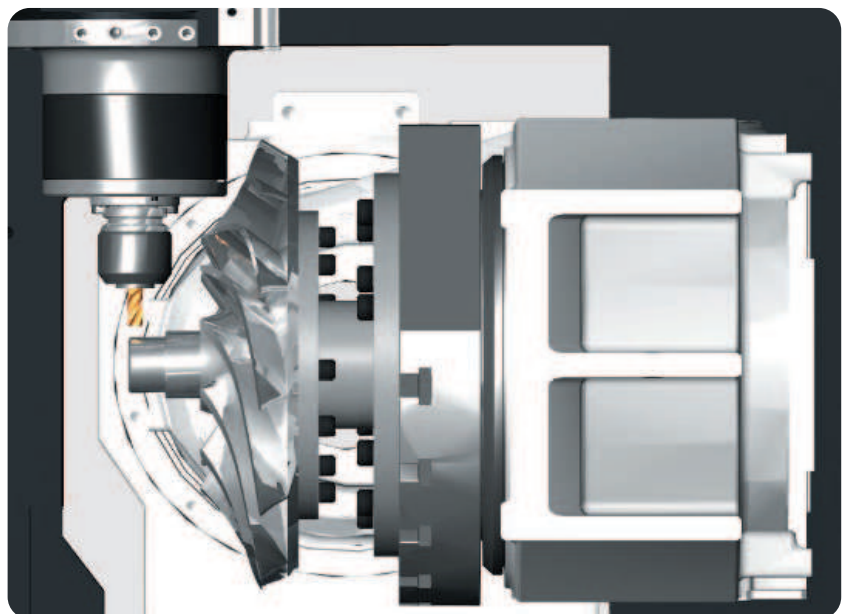
18000 rpm 15 kW
#40 taper spindle

Max. spindle speed	18000 rpm
Spindle output	15 kW (20 HP) (40% ED/30-min. rating)
Max. torque	59.7 N • m (44 ft • lbs) (40% ED/30-min. rating)



Compact spindle cartridge
minimizes workpiece
interference

Large machining area and compact spindle cartridge allows short tools to be used for high-accuracy machining.



Table

High-rigidity table

The A axis features a trunnion design to provide high rigidity for high-accuracy machining.

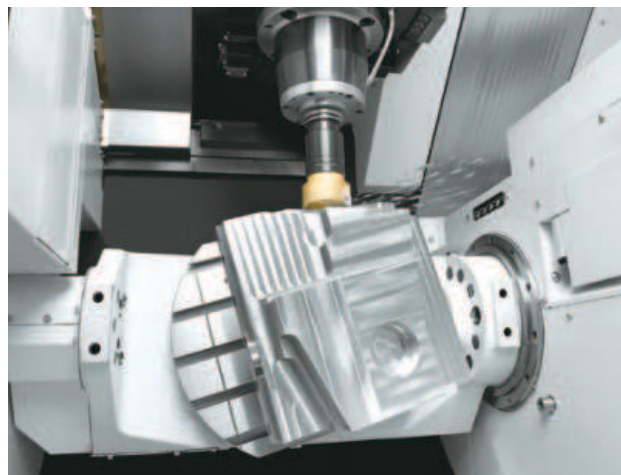
Tilting rotary table for 5-axis machining

Tilting rotary table can be indexed in 0.0001° for simultaneous 5-axis machining of complex workpieces.

(Simultaneous 4 axis (X, Y, Z, C) + A axis [B axis] indexing for VARIAXIS j-500, 600)

Change tool without returning table to home position

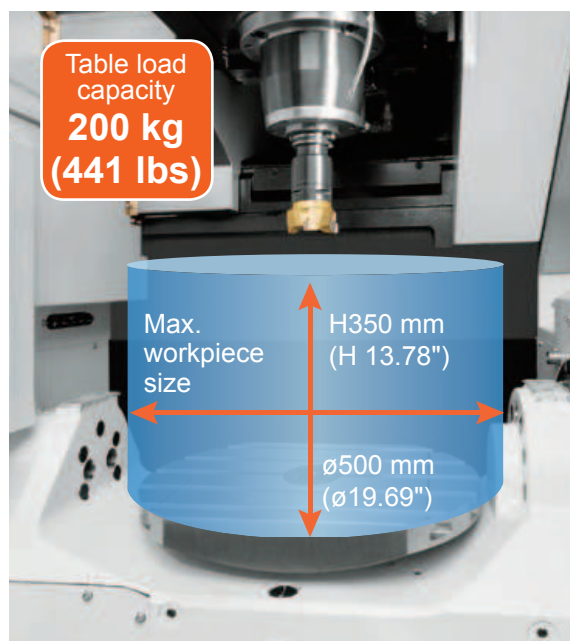
Because it is not necessary to return the VARIAXIS j series table to the home position to change tools, machining cycle time is reduced.



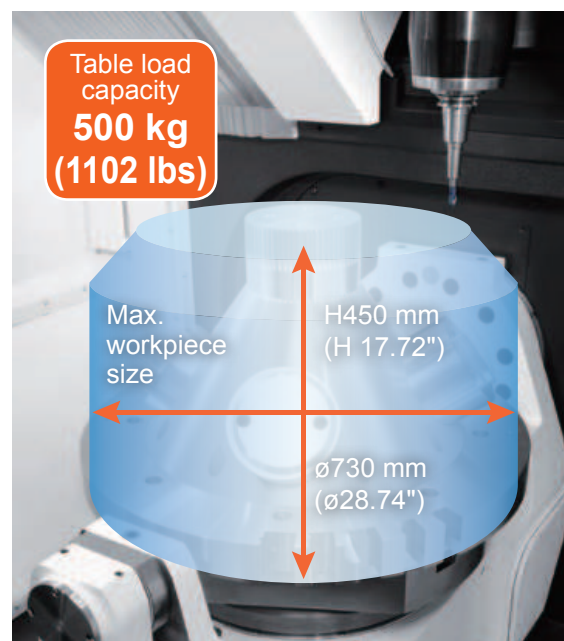
T-slot pallet (option) shown

Large, heavy maximum workpiece capacity

VARIAXIS j-500, j-500/5X



VARIAXIS j-500, j-500/5X



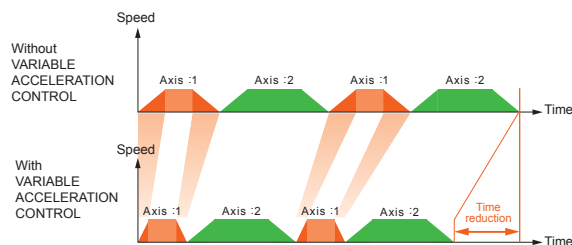
Higher Productivity

SMOOTH MACHINING CONFIGURATION

Machining time, finished surface smoothness and machining shape can be adjusted for improved productivity.

VARIABLE ACCELERATION CONTROL

Variable acceleration control is a new function that permits the faster acceleration capability of linear axes to be used whenever possible. The slower acceleration of the rotary axes is not used for all program commands, resulting in faster machining cycle times.

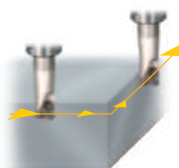


SMOOTH CORNER CONTROL

Improved finished surfaces and reduced cycle times by optimized acceleration/deceleration when machining corners.

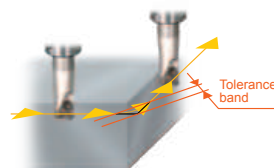
► Other systems

Move to next command position after reaching current command position



► SMOOTH CORNER CONTROL

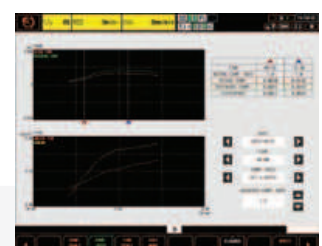
Move to the next command position within tolerance band



Heat Displacement Control – THERMAL SHIELD

The THERMAL SHIELD is an automatic compensation for room temperature changes, which realizes enhanced continuous machining accuracy. Mazak has performed extensive testing in a temperature-controlled environment and has used the results to develop a control system that automatically compensates for temperature changes in the machining area. Changes in the room temperature and compensation data are shown visually.

Temperature and compensation is displayed on screen. Operator can adjust compensation by looking at the data.



Ease of Maintenance

High-Accuracy 5-Axis Calibration – MAZA-CHECK

Position misalignment and incline of the rotary axes can be measured and compensated to realize high-accuracy 5-axis machining. The centers of rotation of both the C and B axes can be measured and compensated automatically.

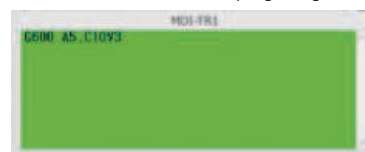
▼ Measurement item selection



▼ Measurement information setting



▼ Automatic measurement program generation



Convenient screen display assists measurement operation.

Comprehensive Spindle Monitoring – PERFORMANCE SPINDLE

The PERFORMANCE SPINDLE monitors a variety of properties, such as temperature, with sensors housed in the spindle, and provides useful information to the operator. Thanks to this monitoring, production loss from machine down time can be minimized.



▲ Condition check

Temperature as well as the motor load can be displayed.



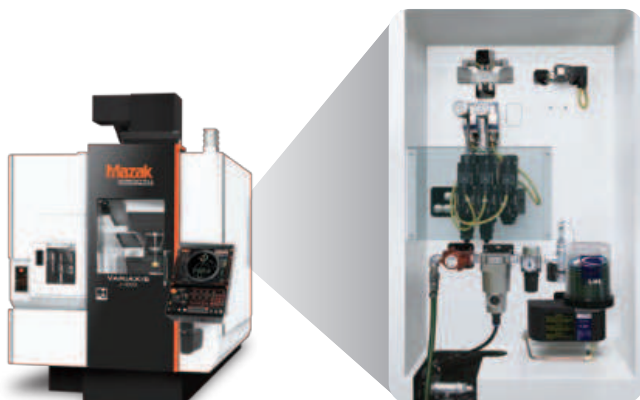
▲ Running recorder

Operation status of milling spindle (rpm, % motor load and temperature) can be recorded for up to one year.

Convenience maintenance

Centralized location

All the items that require frequent access, such as valves and lubrication inlets, are at the same location to make daily maintenance easier.



Comprehensive Maintenance Monitor – MAINTENANCE SUPPORT

Useful information for improved preventive maintenance to prevent unexpected machine downtime.



■ Ergonomics

Designed for convenient accessibility

Tool magazine

The tool magazine door is located at the front of the machine for convenient tool loading and unloading.

Excellent accessibility

The operator has excellent access to the table from the front of the machine for convenient workpiece loading/unloading and machine setup.



VARIAXIS j-600 shown



Maintenance area

Items that require frequent access for machine maintenance are arranged in one central location.



Convenient operation when using an overhead crane

The large top opening is designed for convenient workpiece loading/unloading.



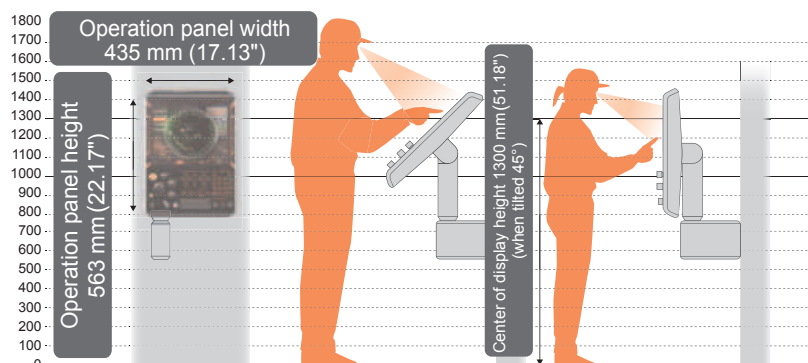
Large window

The large front door window allows the operator to monitor workpiece machining easily.



Touch panel adjustable to be comfortable for all operators

The tilting operation panel allows optimum positioning of the touch panel for operators of all heights.



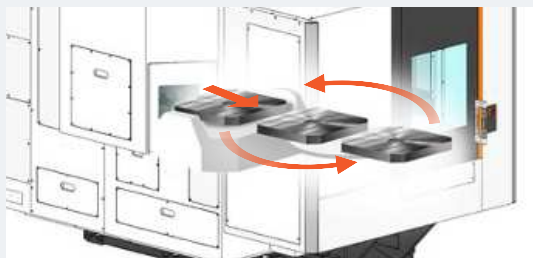
Automation

2 pallet changer (OPTION)

For higher productivity, the next workpiece can be set up during production of the current workpiece.



VARIAXIS j-500/5X 2 pallet changer

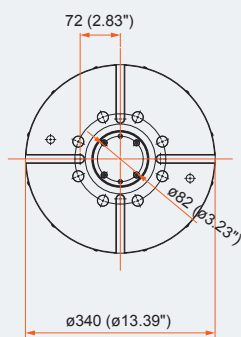


VARIAXIS j-600/5X 2 pallet changer

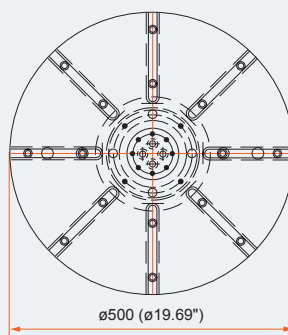


Preparation for hydraulic fixtures (OPTION)

Hydraulic power is supplied through the pallet for hydraulic fixtures.



VARIAXIS j-500
VARIAXIS j-500/5X
Table dimensions



VARIAXIS j-600
VARIAXIS j-600/5X
Table dimensions

unit: mm (inch)

Process Integration

Large reduction of total production time

The DONE IN ONE® concept incorporates all machining processes from raw material input through final machining – in just one machine. It provides the ability to reduce production lead time, improve machining accuracy, reduce floor space and initial cost, lower operating expenses, reduce operator requirements and improve the work environment. As a result, the concept not only streamlines production, it also improves overall management.



Automotive component



General machinery component

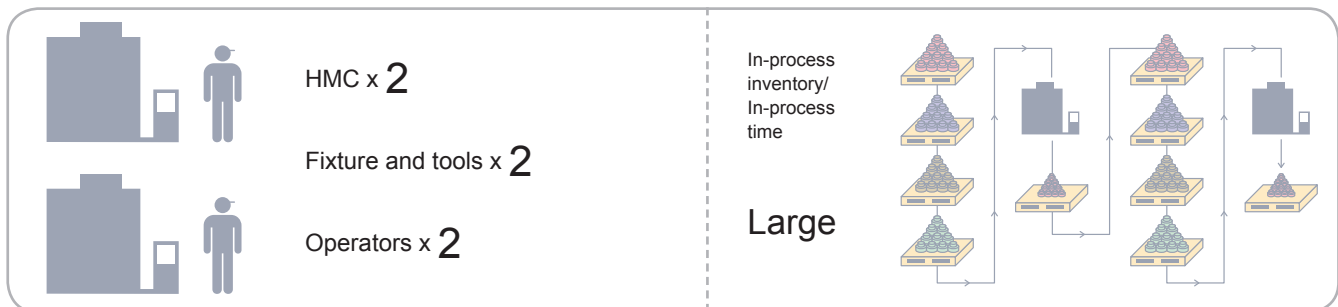


Aerospace component

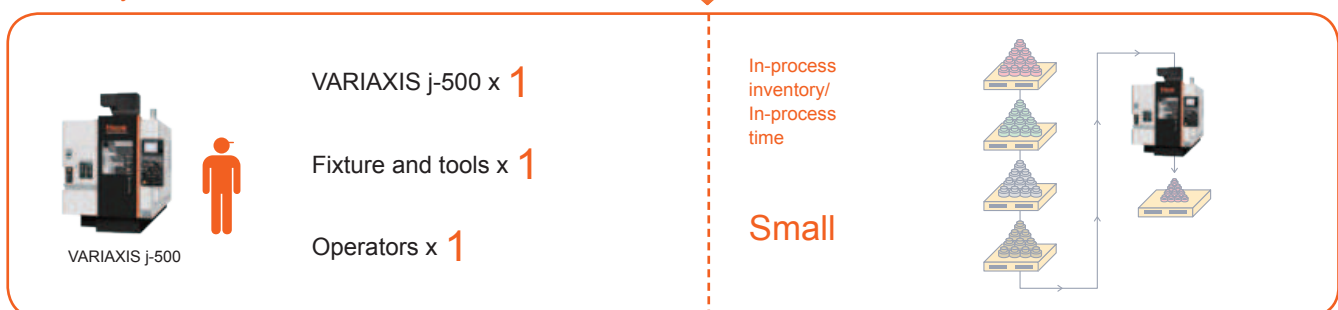
DONE IN ONE example

- Reduction of production lead time
- Improved machining accuracy
- Lower investment
- Lower labor expense
- Minimized manual finishing

Previous production method



VARIAXIS j-500



Automation

The seventh generation MAZATROL CNC system –
the core of SMOOTH TECHNOLOGY

MAZATROL *SMOOTHX*
MAZATROL *SMOOTHG*

From setup to machining – designed for
unsurpassed ease of operation



Three-color status indicator (SmoothX only)

Machining status is indicated by three colors.
Green: Automatic operation mode
Yellow: Machining completion
Red: Alarm

19" touch panel

Touch panel operation similar to
your smartphone or tablet

USB port

Interface for peripheral equipment
USB 1.0 + 2.0 standard

SD card slot

Transfer programs and tool data

Operation switches

Large switches change color from
orange to green when activated

Dials

For selection of frequently-used
axes and feedrate changes

New interface with touch operation assures convenient data processing – programming, confirmation, editing and tool-data registration

Process home screens

Five different home screens display the appropriate data in an easy-to-understand manner. Touch icons in each process display for additional screen displays.

Programming



Tool data



Setup



Machining



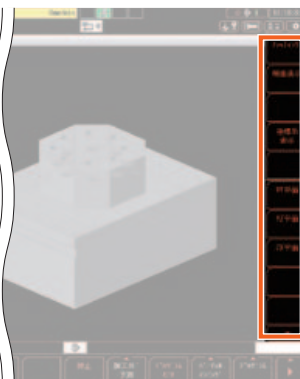
Maintenance



Pop-up windows

Values and items can be input/selected easily on pop-up windows.

Side menu



List menu



Screen keyboard



Ease of Programming

Easy Programming

Multiple-surface machining

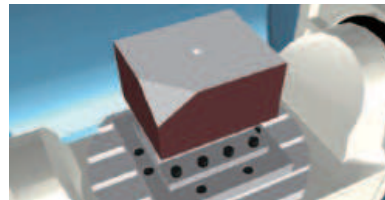
Easy programming of multiple-surface machining, which normally requires complex machining programs.

The same home position and coordinate system can be used for top and angled surfaces without any complicated programming for angled surfaces.

LINE	UNIT	ADD. MPC	X	Y	th	Z	C	A
1	MPC	1	-315.	-315.	0.	-400.	0.	0.
LINE	UNIT	TURN POS. X	TURN POS. Y	TURN POS. Z	ANGLE C	ANGLE A		
2	INDEX			0.	0.	0.		

Setting Coordinate

Setting Index Angle



Program the origin of automatic calculation workpiece coordinate shifts

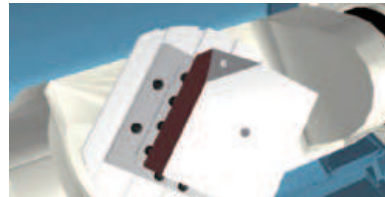
Change program coordinate systems easily.

LINE	UNIT	TURN POS. X	TURN POS. Y	TURN POS. Z	ANGLE C	ANGLE A		
4	INDEX				135.	-45.		
LINE	UNIT	SHIFT-X	SHIFT-Y	SHIFT-Z	SHIFT-C	SHIFT-A	COORD. th	
5	MPCSHIFT	-150.	-100.	0.	135.	-45.	0.	

Setting Coordinate

Setting Index Angle

No complicated calculations required when changing program coordinate system.



ANGLE C	ANGLE A
135.	-45.
TOOL	NOM-0
DRILL	6.

QUICK MAZATROL

MAZATROL program, unit list and 3D workpiece shape are linked to each other. After defining a machining unit in a MAZATROL program, the 3D shape is displayed immediately to check for any programming errors easily and quickly.

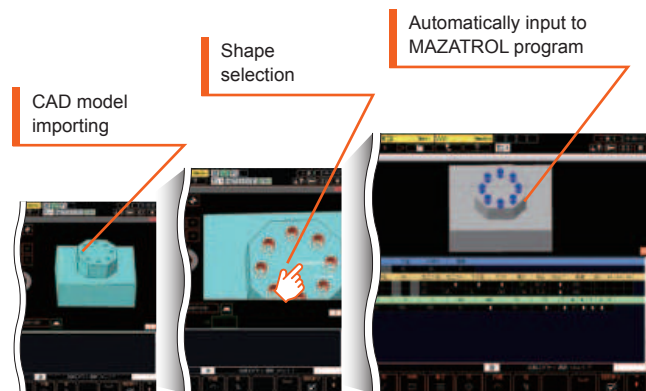
3D model in the process list displays updated programming in real time.



Touch a feature in the 3D model to move quickly to the corresponding feature in the 3D program.

3D ASSIST

Import workpiece coordinate data from 3D CAD data to a MAZATROL program. No coordinate value inputs are required. This can reduce input errors and time for program checking.



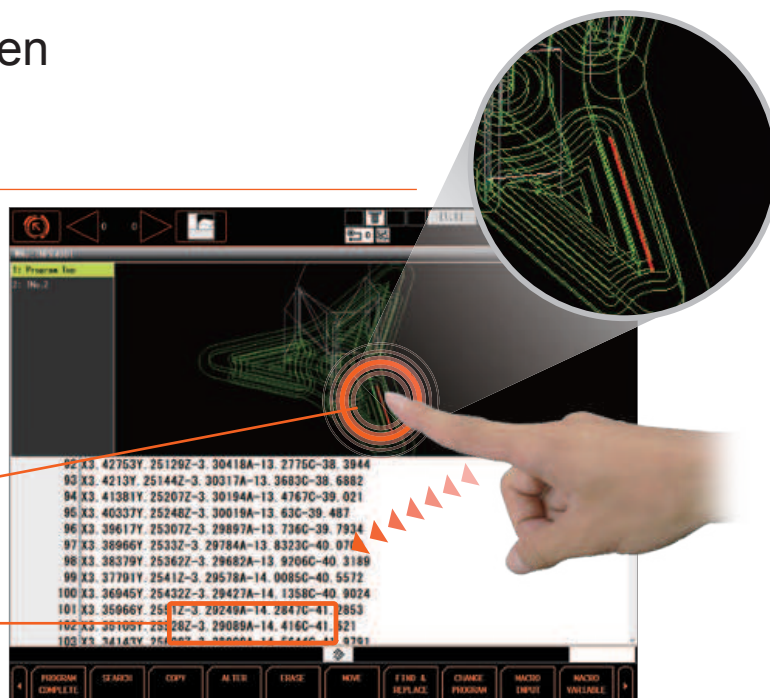
Visible programming screen

QUICK EIA

Program, process list and 3D tool path display are linked to each other. Visible search on touch screen can reduce the time for program checking.

Selecting tool path by touching the screen

Moving to the corresponding EIA program line



VIEW SURF

Analyze the tool to visualize any predictable failure on the finished surface. Modify programs before machining to minimize test-cutting time.

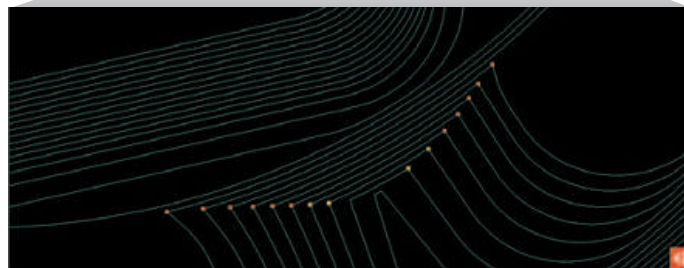
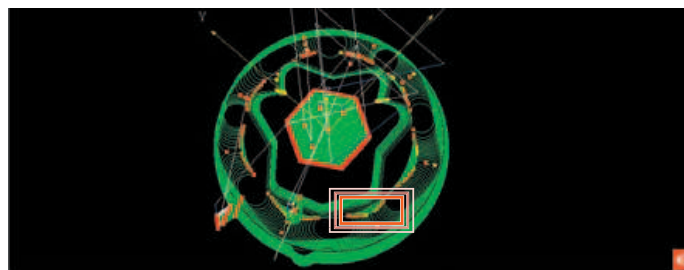
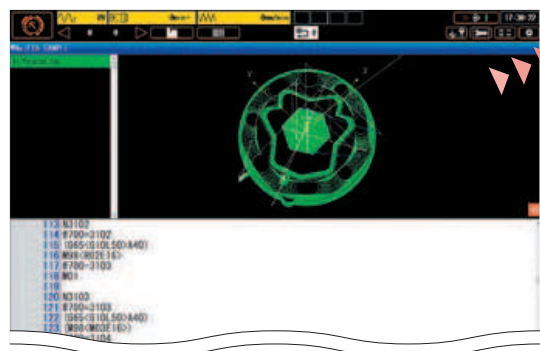
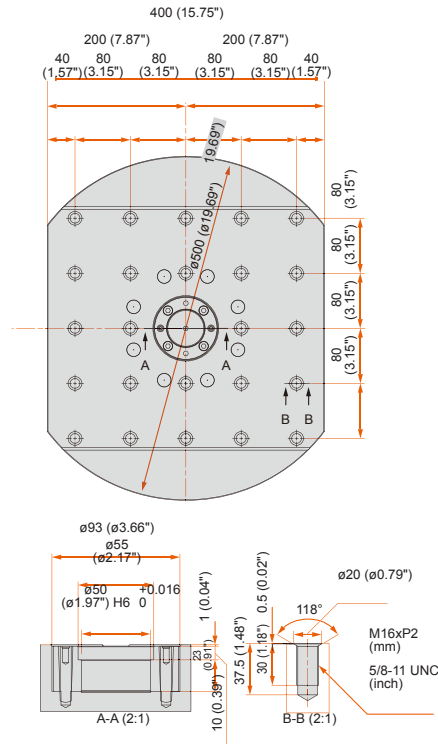


Table Dimensions

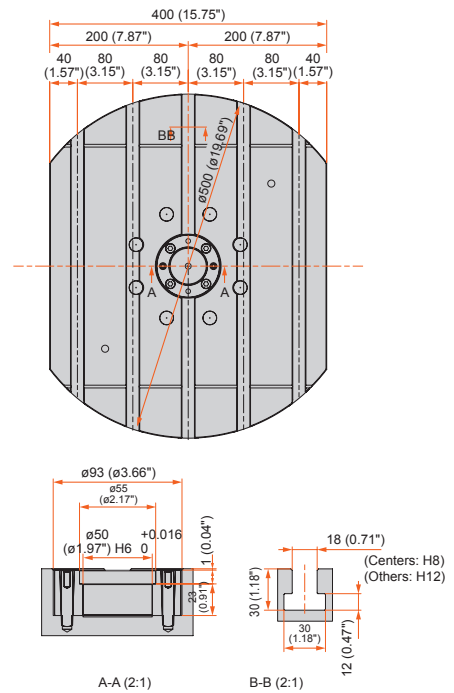
Unit: mm (inch)

VARIAXIS j-500, j-500/5X

Tapped pallet with location bore (standard)

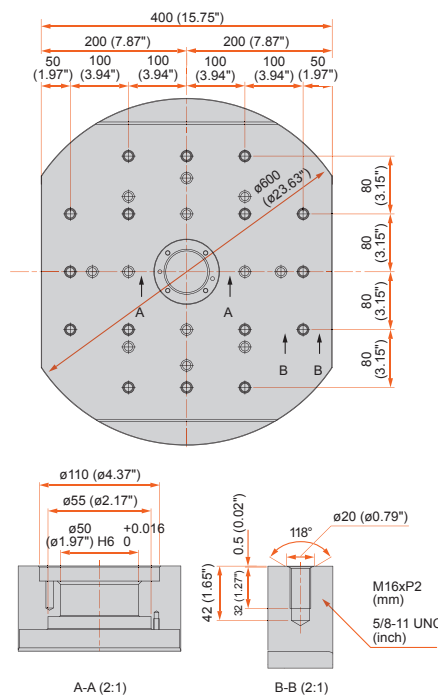


T-slot pallet with location bore (option)

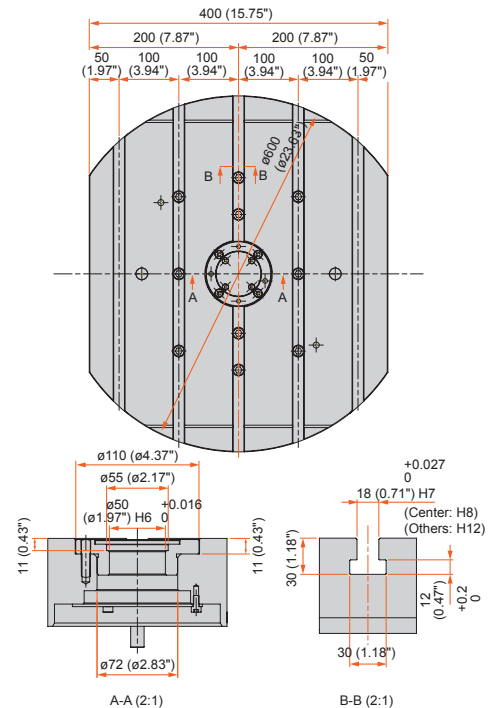


VARIAXIS j-600, j-600/5X

Tapped pallet with location bore (standard)



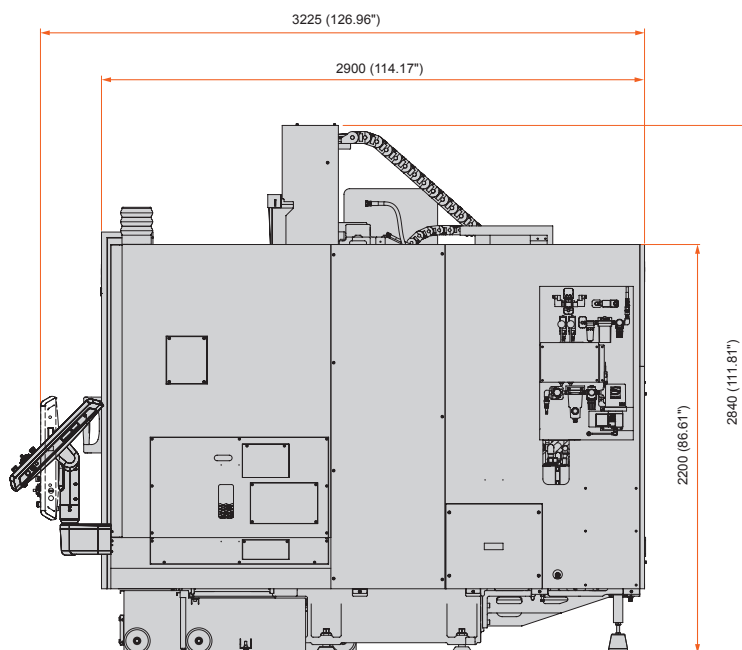
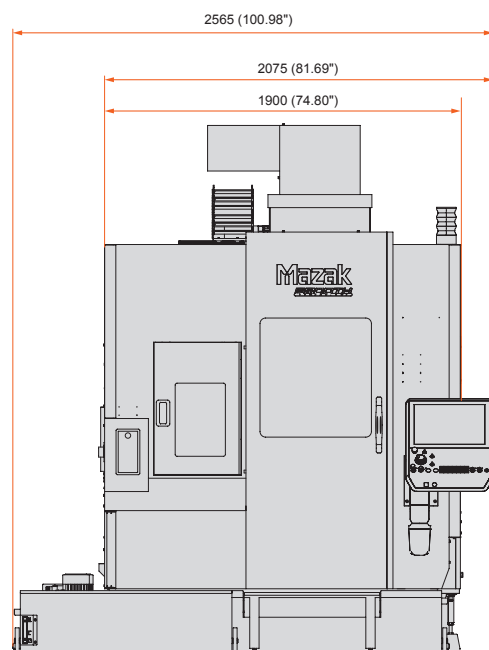
T-slot pallet with location bore (option)



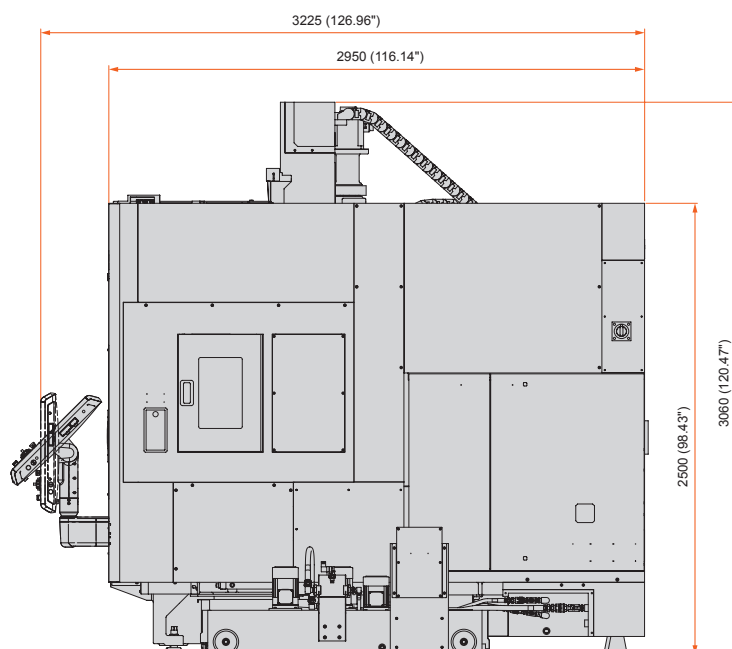
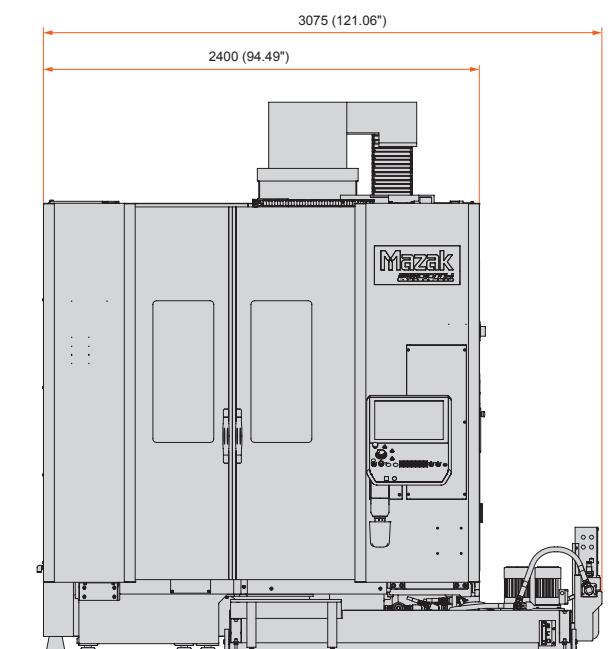
Machine Dimensions

Unit: mm (inch)

VARIAXIS j-500, j-500/5X



VARIAXIS j-600, j-600/5X



Standard Machine Specifications

		VARIAXIS j-500	VARIAXIS j-500/5X	VARIAXIS j-600	VARIAXIS j-600/5X
Stroke	X-axis travel (spindle head left/right)	350 mm (13.78")		850 mm (33.46")	
	Y-axis travel (spindle head back/forth)	550 mm (21.65")			
	Z-axis travel (spindle head up/down)	510 mm (20.08")			
	A-axis travel (table tilt)	-120 ~ +30°		—	
	B-axis travel (table tilt)	—		-120 ~ +90°	
	C-axis travel (table rotation)	360°			
Table	Distance from table top to spindle nose	50 ~ 560 mm (1.97" ~ 22.05") (table horizontal)		70 ~ 580 mm (2.67" ~ 22.83") (table horizontal)	
	Table size	ø500 mm × 400 mm (ø19.69" × 15.75")		ø600 mm × 500 mm (ø23.62" × 19.69")	
	Max. workpiece size	ø500 mm × 350 mm (ø19.69" × 13.78")		ø730 mm × 450 mm (ø28.74" × 17.72")*1	
	Table load capacity (evenly distributed)	200 kg (441 lbs)		500 kg (1102 lbs)	
	Table surface configuration	M16 × P2 (5/8-11 UNC) tap 24		M16 × P2 (5/8-11 UNC) tap 24	
Spindle	Max. spindle speed	12000 rpm			
	Spindle taper	No. 40			
	Spindle bearing ID	ø70 mm (ø2.76")			
Feedrate	Rapid traverse rate (X, Y, Z axis/A axis)	30 m/min (1181 IPM)/30 rpm		—	
	Rapid traverse rate (X, Y, Z axis/B axis)	—		30 m/min (1181 IPM)/30 rpm	
	Rapid traverse rate (X, Y, Z axis/C axis)	30 m/min (1181 IPM)/30 rpm			
	Cutting feedrate (X, Y, Z axis/C axis)	30 m/min (1181 IPM)/30 rpm			
	Simultaneous controlled axes	4 (A axis only indexing)	5-axis	4 (B axis only indexing)	5-axis
	Min. indexing increment (A axis)	0.0001°		—	
	Min. indexing increment (B axis)	—		0.0001°	
	Min. indexing increment (C axis)	0.0001°			
	Indexing time (A axis)	0.6 sec/90°		—	
	Indexing time (B axis)	—		0.6 sec/90°	
Automatic tool changer	Tool shank configuration	No. 40			
	Tool storage capacity	18			
	Max. tool diameter/length (from gauge line)/weight	ø90 mm/300 mm/8 kg (ø3.54"/11.81"/17.6 lbs)			
	Max. tool diameter with adjacent toolpockets empty	ø130 mm (ø5.12")			
	Tool selection method	Random selection, shortest path			
	Tool change time (chip-to-chip)	6.2 sec			
Motors	Spindle (40% ED/30-min. rating/Cont. rating)	11 kW (15 HP)/7.5 kW (10 HP)			
	Electrical power requirement (40% ED/30-min. rating/Cont. rating)	29.0 kVA/24.0 kVA	29.5 kVA/24.5 kVA	29.4 kVA/24.5 kVA	35.4 kVA/30.5 kVA
	Air supply	0.5 MPa ~ 0.9 MPa (73 PSI ~ 131 PSI) 200 NL/min (7.06 ft³/min)			
Machine size	Height	2840 mm (111.81"), 2905 mm (114.37") (Consep)		3060 mm (120.47")	
	Floor space	1900 mm x 3225 mm (74.80" x 126.97")		2400 mm x 3225 mm (94.49" x 126.97")	
	Machine weight	7000 kg (15432 lbs)		11000 kg (24250 lbs)	
CNC		MAZATROL SmoothG	MAZATROL SmoothX	MAZATROL SmoothG	MAZATROL SmoothX

*1 Requires 80 mm (3.15") chamfer on top edge of workplace.

Standard and Optional Equipment

		●: Standard ○: Optional –: N/A			
		VARIAXIS j-500	VARIAXIS j-500/5X	VARIAXIS j-600	VARIAXIS j-600/5X
Table	ø500 mm x 400 mm (ø19.69" x 15.75") tapped table	●	●	–	–
	ø500 mm x 400 mm (ø19.69" x 15.75") T-slot table	○	○	–	–
	ø300 mm (ø11.81") tapped table	○	○	–	–
	ø600 mm x 500 mm (ø23.62" x 19.69") tapped table	–	–	●	●
	ø600 mm x 500 mm (ø23.62" x 19.69") T-slot table	–	–	○	○
ATC	ATC 18-slot magazine	●	●	●	●
	ATC 30-slot magazine	○	○	○	○
Spindle	12000 rpm spindle (#40)	●	●	●	●
	18000 rpm spindle (#40)	○	○	○	○
Factory automation	Absolute position detection	●	●	●	●
	Mazak monitoring system B (RMP600)	○	○	○	○
	Preparation for Mazak monitoring system B (RMP600)	○	●	○	●
	Automatic power on/off and warm-up operation	●	●	●	●
	Status light (3 colors)	○	○	○	○
	Visual tool ID/preparation for data management	○	○	○	○
	Auto tool length measurement and tool breakage detection	●	●	●	●
	Remote manual pulse generator	○	○	○	○
	Front door auto open/close	○	○	○	○
	Preparation for hydraulic power supply for fixture clamping	○	○	○	○
	2 pallet changer	○	○	○	○
High accuracy	Ball screw core cooling (X, Y, Z axes)	●	●	●	●
	Scale feedback (X, Y, Z axes)	○	○	○	○
	Scale feedback (A, C axes)	○	○	–	–
	Scale feedback (B, C axes)	–	–	○	○
Coolant	Coolant temperature control	○	○	○	○
	Handheld coolant nozzle	○	○	○ ^{*1}	○ ^{*1}
	Flood coolant 1.5 kgf/cm ² (21 PSI), 30 L/min (7.93 gal/min)	●	●	●	●
	Coolant through spindle 5 kgf/cm ² (70 PSI)	○	○	○	○
	Workpiece washing coolant	○	○	○	○
	High pressure coolant through spindle 15 kgf/cm ² (21 PSI)	○	○	○	○
	SUPER FLOW coolant system	○	○	○	○
Chip disposal	Workpiece air blast	○	○	○	○
	Chip conveyor (hinge type/Consep)	○	○	○	○
	Chip conveyor (swing type/fixed type)	○	○	○	○
Working equipment	Top cover (Y-axis cover)	●	●	●	●
	Additional worklight	○	○	○	○
	Oil skimmer	○	○	○	○
	Mist collector	○	○	○	○
Other	MAZA-CHECK	○	●	○	●

^{*1} Not available on 2 pallet changer
 Above specifications are for North American market.
 Standard and optional equipment vary by market.

MAZATROL SmoothG Specifications (VARIAXIS j-500, j-600)

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 ~ 4 axes	
Minimum input increment	0.0001 mm, 0.00001 inch", 0.0001"	
High-speed, high-precision control	Shape compensation, SMOOTH CORNER CONTROL, Rapid traverse overlap, Rotational-shape correction	Shape compensation, SMOOTH CORNER CONTROL, Rapid traverse overlap, Rotational-shape correction, High-speed machining mode, High-speed smoothing control
Interpolation	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Cylindrical interpolation, Polar coordinate interpolation, Synchronous tapping*	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Spiral interpolation, Helical interpolation, Cylindrical interpolation*, Fine spline interpolation*, NURBS interpolation*, Polar coordinate interpolation*, Synchronous tapping*
Feedrate	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Dwell (time/rotation), Cutting feed override, G0 speed variable control, Feedrate limitation, Variable acceleration control, G0 slope constant*	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Inverse time feed, Dwell (time, rotation), Rapid traverse override, Cutting feed override, G0 speed variable control, Feedrate limitation, Time constant changing for G1, Variable acceleration control, G0 slope constant*
Program registration	Number of programs: 256 (Standard)/960 (Max.), Program memory: 2MB, Program memory expansion: 8MB*, Program memory expansion: 32MB*	
Control display	Display: 19" touch panel, Resolution: SXGA	
Spindle functions	S code output, Spindle speed limitation, Spindle speed override, Spindle speed reaching detection, Multiple position orient, Constant surface speed, Spindle speed command with decimal digits, Synchronized spindle control, Spindle speed range setting	
Tool functions	Number of tool offset: 4000, T code output for tool number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)	Number of tool offset: 4000, T code output for tool number, T code output for group number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)
Miscellaneous functions	M code output, Simultaneous output of multiple M codes	
Tool offset functions	Tool position offset, Tool length offset, Tool diameter/tool nose R offset, Tool wear offset	
Coordinate system	Machine coordinate system, Work coordinate system, Local coordinate system, Additional work coordinates (300 set)	
Machine functions	—	Tilted working plane, Hobbing*, Shaping function*, Dynamic compensation II*, Workpiece positioning error compensation*
Machine compensation	Backlash compensation, Pitch error compensation, Geometric deviation compensation, Volumetric compensation*	
Protection functions	Emergency stop, Interlock, Pre-move stroke check, Retraction function for the vertical axis, SAFETY SHIELD (manual mode), SAFETY SHIELD (automatic mode), VOICE ADVISER	
Automatic operation mode	Memory operation	Memory operation, Tape operation, MDI operation, Ethernet operation*
Automatic operation mode	Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Machine lock	Optional block skip, Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Restart2, Collation stop, Machine lock
Manual measuring functions	Tool length teach, Touch sensor coordinates measurements, Workpiece offset measurement, WPC coordinate measurement, Measurement on machine	Tool length teach, Tool offset teach, Touch sensor coordinates measurement, Workpiece offset measurement, WPC coordinate measurement, Measurement on machine
Automatic measuring functions	WPC coordinate measurement, Automatic tool length measurement, Touch sensor orientation confirmation, Tool breakage detection, External tool breakage detection*	Automatic tool length measurement, Touch sensor orientation confirmation, Tool breakage detection, External tool breakage detection*
MDI measurement	Semi-automatic tool length measurement, Fully automatic tool length measurement, Coordinate measurement	
Interface	PROFIBUS-DP*, EtherNet/IP*, CC-Link*, USB	
Card interface	SD card interface	
Ethernet	10M/100M/1Gbps	

*: Option

MAZATROL SmoothX Specifications (VARIAXIS j-500/5X, j-600/5X)

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 ~ 4 axes	Simultaneous 5 axes
Minimum input increment	0.0001 mm, 0.00001", 0.0001°	
High-speed, high-precision control	Shape compensation, SMOOTH CORNER CONTROL, Rapid traverse overlap, Rotational-shape correction	Shape compensation, SMOOTH CORNER CONTROL, Rapid traverse overlap, Rotational-shape correction, High-speed machining mode, High-speed smoothing control, 5-axis spline*
Interpolation	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Cylindrical interpolation, Polar coordinate interpolation, Synchronous tapping*	Positioning (interpolation), Positioning (non-interpolation), Linear interpolation, Circular interpolation, Spiral interpolation, Helical interpolation, Cylindrical interpolation*, Involute compensation*, Fine spline interpolation*, NURBS interpolation*, Polar coordinate interpolation*, Synchronous tapping*
Feedrate	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Dwell (time/rotation), Cutting feed override, G0 speed variable control, Feedrate limitation, Variable acceleration control, G0 slope constant*	Rapid traverse, Cutting feed, Cutting feed (per minute), Cutting feed (per revolution), Inverse time feed, Dwell (time/rotation), Rapid traverse override, Cutting feed override, G0 speed variable control, Feedrate limitation, Time constant changing for G1, Variable acceleration control, G0 slope constant*
Program registration	Number of programs: 256 (Standard)/960 (Max.), Program memory: 2MB, Program memory expansion: 8MB*, Program memory expansion: 32MB*	
Control display	Display: 19" touch panel, Resolution: SXGA	
Spindle functions	S code output, Spindle speed limitation, Spindle speed override, Spindle speed reaching detection, Multiple position orient, Constant surface speed, Spindle speed command with decimal digits, Synchronized spindle control, Spindle speed range setting	
Tool functions	Number of tool offset: 4000, T code output for tool number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)	Number of tool offset: 4000, T code output for tool number, T code output for group number, Tool life monitoring (time), Tool life monitoring (number of machined workpieces)
Miscellaneous functions	M code output, Simultaneous output of multiple M codes	
Tool offset functions	Tool position offset, Tool length offset, Tool diameter/tool nose R offset, Tool wear offset	
Coordinate system	Machine coordinate system, Work coordinate system, Local coordinate system, Additional work coordinates (300 set)	
Machine functions	—	Rotary axis pre-filter, Tilted working plane, Hobbing II*, Shaping function*, Dynamic compensation II*, Tool center point control*, Tool radius compensation for 5-axis machining*, Workpiece positioning error compensation*
Machine compensation	Backlash compensation, Pitch error compensation, Geometric deviation compensation, Volumetric compensation*	
Protection functions	Emergency stop, Interlock, Pre-move stroke check, Retraction function for the vertical axis, SAFETY SHIELD (manual mode), SAFETY SHIELD (automatic mode), VOICE ADVISER	
Automatic operation mode	Memory operation	Memory operation, Tape operation, MDI operation, Ethernet operation*
Automatic operation mode	Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Machine lock	Optional block skip, Optional stop, Dry run, Manual handle interruption, MDI interruption, TPS, Restart, Restart2, Collation stop, Machine lock
Manual measuring functions	Tool length teach, Touch sensor coordinates measurement, Workpiece offset measurement, WPC coordinate measurement, Measurement on machine	Tool length teach, Tool offset teach, Touch sensor coordinates measurement, Workpiece offset measurement, WPC coordinate measurement, Measurement on machine
Automatic measuring functions	WPC coordinate measurement, Automatic tool length measurement, Touch sensor orientation confirmation, Tool breakage detection, External tool breakage detection*	Automatic tool length measurement, Touch sensor orientation confirmation, Tool breakage detection, External tool breakage detection*
MDI measurement	Semi automatic tool length measurement, Full automatic tool length measurement, Coordinate measurement	
Interface	PROFIBUS-DP*, EtherNet/IP*, CC-Link*, USB	
Card interface	SD card interface	
Ethernet	10M/100M/1Gbps	

*: Option



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