Mazak

VARIAXIS j

SERIES

Advanced features of the MAZATROL Smooth CNC

Touch screen operation
— Operate similar to your smart phone / tablet

PC with Windows® 8 embedded OS

Fastest CNC in the world — Latest hardware and software for unprecedented speed and precision

Easy conversational programming of multiple surface machining

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

MTConnect® — Convenient networking

Easily configure machine parameters for different workpiece materials and applications requirements

MAZATROL SMOOTH X

MAZATROL SMOOTH G

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

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 a variety of 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

Machine Design

Designed to provide you the maximum value

VARIAXIS j-500 shown

Linear roller guides utilized on the X-, Y-, and Z-axis

The linear roller guides on the X-, Y-and Z-axis 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 and high accuracy machining.

Rotary axes equipped with roller gear cams

Elimination of backlash ensures high accuracy and high efficiency machining.

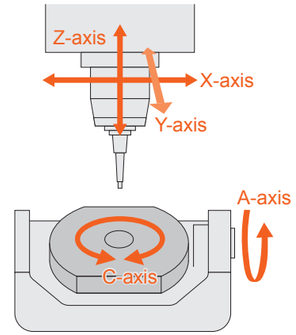
Extensive Series Range

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

VARIAXIS j-500 series

Table size : Φ500 mm × 400 mm
Max. workpiece : Φ500 mm × 350 mm

Spindle : 12000 rpm
Output : 11 kW (40% ED) Torque : 65 N·m (40% ED)
: 18000 rpm OPTION
Output : 15 kW (40% ED) Torque : 59.7 N·m (40% ED)



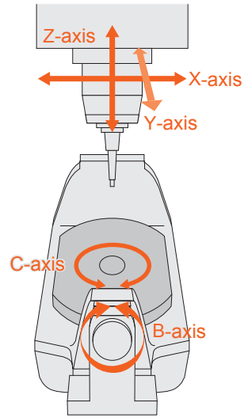
Multi-surface machining
VARIAXIS j-500
(CNC : MAZATROL SmoothG)

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

VARIAXIS j-600 series

Table size : Φ600 mm × 500 mm
Max. workpiece : Φ730 mm × 450 mm

Spindle : 12000 rpm
Output : 11 kW (40% ED) Torque : 65 N·m (40% ED)
: 18000 rpm OPTION
Output : 15 kW (40% ED) Torque : 59.7 N·m (40% ED)



Multi-surface machining
VARIAXIS j-600
(CNC : MAZATROL SmoothG)

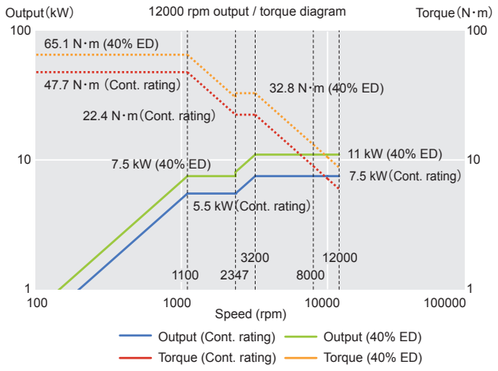
Simultaneous 5-axis machining
VARIAXIS j-600/5X
(CNC : MAZATROL SmoothX)

Higher Productivity

Spindle

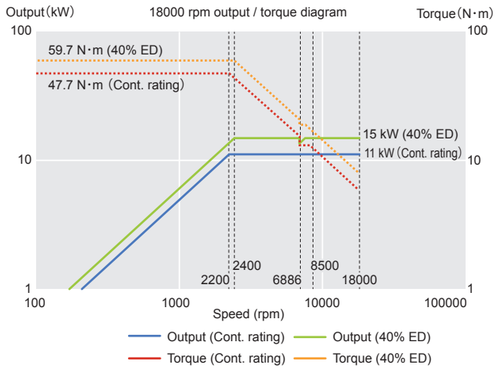
12000 rpm 11 kW, #40 taper spindle

Max. spindle speed	12000 rpm
Spindle output	11 kW (15 HP) (40% ED)
Max. torque	65 N·m (40% ED)



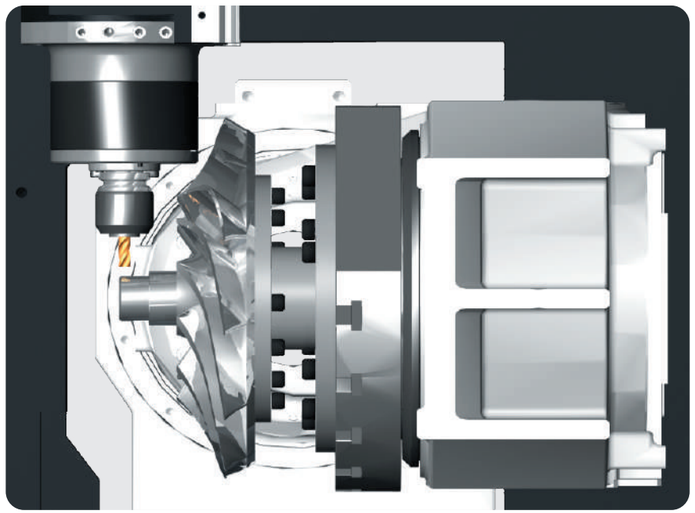
18000 rpm 15kW, high-speed spindle OPTION

Max. spindle speed	18000 rpm
Spindle output	15 kW (20 HP) (40% ED)
Max. torque	59.7 N·m (40% ED)



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

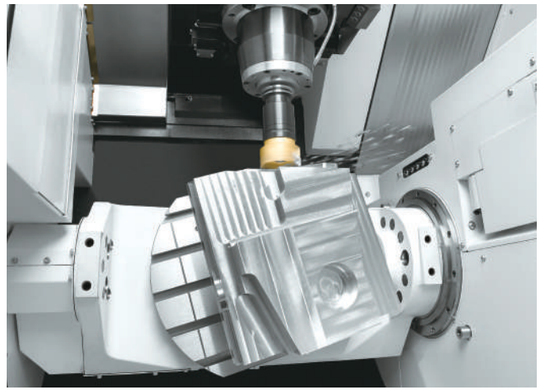
The A-axis features a trunnion design to provide high rigidity for high accuracy machining.

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

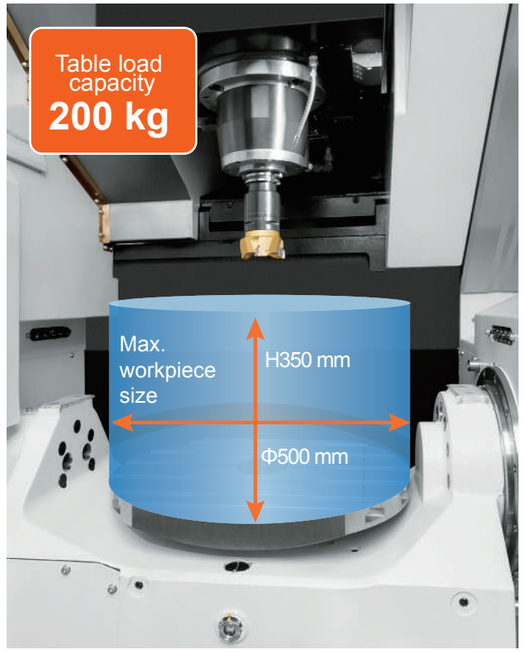
Since it is not necessary to return the VARIAXIS j series table to the home position to change tools, the machining cycle time is reduced.



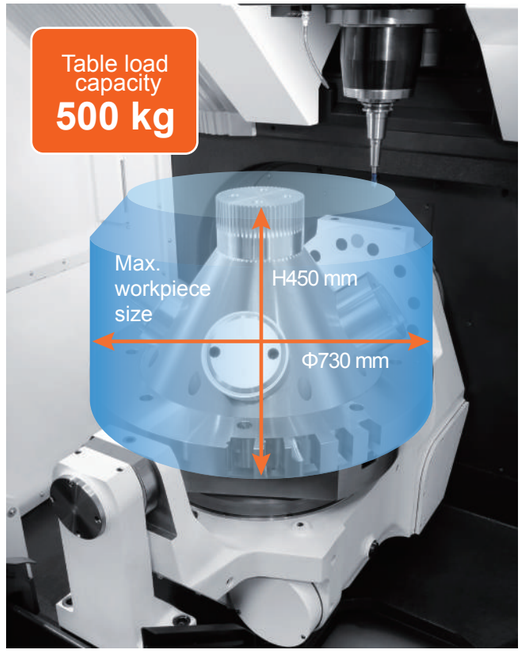
T-slot pallet (option) shown.

Large, heavy maximum workpiece capacity

VARIAXIS j-500, j-500/5X



VARIAXIS j-600, j-600/5X



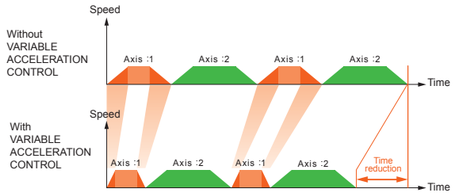
Higher Productivity

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 which 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.

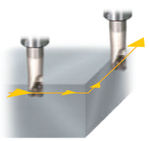


SMOOTH CORNER CONTROL

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

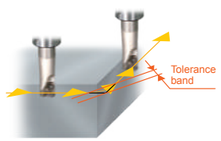
▶ Other systems

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 variety of environments in a temperature controlled room 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.

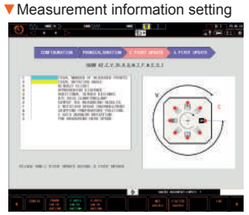
Ease of Maintenance

High-Accuracy 5-Axis Calibration – MAZA-CHECK

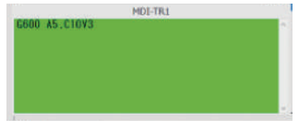
Position misalignment and incline of the rotary axes can automatically be measured and compensated to realize high-accuracy 5-axis machining. The centers of rotation of both the C and B axes can be automatically measured and compensated.

▼Measurement item selection

▼Measurement information setting



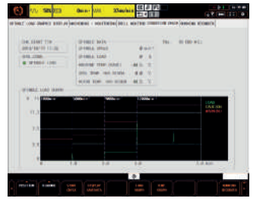
▼Automatic measurement program generation



Convenient screen display assists measurement operation.

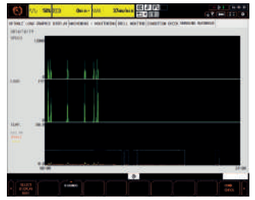
Comprehensive Spindle Monitoring – PERFORMANCE SPINDLE

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 due to 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 up to one year.

Convenient 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 preventative maintenance to prevent unexpected machine downtime.

Ergonomics

Designed for convenient accessibility

ergonomics

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

VARIAXIS j-500 shown

Verbal Message System – VOICE ADVISER

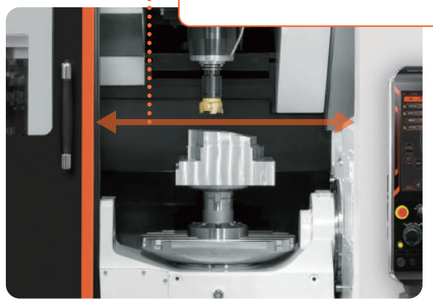
Verbal support for machine setup and safe conditions confirmation.

- Feedrate is 100%. Please watch out.
- There are tools not registered on tool data.
- X-axis was selected.
- Alarm occurred.

Convenient operation when using an overhead crane

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

Opening section
750 mm (j-500, j-500/5X)
1050 mm (j-600, j-600/5X)

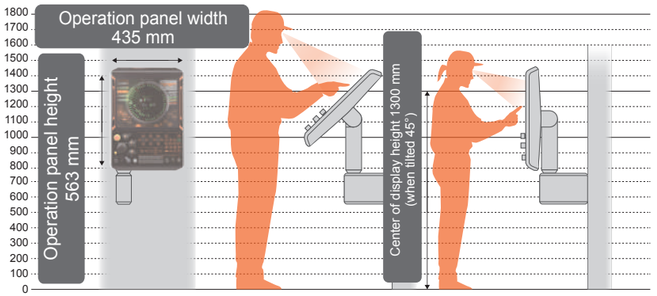


Large window

The large front door window allows workpiece machining to be easily monitored by the operator.

Touch panel adjustable to be comfortable for all operators

The tilting operation panel allows optimum positioning of the touch panel for any height operator to ensure ease of operation.



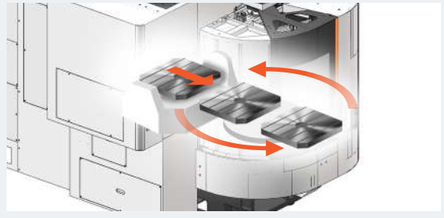
Automation

2 pallet changer OPTION

The next workpiece can be setup during the machining of the current workpiece for higher productivity.

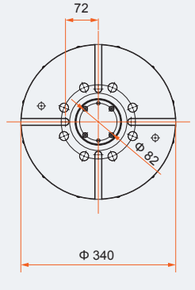
VARIAXIS j-500/5X 2 pallet changer

VARIAXIS j-600/5X 2 pallet changer

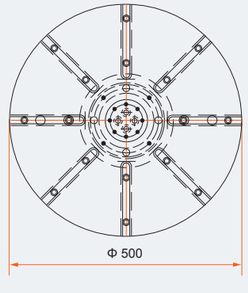


Preparation for hydraulic fixtures OPTION

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

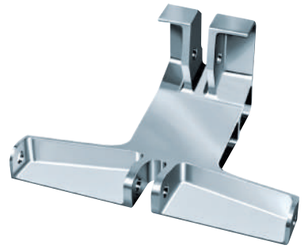
unit : mm

DONE IN ONE

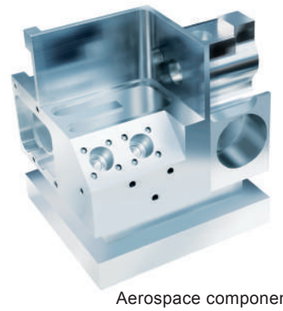
Large reduction of total production time

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 to improve the work environment. As a result, the concept not only streamline production, it also improves overall management.

Automotive component



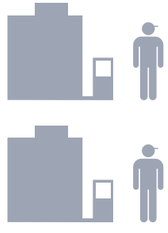
General machinery component



Aerospace component

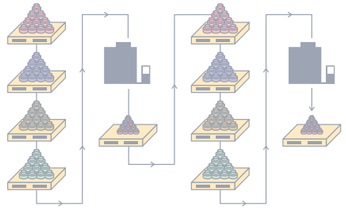
DONE IN ONE example ■Reduction of production lead time ■ Improved machining accuracy ■ Lower investment ■ Lower labor expense ■ Minimized manual finishing

Previous production method



HMC ×2
Fixtures and tools ×2
Operators ×2

In-process inventory / In-process time
Large

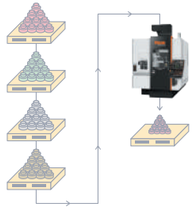


VARIAXIS j-500

VARIAXIS j-500

VARIAXIS j-500 × 1
Fixtures and tools × 1
Operators × 1

In-process inventory / In-process time
Small



MAZATROL CNC SYSTEM

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 of
USB-1.0 + 2.0 standard

SD card slot

Transfer program and tool data

Operation switches

Large switches
— color changes from orange to green
when turned on

Dials

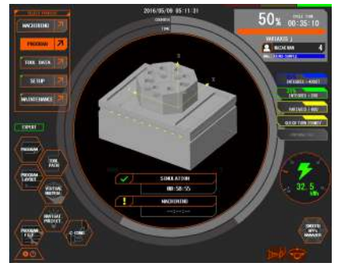
For frequently-used axes selection and
feedrate changes

New interface with touch operation ensures convenient data processing
— programming, confirmation, editing, and tool data registration

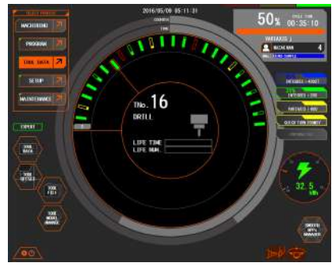
Process home screens

Five different home process screens
— each home screen displays the
appropriate data in an easy-to-understand
manner. Icons can be touched in
each process display for additional
screen displays.

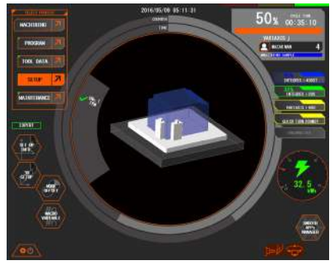
Programming



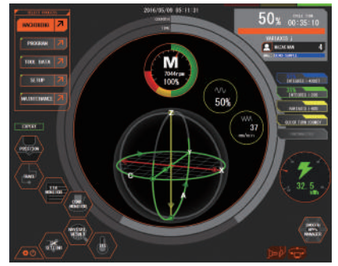
Tool data



Setup



Machining

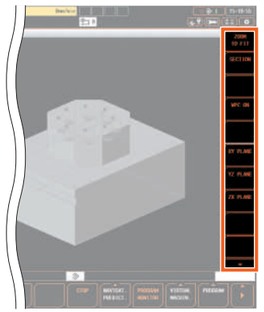


Maintenance

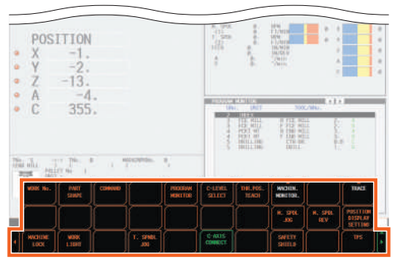
Pop-up windows

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

Side menu



List menu



Screen key board

Ease of Programming

Easy programming

Multiple-surface machining

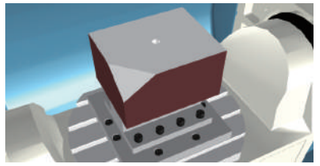
Easy programming of multiple-surface machining which normally requires complex machining programs.

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

Setting Coordinate

Setting Index Angle

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



Program origin automatic calculation workpiece coordinate shift

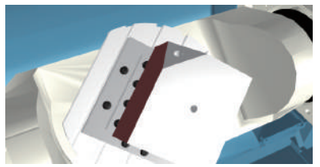
Program origin automatic calculation workpiece coordinate shift.

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

Setting Index Angle

Coordinate Shift

No complicated calculations required when changing program coordinate system.

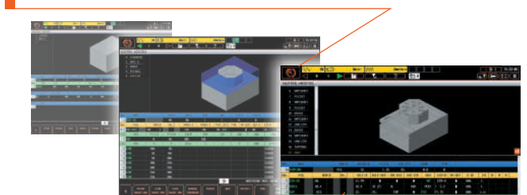


ANGLE C	ANGLE A
135.	-45.
TOOL	NOM-Ø
DRILL	6.

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 immediately displayed to easily and quickly check for any programming error.

3D model in the process list is displayed with updated programming in real time.



Quickly move to the corresponding section in the MAZATROL program by touching a feature in the 3D model.

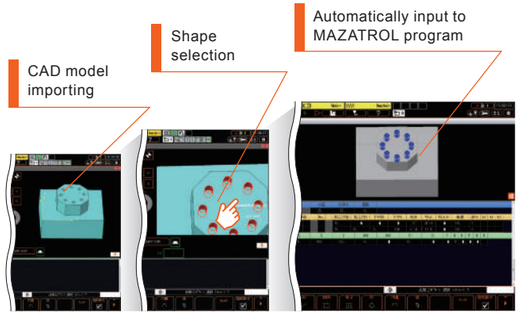
3D assist

Workpiece coordinates data can be imported from 3D CAD data to a MAZATROL program. No coordinate value inputs are required. Can reduce input errors and time for program checking.

CAD model importing

Shape selection

Automatically input to MAZATROL program



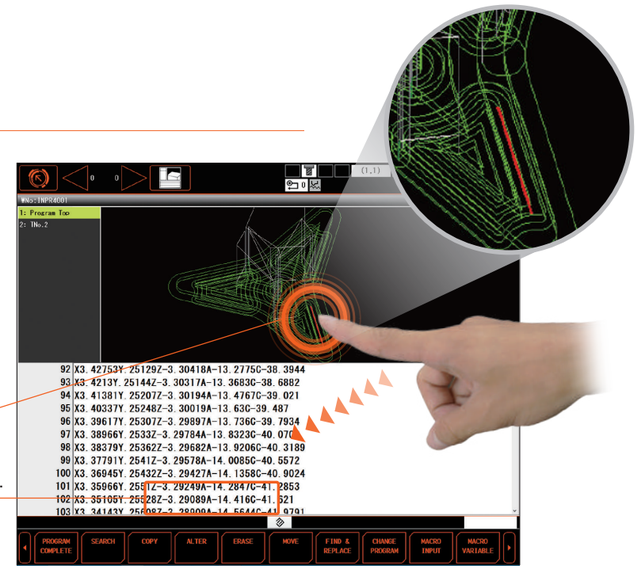
Visible programming screen

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

By analyzing the tool path, any predictable failure on the finished surface can be visualized. Program modification can be done before machining to minimize the time for test cutting.

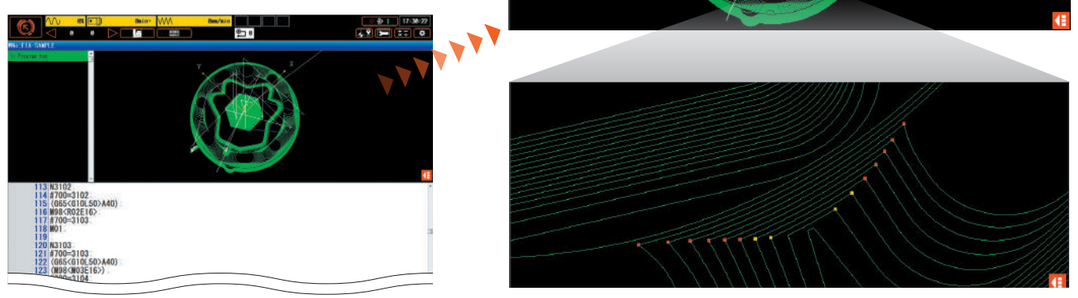
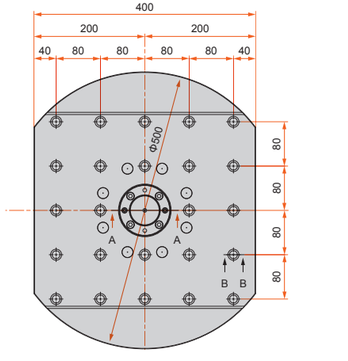


Table Dimensions

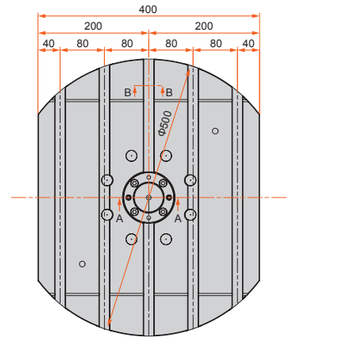
unit : mm

VARIAXIS j-500, j-500/5X

Tapped pallet with location bore (standard)

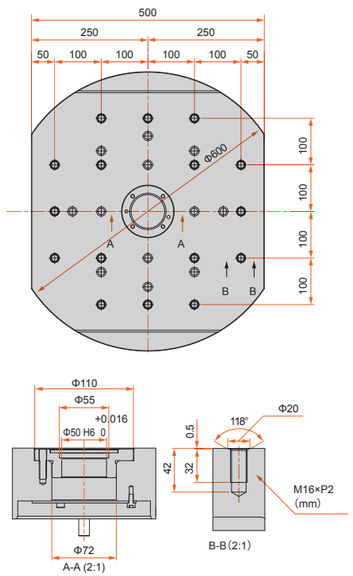


T-slot pallet with location bore (option)

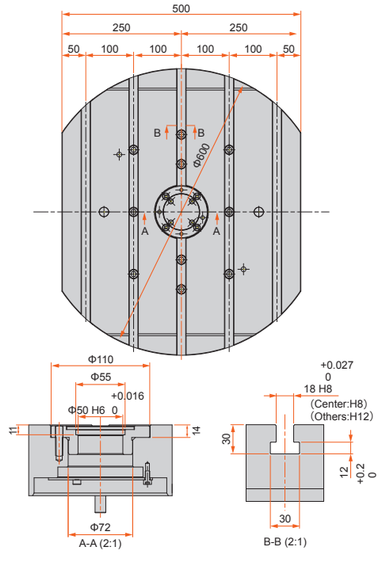


VARIAXIS j-600, j-600/5X

Tapped pallet with location bore (standard)



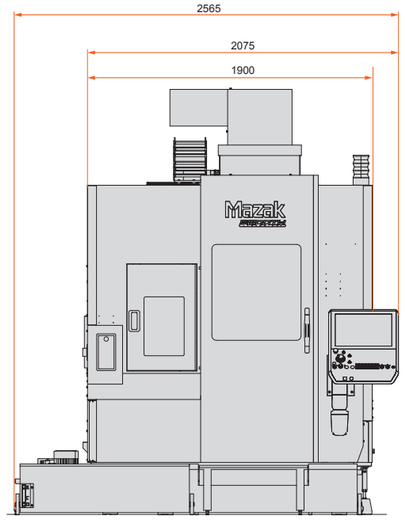
T-slot pallet with location bore (option)

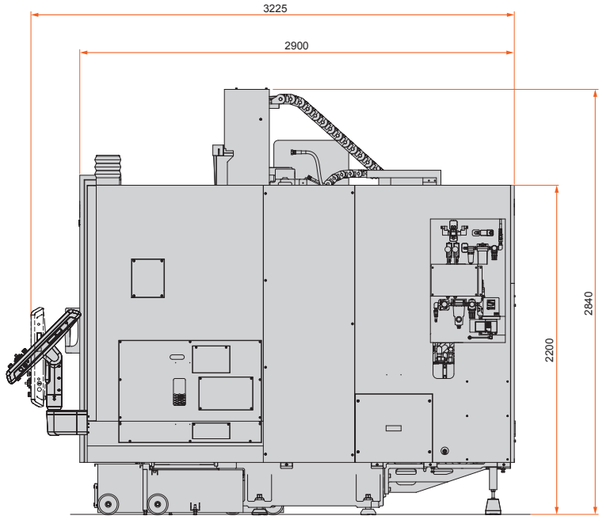


Machine Dimensions

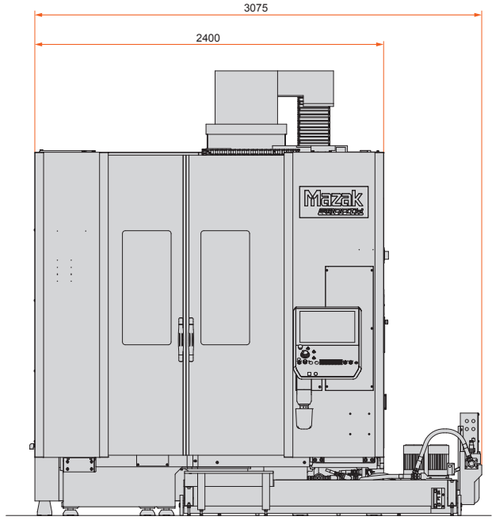
unit : mm

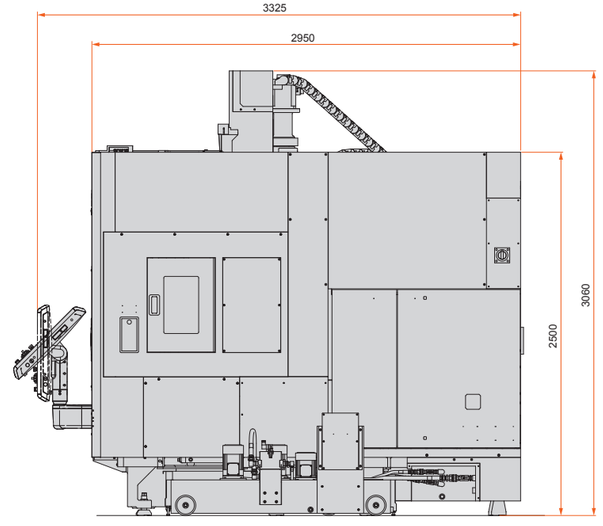
VARIAXIS j-500, j-500/5X





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		850 mm	
	Y-axis travel (spindle head back / forth)	550 mm			
	Z-axis travel (spindle head up / down)	510 mm			
	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 (table horizontal)		70 〜 580 mm (table horizontal)	
	Table size	Φ500 mm × 400 mm		Φ600 mm × 500 mm	
	Max. workpiece size	Φ500 mm × 350 mm		Φ730 mm × 450 mm*1	
	Table load capacity (evenly distributed)	200 kg		500 kg	
	Table surface configuration	M16 × P2 tap 24		M16 × P2 tap 16	
Spindle	Max. spindle speed	12000 rpm			
	Spindle taper	No. 40			
	Spindle bearing ID	Φ70 mm			
Feedrate	Rapid traverse rate (X-,Y-,Z-axis / A-axis)	30 m/min / 30 rpm		–	
	Rapid traverse rate (X-,Y-,Z-axis / B-axis)	–		30 m/min / 30 rpm	
	Rapid traverse rate (X-,Y-,Z-axis / C-axis)	30 m/min / 30 rpm			
	Cutting feedrate (X-,Y-,Z-axis / C-axis)	30 m/min / 30 rpm			
	Simultaneously 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	Φ90 mm / 300 mm / 8 kg			
	Max. tool diameter with adjacent toolpockets empty	Φ130 mm			
	Tool selection method	Random selection, shortest path			
	Tool change time (chip-to-chip)	6.2 sec			
Motors	Spindle motor (40% ED / Cont. rating)	11 kW(15 HP) / 7.5 kW(10 HP)			
	Electrical power requirement (40% ED / 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 200 NL / min			
Machine size	Height	2840 mm, 2905 mm(ConSep)		3060 mm	
	Floor space	2565 mm × 3225 mm		3075 mm × 3325 mm	
	Machine weight	7000 kg		11000 kg	
CNC		MAZATROL SmoothG	MAZATROL SmoothX	MAZATROL SmoothG	MAZATROL SmoothX
Sound	Equivalent continuous sound pressure level at operator position (dependant on equipment options)	Less than 80 db (A)			

*1 Requires 80 mm chamfer on top edge of workpiece.

Standard and Optional Equipment

● : Standard ○ : Option – : N/A

		j-500	j-500/5X	j-600	j-600/5X
Table	Φ500 mm × 400 mm tapped table	●	●	–	–
	Φ500 mm × 400 mm T-slot table	○	○	–	–
	Φ300 mm tapped table	○	○	–	–
	Φ600 mm × 500 mm tapped table	–	–	●	●
	Φ600 mm × 500 mm T-slot table	–	–	○	○
ATC	ATC 18 tool magazine	●	●	●	●
	ATC 30 tool 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-axis)	●	●	●	●
	Scale feedback (X, Y, Z-axis)	○	○	○	○
	Scale feedback (A, C-axis)	○	○	–	–
	Scale feedback (B, C-axis)	–	–	○	○
Coolant	Coolant temperature control	○	○	○	○
	Hand held coolant nozzle	○	○	○ *1	○ *1
	Flood coolant 1.5 kgf/cm², 30 L/min	●	●	●	●
	Coolant through spindle 5 kgf/cm²	○	○	○	○
	Workpiece washing coolant	○	○	○	○
	High pressure coolant through spindle 15 kgf/cm²	○	○	○	○
	SUPER FLOW coolant system	○	○	○	○
Chip disposal	Workpiece air blast	○	○	○	○
	Chip conveyor (Hinge type / ConSep)	○	○	○	○
	Chip bucket (swing type / fixed type)	○	○	○	○
Working environment	Top cover (Y-axis cover)	●	●	●	●
	Additional worklight	○	○	○	○
	Oil skimmer	○	○	○	○
	Mist collector	○	○	○	○
Others	MAZA-CHECK	○	●	○	●

*1 Not available on 2 pallet changer

Above specifications are for European 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	
Least 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**1
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 : 2 MB, Program memory expansion : 8 MB*, Program memory expansion : 32 MB*	
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*, Tool center point control**1, Tool radius compensation for 5-axis machining**1, 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, 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	10 M / 100 M / 1 Gbps	

*1 Simultaneous 4-axis interpolation

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

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 ～ 4 axes	Simultaneous 2 ～ 4 axes, Simultaneous 5 axes
Least 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 : 2 MB, Program memory expansion : 8 MB*, Program memory expansion : 32 MB*	
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*, Shaping function*, Dynamic compensation Ⅱ*, Tool center point control**1, Tool radius compensation for 5-axis machining**1, 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, 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	10 M / 100 M / 1 Gbps	

*Option

VARIAXIS j SERIES

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