Mazak

VARIAXIS i-300 AWC

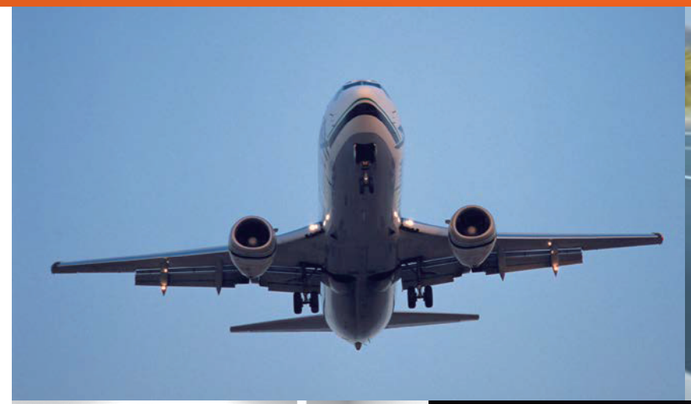
[Auto Work Changer]

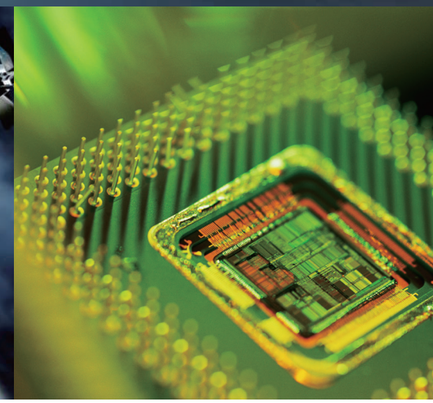
VARIAXIS i-300 AWC

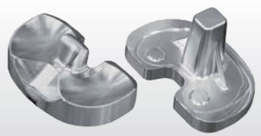
Compact automation system to machine a wide variety of components in small lots

- SMOOTH AWC software embedded in CNC control for Auto Work Changer management and operation
- Compact workpiece stocker and tool magazine
- Workpiece stocker: 32 workpieces (standard), 40 workpieces (option)
  Tool magazine: 145 tools (standard), up to 505 tools (option)
- Continuous automatic machining of complex components
- New MAZATROL SmoothAi CNC for higher productivity

VARIAXIS i-300 AWC
Shown with optional equipment





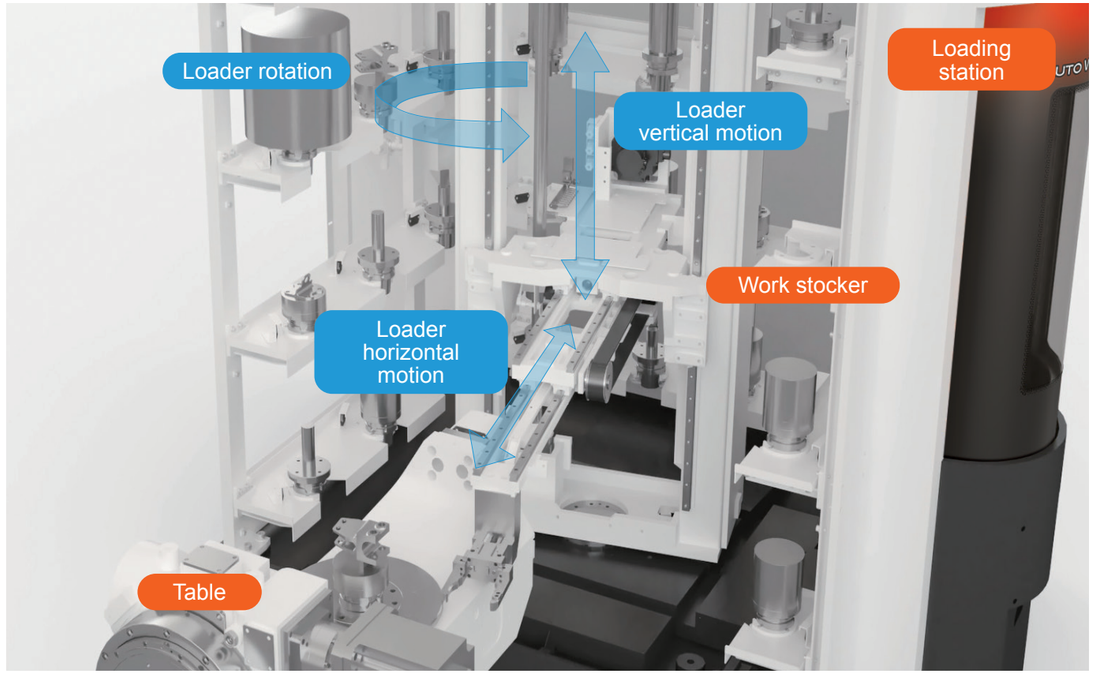


Medical industry	Automotive industry	General machinery
Prosthetic bone	Arm	Optical device component

Automation

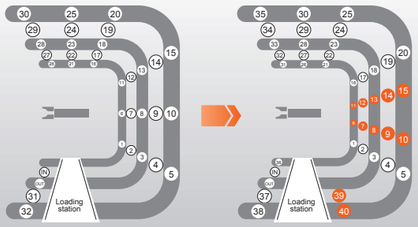
Auto Work Changer (AWC)

The Auto Work Changer (AWC) loads and unloads work holders to and from the stocker and machining area. After a workpiece is set up at the loading station, the high-speed loader moves the work holder to the stocker. The work holder is then moved to the machine table for machining according to the production schedule.



Selectable work stocker

In response to increased production requirements, stocker capacity can be expanded from 32 work holders to 40 work holders after initial installation of the AWC.



Work stocker: 32 Work stocker: 40

Workholder specifications

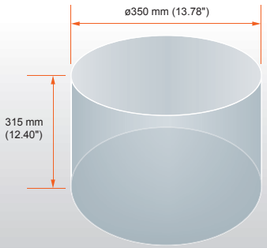
- Max. load *1

65 kg (143 lbs)

*1 Includes work holder (11 lbs/5 kg) weight

- Max. workpiece size*2

(ø350 mm × H 315 mm)
ø13.78" × H 12.40"



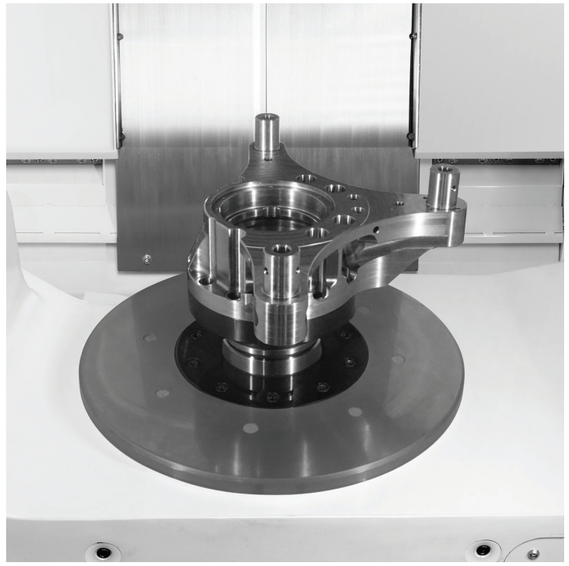
*2 When work stocker expands to 40 work holders, maximum workpiece diameter differs for some storage locations.

Workholder clamp interface

In addition to the standard HSK-A100 clamp interface, CAPTO C8 is optionally available.
All are readily available from tooling suppliers.

Workholder with workpiece on machine table

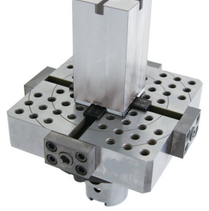
Many workholder specifications are available to meet a wide range of workpiece requirements.



Dovetail clamp

Flange clamp

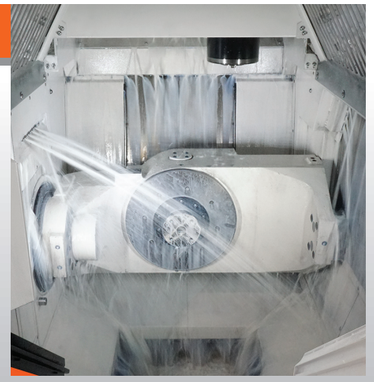
Side screw clamp



Vise

Work-Washing Coolant

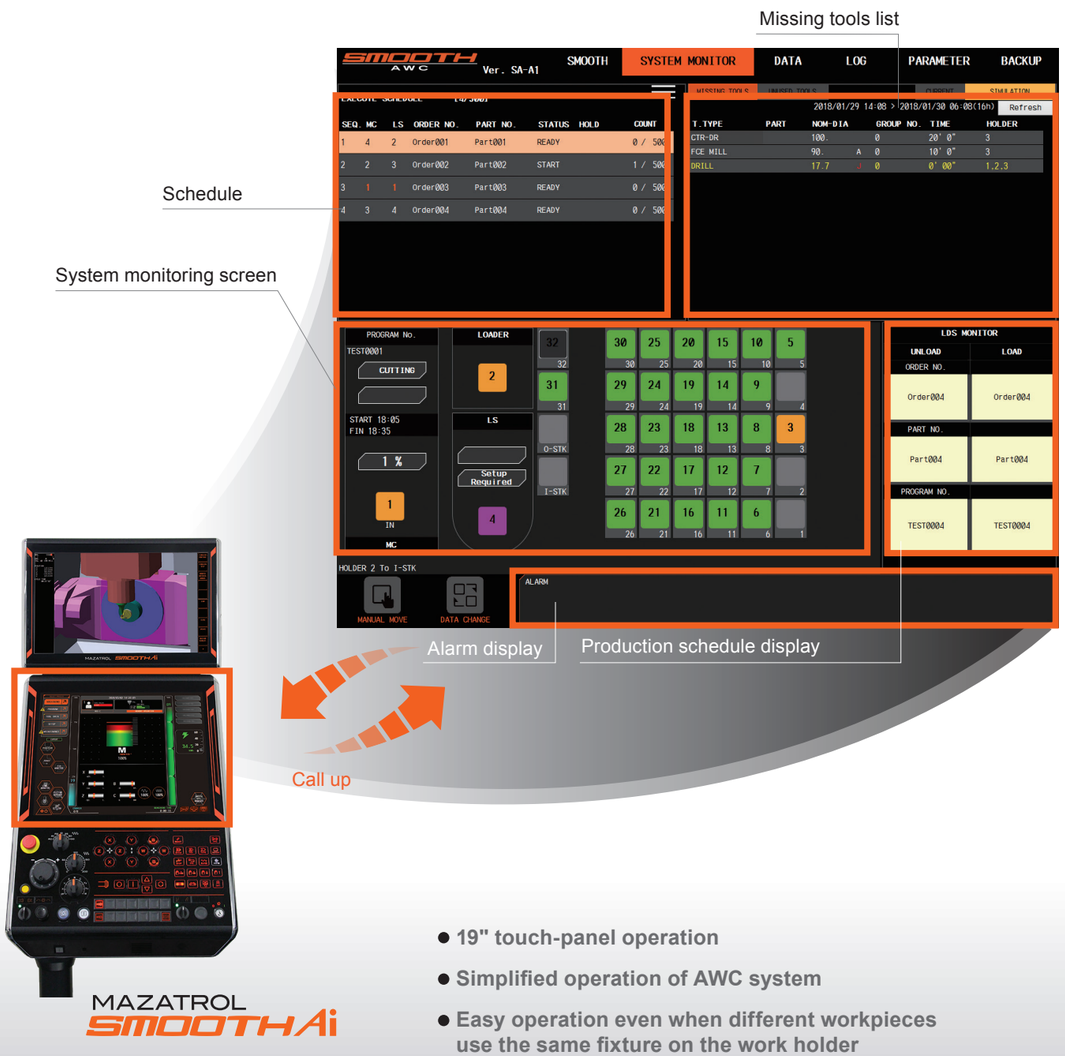
A large volume of coolant discharged from nozzles removes accumulated chips efficiently.
This is particularly effective with large numbers of machined chips.



Automation

SMOOTH AWC

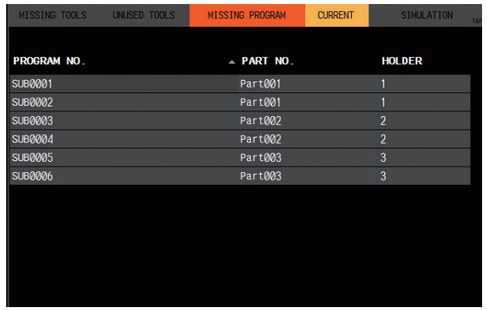
SMOOTH AWC software is incorporated into the MAZATROL SmoothAi CNC for Auto Work Changer management and operation.



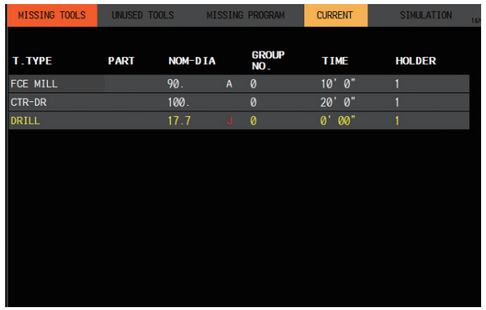
- 19" touch-panel operation
- Simplified operation of AWC system
- Easy operation even when different workpieces use the same fixture on the work holder
- Instructions are displayed for the operator

Resource check function

After entry of the production schedule, a resource check automatically confirms that required machining programs are stored in CNC memory. If any are not, instructions are displayed for the operator. Similarly, tools required for the upcoming production schedule are confirmed to be in the tool magazine. If any are not, a list of missing tools is displayed.



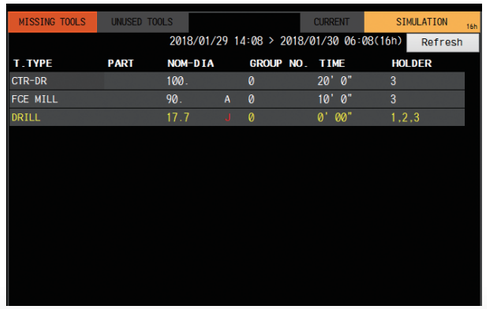
Missing program display



Missing tools display

Real-time tool simulation function

Tools in the magazine are checked every 30 minutes to determine whether sufficient tool life remains for the next 16 hours of production. Tools with insufficient remaining tool life are added to the list of missing tools. To ensure high efficiency, resource checking eliminates a common source of machine downtime during automated operation.



Display of tools that are required in the next 16 hours

Interface for integration with production management system OPTION

Access a production management system through an optional interface.

Automation

Multiple-Drum Tool Magazine

The compact multiple-drum tool magazine offers a large tool-storage capacity to meet the machining requirements of a wide variety of small-lot workpieces. Tools load automatically from the multiple-drum tool magazine to the magazine next to the machining area. During machining, operators can load and unload tools safely to and from the multiple-drum tool magazine and input tool data.

Magazine Operation Panel

To reduce tool setup time, load/unload tools and edit data (of tools stored in the magazine), on the tool magazine operation panel.

Tool ID

OPTION

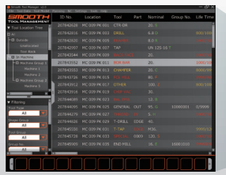
Tool ID allows automatic input and update of tool data into the CNC for machines on a network. It eliminates tool-loading and tool-data input mistakes while it reduces setup time. (Requires retention bolt with tool ID and tool presetter.)

SMOOTH Tool Management

Tool data analysis

OPTION

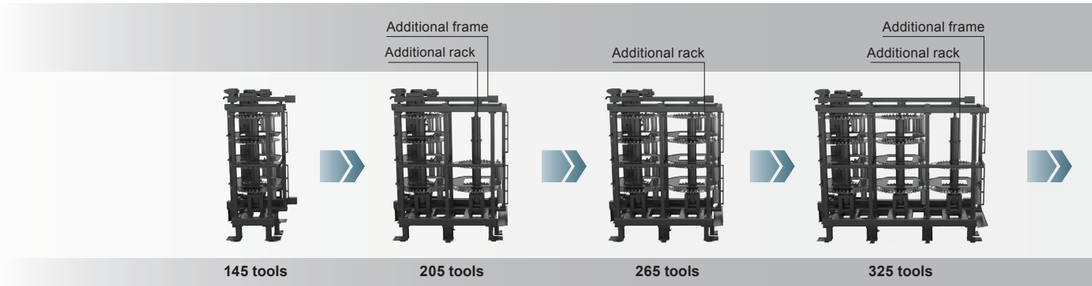
SMOOTH Tool Management software handles tool data for an entire factory. Centrally managing tools and registering tool data/setup reduces machine non-cutting time. To improve productivity, the software also can eliminate tool information input errors in the CNC.



- Centralized management of data for all tools in the factory
- Inputting tool data with tool presetter
- Tool management through tool IDs

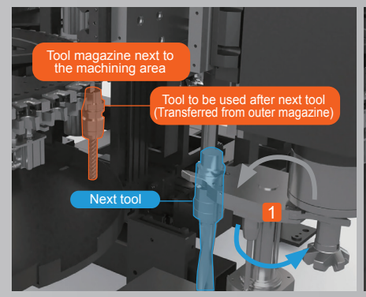
Compact Tool Magazine With Large Tool Storage Capacity

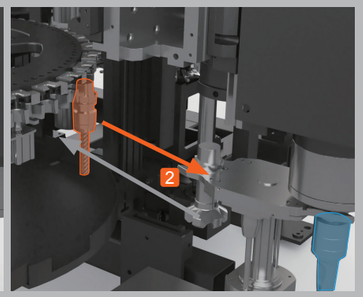
Select the tool magazine size that best meets your production requirements.



Considerable reduction in tool waiting time

The new shifter mechanism reduces tool waiting time by positioning two tools for sequential use. This reduces non-cutting time when changing tools with short individual machining cycle times.

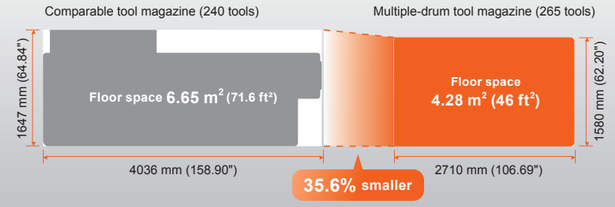




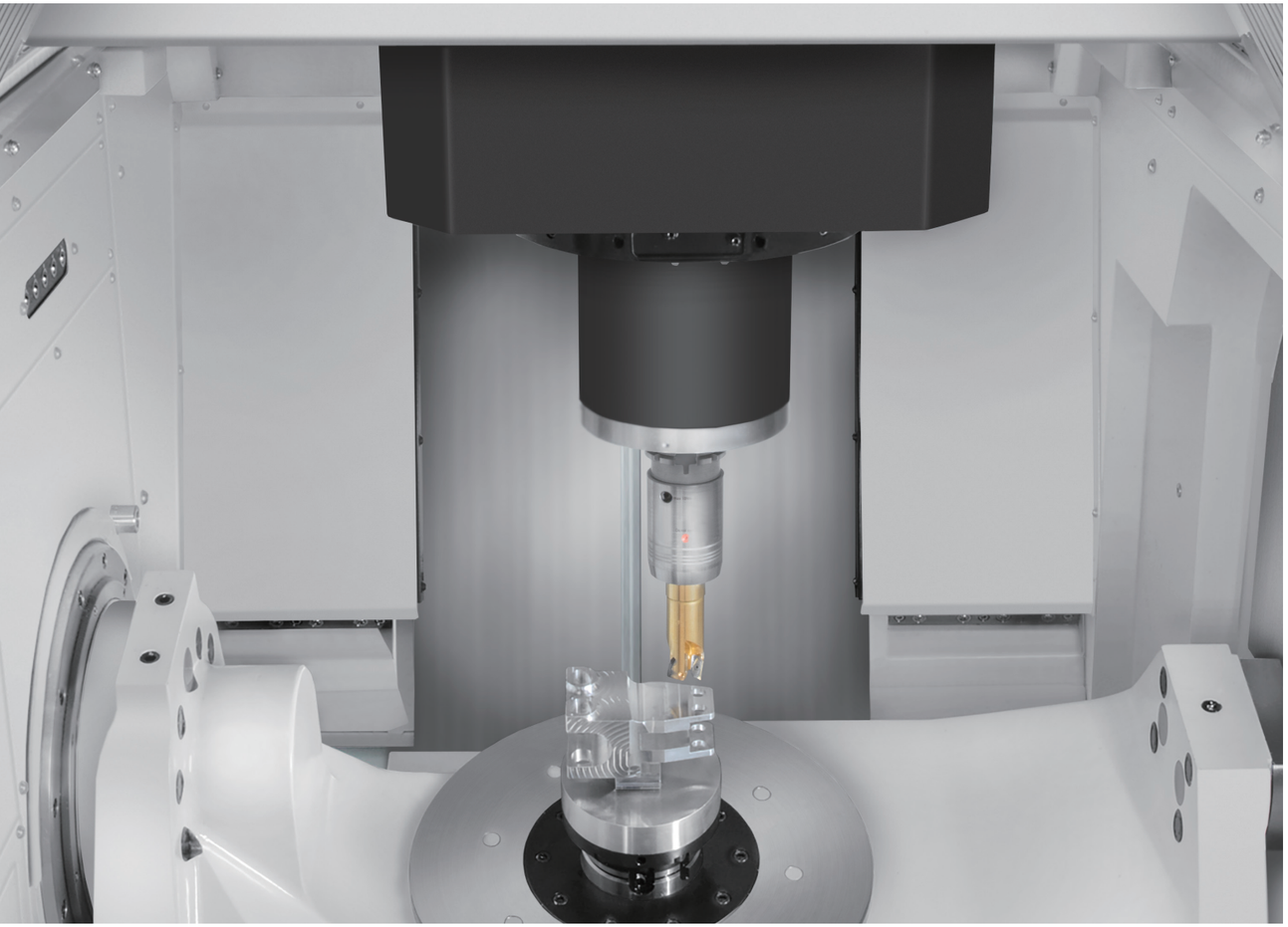
Magazine stores used tools, and tool to be used after next tool is moved to next tool position.

Compact Floor Space

To store more tools in less floor space, stack 30-tool drum-type magazines inside expandable frames.

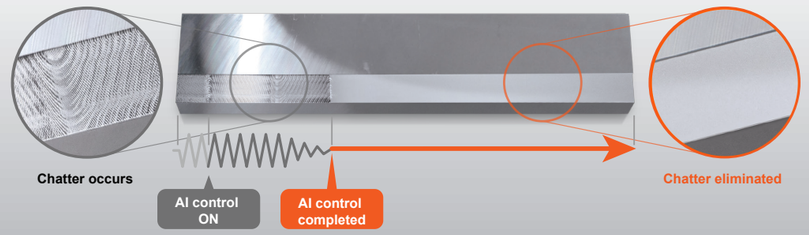


Higher Productivity

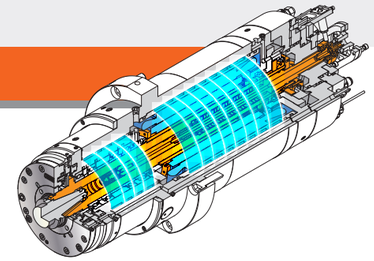


SMOOTH Ai Spindle OPTION

For unsurpassed surface finishes and high productivity, artificial intelligence detects milling spindle vibration and automatically changes machining conditions. Compensation is easy and quick, even without a skilled operator.



Spindle



A wide variety of spindle specifications meets a large range of machining requirements, from high torque for heavy-duty machining to high speed for machining aerospace and high-precision components.

Integral spindle/motor

Integral spindle/motor design minimizes vibration during high-speed operation to ensure exceptional surface finishes and maximum tool life.

Spindle temperature control

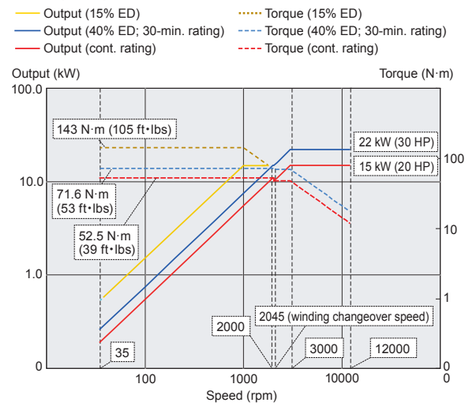
For high-accuracy machining, temperature-controlled cooling oil circulates around the spindle bearings and headstock to minimize any thermal change to the spindle.

Speed	Standard	High-torque OPTION	High-speed OPTION	
	12000 rpm	18000 rpm	25000 rpm	30000 rpm
Output (40% ED; 30-min. rating)	22 kW (30 HP)	35 kW (47 HP)	23 kW (31 HP)	23 kW (31 HP)
Max. torque (40% ED; 30-min. rating)	71.6 N·m (53 ft·lbs)	134 N·m (99 ft·lbs)	22 N·m (16 ft·lbs)	22 N·m (16 ft·lbs)
Tool shank	No. 40/BBT-40*/ HSK-A63*	No. 40/BBT-40/ HSK-A63	HSK-A63	HSK-F63

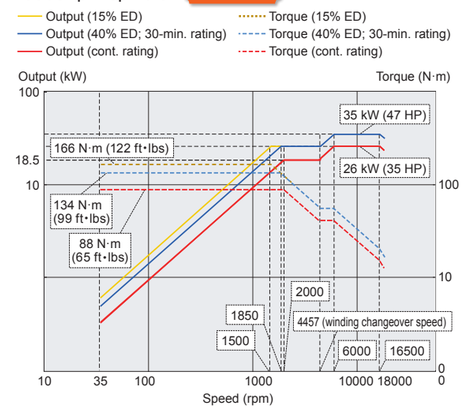
*Option

Spindle output/torque diagrams

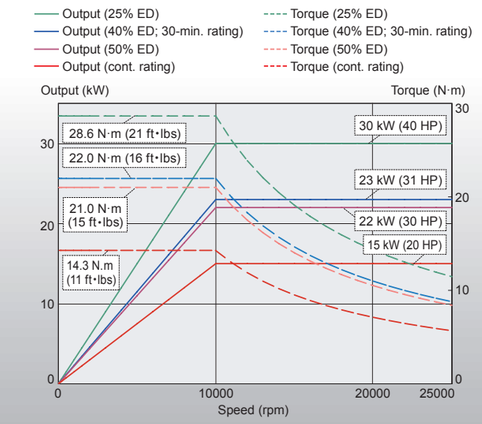
12000 rpm spindle



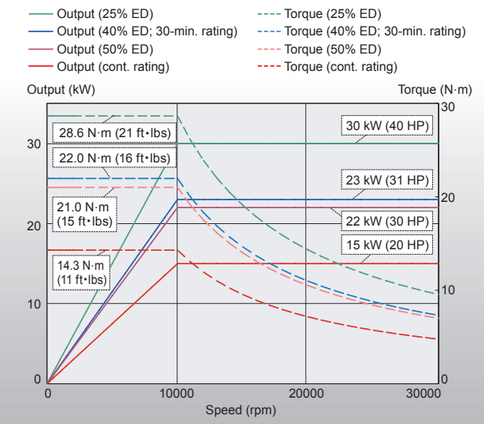
18000 rpm spindle OPTION



25000 rpm spindle OPTION



30000 rpm spindle OPTION

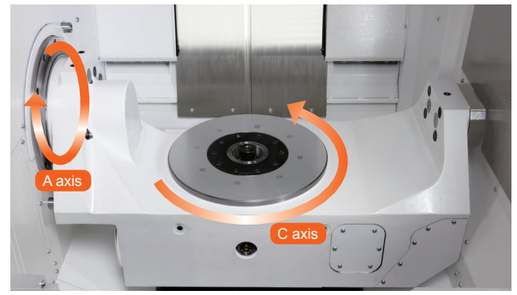


Higher Accuracy

VARIAXIS i-300 AWC
Shown with optional equipment

High-Rigidity Table

A trunnion unit rigidly supports the tilting/rotary table on both ends to ensure high-accuracy machining. To meet the requirements of complex workpieces, the minimum programming increment of the A and C axis is 0.0001°.

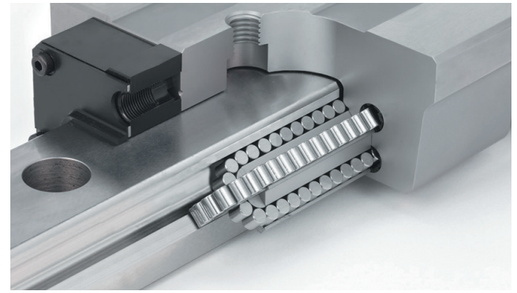


Ball Screw Core Cooling

To ensure stable machining accuracy over extended periods of high-speed operation, temperature-controlled cooling oil circulates through the ball screw cores.

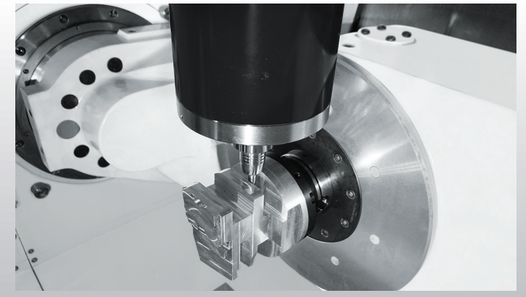
Linear Roller Guides on the X, Y and Z Axis

For high-accuracy positioning, the VARIAXIS i-300 AWC uses linear roller guides on the X, Y and Z axis. Additionally, the high rigidity and considerably lower friction of these guides enable the use of high-speed feedrates over a wide range of machining operations, from heavy-duty to high-speed cutting.



Compact Spindle Cartridge

To minimize workpiece interference and enable the use of shorter tools, the VARIAXIS i-300 AWC uses a compact spindle cartridge and clamps the work holder on the HSK-A100 interface.

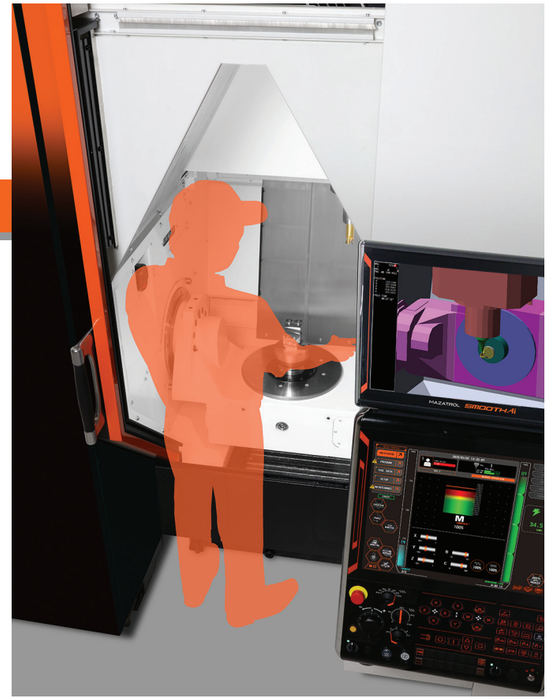


Ergonomics

Ergonomically focused design provides unsurpassed ease of operation

Excellent Accessibility

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



Excellent Visibility

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

Maintenance Area

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

Environmentally Friendly

Designed with environmental considerations

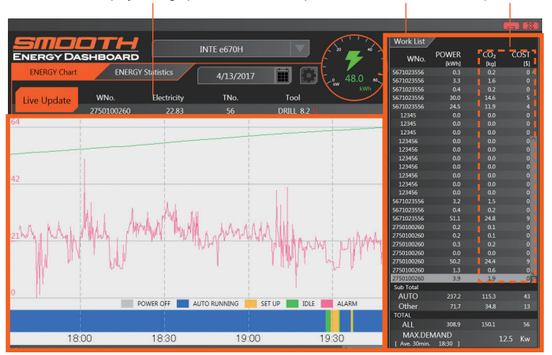
SMOOTH Energy Dashboard — OPTION

The SMOOTH Energy Dashboard provides convenient visual monitoring of energy consumption and analysis.

Energy consumption displayed on graph

Energy consumption by workpieces

Approximate CO_2 emission from electrical power generation and electrical power cost



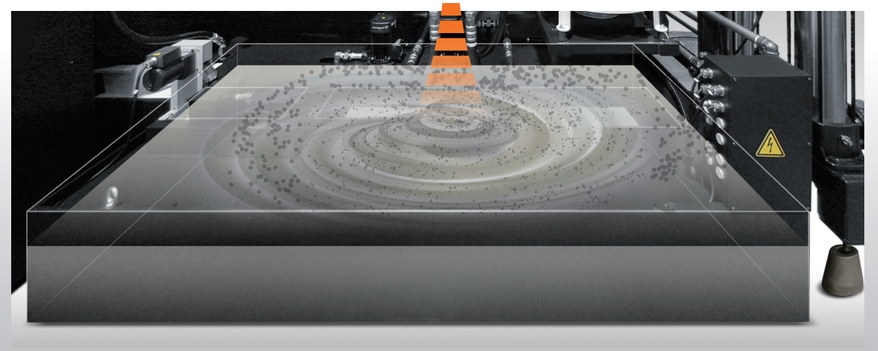
Process screen display

- Total energy consumption of workpiece in operation
- Current energy consumption

Clean Coolant System* — OPTION

The coating on internal wall surfaces of the 1100 L large volume coolant tank prevents small machined chips from adhering. A jet makes a vortex in the center of the coolant tank so small machined chips do not settle in the tank. These features send coolant smoothly to the dedicated coolant filter, which removes more than 98% of particles larger than 10 µm. The system reduces the frequency of tank and filter cleaning.

*Included in coolant package (option)



Sludge settled in the collecting drain cup is removed.

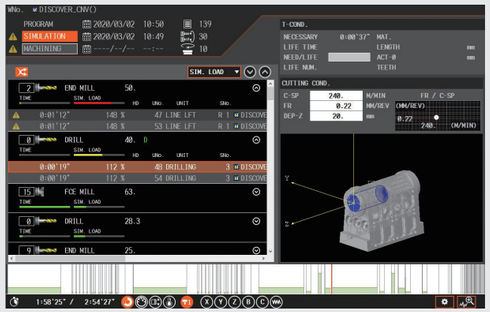
Innovative Functions for Higher Productivity

Improve throughput from programming to machining

Machining analysis, simulation and optimization

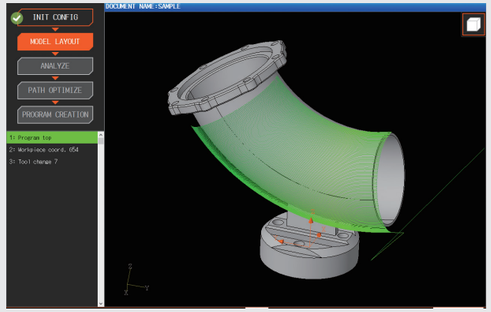
Cutting Adviser

Cutting adviser optimizes machining conditions with MAZATROL SmoothAi CNC and MAZATROL SMOOTH CAM Ai simulation.



SMC PLUS OPTION

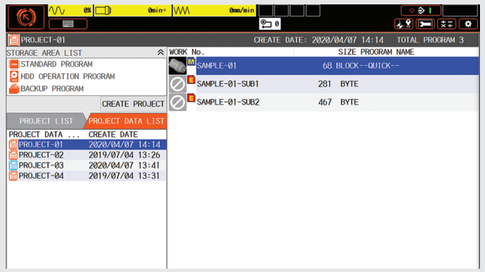
To ensure correct tool paths and high-accuracy finished surfaces, SMOOTH Machining Configuration (SMC) compares the cutting point of an EIA program with a 3D model so the command point can be changed.



Setup

Project Function

Data required to execute machining are managed as project data. To reduce data-input time dramatically, project data can be exported to the machine. Additionally, SMOOTH Project Manager (optional software) can manage project data for an entire factory.



Machining

Ai Thermal Shield

Ai Thermal Shield ensures enhanced heat displacement compensation. For even higher machining accuracy, new algorithms monitor changes in temperature and automatically determine the amount of compensation to be applied.

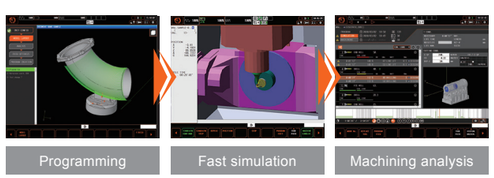
Advanced Digital Technology

MAZATROL TWINS software for high productivity OPTION

Virtual machines in your office accurately duplicate the operation of machines on your factory floor. To increase production efficiency substantially, available software can be used with machines equipped with the MAZATROL SmoothAi CNC.

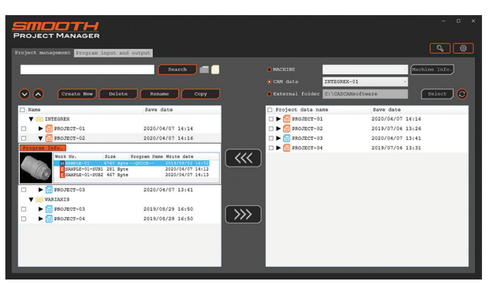
SMOOTH CAM Ai

Make and edit programs, and perform simulation and analysis for multiple machines, with SMOOTH CAM Ai. Send these data to machines in the factory for fast, accurate setups.



SMOOTH Project Manager

SMOOTH Project Manager manages data for the entire factory. These data can be synchronized between machines in the factory and PCs in the office.

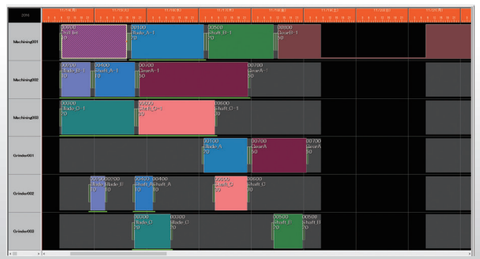


SMOOTH Monitor AX/SMOOTH Link

To improve factory productivity, SMOOTH Monitor AX software tracks operational status and analyzes accumulated manufacturing data. With SMOOTH Link software, view operational status and machining programs on tablets and smartphones to see necessary information instantly while away from the CNC.

SMOOTH Scheduler

SMOOTH Scheduler software uses production data to create effective machining schedules. Schedule display provides convenient monitoring of production progress.



Standard Machine Specifications

		VARIAXIS i-300 AWC
Stroke	X-axis travel (spindle head left/right)	350 mm (13.78")
	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 tilting)	-120° ~ +30°
	C-axis travel (table rotating)	±360°
Table	Workholder clamp interface	HSK-A100
	Workholder diameter	ø130 mm (ø5.12")
Spindle	Max. spindle speed	12000 rpm
Feedrate	Rapid traverse rate (X, Y axis/Z axis/A, C axis)	60 m/min (2362 IPM)/56 m/min (2205 IPM)/50 rpm
	Rapid traverse acceleration	0.7G
	Simultaneously controlled axes	5
Automatic tool changer	Tool shank configuration	CAT No. 40
	Tool storage capacity	145
	Max. tool diameter/length (from gauge line)/weight	ø90 mm (3.54")/350 mm (13.78")/8 kg (17.6 lbs)
	Max. tool diameter with adjacent tool pockets empty	ø130 mm (ø5.12")
	Tool selection method	Random selection/shortest path (fixed pocket assignment)
Auto Work Changer (AWC)	Max. workpiece size	ø350 mm × 315 mm (ø13.78" × 12.40")
	Max. load	65 kg (143 lbs)*1
	Work holder storage	32
Motors	Spindle motor (40% ED; 30-min. rating/cont. rating)	22.0 kW (30 HP)/15.0 kW (20 HP)
Machine size	Machine height	2968 mm (116.85")
	Floor space requirement	3430 mm × 3950 mm (135.04" × 155.51")

*1 Includes work holder weight

Standard and Optional Equipment

●: Standard ○: Option

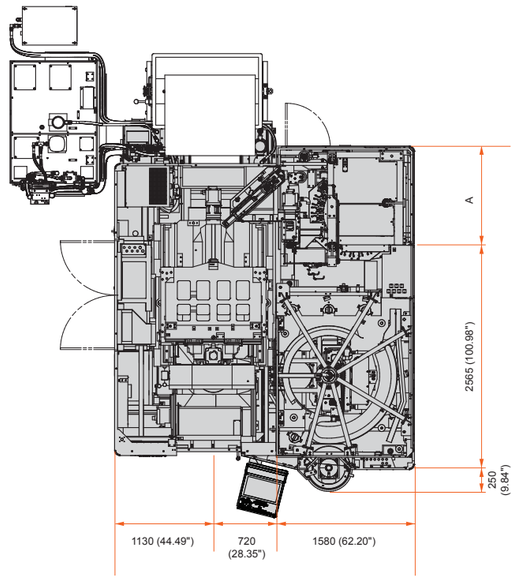
		VARIAXIS i-300 AWC
Machine	Work light	●
	Additional work light (LED)	○
	Top cover	●
	Manual pulse generator	○
	AWC 32 work stocker (holders not included)	●
	AWC 40 work stocker (holders not included)	○
	Work holder ø130 mm (ø5.12") (HSK-A100)	○
	Work holder ø130 mm (ø5.12") (HSK-A100) (high accuracy)	○
	Work holder ø130 mm (ø5.12") (CAPTO C8)	○
	Work holder ø130 mm (ø5.12") (CAPTO C8) (high accuracy)	●
	12000 rpm spindle (#40)	●
	18000 rpm spindle (#40)	○
	25000 rpm spindle (HSK-A63, tool ID N/A)	○
	30000 rpm spindle (HSK-F63, tool ID N/A)	○
	12000 rpm spindle (#40 BIGP)	○
	18000 rpm spindle (#40 BIGP)	○
	18000 rpm spindle (HSK-A63)	○
	Multiple-drum tool magazine (145 tools)	●
	Multiple-drum tool magazine (205 tools)	○
	Multiple-drum tool magazine (265 tools)	○
	Multiple-drum tool magazine (325 tools)	○
	Multiple-drum tool magazine (385 tools)	○
	Multiple-drum tool magazine (445 tools)	○
	Multiple-drum tool magazine (505 tools)	○
Automation	Automatic power ON/OFF + warm-up operation	●
	Machining end buzzer	○
	Status light (3 colors)	○
	Automatic tool length measurement (RENISHAW PRIMO LTS)	○
	Work measurement printout function (without printer)	○
	Preparation for Mazak monitoring system B (RMP600)	●
	Wireless touch sensor (RMP600)	○
Safety	Operator door interlock	●
High accuracy	Scale feedback (X, Y, Z axis)	○
	Scale feedback (A, C axis)	○
	Ball screw core cooling (X, Y, Z axis)	●
	Absolute position detection	●
	MAZA-CHECK*1	●
Coolant/Chip control	Coolant system	●
	Work air blast	○
	Oil skimmer	○
	Coolant temperature control	○
	Flood coolant 0.15 MPa, 30 L/min (22 PSI, 8 gal/min)	●
	Air through spindle (can be used during spindle operation)	○
	Coolant through spindle 0.5 MPa (73 PSI)	○
	Hand-held coolant nozzle	○
	Coolant for workpiece washing	●
	High pressure coolant through spindle 1.5 MPa (218 PSI)	○
	High pressure coolant through spindle 7.0 MPa (1015 PSI)	○
	SUPERFLOW coolant system	○
	Mist collector	○
	Coolant package*2	○
	Chip conveyor (rear discharge/ConSep 2WS)	○
	Chip bucket (rotary)	○
	Chip bucket (fixed)	○
Others	Grease cartridge	○
	CD manuals	●
	Additional CD manuals	○

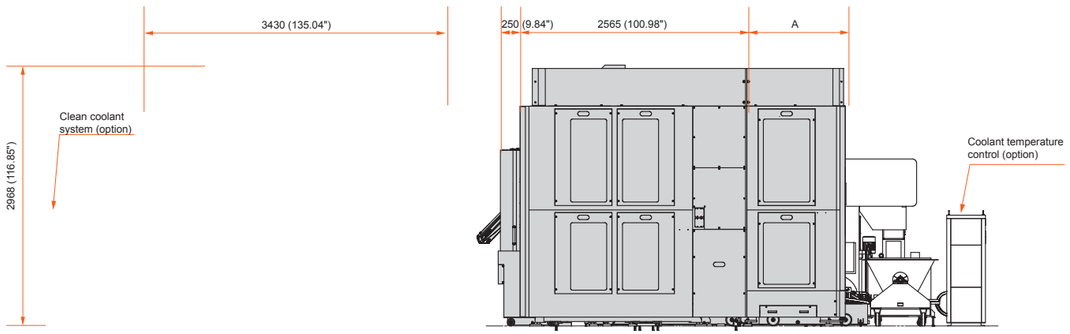
*1 MAZA-CHECK requires RMP600 wireless touch probe.
*2 Package option recommended for extended periods of operation. Package includes chip conveyor (rear discharge/ConSep 2WS), high-pressure coolant through spindle 1.5 MPa (218 PSI), coolant temperature control, work air blast and clean coolant system.

Machine Dimensions

Unit: mm (inch)

Specifications	A
Standard (145-tool magazine)	1135 mm (44.69")
Option (205, 265-tool magazine)	2240 mm (88.19")
Option (325, 385-tool magazine)	3320 mm (130.71")
Option (445, 505-tool magazine)	4400 mm (173.23")





MAZATROL SmoothAi Specifications

	MAZATROL	EIA
Number of controlled axes	Simultaneous 2 ~ 4	Simultaneous 5
Least input increment	0.0001 mm, 0.00001 inch, 0.0001 deg	
High-speed, high-precision control	Shape compensation, Smooth corner control, Rapid traverse overlap, Rotary axis shape compensation	Shape compensation, Smooth corner control, Rapid traverse overlap, Rotary axis shape compensation, High-speed machining mode, High-speed smoothing control, 5-axis spline*, Path error suppression control*, Tool path optimization*
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 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), Rapid traverse override, 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 prefilter, 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, AI Thermal Shield, 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 control	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, Restart 2, 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, Measurement on machine
Automatic measuring functions	WPC coordinate measurement, Automatic tool length measurement, Sensor calibration, Tool breakage detection, External tool breakage detection*	Automatic tool length measurement, Sensor calibration, Tool breakage detection, External tool breakage detection*
MDI measurement	Semi-automatic tool length measurement, Full-automatic tool length measurement, Coordinate measurement	
Peripheral network	PROFIBUS-DP*, EtherNet/IP*, CC-Link*	
Interface	SD card interface, USB	
EtherNet	10M/100M/1Gbps	

*Option

VARIAXIS i-300 AWC

Mazak

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