

**Mazak**

# VARIAXIS i-300 AWC

[ Auto Work Changer ]



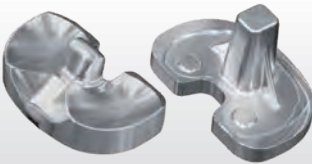
# VARIAxis i-300 AWC

Compact automation system for machining a wide variety of components in small size lots

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

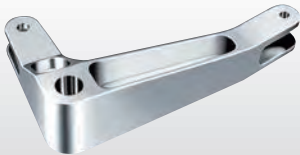


VARIAxis i-300 AWC  
Shown with optional equipment



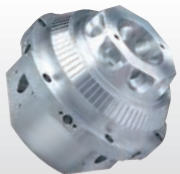
Medical industry

Prosthetic bone



Automotive industry

Arm

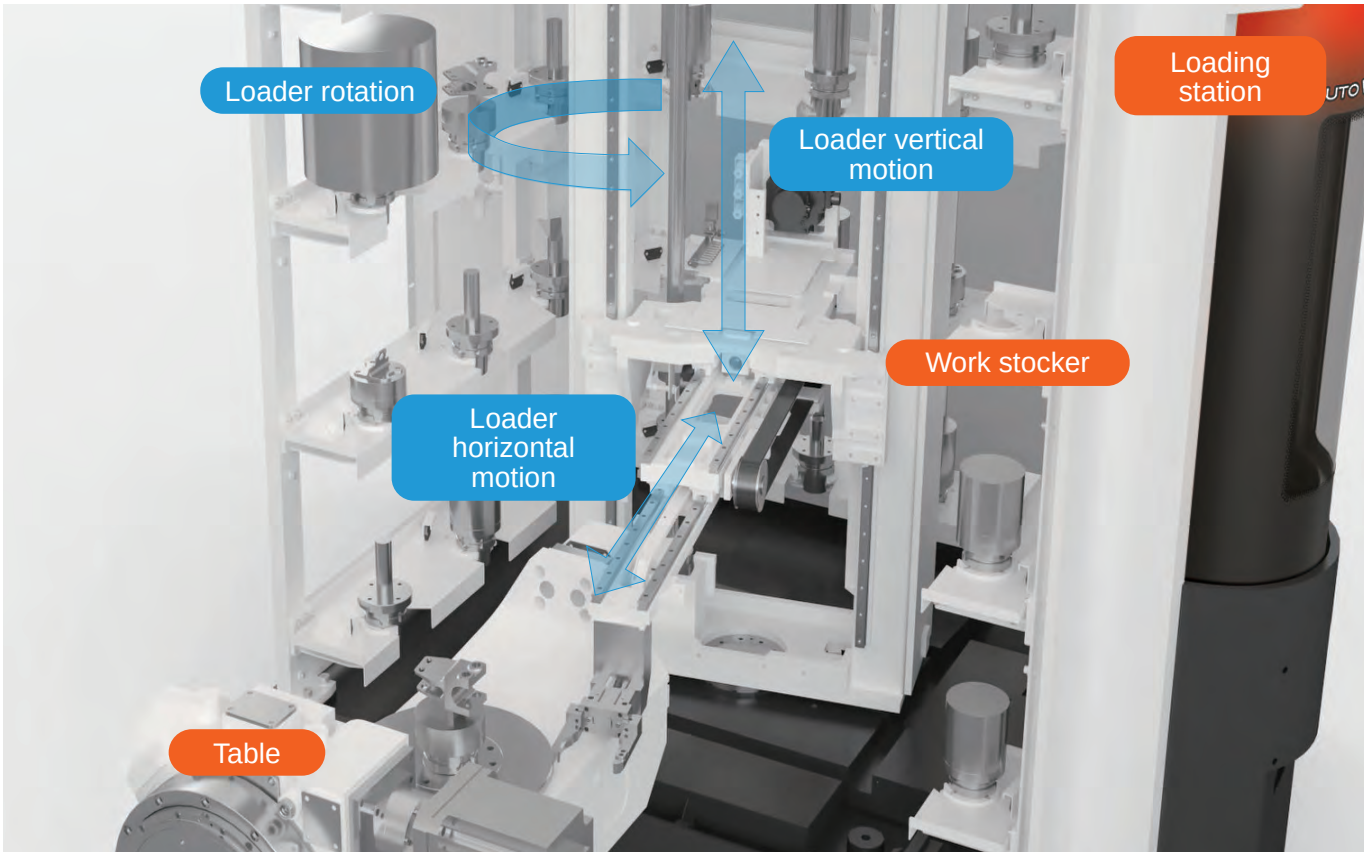


General machinery

Optical device component

Auto Work Changer (AWC)

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



Work holder 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 different workholder specifications are available to meet a wide range of workpiece requirements.



Dove-tail clamp



Flange clamp



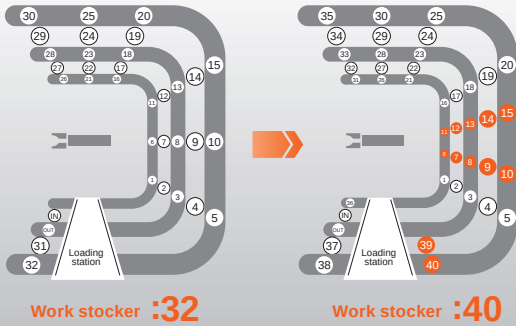
Side screw clamp



Vise

Selectable work stocker

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



Work holder specifications

- Max. load \*1

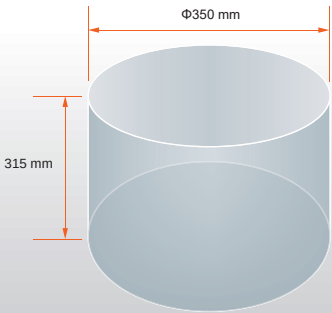
65 kg

\*1 Includes work holder (5 kg) weight

- Max. workpiece size \*2

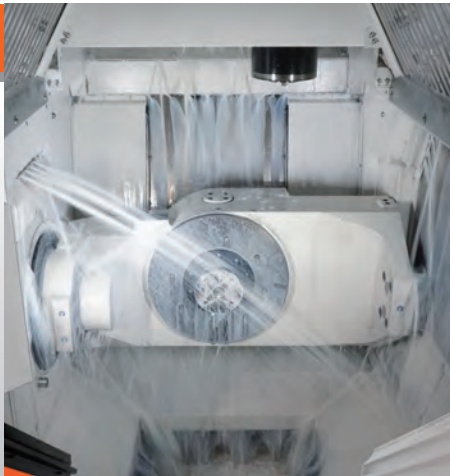
Φ350 mm × H315 mm

\*2 For 40 work stockers, maximum workpiece diameter is different for some storage locations.



Work washing coolant

Accumulated machined chips are efficiently removed thanks to the large volume of coolant discharged from nozzles. This is particularly effective when large amounts of machined chips are produced.



Smooth AWC

Smooth AWC software is incorporated in the MAZATROL SmoothAi 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 the production schedule is entered, resource check will automatically confirm that the required machining programs are stored in the CNC memory. If any are not, instructions will be displayed for the operator. In a similar method, the 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 TOOLS | UNUSED TOOLS | MISSING PROGRAM | CURRENT | SIMULATION |
|---------------|--------------|-----------------|---------|------------|
| PROGRAM NO.   | PART NO.     | HOLDER          |         |            |
| SUB0001       | Part001      | 1               |         |            |
| SUB0002       | Part001      | 1               |         |            |
| SUB0003       | Part002      | 2               |         |            |
| SUB0004       | Part002      | 2               |         |            |
| SUB0005       | Part003      | 3               |         |            |
| SUB0006       | Part003      | 3               |         |            |

Missing program display

| MISSING TOOLS | UNUSED TOOLS | MISSING PROGRAM | CURRENT   | SIMULATION |        |
|---------------|--------------|-----------------|-----------|------------|--------|
| T. TYPE       | PART         | NOM-DIA         | GROUP NO. | TIME       | HOLDER |
| FCE MILL      | 90.          | A 0             | 10' 0"    | 1          |        |
| CTR-DR        | 100.         | 0               | 20' 0"    | 1          |        |
| DRILL         | 17.7         | J 0             | 0' 00"    | 1          |        |

Missing tools display

Real time tool simulation function

The remaining tool life of the tools in the magazine are checked every 30 minutes to determine that there is sufficient tool life to perform production over the next 16 hours. If there are tools with insufficient remaining tool life, they will be added to the list of missing tools. The resource checking of required tools and machining programs will eliminate machine down time during automatic operation to ensure high efficiency.

| MISSING TOOLS                            | UNUSED TOOLS | CURRENT |           | SIMULATION |        |
|------------------------------------------|--------------|---------|-----------|------------|--------|
| 2018/01/29 14:08 > 2018/01/30 06:08(16h) |              |         |           | Refresh    | 16h    |
| T. TYPE                                  | PART         | NOM-DIA | GROUP NO. | TIME       | HOLDER |
| CTR-DR                                   | 100.         | 0       | 0         | 20' 0"     | 3      |
| FCE MILL                                 | 90.          | A       | 0         | 10' 0"     | 3      |
| DRILL                                    | 17.7         | J       | 0         | 0' 00"     | 1.2.3  |

Display of tools required in the next 16 hours

Interface for integration with production management system OPTION

Interface with a production management system to access the production schedule is available upon request.

Multiple drum tool magazine

The compact multiple drum tool magazine has a large tool storage capacity to meet the machining requirements of a wide variety of workpieces in small size lots. Tools are automatically loaded from the multiple drum tool magazine to the magazine next to the machining area. Tool loading / unloading to / from the multiple drum tool magazine as well as tool data input can be safely performed during machining.



Magazine operation panel

The tool magazine operation panel is used to perform magazine operation, tool loading / unloading and tool data editing (of tools stored in the magazine) to reduce tool setup time.

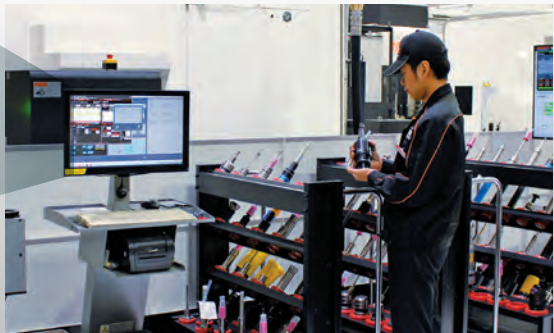
TOOL ID

Tool ID allows automatic input and update of tool data into the CNC for machines in a network. It eliminates mistakes when loading tools into the magazine and tool data input as well as reducing setup time. (requires retention bolt with tool ID and tool presetter)



SMOOTH TOOL MANAGEMENT

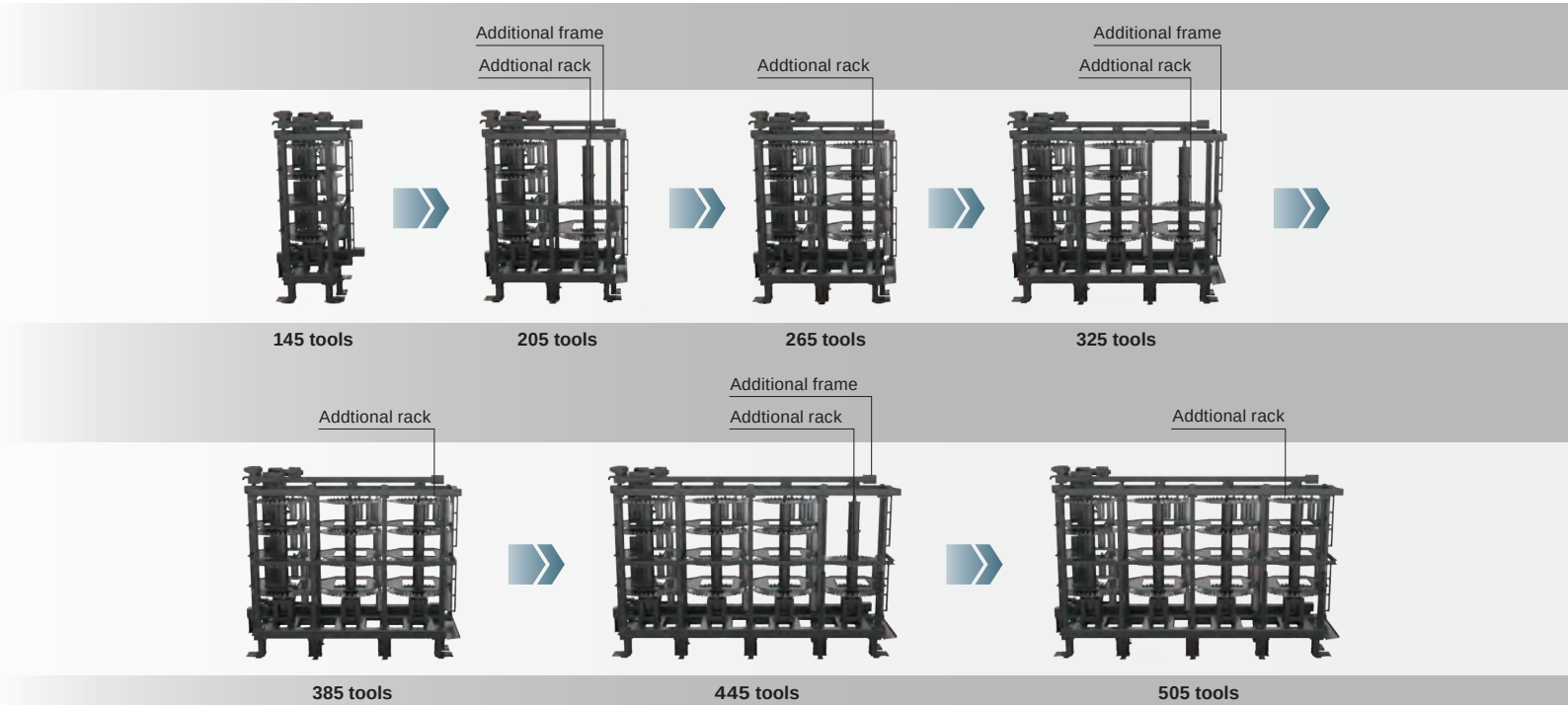
The Smooth Tool Management software manages data of the large number of tools in use by a factory. By centrally managing tools and registering tool data as well as tool setup, machine non-cutting time can be reduced. This software can also eliminate tool information input errors in the CNC to improve productivity.



- Centralized management of data for all tools inside the factory
- Inputting tool data by tool presetter
- Tool management using tool IDs

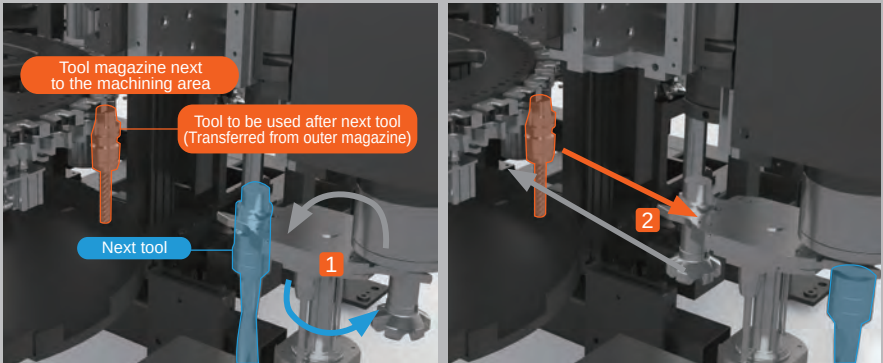
Compact tool magazine with large tool storage capacity

Select the tool magazine size that best meets your production requirements



Considerably reduced tool waiting time

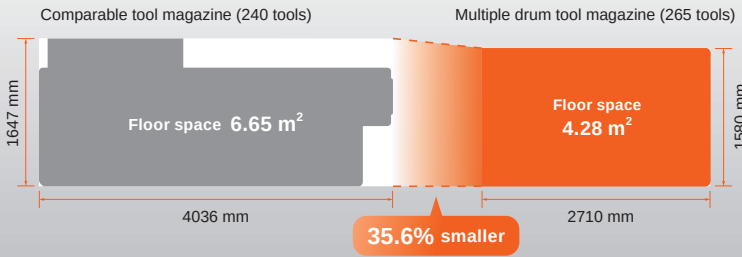
The new shifter mechanism has reduced tool waiting time by its ability to position the tool to be used after the next tool. As a result, non-cutting-time is minimized by reducing waiting time when tools are changed which have individual short machining cycle times.



Used tools are stored in magazine and tool to be used after next tool is moved to next tool position

Compact floor space

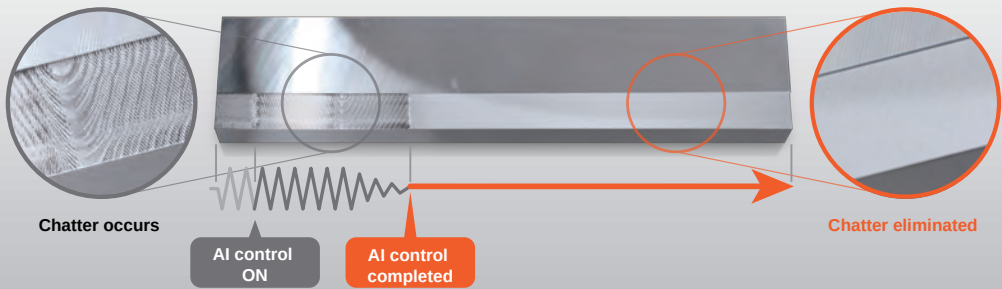
Tool magazine designed to pursue maximum space-efficiency. Number of tools can be increased while minimizing the space required by stacking 30 tool drum magazine.





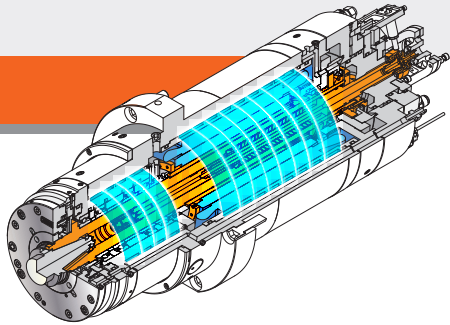
Smooth Ai Spindle **OPTION**

Using AI, milling spindle vibration is detected and machining conditions are automatically changed to realize unsurpassed surface finishes and high productivity. Thanks to AI, compensation can be easily done in a short time without skilled operator.



Spindle

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



Integral spindle / motor

Thanks to the integral spindle / motor design, vibration is minimized during high speed operation to ensure exceptional surface finishes and maximum tool life.

Spindle temperature control

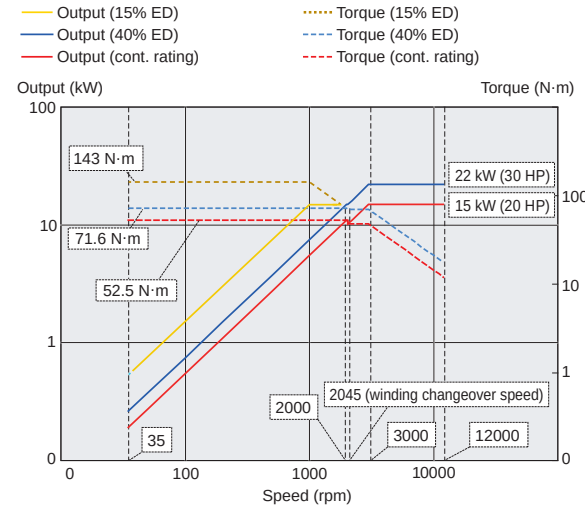
For high accuracy machining, temperature controlled cooling oil is circulated around the spindle bearings and headstock to minimize any thermal change to the spindle.

| Speed                | Standard                   | High-torque <b>OPTION</b> | High-speed <b>OPTION</b> |               |
|----------------------|----------------------------|---------------------------|--------------------------|---------------|
|                      | 12000 rpm                  | 18000 rpm                 | 25000 rpm                | 30000 rpm     |
| Output (40% ED)      | 22 kW (30 HP)              | 35 kW (47 HP)             | 23 kW (31 HP)            | 23 kW (31 HP) |
| Max. torque (40% ED) | 71.6 N·m                   | 134 N·m                   | 22 N·m                   | 22 N·m        |
| Tool shank           | No.40 / BBT-40* / HSK-A63* | No.40 / BBT-40 / HSK-A63  | HSK-A63                  | HSK-F63       |

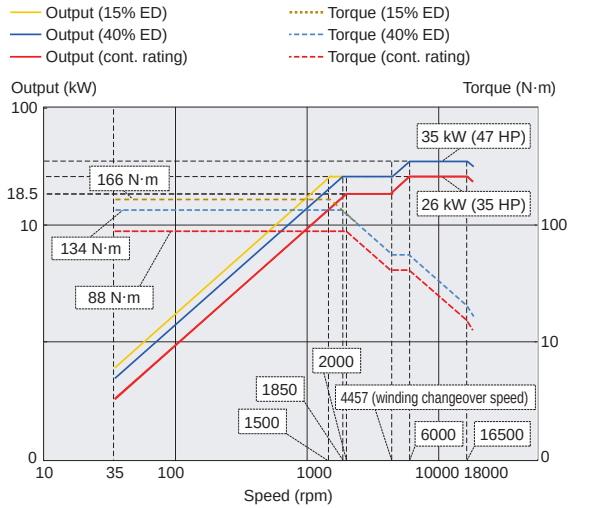
\*Option

Spindle output / torque diagram

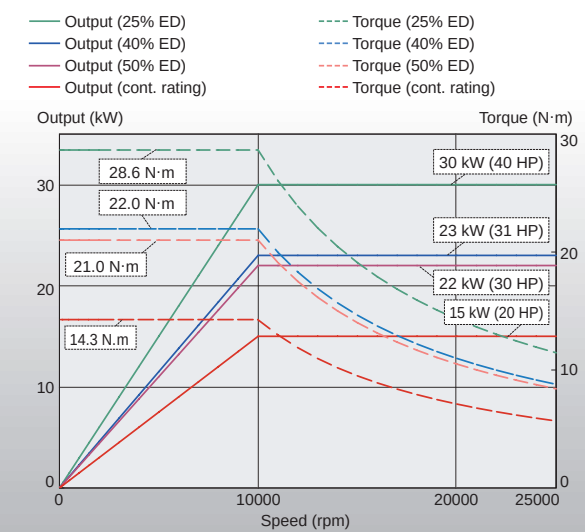
12000 rpm spindle



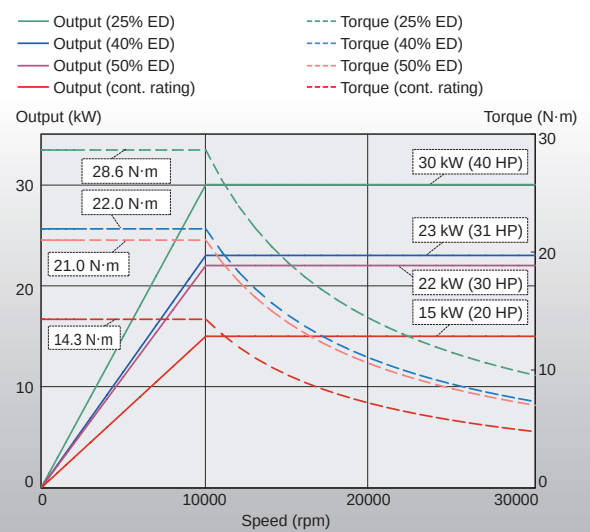
18000 rpm spindle **OPTION**



25000 rpm spindle **OPTION**



30000 rpm spindle **OPTION**





VARIAXIS I-300 AWC  
Shown with optional equipment

## High-rigidity table

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



## Ball screw core cooling

Temperature controlled cooling oil circulates through the ball screw cores to ensure stable machining accuracy over extended periods of high speed operation.



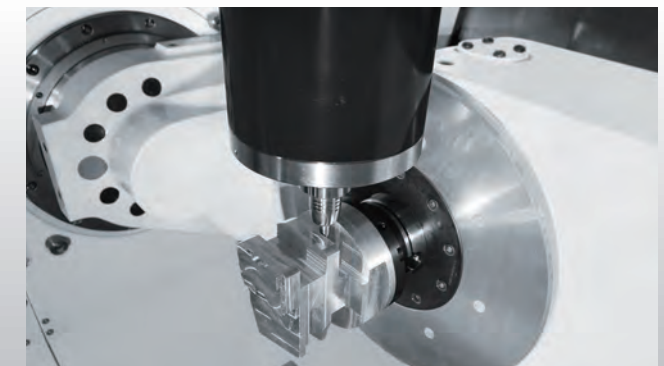
## Linear roller guides utilized on the X-, Y- and Z-axis

The linear roller guides on the X-, Y- and Z-axis utilized by the VARIAXIS I-300 AWC 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.



## Compact spindle cartridge

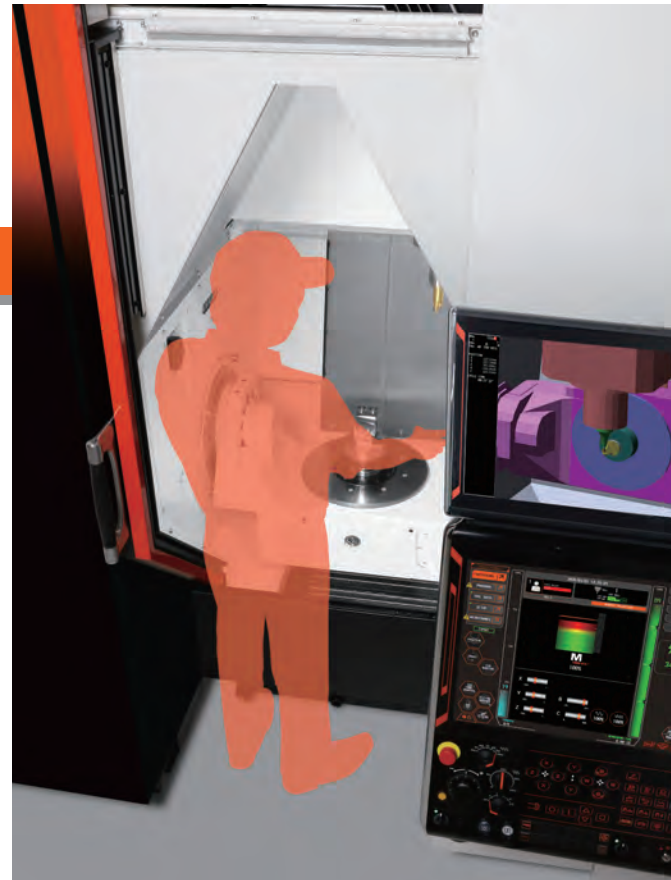
The compact spindle cartridge and the work holder being clamped on the HSK-A100 interface minimize workpiece interference allowing shorter tools to be used.



## Design focus on ergonomics provides unsurpassed ease of operation

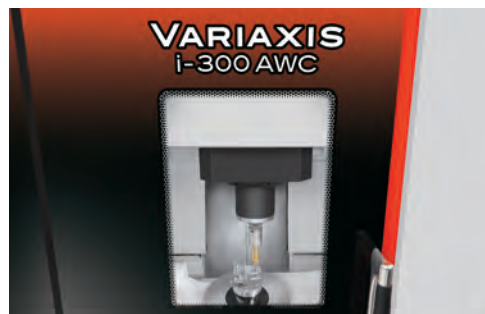
### Excellent accessibility

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



## Excellent visibility

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



## Maintenance area

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

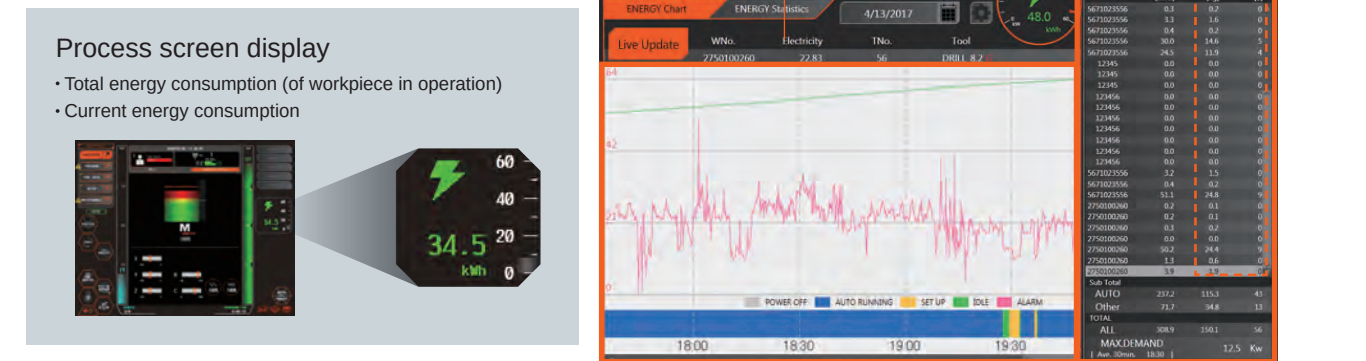


## Environmentally Friendly

## Designed with environmental considerations

## Energy Dashboard

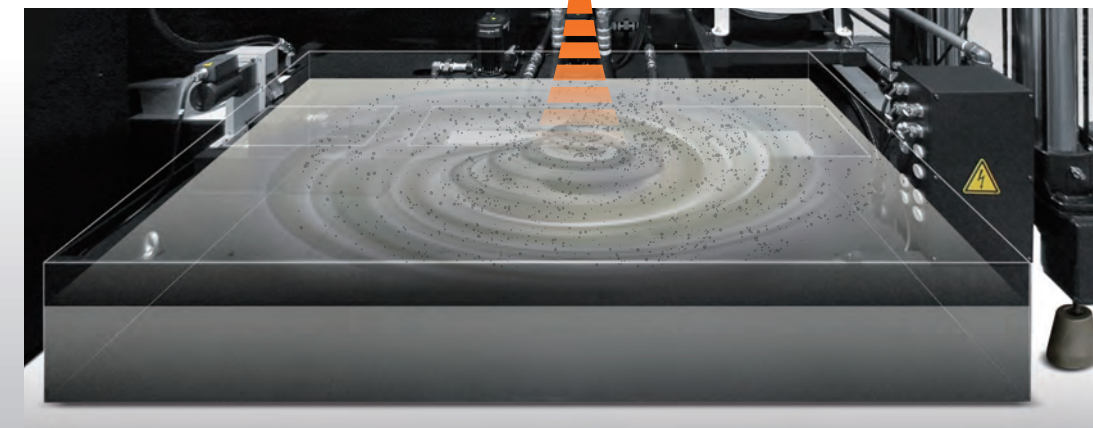
The Energy Dashboard provides a convenient visual monitoring of energy consumption and analysis.



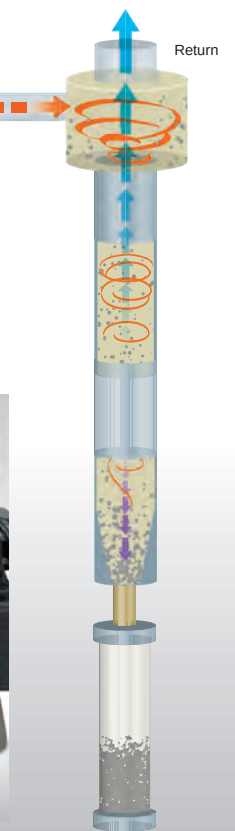
## Clean coolant system\*

The internal wall surfaces of the 1100L large volume coolant tank have a coating that prevents small machined chips from adhering. The coolant tank has a coolant jet that makes a vortex in the center so that small machined chips will not settle in the tank. Thanks to these features, coolant is smoothly sent to the coolant filter, where more than 98% of particles larger than 10  $\mu\text{m}$  are removed by the dedicated cyclone filter. The frequency of tank and filter cleaning is significantly reduced by this system.

\*Clean coolant system included in coolant package (option)



Sludge settled in the collecting drain cup is removed.



Innovation for Higher Productivity

# MAZATROL SMOOTH*Ai*

## New MAZATROL SmoothCNC

Designed to provide unsurpassed productivity through even faster and higher precision control while elevating your production to the next level with AI and digital twin technology

- Touch screen operation — similar to using your smartphone/tablet
- MAZATROL Smooth graphical user interface for unsurpassed ease of operation
- CNC System integrates with your Windows® PC
- Latest hardware and software for unprecedented speed and precision
- Higher machining speed for high accuracy 5-axis machining
- Fine tuning function - easy machining parameter setting for various workpieces
- MAZATROL TWINS - software that enables real-time sharing and centralized management of various data for increase productivity

■ Automation

Advanced automation utilizing robot and software



■ AI

Increase your productivity with AI technology



■ Digital Twin

Create a virtual machine on your office PC for efficient setup and improved productivity



Shown with optional MAZATROL SmoothAi dual monitor

Innovative functions to improve productivity from programming to machining

Simulation, Test cutting (machining analysis, optimization)

Cutting Adviser

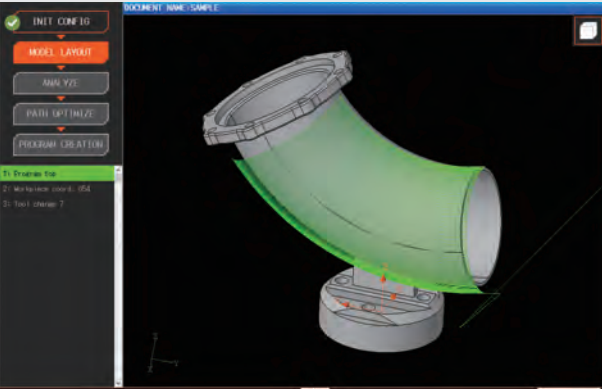
Cutting adviser optimizes machining conditions by MAZATROL SmoothAi CNC and Smooth CAM Ai simulation (optional software).



SMC PLUS

OPTION

Compares the cutting point of the EIA program with the 3D model so the correct command point can be changed to ensure the correct tool path and high accuracy finished surfaces.



Set up

Project function

Data required to execute machining is managed as project data. Project data can be exported to the machine, drastically reducing time for inputting data. Additionally, project data of entire factory can be managed with Smooth Project Manager. (optional software)



Machining

Ai Thermal Shield

Ai Thermal Shield ensures enhanced heat displacement compensation. New algorithms automatically determines the amount of compensation to be applied according to changes in the temperature to ensure even higher machining accuracy.



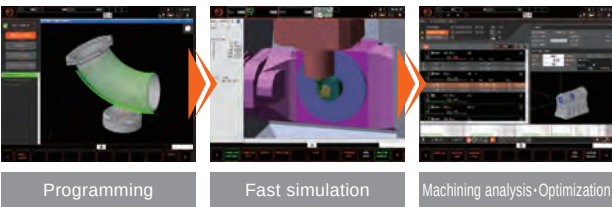
MAZATROL TWINS (software) for high productivity

OPTION

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

Smooth CAM Ai

Programs can be made and edited, as well as performing simulation and analysis on the Smooth CAM Ai for multiple machines. This data is sent to machines in the factory for fast and accurate machine setups.



Smooth Project Manager

Smooth Project Manager is used to manage the project data of the entire factory. The data can be synchronized between the machine in the factory and the PC in the office.



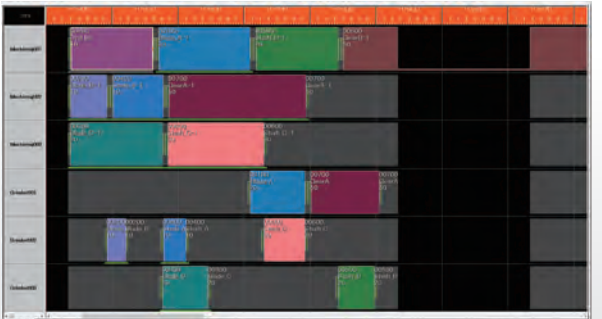
Smooth Monitor AX · Smooth Link

Smooth Monitor AX is software to monitor operational status and analyze accumulated manufacturing data for factory productivity improvement. Smooth Link is software to view operational status and machining programs on tablets and smart phones, so the operator can instantly view necessary information while monitoring away from the monitor.



Smooth Scheduler

Smooth Scheduler is software to create effective machining schedules utilizing production data. Schedules are displayed for convenient monitoring of production progress.



Standard Machine Specifications

| VARIAXIS i-300 AWC      |                                                                                                  |                                                            |
|-------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Stroke                  | X-axis travel (spindle head left / right)                                                        | 350 mm                                                     |
|                         | Y-axis travel (spindle head back / forth)                                                        | 550 mm                                                     |
|                         | Z-axis travel (spindle head up / down)                                                           | 510 mm                                                     |
|                         | A-axis travel (table tilting)                                                                    | -120° ~ +30°                                               |
|                         | C-axis travel (table rotating)                                                                   | ±360°                                                      |
| Table                   | Work holder clamp interface                                                                      | HSK-A100                                                   |
|                         | Work holder diameter                                                                             | Φ130 mm                                                    |
| Spindle                 | Max. spindle speed                                                                               | 12000 rpm                                                  |
| Feedrate                | Rapid traverse rate (X-, Y-axis / Z-axis / A-, C-axis)                                           | 60 m/min / 56 m/min / 50 rpm                               |
|                         | Rapid traverse acceleration                                                                      | 0.7G                                                       |
|                         | Simultaneously controlled axes                                                                   | 5                                                          |
| Automatic tool changer  | Tool shank configuration                                                                         | No.40                                                      |
|                         | Tool storage capacity                                                                            | 145                                                        |
|                         | Max. tool diameter / length (from gauge line) / weight                                           | Φ90 mm / 350 mm / 8 kg                                     |
|                         | Max. tool diameter with adjacent tool pockets empty                                              | Φ130 mm                                                    |
|                         | Tool selection method                                                                            | Random selection / shortest path (fixed pocket assignment) |
| Auto work changer (AWC) | Max. workpiece size                                                                              | Φ350 mm × 315 mm                                           |
|                         | Max. load                                                                                        | 65 kg *1                                                   |
|                         | Work holder storage                                                                              | 32                                                         |
| Motors                  | Spindle motor (40% ED / cont. rating)                                                            | 22.0 kW (30 HP) / 15.0 kW (20 HP)                          |
| Machine size            | Machine height                                                                                   | 2968 mm                                                    |
|                         | Floor space requirement                                                                          | 3430 mm × 3950 mm                                          |
| Sound                   | Equivalent continuous sound pressure level at operator position (dependant on equipment options) | Less than 80 dB (A)                                        |

\*1 Includes work holder weight

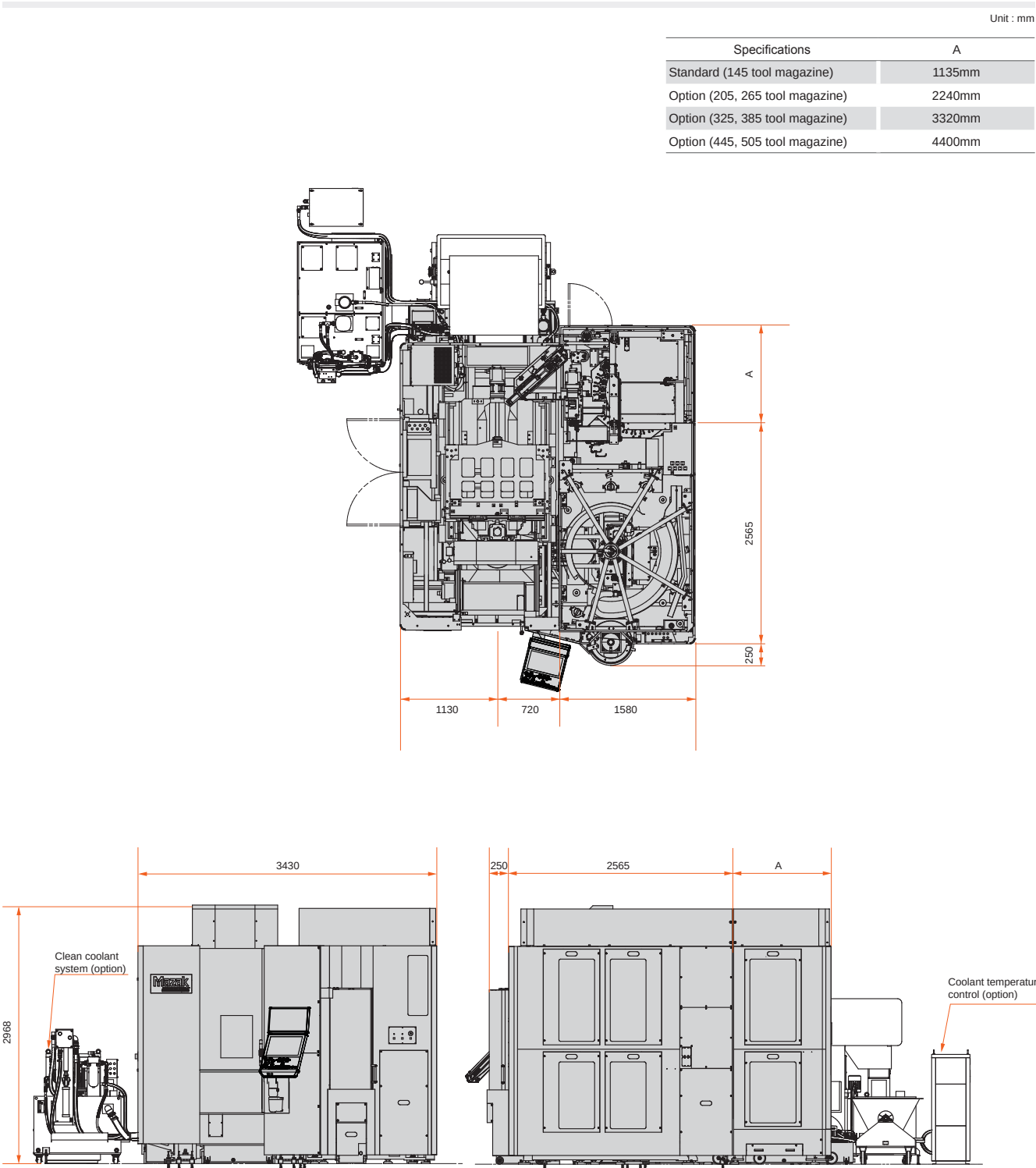
Standard and Optional Equipment

| VARIAXIS i-300 AWC         |                                                            |   |
|----------------------------|------------------------------------------------------------|---|
| ● : Standard    ○ : Option |                                                            |   |
| 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 Φ130 mm (HSK-A100)                             | ○ |
|                            | Work holder Φ130 mm (HSK-A100) (high accuracy)             | ○ |
|                            | Work holder Φ130 mm (CAPTO C8)                             | ○ |
|                            | Work holder Φ130 mm (CAPTO C8) (high accuracy)             | ○ |
|                            | 12000 rpm spindle (#40)                                    | ● |
|                            | 12000 rpm spindle (#40 BIGP)                               | ○ |
|                            | 12000 rpm spindle (HSK-A63)                                | ○ |
|                            | 18000 rpm spindle (#40)                                    | ○ |
|                            | 18000 rpm spindle (#40 BIGP)                               | ○ |
|                            | 18000 rpm spindle (HSK-A63)                                | ○ |
|                            | 25000 rpm spindle (HSK-A63, tool ID N/A)                   | ○ |
|                            | 30000 rpm spindle (HSK-F63, tool ID N/A)                   | ○ |
|                            | 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 print out 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 (1.5 kgf/cm²), 30 L/min             | ● |
|                            | Air through spindle (can be used during spindle operation) | ○ |
|                            | Coolant through spindle 0.5 MPa (5 kgf/cm²)                | ○ |
|                            | Hand-held coolant nozzle                                   | ○ |
|                            | Coolant for workpiece washing                              | ● |
|                            | High pressure coolant through spindle 1.5 MPa (15 kgf/cm²) | ○ |
|                            | High pressure coolant through spindle 7.0 MPa (70 kgf/cm²) | ○ |
|                            | 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 sensor.

\*2 Package option recommended for over extended periods of operation. Package includes ; chip conveyor (rear discharge / ConSep 2WS), high pressure coolant through spindle 1.5 MPa (15 kgf/cm²), coolant temperature control, work air blast and clean coolant system.

Machine Dimensions



MAZATROL SmoothAi Specifications

|                                    | MAZATROL                                                                                                                                                                                                                                                           | EIA                                                                                                                                                                                                                                                                                                                   |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of controlled axes          | Simultaneous 2 ~ 4 axes                                                                                                                                                                                                                                            | Simultaneous 5 axes                                                                                                                                                                                                                                                                                                   |
| 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, 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, WPC coordinate 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                           | 10 M / 100 M / 1 Gbps                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                       |

\*Option



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