MA-600HIII

Horizontal Machining Center

MA-600HⅢ

Horizontal Machining Center

Intelligent Technology

- Thermo-Friendly Concept
- Collision Avoidance System
- Machining Navi
- SᴇʀᴠᴏNᴀᴠɪ

A horizontal machining center that delivers outstanding productivity capacity, from overwhelming machining capacity and incredible reliability

Increased processing capacity with powerful new spindle 10,000 min⁻¹ (option)

- 10,000 min⁻¹ No. 50 spindle machining capacity: 1,240 cm^3/min (S45C)
  1,496 cm^3/min (FCD450)

Higher floor space productivity* with larger work envelope

- X-axis travel: 1,050 mm (longer than previous machine)
- Max load workpiece size: ø1,050 × 1,200 mm (larger than previous machine)
  (2-pallet APC only)

  * Area productivity: Ratio of required machine floor area to processing area

Outstanding dimensional stability even for long-run machining of large workpieces

- The Thermo-Friendly Concept minimizes dimensional changes due to ambient temperature changes and machining heat.
  Achieves outstanding dimensional stability even during long-run machining.

Contributing to the realization of a decarbonized society by achieving high productivity and high precision, together with environmental friendliness

- ECO suite plus is a thermo-friendly concept and energy-saving system compatible with a decarbonized society that autonomously achieves both stability of dimensional accuracy and reduction of energy consumption.

Productivity improved by shortening non-cutting times

- Shorter tool change times are possible when using thru-spindle coolant, and non-cutting times are also shortened by faster table indexing.

Chip discharge that maximizes uptime

- Effective workspace area washing suppresses chip accumulation and reduces frequent chip cleaning inside the machine.

"Sludgeless Tank" enhances stable operations (recommended option)

- The Sludgeless Tank removes coolant impurities (sludge) that impact machining performance, dramatically reducing the number of troublesome tank cleanings.
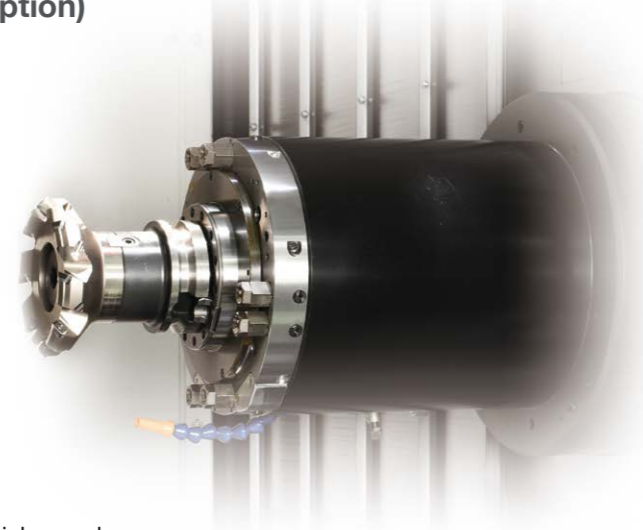
Automation support to further improve productivity

- Flexibly responds to automation with a greatly expanded number of ports for hydraulic and pneumatic jigs and multi-pallet APC.

Photographs and images used in this brochure may include optional equipment.

Increased processing capacity with powerful new spindle 10,000 min⁻¹ (option)

Supporting a wider range of applications with a new spindle lineup

Delivering high machining capacity across a wide range of low to high speeds.
Effectively handles a wide range of workpieces from heavy-duty cutting of steel to aluminum machining.

■ Powerful new spindle: 10,000 min⁻¹ No. 50 (option) Machining capacity

Material: S45C Actual data

● Milling capacity

1,240 cm³/min (S45C)

Tool:	ø160 mm face mill
	16 blades (carbide)
Spindle speed:	597 min⁻¹
Cutting Speed:	300 m/min
Feed rates:	3,820 mm/min
Cut width × depth:	112 mm × 2.9 mm
(Cut position: 728 mm from pallet top)	

● End milling capacity

642 cm³/min (S45C)

Tool:	ø50 mm end mill
	4 blades (carbide)
Spindle speed:	1,337 min⁻¹
Cutting Speed:	210 m/min
Feed rates:	1,604 mm/min
Cut width × depth:	10 mm × 40 mm
(Cut position: 762 mm from pallet top)	

Material: FCD450 Actual data

● Milling capacity

1,496 cm³/min (FCD450)

Tool:	ø160 mm face mill
	16 blades (carbide)
Spindle speed:	497 min⁻¹
Cutting Speed:	250 m/min
Feed rates:	3,180 mm/min
Cut width × depth:	112 mm × 4.2 mm
(Cut position: 760 mm from pallet top)	

● End milling capacity

1,031 cm³/min (FCD450)

Tool:	ø80 mm end mill
	4 blades (carbide)
Spindle speed:	895 min⁻¹
Cutting Speed:	225 m/min
Feed rates:	1,074 mm/min
Cut width × depth:	16 mm × 60 mm
(Cut position: 577 mm from pallet top)	

Note: The "actual data" referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting condition, and others.

■ Spindle structure designed for powerful machining

Roller bearings for the front make the spindle extremely rigid.
That enables full-potential tooling applications and solid support for powerful cutting.

[Applied spindles]
● **Powerful new spindle:** **10,000 min⁻¹ No. 50**
● Standard spindle: 6,000 min⁻¹ No. 50
● High-torque spindle: 6,000 min⁻¹ No. 50

Roller bearings

7/24 taper No. 50   VAC motor

■ Long service life provided by all spindles equipped with oil-air lubrication systems
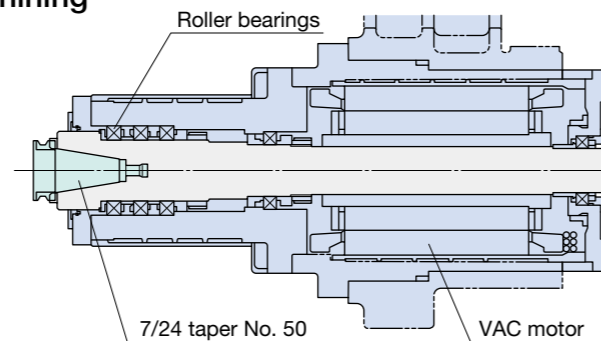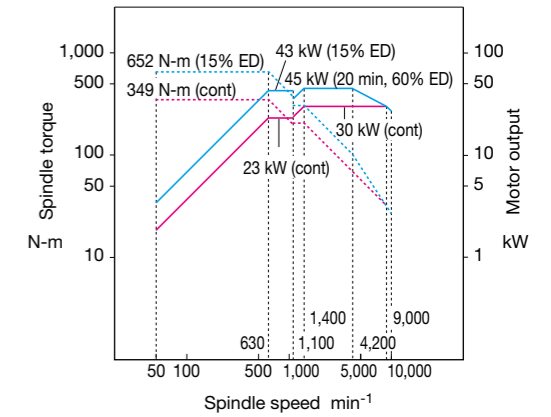

■ Spindle variations

■ Handling a wide range of applications from heavy-duty to high-feed machining

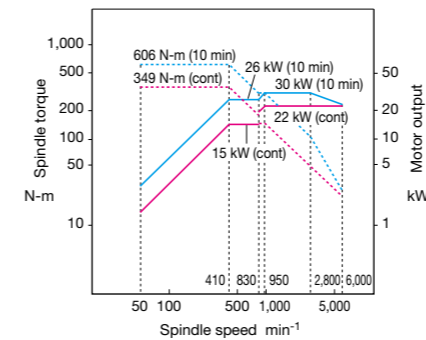**Powerful new spindle: 10,000 min⁻¹ No. 50** (option)

● Max output: **45/30 kW** (20 min, 60% ED/cont)
● Max torque: **652/349 N-m** (15% ED/cont)

■ Mainly for steel workpieces

Standard spindle No. 50

● Spindle speed: 6,000 min⁻¹
● Max output: 30/22 kW (10 min/cont)
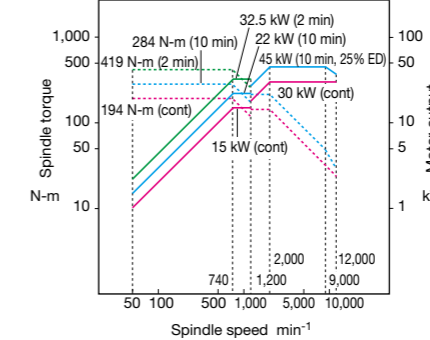● Max torque: 606/349 N-m (10 min/cont)

■ Machines materials from aluminum to steel

Wide-range spindle No. 50 (option)

Max output: 45 kW
(1.2 times more than previous model)

● Spindle speed: 12,000 min⁻¹
● Max output: 45/30 kW (10 min, 25% ED/cont)
● Max torque: 419/194 N-m (2 min/cont)

■ Machines inconel, titanium and other difficult-to-cut materials

High-torque spindle No. 50 (option)

Max torque: 1,071 N-m
(heavy-duty cutting)

● Spindle speed: 6,000 min⁻¹
● Max output: 45/37 kW (20 min/cont)
● Max torque: 1,071/637 N-m (3 min/cont)
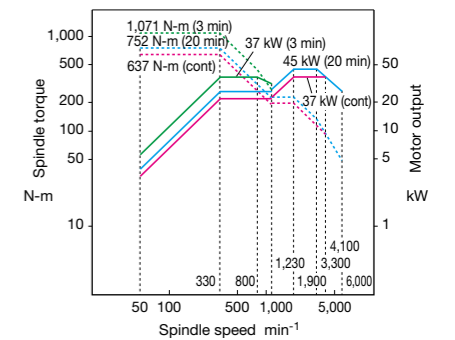
■ Steel and aluminum machining

Wide-range spindle No. 40 (option)

● Spindle speed: 15,000 min⁻¹
● Max output: 26/18.5 kW (10 min/cont)
● Max torque: 199/146 N-m (5 min/cont)
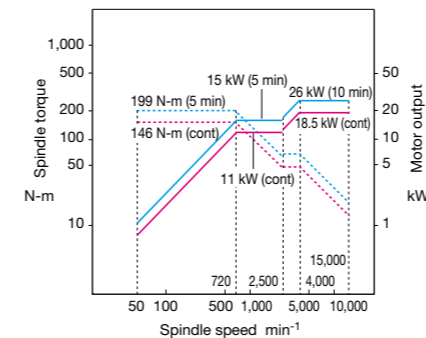
■ Die/mold and aluminum machining

High-speed spindle HSK-A63 only (option)

● Spindle speed: 20,000 min⁻¹
● Max output: 30/22 kW (10 min/cont)
● Max torque: 57/42 N-m (10 min/cont)

Higher floor space productivity with larger work envelope
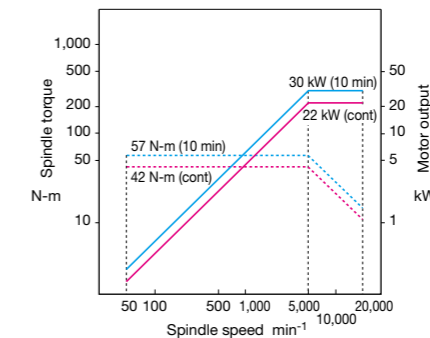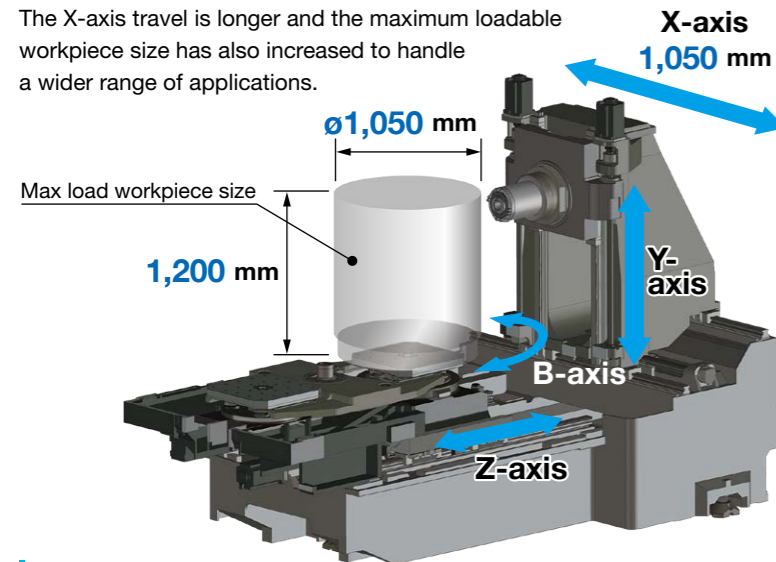
Optimal travels for the large parts applications

The X-axis travel is longer and the maximum loadable workpiece size has also increased to handle a wider range of applications.

X-axis 1,050 mm

ø1,050 mm

Max load workpiece size

1,200 mm

Y-axis

B-axis

Z-axis

■ Work envelope

X-axis travel: **1,050** mm
(longer than previous machine)

Y-axis travel: 900 mm

Z-axis travel: 1,000 mm

■ Max load workpiece size

ø1,050 × 1,200 mm[*1, *2]
(larger than previous machine)

*1. Standard 2-pallet APC only

*2. From pallet top to 120 mm up, max workpiece diameter is ø1,000 mm

■ Max tool length

630 mm[*3] (option)
(longer than previous machine)

*3. Chain magazine only

Machine structurally designed for ease of use

Built for operator-friendly workability.

■ Good accessibility to the spindle and workpiece

● 800 mm from the operation panel to the spindle.

■ Operation panel mounted on the left Swivel movement improves visibility and workability

● Workpiece and operation screen XYZ directions are the same

● Operator can be close to the screen, for less fatigue

■ Open ceiling for both setup station and workspace area (with door open)

● Easy part load/unload by crane

● Lighting is good, and coolant doesn't drop in the workspace area

Setup station

Workspace area

Outstanding dimensional stability even for long-run machining of large workpieces
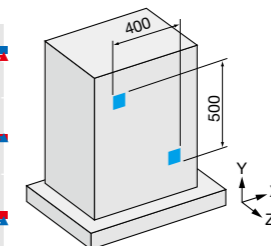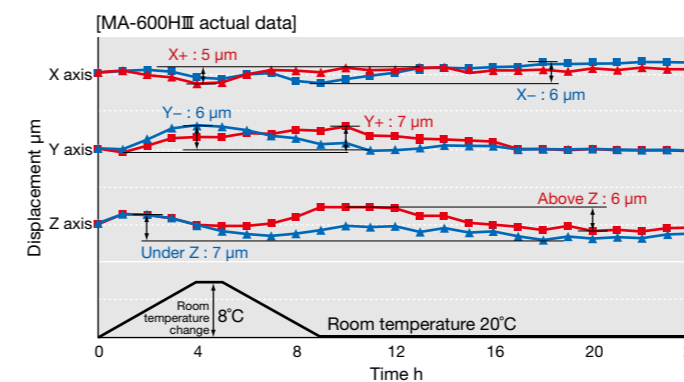
Thermo-Friendly Concept
The unique approach of "accepting temperature changes."

■ Outstanding dimensional stability

Okuma's Thermo-Friendly Concept achieves high dimensional stability not only when the room temperature changes, but also at machine startups or when machining is resumed. To stabilize thermal deformation, warming-up time is shortened and the burden of dimensional correction during machining restart is reduced.

MA-600HⅢ Thermal deformation over time: 7 μm
(room temperature change: 8°C)

[MA-600HⅢ actual data]

X axis — X+ : 5 μm, X− : 6 μm

Y axis — Y− : 6 μm, Y+ : 7 μm

Z axis — Above Z : 6 μm, Under Z : 7 μm

Displacement μm

Room temperature change 8°C — Room temperature 20°C

Time h: 0 4 8 12 16 20 24

■ TAS-C
Thermo Active Stabilizer—Construction

Providing optimal control of the machine and stable machining accuracies even during ambient temperature changes.

■ TAS-S
Thermo Active Stabilizer—Spindle

Spindle deformation will be accurately controlled even during operations with frequent speed changes.

Measuring position X: 400 mm, Y : 500 mm Coolant (with shower washing)

Note: The "actual data" referred to above for this brochure represent examples, and may not be obtained due to differences in specifications.

Machine is structurally designed to achieve outstanding accuracy

● Highly rigid 3-point supported bed
Easy installation thanks to bed that does not twist. Supporting stable, high accuracy over a long period.

● Ball-screw bracket
The ball-screw brackets at both ends of the X-Y-Z axes are reinforced and combined for highly accurate drive and positioning.

● Ball-screw cooling
X-Y-Z axes ball-screw cooling and Y-axis motor bracket cooling are standard. Assuring stable accuracy during high rates of operation.

● Indexing table and pallet
Highly accurate indexing table
 • Standard: Curvic coupling (1 degree indexing)
 • Optional: NC (0.001 degree indexing)
The pallet seating on a tapered cone achieves highly accurate positioning and excellent durability.

■ The exactness of bi-directional positioning
(MA-600HⅢ AbsoScale actual data*)
 ● X-axis (travel: 1,050 mm) **1.9 μm**
 ● Y-axis (travel: 900 mm) **2.6 μm**
 ● Z-axis (travel: 1,000 mm) **1.8 μm**

■ Bi-directional repeatability
(MA-600HⅢ AbsoScale actual data*)
 ● X-axis (travel: 1,050 mm) **1.4 μm**
 ● Y-axis (travel: 900 mm) **1.2 μm**
 ● Z-axis (travel: 1,000 mm) **1.1 μm**

* The "actual data" referred to above represent examples of data obtained by using ISO 230-2 test methods done at Okuma factories, and they are not guaranteed values.

Contributing to the realization of a decarbonized society by achieving high productivity and high precision, together with environmental friendliness

Highly productive, accurate and eco-friendly

Green-Smart Machine

Okuma has worked to reduce energy consumption in order to achieve carbon neutrality at the three factories in Japan which are our main production bases.

We have realized high productivity through automation and process-intensive machining, in addition to high-accuracy machining, and we then introduced the use of green energy to transform the three domestic factories into carbon-neutral factories.

"Green-Smart Machines" is our definition of Okuma's intelligent machine tools, which autonomously achieve stable dimensional accuracy and reduced energy consumption, to support environmentally friendly production. Our policy is to deploy "Green-Smart Machines" fully, to help achieve a carbon-free society.

Starting with products manufactured at those carbon-neutral factories and supplying them all over the world, we will work together with our customers to help solve the social issues faced by the manufacturing industry.

Green-Smart Machines are **environmentally friendly**
products that autonomously achieve stable dimensional accuracies and reduced energy consumption.
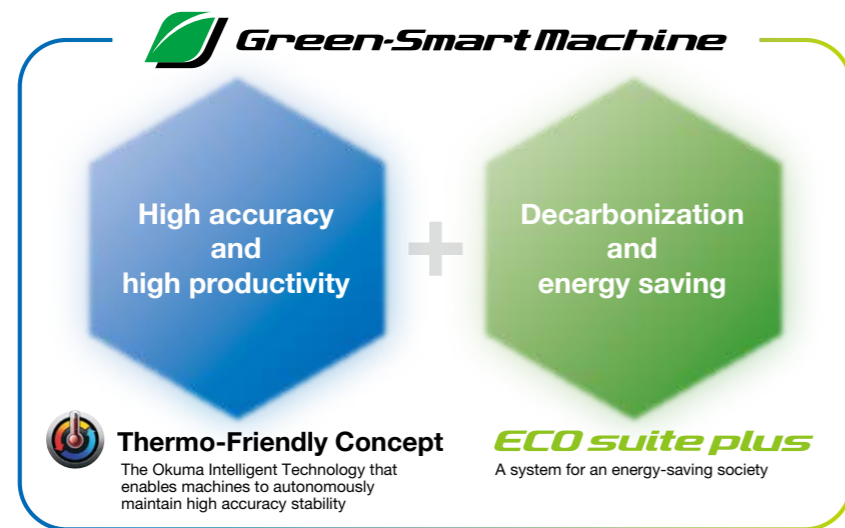
Green-Smart Machine

High accuracy and high productivity
+
Decarbonization and energy saving

Thermo-Friendly Concept
The Okuma Intelligent Technology that enables machines to autonomously maintain high accuracy stability

ECO suite plus
A system for an energy-saving society

Thermo-Friendly Concept
The Okuma Intelligent Technology that enables machines to autonomously maintain high accuracy stability

The unique concept of accepting temperature changes achieves consistent high accuracy without special coolers or excessive air conditioning.

■ **Reduction of warm-ups and dimensional compensation**

Reduce the time needed for daily warm-ups and dimensional compensation to adjust to ambient temperature changes

■ **Reduction of power used for air conditioning**

Maintain high stability of dimensional accuracy even if the air conditioning temperature range is expanded.

■ **Reduction of machine body coolers**

Achieve outstanding dimensional accuracy without any special machine body cooling being required to maintain accuracy

■ **The Okuma way to cool**

Spindle   Spindle cooler

Cooling

Constant temperature
(always)
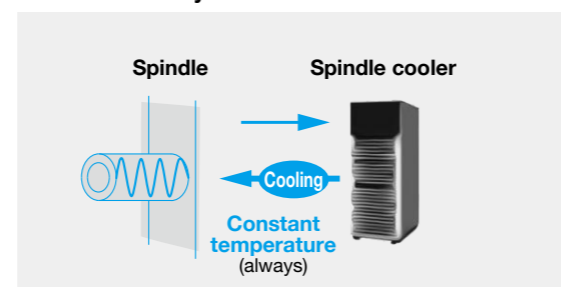
By always setting a constant coolant supply temperature, the cooler power consumption is reduced.

ECO suite plus
A system for an energy-saving society

■ **ECO Idling Stop**

Auxiliary equipment consume a substantial portion of the power used in a factory. This function enables each of them to be turned off when not needed to reduce power consumption.

In addition to when automatic operation is suspended, it is now possible to stop idling during manual operation. Power consumption and carbon dioxide emissions are reduced without conscious effort by the operator.

■ **ECO Operation**

By using only the required peripherals (chip conveyor, mist collector), energy-saving operations are possible.

■ **ECO Power Monitor**

Power is shown individually for spindle, feed axes, and auxiliaries on the OSP operation screen.
In addition to regenerative power, the energy-saving benefits from auxiliary equipment stopped with ECO Idling Stop can be confirmed on the spot.

■ **The machine monitors the cooling level when not machining, and proactively turns off the cooler while maintaining high accuracy conditions.**

Cooling status monitoring

Spindle temp sensor

Determines accuracy impact
Thermal deformation estimates with Thermo Active Stabilizer
Temperature measurement

STOP

Spindle cooler

1 Check carbon dioxide emissions on the spot

With ECO suite plus, you can also check the power consumption of each device.

2 Simultaneously records operating status and carbon dioxide emissions

With ECO suite plus, recording carbon dioxide emissions for each device, and data output is possible.

3 Analyze carbon dioxide emissions and improve machine tool operation

With ECO suite plus, not only the display on the machine but data analysis for each device is also possible on a PC, to see a more detailed carbon dioxide emission analysis.

Example of utilizing One-Touch Spreadsheet (option) to create visual feedback of machine's power consumption and carbon dioxide emissions.

Productivity improved by shortening non-cutting time

Shorter tool change times are possible when using thru-spindle coolant

● Suction of excess coolant in spindle

Removes residual coolant dripping from the tool in 0.4 seconds (actual value using a drill tool).
In-spindle coolant suction eliminates the need for an air blow (minimum 15 seconds) to remove residual coolant, shortening tool change time.

Coolant suction time: 0.4 seconds*

Note: Coolant suction time varies depending on the tool.

0.4 seconds

Shorter table indexing times

Table indexing time is shortened by the SERVONAVI Rotary Axis Inertia Auto Setting function.
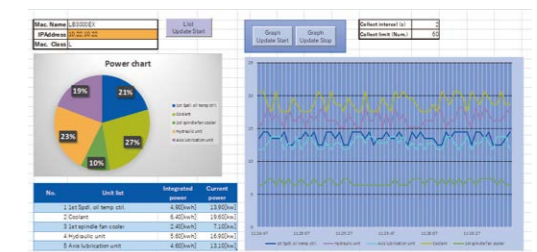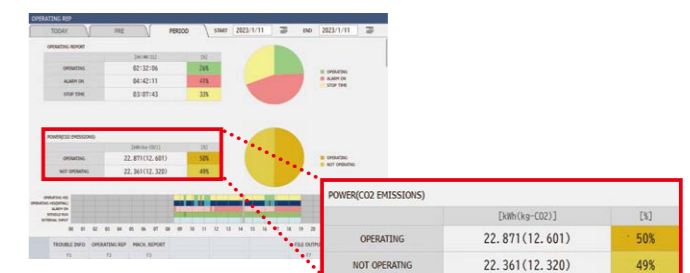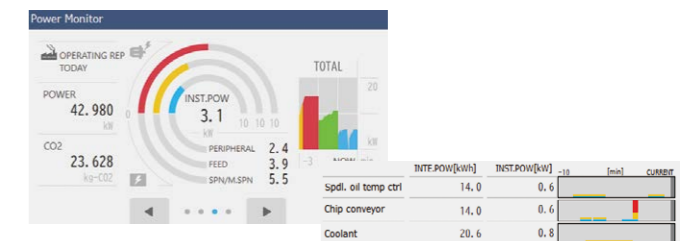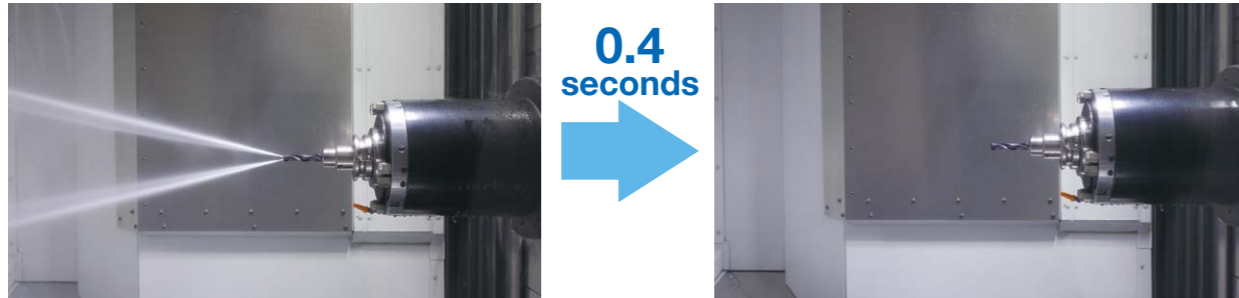
Table indexing time: 1 degree indexing

1.6 sec/90°*1 **20**% reduction
(compared to previous model)

Table indexing time: 0.001 degree indexing

1.4 sec/90°*1 **44**% reduction
(compared to previous model)

*1. At low inertia

High speed operations

Rapid traverse	: 60 m/min (X-, Y-, Z-axis)
Rapid acceleration	: 0.7 G (max)
Tool change	: 2.0 sec (T-T)*2
	: 3.7 sec (C-C)*2
	: 3.7 sec (CTC min)*3
Pallet change time	: 12 sec*2
	: 13 sec*3

*2. MAS standard measurements (formerly JIS B 6013)
*3. ISO 10791-9 (2001) (JIS B 6336-9) measurements

Chip discharge that maximizes uptime

With simple workspace covering and reinforced coolant applications, efficient chip discharge and long-run applications possible

Just Z-axis travel single cover and a smooth X-,Y-axis telescopic covers suppress chip accumulation.
Moreover, in dry machining without coolant, washing only the lower workspace area with coolant is possible.
In-machine washing prevents likely areas of chip accumulation, by cleaning away chips to maintain long-run production runs.

■ Chip discharge and workspace area designed to prevent chip accumulation

In-machine wash coolant: 450 L/min (60 Hz) (18% improvement compared to previous machine)

Stronger workspace lower area wash and hinge conveyor smoothly removes large-volume coolant and accumulated chips out of the machine.

From the upper area of the workspace, a shower coolant system (option) and coolant from the X-,Y-axis telescopic covers suppress chip accumulation.

Preventing chip accumulation with smooth X-,Y-axis telescopic covers and Z-axis stainless steel single cover.

Flat covers in the workspace prevent chip accumulation

Center trough design enhances large amount of chip discharge out of the machine

Z-axis stainless steel single cover

X-,Y-axis telescopic covers

■ Out-of-machine chip discharge

Optional a lift-up chip conveyor that discharges chips to the outside of the machine, and a Sludgeless Tank (recommended option) that efficiently collects sludge are available.

Lift-up chip conveyor

Sludgeless Tank

"Sludgeless Tank" enhances stable operations
(recommended option)

> **The number of troublesome coolant tank cleaning operations is significantly reduced, improving productivity.**
> **Furthermore, environmental impact due to coolant disposal is also reduced.**

It is important to remove impurities (sludge) contained in the coolant for the stable operation of the machine, and coolant tank cleaning is indispensable.
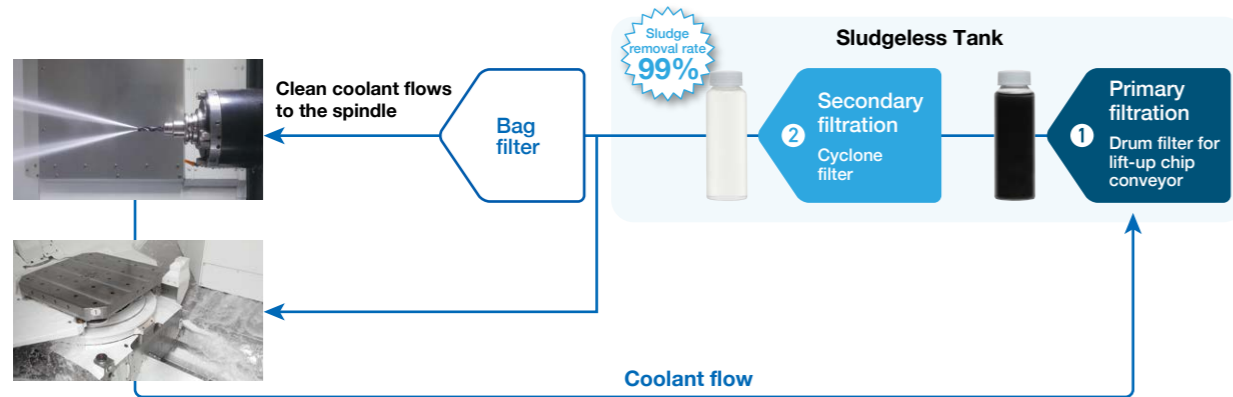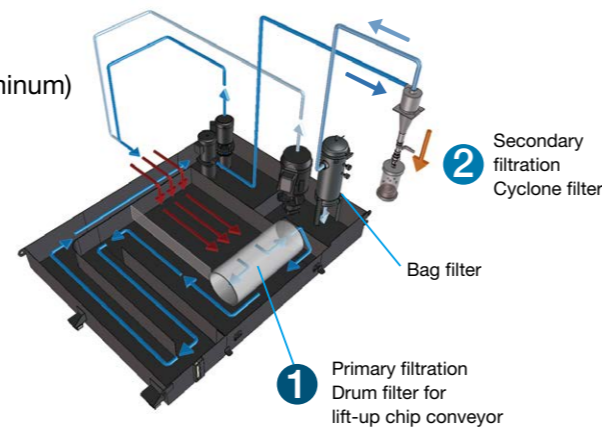
The Sludgeless Tank (recommended option) efficiently collects sludge and reduces defects caused by coolant containing sludge, such as scratches on machined surfaces and trouble with cutting tools. Sludge accumulation in the tank is suppressed, which also drastically reduces the frequency of troublesome tank cleaning and enables stable operation over long hours. In addition, the frequency of coolant replacement can be greatly reduced, which also reduces the environmental impact of coolant disposal. Coolant supplied with thru-spindle coolant specifications uses a bag filter to collect even finer sludge and improve machined surface quality.

Sludge removal rate **99%** (when the material is casting and aluminum)
Note: · After secondary filtration (cyclone filter) permeation
· Okuma evaluated removal rate

No tank cleaning for 3 years (okuma equipment actual data)

No coolant replacement for 3 years (okuma equipment actual data)

Note: It is necessary to select a chip conveyor with hinges + scraper (with drum filter) if the Sludgeless Tank option is chosen.

② Secondary filtration Cyclone filter

Bag filter

① Primary filtration Drum filter for lift-up chip conveyor

Sludgeless Tank

Sludge removal rate **99%**

Clean coolant flows to the spindle

Bag filter

② Secondary filtration Cyclone filter

① Primary filtration Drum filter for lift-up chip conveyor

Coolant flow

■ Keeping spindle tapers clean

The three filtration devices in the Sludgeless Tank and coolant suction inside the spindle reduce dirt on the spindle taper and lessen defective machining.

Note: Suction of coolant from the spindle also limits the outflow of coolant to the spindle taper when changing tools.

■ Compact—integrated with the through-spindle coolant tank

The thru-spindle coolant tank is integrated, and the coolant heater/cooler (option) can be mounted on the tank, saving space.

Lift-up chip conveyor (option)

Coolant heater/cooler (option) mounted on the tank

Integrated with through-spindle coolant tank
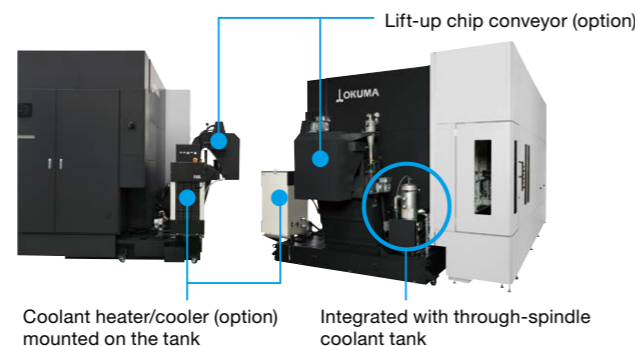
Automation support to further improve productivity

> **Flexible automation support**

■ Significantly increased number of pallet-through jig ports (option)

The setup station pallet base can be equipped with up to 16 fixture ports for hydraulic and pneumatic pressure, and the workspace area table base can have up to 8 ports for flexible automation applications. Hydraulic circuits that tend to be complicated can be simplified, and auto-clamp fixture designing becomes easy. Customers benefit from more freedom in systemizing and in meeting more diverse automation needs.

Setup station

Max **16** ports (hyd/pneu)[1, 2]
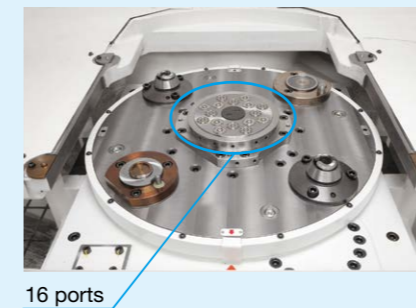
16 ports

For the setup station 16 port preps

With 16 ports, arrangements for robotic and automation applications will be expanded, and more flexible fixture support will be possible. With 16 ports, a large number of parts can be mounted, and a different workpiece can be clamped on each side of a 4-sided tooling block fixture.

[1]. 8 or 16 ports available.
(for 16 ports, max 12 hydraulic ports)
[2]. Hydraulic pressure: 7 MPa.

Workspace area (in machine)

Part load/unload[1]: Max **7** ports[3]
Workholding clamps[2]: Max **8** ports[3]

7 or 8 ports   In-machine step (option)
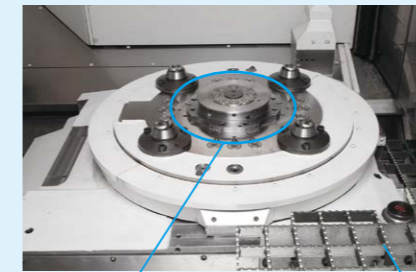
Part load/unload in workspace area (table) also possible

"Part load/unload" jig ports also allow part load/unload in the workspace area in the machine. Adjustment times for trial cuts can be shortened and fixture readjustments in the workspace improve work efficiency. With more ports, hydraulic applications have increased, eliminating complicated hydraulic circuits arrangements.

[1]. For part load/unload in the workspace area, **select part load/unload.**
[2]. If the above is not required, **select workholding clamps.**
[3]. Hydraulic pressure: 7 MPa.
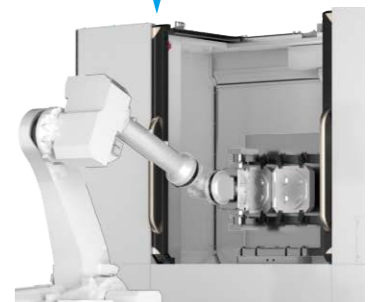
Example of robotic automation

■ Auto Setup Station Pallet Rotate (option)

This feature automatically rotates the setup station pallet in 90° increments by stepping on the foot switch. Operator efficiency has been improved, and robotic part load/unload can be done from multiple fixtures.

Foot switch

Flexible production of large-variety workpiece applications

An impressive lineup of automation systems

■ Flexible APC systems*

Multi-pallet APCs allow the operator to single setup a large number of workpieces, and use the extra time available for other jobs.

Additionally, if the unit is set up before the end of the day, the system can run unattended at night.

- Multi-pallet APC connects to standard 2-pallet rotary-shuttle APC
- Pallet change time is the same as in the standard APC
- Can be adapted to match plant layout and type of production

6-pallet APC   **10-pallet APC**   **12-pallet APC**

3,015 mm   5,202 mm   6,317 mm
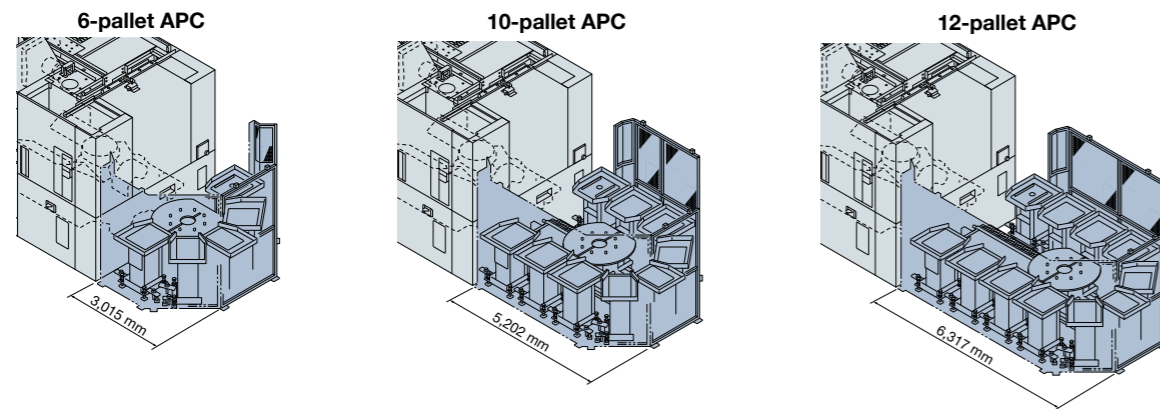
■ Multi-Pallet Tower APC*

Making the pallet magazine multi-stage saves space and allows long unattended continuous operation, improving productivity.

* For multi-sided APC/FMS specifications, the maximum loadable workpiece dimensions are ø1,000 x 1,000 mm.
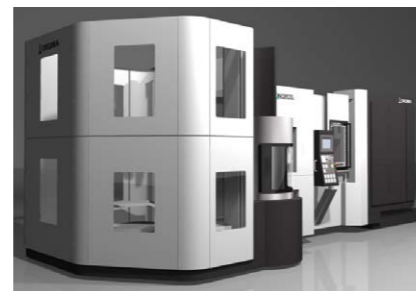
Tower 12P-APC system illustration

■ Auto tool changer

The standard number of tools that can be stored is 60. Flexible, high-volume tool storage systems available for adding more types of workpieces.
Matrix magazines store larger numbers in compact, quick tool-change arrangements.

- Matrix magazines: Tool preparation time   Minimum: 12 seconds (multiple magazines: 19 seconds)

ATC magazine capacity	Magazine type	ATC tool		Maximum length, mass, moment	
		Max diameter			
		w/adjacent	w/o adjacent		
40 tools, 60 tools (standard)	Chain magazine	ø140 mm	ø240 mm	Max length 450 [630] mm	
81 tools, 111 tools, 141 tools, 171 tools	Matrix magazine (171 tool cabinet)	ø105 mm (standard) ø130 mm (mid-size)	ø240 mm (large size)	Max length 450 [600] mm	Max mass 25 kg Mass moment 36.75 N-m
195 tools, 225 tools, 255 tools, 285 tools	Matrix magazine (285 tool cabinet)				
100 tools, 150 tools 200 tools, 240 tools 320 tools	Multiple magazine	ø135 mm	ø240 mm		

[   ]: Option

Matrix system ATC magazine (option)

13

OSP-P500

Improved productivity and stable production

As Your Single Source for M-E-I-K (Mechanics - Electronics - IT - Knowledge) merging technology, Okuma offers this CNC to build an advanced "digital twin" that faithfully reproduces machine control and machining operations and create new value. In addition, Okuma offers productivity improvement and stable production with ease of use that allows customers to use their machining know-how, an energy-saving solutions that achieve both high accuracy/productivity and eco-friendly products, with robust security protection against increasing threats of cyber attacks.

Faithful reproduction of machines and processing — Digital support for shop floor work
Digital Twin (option)

"Okuma's **two** digital twins" made possible by an office PC and a next-generation CNC reduce machine downtime and improve machine utilization

Simulation using the latest machine information can be achieved with an office PC and OSP-P500 installed on the physical machine. This enables preparation for machining in advance in the office environment (front loading). Preparing machining for the next part while continuing machining can reduce the preparation time for the physical machine. When a problem occurs on the shop floor, it can be solved quickly on site without going back to the office.

15-inch operation panel

1 Digital Twin On PC*
Simulate shop machines in the office

Front loading is performed with the actual status matched with the data on the office PC to further improve productivity.
Highly accurate pre-verification minimizes trial and error in first part machining, and reduces machine downtime to the minimum.

* The PC software is to be used with one package for one machine.

2 Digital Twin On Machine
Simulating the CNC of a real machine

Super-fast and super-accurate machining simulations are performed with the CNC of a real machine on-site to minimize machining preparation work.
Actual machining can be started immediately, greatly improving the operating rate of the machine.

Front loading
Reducing work on the physical machine to increase the operating rate

Using the results confirmed by the office simulator on the actual machine

Verification of setup
Verifying the setup status in a virtual space on the machine

Virtual space

IIoT gets the latest machine data

Virtual space

Real space

Information check, actual machining by simulator

Using the latest machine data in the office simulators

Actual machining

Note: The screens above are examples of the Collision Avoidance System (option).

Connect Plan

Get Connected, **G**et Started, and **G**et Innovative with Okuma "*Monozukuri*"

Connect, Visualize, Improve

Okuma's Connect Plan is a system that provides analytics for improved utilization by connecting machine tools and visual control of factory operation results and machining records. Simply connect the OSP and a PC and install Connect Plan on the PC to see the machine operation status from the shop floor, from an office, from anywhere. The Connect Plan is an ideal solution for customers trying to raise their machine utilization.

Machine tool and PC

Connect

14
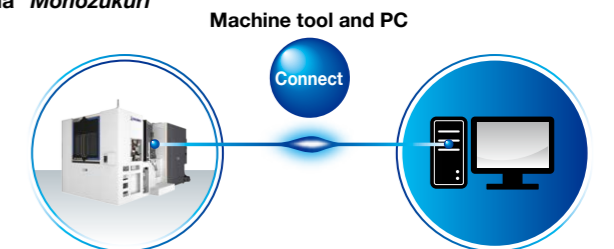
Advanced technology—effective for machine shops

AI Machine Diagnosis Function (option)
Machine tool diagnostics technology with artificial intelligence (AI)

■ With predictive maintenance, prevent machine stoppages just in time

Okuma's AI-equipped control diagnoses the presence or absence of abnormalities in the machine spindle and feed axes and identifies any irregularities found.

Downtime from machine stoppage is minimized, so the benefits are highly accurate, productive, and stable operations over the long term. The operators themselves can easily diagnose the machine by following simple screen guidelines on the Okuma control.

Notes:
AI diagnostic models are already installed, and diagnoses can be performed by the machine itself. AI diagnostic models can be updated through Okuma's Connect Plan.
With AbsoScale detection specs, ball-screw wear detection is possible.

AI Spindle Diagnosis Function
Detects damage to spindle bearings

AI Feed Axis Diagnosis Function
Detects ball-screw wear condition
Detects damage to ball-screw support bearings

Self-diagnosis of spindle and feed axis status with AI

Turn-Cut (option)
Turning operations on machining centers

■ Shorter lead times with process-intensive machining

Simultaneously controlling X-Y circular motion with the tool edge position rotated by the spindle tool enables lathe-like turning.

● Tapers also possible
● Hole making with different diameters — with one tool
● IDs and ODs can be machined when they exceed the maximum tool diameter that ATC can handle
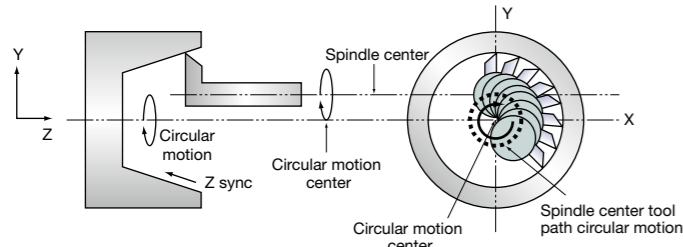
Note: AbsoScale detection and ball-screw cooling required

Example of use: Turning valve parts
With Turn-Cut, it's possible to turn the seating surfaces required by gas pipe sealing conditions.

Flat-Tool Grooving (option)
Airtight seal grooving

■ Grooving with high sealability

The spindle phase is precisely synchronized with cutting edge motion, to perform highly accurate grooving.

● Getting high sealability without hand finishing.
● Complex seal groove curves also cut with flat tools.
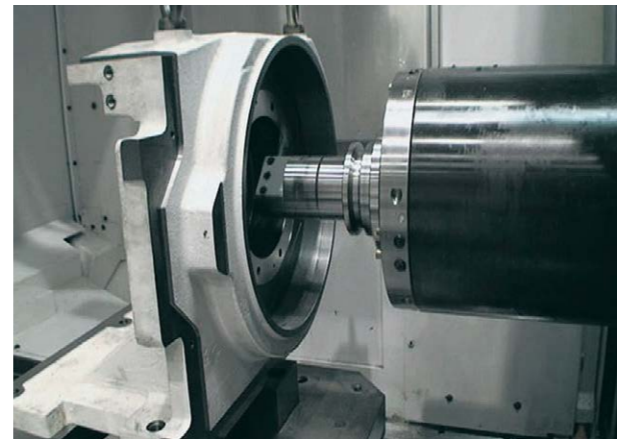

Collision Avoidance System (option)
Collision prevention

Allowing operators to focus on making parts

■ World's first "Collision-Free Machine"
CAS prevents collisions in automatic or manual mode, providing risk-free protection for the machine and great confidence for the operator.
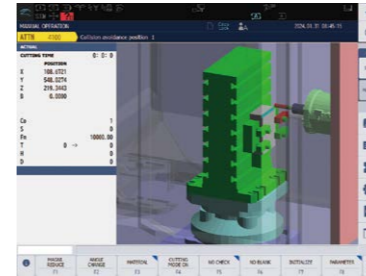
SERVONAVI
Optimized Servo Control

Achieves long term accuracy and surface quality

■ SERVONAVI AP (Automatic Parameter setting)

Work Weight Auto Setting
● Cycle time shortened with faster acceleration
Work Weight Auto Setting estimates the weight of the workpiece and fixture on the table and automatically sets the liner axis servo parameters, including acceleration, to the optimum values.
Cycle times are shortened with no changes to machining accuracy.

Rotary Axis Inertia Auto setting
● Maintains high accuracy and stable movements
The "ServoNavi Rotary Axis Inertia Auto Setting" estimates the inertia of the workpiece and jig from the acceleration torque, and automatically sets the optimum servo parameters for the table rotation axis, including acceleration, thereby maintaining the high-precision operation of the table rotary axis.
Moreover, the table indexing time for light weight workpieces is reduced.

Cycle time reduction
Significantly shortens cycle times and reduces power consumption

● Operation time reduction: The non-cutting time is shortened by simultaneously performing multiple operations, such as spindle rotation and axis feed, and allowing the rotary axis to take the shortest path
● Machining time shortening: The cycle time is reduced for parts machining with frequent switches between cutting feed and rapid traverse by using feeder-mode high-speed switching and optimal acceleration/deceleration
● Easy parameter setting: Collects parameters related to cycle time reduction in a single screen for enabling changes and reuse in a single operation

Parameter easy setting
Setting screen

Machining Navi M-*i*, M-*g*II+ (option)
Cutting condition search for milling

Longer tool life and shorter machining times by optimizing cutting conditions

■ Searches for the best cutting conditions

● Machining Navi M-*i* changes automatically to optimum spindle speed
● Machining Navi M-*g*II+ displays several spindle speed possibilities

Changing to optimum spindle speed

Changing spindle speed

Lower cutting load required

Machining Navi (OSP) provides the answer!

■ SERVONAVI SF (Surface Fine-tuning)

Reversal Spike Auto Adjustment
● Maintains machining accuracy and surface quality
SERVONAVI's Reversal Spike Auto Adjustment maintains machining accuracy by switching servo parameters to the optimum values matched to changes in slide resistance.

Vibration Auto Adjustment
● Contributes to longer machine life
Vibration Auto Adjustment can quickly eliminate noise and vibration even from machines with years of operation.

■ Machine Specifications

	Item	Unit	MA-600HⅢ No.50	[No.40]*1
Travels	X-axis (column left/right)	mm (in)	1,050 (41.34)	
	Y-axis (spindle up/down)	mm (in)	900 (35.43)	
	Z-axis (table front/back)	mm (in)	1,000 (39.37)	
	Spindle center to pallet top	mm (in)	50 to 950 (1.97 to 37.40)	
	Spindle nose to pallet center	mm (in)	70 to 1,070 (2.76 to 42.13)	
Pallet	Work area	mm (in)	630 × 630 (24.80 × 24.80)	
	Max load capacity	kg	1,200 [1,400]	
	Indexing angle	deg	1 [0.001]	
	Max workpiece dimensions*2	mm (in)	ø1,050 × 1,200 (ø41.34 × 47.24)	
Spindle	Speed	min-1	50 to 6,000 [50 to 10,000, 50 to 12,000, 50 to 6,000 (high-torque spindle]	50 to 15,000, [50 to 20,000]
	Tapered bore		7/24 taper No. 50 [HSK-A100]	HSK-A63 [7/24 taper No. 40]*3
	Bearing dia	mm (in)	ø100 (ø3.94)	ø70 (ø2.76)
Feed rate	Rapid traverse	m/min (ipm)	X, Y, Z: 60 (2,362)	
	Cutting feed rate	mm/min (ipm)	X, Y, Z: 1 to 60,000 (0.04 to 2,362)	
Motors	Spindle	kW (hp)	30/22 (40/30) (10 min/cont) [10,000 min-1: 45/30 (60/40) (20 min · 60 %ED/cont), 12,000 min-1: 45/30 (60/40) (10 min · 25 %ED/cont), High-torque spindle: 45/37 (60/50) (20 min/cont)]	26/18.5 (35/25) (10 min/cont) [20,000 min-1: 30/22 (40/30) (10 min/cont)]
	Feed axes	kW (hp)	X: 4.6 (6.13), Y: 4.6 (6.13) × 2, Z: 5.2 (6.93)	
	Table indexing	kW (hp)	3.5 (4.67)	
ATC	Tool shank		MAS403 BT50 [CAT50, DIN50, HSK-A100]	HSK-A63 [MAS403 BT40, CAT40, DIN40]*3
	Pull stud		MAS2 [MAS1, CAT, DIN, JIS]	– [MAS2, MAS1, CAT, DIN, JIS]*3
	Magazine capacity	tools	60 [40 (chain magazine type)] [81, 111, 141, 171, 195, 225, 255, 285 (matrix magazine type)] [100, 150, 200, 240, 320, 400 (multiple magazine system)]	
	Max tool dia (w/o adjacent tool)*4	mm (in)	ø140 (5.51) / ø240 (9.45)	ø100 (3.94) / ø150 (5.91)
	Max tool length	mm (in)	450 (17.72) [600*5, 630*6 (23.62, 24.80)]	
	Max tool mass	kg (lb)	25 (55)	10 (22)
	Tool selection		Memory random [fixed address for 81 or more tools]	
Machine size	Height	mm (in)	3,174 (124.96)	
	Floor space; width × depth	mm (in)	3,435 × 7,068 (135.24 × 278.27)*7	
	Mass	kg (lb)	25,000 (55,000)*8	
Controller			OSP-P500M	

[ ]: Option
*1. No. 40 spindle is option.
*2. Standard 2-pallet APC. Multi-pallet APC and FMS: ø1,000 × 1,000 mm, hydraulic fixtures (link): ø1,000 × 900 mm.
*3. Selectable for 15,000min-1 spindle. (20,000min-1 is HSK only.)
*4. Values differ with a matrix magazine. Please inquire.
*5. This is a special specification with matrix and multiple magazine specifications. (For multiple magazines, only the front row supports special maximum tool length.)
*6. Chain magazines.
*7. Off-machine chip discharge; hinge + scraper (with drum filter) (recommended). Depth with chip pan is 6,418mm.
*8. Workpieces and tools not included.

■ MA-600HⅢ Standard Specifications

Spindle speed	6,000 min-1, 30/22 kW (10 min/cont)	Air filter and oiler	
ATC magazine capacity	60 tools	Telescopic cover	
Spindlehead cooling system		Hydraulic unit	
Simple ball-screw cooler	X-Y-Z axes	Automatic 1° indexing table	
Centralized lubrication	Oil level alarm and pressure alarm	2-pallet rotary-shuttle APC	Pallet top surface M16 tap
Coolant supply system	Tank: 1,144 L (Dirty tank: 1,018 L (effective: 696 L) Clean tank: 126 L) Pump: 3.0 kW, 1.5 kW, 0.55 kW (50 Hz)/0.75 kW (60 Hz)	Full enclosure shielding	2-pallet pivoted type for APC
		Operation panel	15 inch
		ATC operation panel	For manual operation
		NC (OSP) control cabinet ventilation fan	
In-machine chip discharge	Hinge	Work lamp	LED
Chip pan for above		Status indicator	3 phase C type
Thru-spindle coolant*	1.5 MPa	Foundation washers, jack bolts	
Suction of excess coolant in spindle		Slip stoppers and chemical anchors	
ATC air blower (blast)		Tool release lever	
Chip air blower (blast)	Nozzle type	Tapered bore cleaning bar	
Coil conveyor under APC		Hand tools	
In-machine chip washer		Tool box	
APC fork washer		TAS-S	Thermo Active Stabilizer—Spindle
		TAS-C	Thermo Active Stabilizer—Construction

* Okuma pull stud required with thru-spindle coolant.

■ MA-600HⅢ Optional Specifications

Spindle speed *See p4 for details.	No. 50	50 to 10,000 min-1, 45/30 kW	Oil mist lubricator	
		50 to 12,000 min-1, 45/30 kW	Chip air blower (blast)	Adapter
	No. 40	50 to 15,000 min-1, 26/18.5 kW	Coolant system	Sludgeless Tank (recommended option)
	HSK-A63	50 to 20,000 min-1, 30/22 kW	Off-machine chip discharge (lift-up chip conveyor types)	Refer to Recommended chip conveyors.
High-torque spindle	No. 50	50 to 6,000 min-1, 45/37 kW, 1,071 N-m		
Dual contact spindle*1		HSK, BIG-PLUS®	Chip bucket for above	Height 700 mm, 1,000 mm
ATC magazine capacity (tools)		40 tools (chain magazine type)	Hydraulic oil cooler	
		81, 111, 141, 171, 195, 225, 255, 285 tools (matrix magazine type)	Coolant heater / cooler	
			Auto tool length comp/ breakage detection	Touch sensor
		100, 150, 200, 240, 320, 400 tools (multiple magazine system)	Auto zero offset/auto gauging	Touch probe
AbsoScale detection		X-Y-Z axes, X-Y axes	Tool life management	By hour meter
Auto 0.001° indexing table		Built-in NC table	Turn-Cut	AbsoScale detection and ball-screw cooling required.
APC Auto pallet changer		Parallel shuttle: 6P, 10P, 12P		
		Tower: 12P	Pull stud bolt shape	MAS1, CAT, DIN, JIS
FMS 2-pallet APC		Wing block type, Under-pallet fork type	Pull stud bolt	MAS1, MAS2, CAT, DIN, JIS
Pallet top surface configuration		T-slot, Inch specifications	2-sided tooling block	Height: 825 mm, Pitch: 125 mm
Spare pallets			4-sided tooling block	Height: 825 mm, Pitch: 125mm
Edge locator			Ball-screw cooler	X-Y-Z axes
Oil-hole coolant system		1.5 MPa	Recommended for die machining	AbsoScale detection (X-Y-Z axes) Hyper-Surface Ⅱ DNC-DT, 0.1 µm control
Thru-spindle coolant*2		7.0 MPa, large flow 1.5 MPa, large flow 7.0 MPa		
Shower coolant		10 nozzles		
Work wash gun				

*1. Be sure to select this specification when BIG-PLUS® holder is used.
*2. Okuma pull stud required with thru-spindle coolant.

■ Recommended chip conveyors (Please contact an Okuma sales representative for details.)

○: Recommended
△: Conditionally recommended

Workpiece Material		Steel	Cast iron	Aluminum/ non-ferrous metal	Mixed (general use)
Chip shape					
In-machine chip discharge	Hinge type (standard)[*1]	○	○	○	○
Off-machine chip discharge (option)[*2]	Hinge + scraper (with drum filter) (recommended)	○	○	○	○
	Hinge type	○	—	—	—
	Scraper type[*3]	—	○ (dry)	—	—
	Scraper type (with drum filter)	—	○ (wet) with magnet	△[*3]	—

*1. Scraper type (option) also available. *2. With limitations per conveyor discharge direction. *3. When chips are shorter than 100 mm

■ Off-machine lift-up chip conveyors

Type	Hinge + scraper (with drum filter)	Hinge	Scraper	Scraper (with drum filter)
Shape				

Note: Becomes hinge + scraper (with drum filter) if Sludgeless Tank (option) is selected.

■ A next-generation CNC OSP-P500M standard specifications

Basic Specs	Control	X, Y, Z, simultaneous 3 axis, spindle control (1 axis)
	Position feedback	OSP full range absolute position feedback (zero point return not required)
	Coordinate functions	Machine coordinate system (1 set), work coordinate system (20 sets)
	Min / Max command	±99999.999 mm, ±9999.9999° 8-digit decimal, command units: 0.001 mm, 0.01 mm, 1 mm, 0.0001°, 0.001°, 1°
	Feed	Cutting feed override: 0 to 200%
	Spindle control	Direct spindle speed commands, override 30 to 300%, multi-point indexing
	Tool compensation	No. of registered tools: Max 999 sets, tool length/radius compensation: 3 sets per tool
	Display	15-inch color LCD + multi-touch panel operations
	Security	Operator authentication, Lock screen, OSP-VPSII-STD
Programming	Program capacity	Program storage capacity: 4 GB; operation buffer: 2 MB
	Program operations	Scheduled program, fixed cycle, G-/M-code macros, arithmetic, logic statements, math functions, variables, branch commands, Coordinate calculate, area machining, coordinate convert, programming help, user task, keyway cycle
Operations	OSP suite	"suite apps" to graphically visualize and digitize information needed on the shop floor, "suite operation" enable one-touch access to "suite apps".
	Easy Operation	"Single-mode operation" to complete a series of operations. Advanced operation panel/graphics facilitate smooth machine control
	MacMan plus	Machining management: aggregation and display of machining records, operating records and problem information, Visualization of power consumption, file output
	Machine operations	Operation help, load meter, alarm help, sequence return, manual interrupt/auto return, pulse handle overlap, parameter I/O, PLC monitor, auto power shut-off
Communications / Networking		USB (2 ports), Ethernet, DNC-T1, Smart I/F
High speed/accuracy specs		Thermo Active Stabilizer—Spindle (TAS-S), Thermo Active Stabilizer—Construction (TAS-C), Hi-Cut Pro, Pitch error compensation, Hi-G control, SERVONAVI, Cycle time reduction (operation time reduction, machining time shortening, easy parameter setting)
Energy-saving	ECO suite plus	ECO Idling Stop, ECO Operation, oil temperature controller auto control, ECO Power Monitor
	Power Regeneration System	Regenerative power is used when the spindle and feed axes decelerate to reduce energy waste.

■ A next-generation CNC OSP-P500M kit specifications/optional specifications

Item	Kit Specs	NML E	NML D	AOT E	AOT D	DT E	DT D	DT AOT E	DT AOT D
Digital Twin									
Virtual Machining						● (VE)	● (VD)	● (VE)	● (VD)
Quick Modeling						● (VE)	● (VD)	● (VE)	● (VD)
OPC UA for Machine Tools						●	●	●	●
OSP API KIT						●	●	●	●
Interactive functions									
Advanced One-Touch IGF-M (w/ Real 3-D simulation)				●	●			●	●
Interactive MAP (I-MAP)				●	●			●	●
Smart OSP Operation				●	●	●	●	●	●
Programming									
Operation buffer 10MB		●	●	●	●	●	●	●	●
Program notes (MSG)		●	●	●	●	●	●	●	●
Auto scheduled program update		●	●	●	●	●	●	●	●
Block skip; 9 sets									
Program branch; 9 sets									
Coordinate system select (Std: 20 sets)	100 sets	●		●		●		●	
	200 sets		●		●		●		●
	400 sets								
Helical cutting		●	●	●	●	●	●	●	●
3-D circular interpolation									
Skip									
Synchronized Tapping II		●	●	●	●	●	●	●	●
Arbitrary angle chamfering		●	●	●	●	●	●	●	●
Cylindrical side facing									
Tool max rotational speed setting									
F1-digit feed	External switch type, parameter type								
Programmable travel limits (G22, G23)		●	●	●	●	●	●	●	●
Slope machining	Type I, Type II								
Axis name designation									
Fixture offset II									
Dynamic fixture offset									
Tool grooving									
Turn-Cut									
Dynamic Tool Load Control									
3-D tool compensation									
Coordinate change and drawing conversion	Programmable mirror image (G62)		●		●		●		●
	Enlarge/reduce (G50, G51)		●		●		●		●
User task	Common variables 1,000, 2,000 pcs								
	G code macros: 80 sets added								
	I/O variables (16 each)								
Sequence stop		●	●	●	●	●	●	●	●
Sequence return	Mid-block sequence return		●		●		●		●
Tool wear compensation	Includes input restriction	●	●	●	●	●	●	●	●
Tool life management	Includes warning	●	●	●	●	●	●	●	●
External I/O communication									
RS-232C connector									
DNC connection	DNC-T3, DNC-B, DNC-DT								
	DNC-C/Ethernet								

Item	Kit Specs	NML E	NML D	AOT E	AOT D	DT E	DT D	DT AOT E	DT AOT D
Gauging									
Auto tool length offset/breakage detection									
In-magazine tool breakage detection									
Auto Workpiece Gauging/Auto zero offset									
Manual gauging (w/o sensor)		●	●	●	●	●	●	●	●
Interactive gauging (touch sensor, touch probe required)									
Monitoring									
21.5-inch color LCD operation panel tilt adjustment									
One-Touch Spreadsheet									
Collision Avoidance System									
Real 3-D Simulation						●	●	●	●
Simple load monitor	Spindle overload monitor	●	●	●	●	●	●	●	●
NC operation monitor	Hour meter, workpiece counter	●	●	●	●	●	●	●	●
Status indicator									
Operation end buzzer									
Workpiece counters on machine									
Tool breakage no-load detection		●		●		●		●	
MOP-TOOL	Adaptive control, overload monitor								
AI machine diagnostics *	Spindle/feed axes, or feed axes only								
Machine Status Logger									
Cutting Status Monitor									
Machining Navi M-i, M-gII+(cutting condition search)									
Feed axis retraction									
Tool retract cycle									
Automation / unattended operation									
Warm-up (calendar timer)									
External program	Button, rotary switch								
	Digital switch, BCD (2-digit, 4-digit)								
Pallet pool control (PPC) (Required for multi-pallet APC)									
Connection with automated devices	Robot, loader I/F								
	Stacker crane I/F								
	FMS link I/F								
High-speed, high-precision									
AbsoScale detection	X-Y-Z axes								
Dynamic displacement compensation		●	●	●	●	●	●	●	●
0.1 μm control (linear axis commands)									
Hyper-SurfaceII	3 linear axes, 3 linear axes + 2 rotary axes								
ECO suite plus									
ECO Power Monitor	On-machine wattmeter								
Spindle Power Peak Limiter									
Energy-saving hydraulic unit	ECO Hydraulics								
External output interface of consumed electricity									
Other									
Circuit breaker									
OSP-VPSII (Virus Protection System)									
Pulse handles	2 pcs, 3 pcs								
External M codes [4 sets, 8 sets]									

Note 1. NML: Normal kit, AOT: Advanced One-Touch IGF-M kit, DT: Digital Twin kit, DT AOT: Digital Twin Advanced One-Touch IGF-M, E: Economy, D: Deluxe
   VE and VD kits are also equipped with the Digital Twin on PC function, allowing running from a PC.
Note 2. Specifications, etc. are subject to change without notice.
* With AbsoScale detection specs, ball-screw wear detection is possible.

■ Pallet dimensions

65
125
125
125
125
65

80
25 40
15
18
36

Column side

630

118°
ø20.5
M16
0.7
30
40

Workpiece clamp tapped hole detail

65
125
125
125
125
65
630
24-M16

30
65

315
57.5
100
100
57.5
30
36
18

Edge locators
(option)

14.5
15.5
ø26
ø18

Workpiece hitch bolt hole detail
(option)

ø55
10
75
ø50 H7

Center hole detail

■ Working range

Unit: mm

Z-axis travel: 1,000
X-axis travel: 1,050
70
120
Area B
Area A
Pallet center
255
85 [115]
Pallet top
50 [20]
Y-axis travel 900

Travel

	MA-600HⅢ
X	1,050
Y	900
Z	1,000

[ ]: T-slot pallets
Note: the following interference areas
A: Spindlehead interference when the B-axis is 0, 90, 180, or 270 degrees
B: When max workpiece dia is ø810 to ø1,050 mm

■ Maximum workpiece dimensions

Unit: mm

2-pallet rotary-shuttle APC specification (standard 2-pallet APC only)

Max. diameter: ø1,050*1
ø810
Y-axis travel 900
Max hight 1,200 [1,170]
50 [20]
Interference with
telescopic covers
*2

[ ] : T-slot pallets
*1. Workpiece diameter should be within ø810 mm or interference with X-, Y-axis
telescopic covers will occur at the negative limit of the Z-axis.
*2. From pallet top to 120 mm up, max workpiece diameter is ø1,000 mm.
Note: The minus Z and Y-axis limit area is a spindle / pallet interference zone.

MA-600Ⅲ
Dimensional/Installation Drawings

Power inlet
2,390 mm from floor
(CNC cabinet top)

Air intake
Rc1/2 1,543 mm from floor
Supplied air temperature:
within 5°C over room temperature

Coolant tank
Coolant heater/cooler
(option)
Chip bucket (option)
Lift-up chip conveyor
with drum filter EC
H1,000 (option)

CNC

2,490
790 (door open)
3,159
50 (margin)
862
1,500
1,320
(APC door opening)
1,470
200
3,435
4,545
465
248
500 (margin)

450
(max. tool length)

Hydraulic oil cooler (option)
380
460
100
420
500
200
Ball-screw cooler
(option)

1,200
(margin)
5,013
7,068
1,142
500
(margin)

60-tool magazine
Magazine operation panel
913
Spindle gauge line
70
1,000
(Z-axis travel)
600
1,050
(max. workpiece
diameter)
APC swing center
Pallet top surface
1,200
(max. workpiece
height)
1,300
FL
304
6,155
6,459
95
Hydraulic unit

Tool change position
1,050
(X-axis travel)
525
525
Status
indicator
APC
operation panel
70
103
2,933
855
612
900
(Y-axis travel)
50
1,300
3,024
3,174
57
3,435
352
3,844

When using Okuma products, always read the safety precautions
mentioned in the instruction manual and attached to the product.

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