

MS-320H

Compact Horizontal Machining Center



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Received The Nikkan Kogyo Shimbun
55th Machine Design Award IDEA
Best Award (Minister of Economy,
Trade and Industry Award)

Achieves a New Form of Manufacturing A New-Concept Machine that Pursues Manpower Saving and Automation

In production environments where labor shortages are becoming more serious, awareness towards work styles is changing. In addition, manufacturing is diversifying according to each customer's scale and production method. In shop floors where labor shortage is so serious that no one can load or unload workpieces, there is a growing demand for a new form of manufacturing that can achieve manpower saving and automation. On the other hand, there are customers that have existing problems such as "there is no space to install an automation system inside factory" or "even if it is automated, it takes manpower to discharge chips."

The MS-320H compact horizontal machining center, a new-concept machine that achieves new forms of manufacturing, is useful in solving these problems at shop floors.

The MS-320H can automate various types of production within a minimal space.

From automotive components and semiconductor manufacturing equipment components to construction machine and precision machine components, we achieve optimal automation for small parts machining, from high-mix, low-volume production to mass production in a wide range of industries.

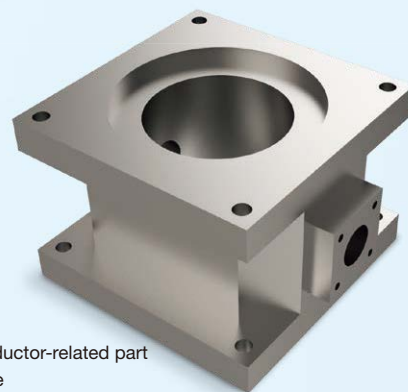
The machine also eliminates chip troubles, which are a bottleneck to automation. This enables continuous operation for many hours with an innovative machine structure that minimizes manual human labor.

This one unit fulfills the growing demands for manpower-saving and automation solutions, and solves problems surrounding labor shortages.

In an era where work style is constantly being reformed, the MS-320H contributes to creating production lines that do not stop even if operators are not present on the shop floor.



Automotive part
Hub (outer ring)



Semiconductor-related part
Gear case



Automotive part
Wheel hub



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



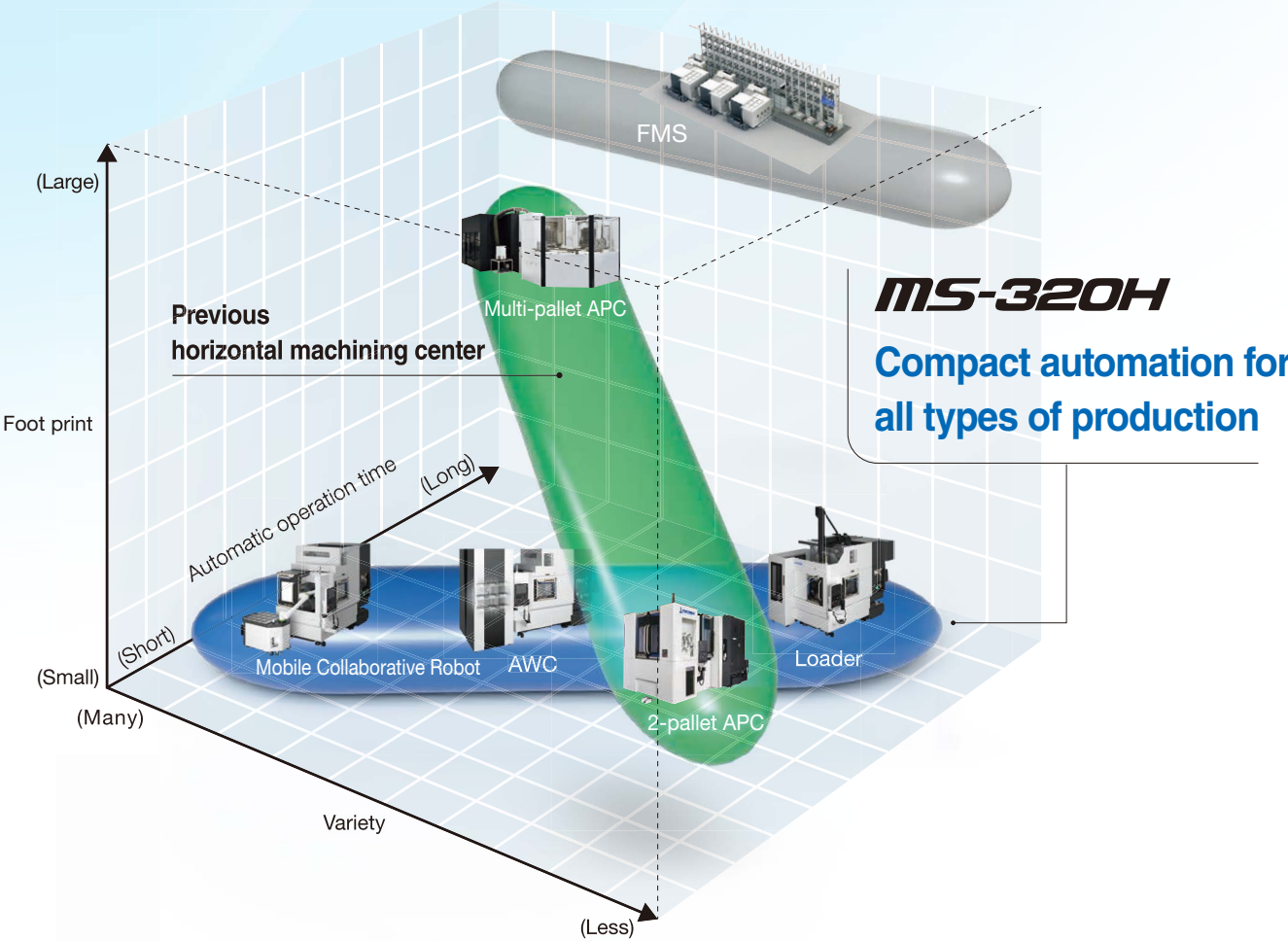
Achieves “solutions to the worsening labor shortage” and “new forms of manufacturing”

In the past, horizontal machining centers were often used for manufacturing that prioritized productivity, and in the machining of medium and small parts, a production system in which multiple workpieces are attached to the tombstone at once was often adopted.

In this case, the machining time per workpiece can be shortened and productivity can be increased, but an operator must always load and unload a workpiece at the setup station.

The new concept's MS-320H compact horizontal machining center frees operators from the work of loading and unloading workpieces by flexibly supporting the automation of loading and unloading workpieces according to various types of production. Operators are only required to simply load and unload workpieces to the stocker, and it achieves long-term automatic operation with minimal space without people attending the machine.

As manufacturing evolves into various forms in the future, we will solve labor shortages and propose new forms of manufacturing to customers who wish to reform their work styles.



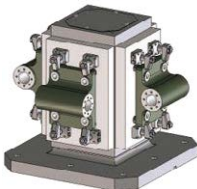
Previous horizontal machining center

Manufacturing that prioritizes productivity

In the machining of medium and small parts, **an operator attaches multiple workpieces to a fixture at once for machining**



Previous-type horizontal machining center



Attach multiple workpieces to a fixture

Improved productivity by shortening the machining time per piece

A new concept machine that achieves a new form of manufacturing

Compact Horizontal Machining Center *MS-320H*

A new form of manufacturing aimed at work-style reform

In the machining of medium and small parts, **operators only load and unload workpieces to stockers by automating the loading and unloading of workpieces**



Loader Stocker



Mobile Collaborative Robot stoker

Eliminates the loading and unloading of workpieces

Automating the loading and unloading of workpieces enables production line to be flexibly adjusted according to production situation

From a single-machine machining cell to multiple production lines, various types of production can be automated with minimal space



Mobile Collaborative Robot



AWC



Loader machining cell

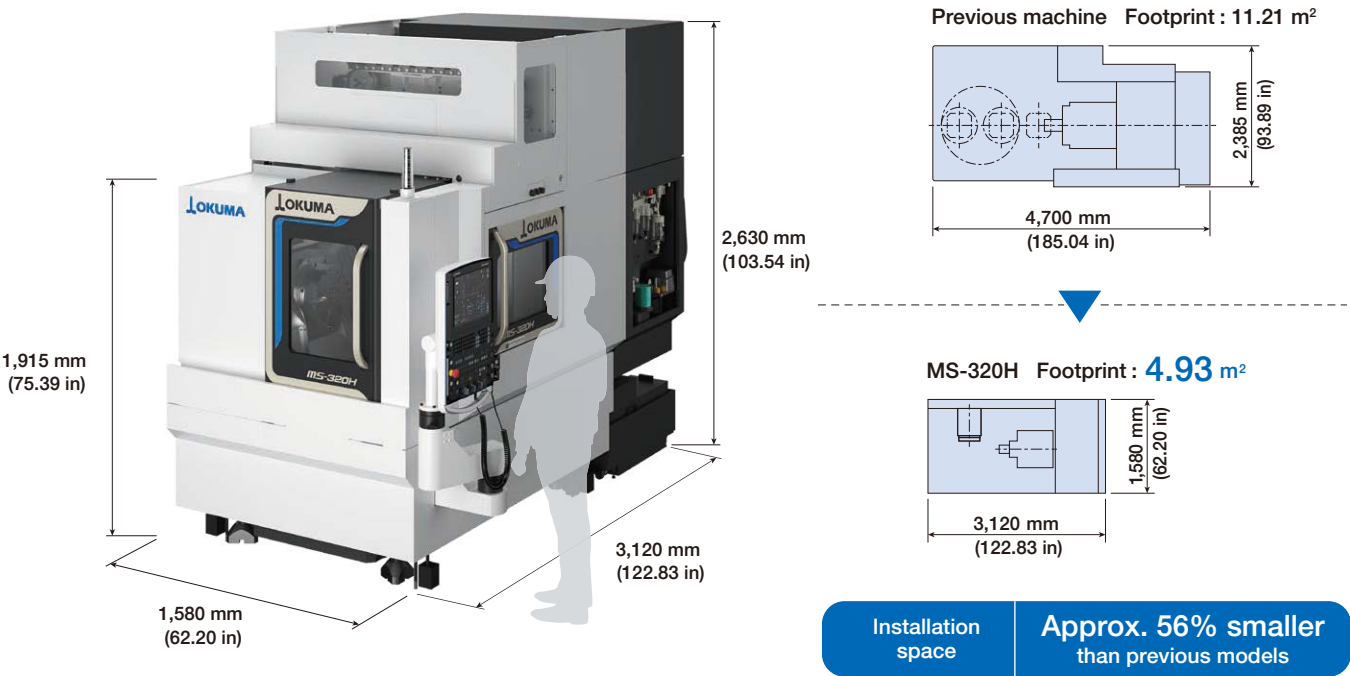


Mixed line with lathe

Stable automatic operation for a long period of time in a compact space

Compact base machine for automation

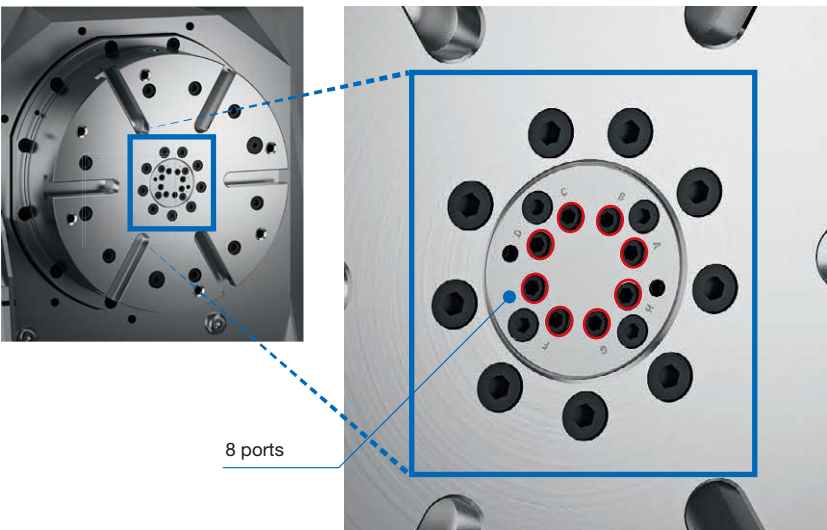
Machining of medium and small parts of □250 mm (9.84 in) or less can be handled with a space saving of 56% compared to previous machines.



Flexible automation support

8 ports (hydraulic and pneumatic ports)

“8-port” fixture ports for supplying hydraulic and pneumatic pressure are provided as standard. This has made it possible to flexibly use fixtures and automatically load and unload workpieces of various shapes.



A versatile lineup of automation systems

In pursuit of a structure capable of flexible automation, we can respond to various types of production, from high-mix, low-volume production to mass production, and from a single-machine machining cell to mass production lines of multiple units.



A machining cell that can be switched according to the busy situation
Mobile Collaborative Robot



Machining cell suitable for high-mix, low-volume production
AWC (Auto Workpiece Changer)

Stable dimensional accuracy increases the productivity of the automated system



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

The Thermo-Friendly Concept has been applied to the MS-320H in order to achieve dimensional consistency of precision that enables outstanding accuracy even for continuous machining over a long period of time. This saves labor for dimensional management and helps increase productivity.

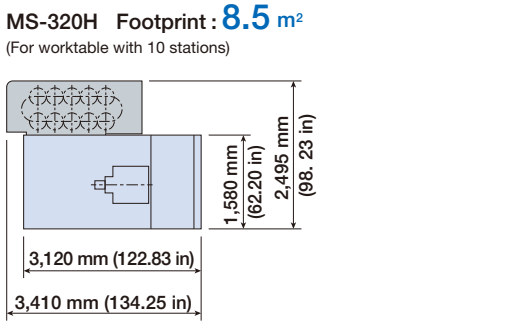
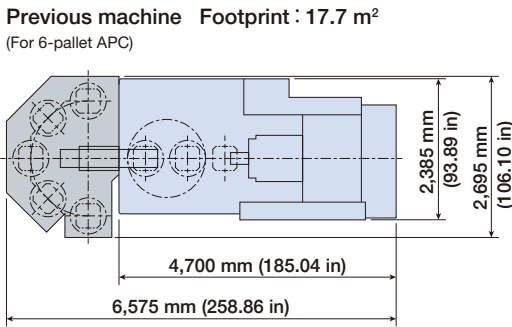
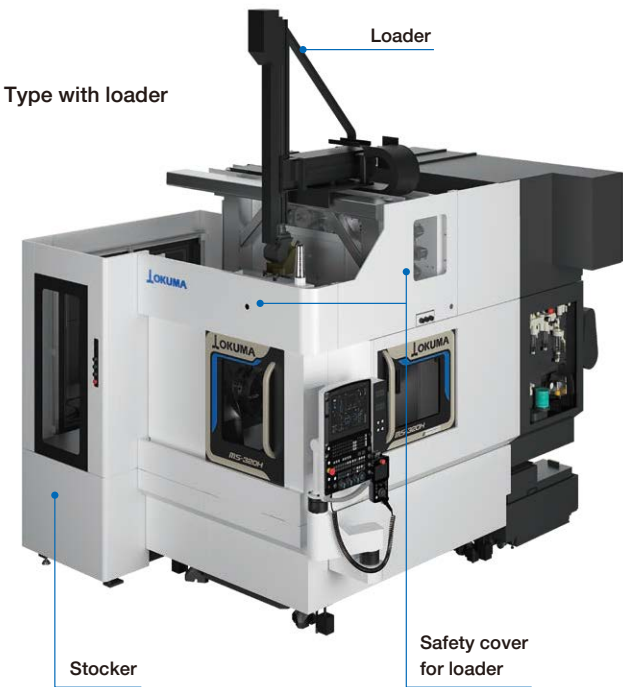
The automation of loading and unloading workpieces frees operators from such work

A machining cell that improves the productivity of mass production

Loader

Compact automation achieved with onboard loader

We also offers a MS-320H equipped with an onboard loader, and compact automation using a loader is achieved only in the installation space of the machine with a stocker added. The installation space of the previous horizontal machining center (6-pallet APC) can be reduced by **52%**, enabling long-term automatic operation in a minimal space.



Installation space

Approx. 52% smaller than previous models

Electric ceiling shutter shortens loader line takt

The electric ceiling shutter, which opens and closes when the loader enters, enables locating the position of the shutter, eliminating wasted movements. In addition, it achieves both high speed and reliability without the shock caused by opening and closing the shutter.

Loader workpiece loading and unloading time	5.3 sec
Workpiece size	ø250 x L80 mm (ø9.84 x L3.15 in) (8 kg x 2 pts) ø150 x L120 mm (ø5.91 x L4.72 in) (4 kg x 2 pts)

Ceiling shutter opening and closing time	0.5 sec
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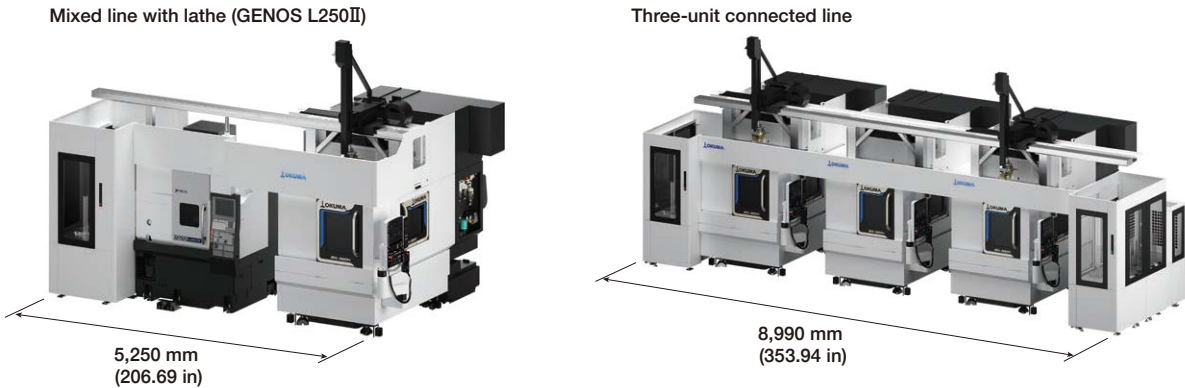
Stocker with high visibility

Large acrylic windows are adopted for the work table with 10 stations. The quantity of workpieces and finished goods can be checked at a glance, preventing machining stop due to insufficient preparation of workpieces, etc.



Space-saving mass production lines with improved area productivity

Because the machine width is narrow and maintenance space is small, space-saving mass production lines are possible. It supports the construction of a wider range of production systems in a limited space. In addition, the machine configuration that assumes a mixed line with a lathe makes it possible to transfer workpieces with a single loader because the machine height of the loader traveling part is equal to that of a lathe. It eliminates the need for peripheral equipment to connect the loaders, and achieves a compact multi-machine line.



A machining cell that can be switched according to the busy situation

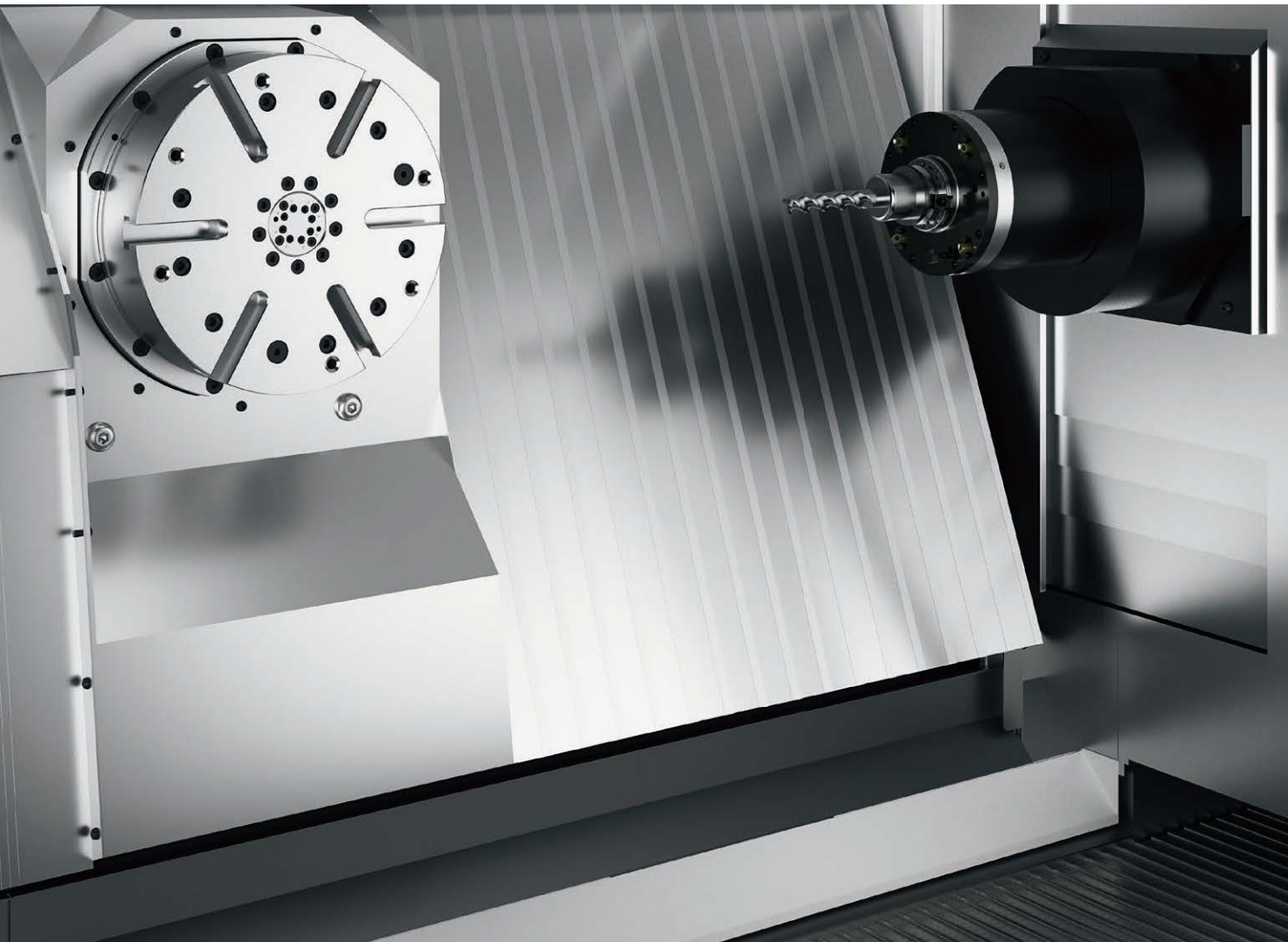
Mobile Collaborative Robot

Easy and compact automation achieved

The mobile Collaborative Robot, which automates the loading and unloading of workpieces, achieves the automation of high-mix, low-volume production. Since no safety fence is required, the machine can be moved freely within the factory, allowing for flexible automation according to the busy situation. It can be installed in the operator's area of a single machine and achieves compact automation.



Innovative machine structure to prevent chip accumulation in the machine



In-machine cover structure to prevent chips from accumulating in the machine

The increased angle of the stainless-steel internal cover around the table and under the table (up to 81°) prevents the accumulation of chips.



The moving part of the Z-axis without the snagging part of the chips. The design of a single stainless steel cover on the X-axis and a flat Y-axis telescopic cover prevents chip accumulation.



The moving part of the Z-axis

The single stainless steel cover on the X-axis



Y-axis telescopic cover

Full-center trough that collects chips across the entire machining chamber area, and a vertical surface table

A full center trough mechanism that achieves chip discharge from the entire machining area which greatly improves chip discharge capacity. By placing the table vertically, chips fall directly on the in-machine chip conveyor directly below the machining point, and are discharged to the outside of the machine without chip accumulation on the workpiece or table. It achieves stable, continuous machining over a long period of time without worrying about chips.

Vertical surface table

In-machine chip conveyor with full center trough mechanism



The chips fall directly

Environmentally-friendly in-machine cleaning

Pinpoint discharge without the use of a large amount of cleaning coolant prevents chip accumulation in an environmentally friendly manner, and reduces power consumption of coolant pumps. By eliminating the accumulation of chips inside the machine, the frequency of cleaning inside the machine can be reduced, which also eases the workload of the operator.



Manpower-saving solutions that reduce the operator’s workload

Coolant maintenance work is significantly reduced
The environmental impact of coolant disposal is also minimized

Sludgeless Tank

option

The Sludgeless Tank continuously circulates cutting fluid within the tank, efficiently collecting sludge to prevent accumulation and significantly reducing issues and maintenance work. This significantly reduces the frequency of tank cleaning, enabling stable operation over long periods and improving productivity. It also extends the cutting fluid’s lifespan, helps prevent spoilage and odors, and creates a better working environment. Furthermore, reducing the frequency of cutting fluid changes decreases industrial waste and lessens the environmental impact.

Sludge removal rate

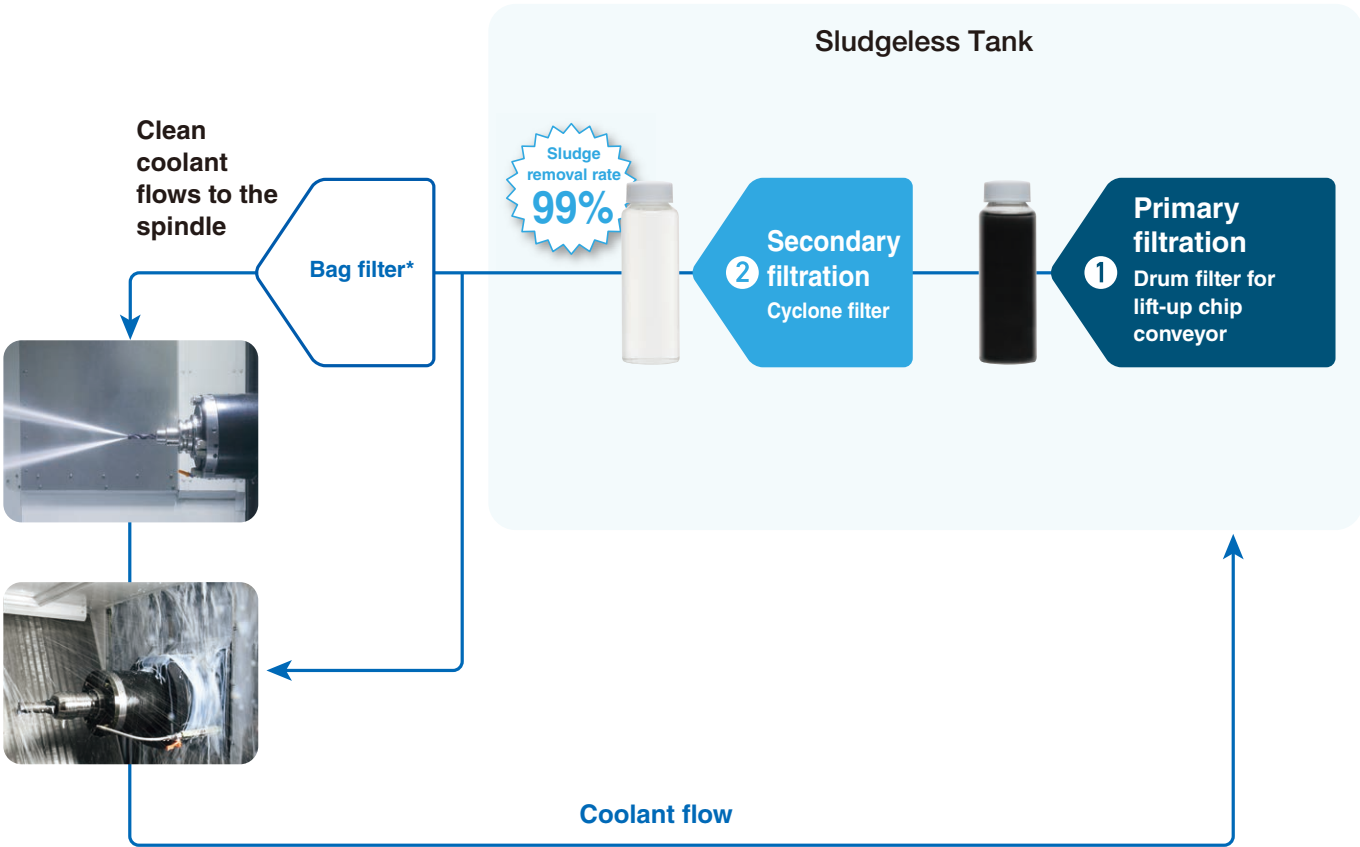
99% (when the material is casting and aluminum)

Notes: After secondary filtration (cyclone filter) permeation
Okuma evaluated removal rate

No coolant tank cleaning required for 3 years
(Okuma equipment actual data)

No coolant replacement required 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.



* Provided only to thru-spindle coolant units

A compact machine that can reduce wasted time and perform thorough cutting

It is equipped as standard with a powerful No. 40 spindle, which can also machine steel parts sufficiently

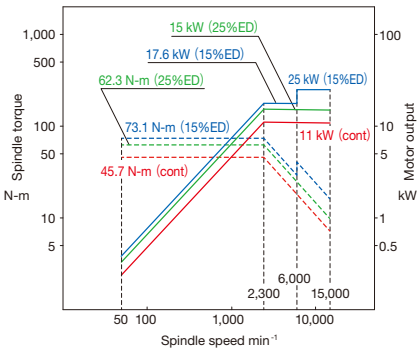
The No. 40 powerful spindle, which also enables machining of steel parts without difficulty, is adopted as a standard specification, and it achieves powerful cutting even with a compact machine.

Standard spindle No. 40

Spindle speed:
15,000 min⁻¹

Max output:
25/15/11 kW
(33/20/15 hp)
(15%ED/25%ED/cont)

Max torque:
73.1 N·m
(54 ft·lbf)
(15%ED)



Material: S45C actual data

Cutting Capacity 294 cm³/min (face milling)
343 cm³/min (end milling)

Tool	Spindle speed min ⁻¹	Cutting speed m/min	Feed rate mm/min	Cutting width mm	Cutting depth mm
ø50 face mill, 5 blades (carbide)	1,910	300	3,820	35	2.2
ø20 roughing end mill, 7 flutes	4,000	251	9,520	1.8	20
ø30 insert drill, f0.15	1,060	100	—	—	—
Tap M24 P3	400	30	—	—	177% (Spindle load)

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.

High speed operations shorten non-cutting time

An ATC electric shutter, shortened non-cutting time, is installed as standard

ATC electric shutter

The ATC shutter open/close time is shortened
Tool change time is shortened with the synchronous control of the shutter and the tool change arm

With the ATC electric shutter provided as standard, the position of the shutter can be grasped, so synchronous control of the shutter and the tool change arm eliminates wasted movements to shorten the tool change time. In addition, it eliminates problems caused by the shock that easily occur with an air-driven type, contributing to stable machine operation.

Reduced ATC times

ATC time T-T⁻¹ 0.94 sec CTC min⁻² 2.26 sec

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

High speed operations of the feed axis and table

Feed axes (X-Y-Z axes)

Rapid traverse X-Y: 50 m/min (1,969 ipm) Z: 60 m/min (2,362 ipm)

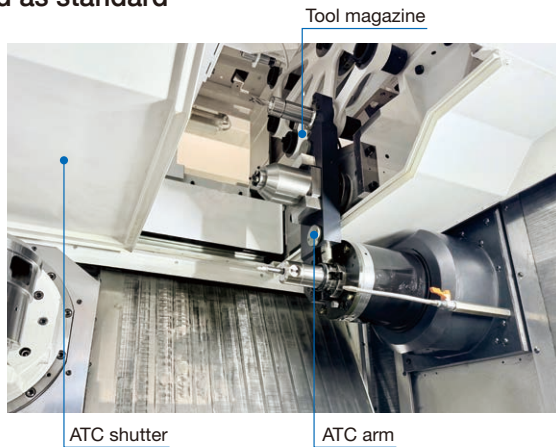
Rapid traverse acceleration (max) 1.0 G

Table (A-axis)

High speed operations 45 min⁻¹

A-axis indexing accuracy / repeatability ±3 sec/±2 sec, 0.001° indexing

Table indexing time 1.0 sec/90° 1.34 sec/180°



Tool change time is shortened by reducing residual coolant discharge time

Suction of excess coolant in spindle

option

Residual coolant in tools is removed instantly in 0.5 seconds (actual value for drill tools). The suction of coolant in spindles eliminates the need for air blowing to remove residual coolant (at least 15 seconds), and so shortens tool change time.

Coolant suction time 0.5 sec*

* The coolant suction time varies depending on the tool.
Note: It can be selected in the thru-spindle coolant specification.

Outstanding dimensional stability greatly shortens compensation and warm-up time

Reliable machining with high accuracy and excellent thermal stability

The Thermo-Friendly Concept is an Okuma Intelligent Technology intended to achieve amazing machining accuracy with unique structural design and thermal deformation control technology. It eliminates the need for cumbersome dimensional compensation and warm-up and demonstrates outstanding dimensional stability, even when operation continues over many hours or when the ambient temperature in the factory changes.



Thermo-Friendly Concept

The Okuma Intelligent Technology that enables machines to autonomously maintain high accuracy stability

Thermo-Friendly structure gives outstanding thermal stability

Forced cooling and restraining of thermal deformation

- 1
- Minimal temperature deviation
- 2
- Manageable thermal deformation
- 3
- Accurate compensation

Thermo Active Stabilizer - Construction (TAS-C)

Thermo Active Stabilizer - Spindle (TAS-S)

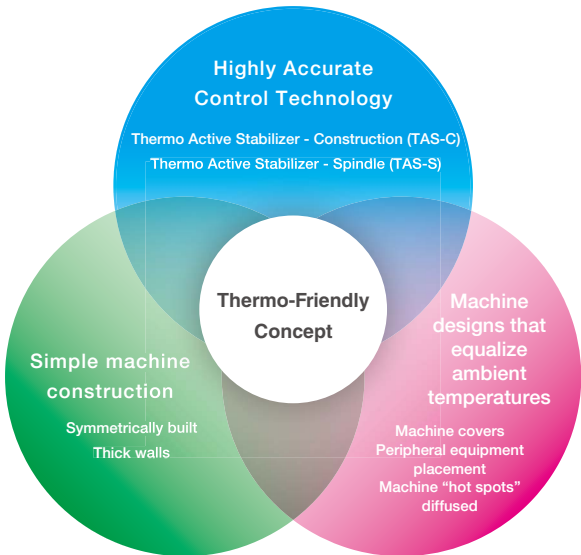
Eliminate waste with the Thermo-Friendly Concept

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. The warm-up operation time to stabilize thermal deformation is shortened, and the burden of dimensional correction when resuming machining is reduced.

- Machine startup
- Machining restart
- Room temp change

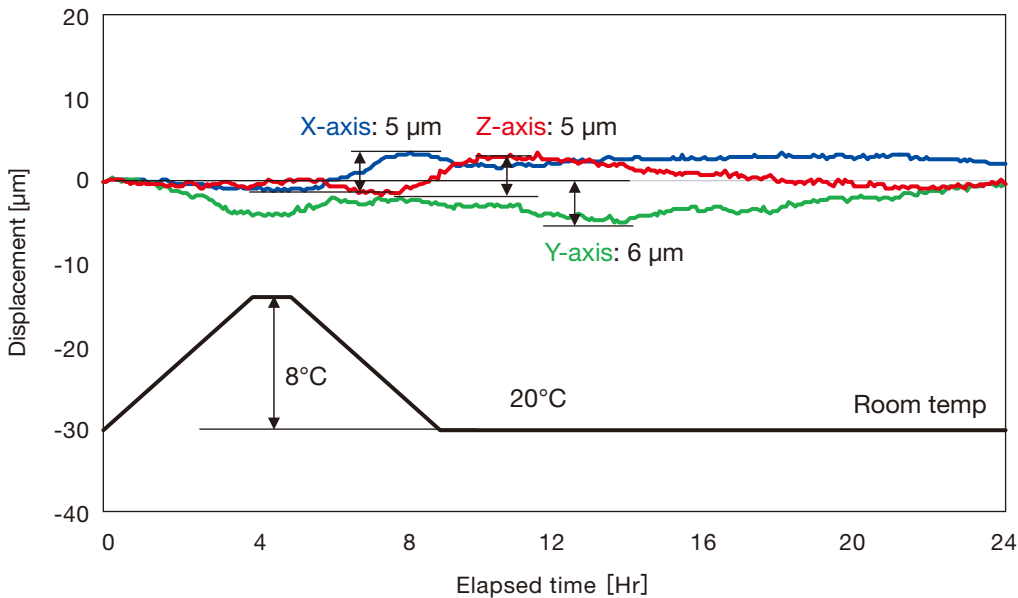
High dimensional stability

Machining dimensional change over time minimized with outstanding dimensional stability



and improves productivity

Thermal deformation over time (actual data) 6 μm / Room temp 8°C change



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.

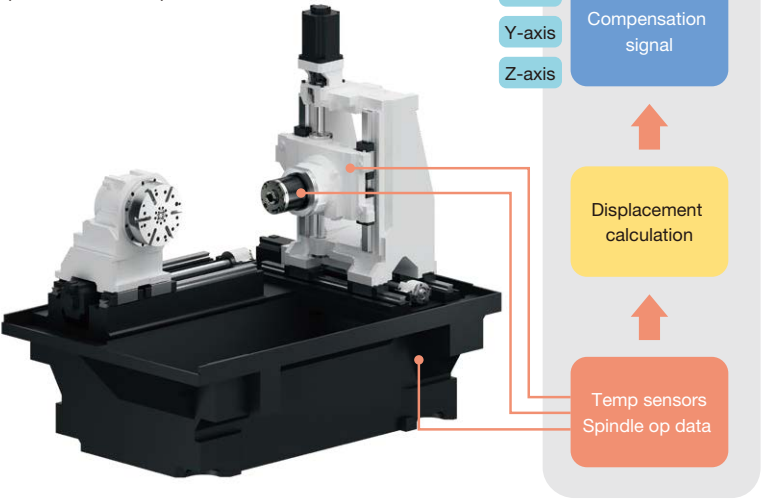
TAS-C Thermo Active Stabilizer - Construction

When machining under changing ambient temperatures, machining dimensional changes are affected by expanding/contracting machine components. TAS-C, based on machine thermal characteristics, with appropriately placed temperature sensors, will predict and accurately control thermal deformation in machine construction when ambient temperatures change.

TAS-S Thermo Active Stabilizer - Spindle

Thermal deformation of the spindle changes greatly both when the spindle is turning and when it is stopped, affecting machining accuracy. TAS-S considers not only spindle temperature information but also spindle rotation, spindle speed changes, and spindle stoppage. Thermal deformation of the spindle is accurately controlled even when spindle speed changes frequently.

Outline of thermal deformation control (TAS-C, TAS-S)



Achieving high-accuracy machining

MS-320H with AbsoScale; actual data (measurement method based on ISO 230-2)

The exactness of bi-directional positioning

X-axis (travel 250 mm)	1.4 μm
Y-axis (travel 250 mm)	1.9 μm
Z-axis (travel 570 mm)	1.9 μm

Bi-directional repeatability

X-axis (travel 250 mm)	0.7 μm
Y-axis (travel 250 mm)	1.4 μm
Z-axis (travel 570 mm)	1.5 μm

Note: 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.

Ease of use with consideration of harmony between people and machines

1 OSP-P500 operation panel with excellent operability and visibility

The swivel type allows for angle adjustment both in the left-right direction and the up-down direction for improved operability.

It can be swiveled according to the working position, ensuring good operability

The angle can be adjusted to suit the body height of the operator

Body height 158 cm (62.20 in) Body height 185 cm (72.83 in)

2 Operator-friendly working environment

Two doors (front operator's side and right-side operator's side) allow easy access to the spindle and table, reducing operator workload. The operation panel swivels according to the operator's working position to achieve an optimal working environment.

Full enclosure shielding to table center: 511 mm (20.12 in)

Full enclosure shielding to spindle center: 615 mm (24.21 in)

Front operator's side (loading and unloading workpieces and table setup work) Right-side operator's side (machining check, tool load/unload)

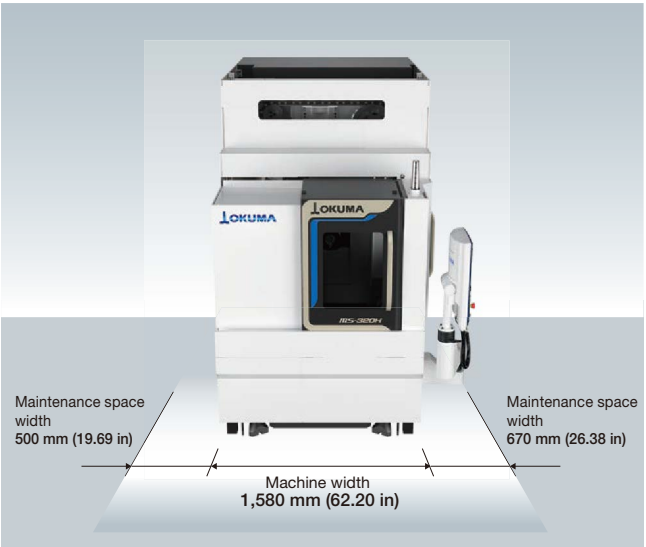
3 The workflow is minimized by gathering daily inspection equipment on the right-side operator's side

The air equipment and lubricating oil tank are grouped on the right-side operator's side. Improved maintainability and shortened workflow reduce operator workload.



4 Space-saving maintenance around the machine

Maintenance work such as ball-screw replacement can be handled in space saving. A compact mass production line is achieved by the narrow space for maintenance work.



5 Stress-free, easy maintenance

A compact machine with an openable cover for easy access to maintenance points reduces the workload of the operator. The large working area makes it easier to work, shortens maintenance time, and reduces machine downtime to the minimum.

● Openable air panel

The air panel can be opened and closed for easy access to the spindle column and for easy maintenance work around the spindle.

Various advanced technologies that increase productivity

Okuma's advanced technology - effective for shop floors

Allowing operators to focus on making parts



Collision Avoidance System
Collision prevention

option

CAS prevents collisions in automatic or manual mode, providing risk-free protection for the machine and great confidence for the operator.

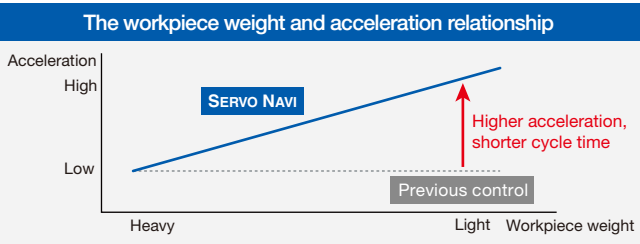
Improved, long-term machining accuracy and surface quality through optimized servo control



SERVO NAVI
Optimized Servo Control

Cycle time shortened with faster acceleration

■ **SERVO NAVI AP (Automatic Parameter setting):** Work Weight Auto Setting
On table travel type machining centers, the table feed acceleration with the previous system was the same regardless of weight, such as workpieces and fixtures loaded on the table. Work Weight Auto Setting estimates the weight of the workpiece and fixture on the table and automatically sets the linear axis servo parameters, including acceleration, to the optimum values. Cycle times are shortened with no changes to machining accuracy.



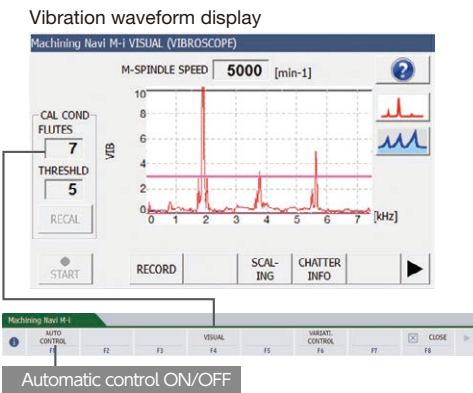
Automatically changes to optimum spindle speed



Machining Navi M-i
Cutting condition search for milling

option

Chatter vibration is measured by built-in sensors, and Machining Navi automatically changes spindle speed to the optimum speed.



Maintains machining accuracy and surface quality

■ **SERVO NAVI SF (Surface Fine-tuning):** Reversal Spike Auto Adjustment
Slide resistance changes with length of time machine tools are utilized, and discrepancies occur with the servo parameters that were the best when the machine was first installed. This may produce crease marks at motion reversals and affect machining accuracy (part surface quality). Reversal Spike Auto Adjustment maintains machining accuracy by switching servo parameters to the optimum values matched to changes in slide resistance.

Contributes to longer machine life

■ **SERVO NAVI SF (Surface Fine-tuning):** Vibration Auto Adjustment
When aging changes machine performance, noise, vibration, crease marks, or fish scales may appear. Vibration Auto Adjustment can quickly eliminate noise and vibration even from machines with years of operation.

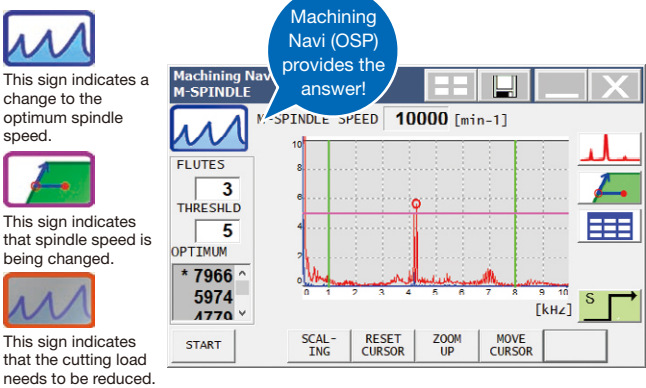
Adjust cutting conditions while monitoring the data



Machining Navi M-gII+
Cutting condition search for milling

option

Based on the chatter noise captured by the microphone, Machining Navi displays a number of optimal spindle speed possibilities on the screen. The operator can change to the indicated spindle speed with a single touch and immediately confirm the result.



Detect signs of spindle bearing and ball-screw failure, and reduce downtime

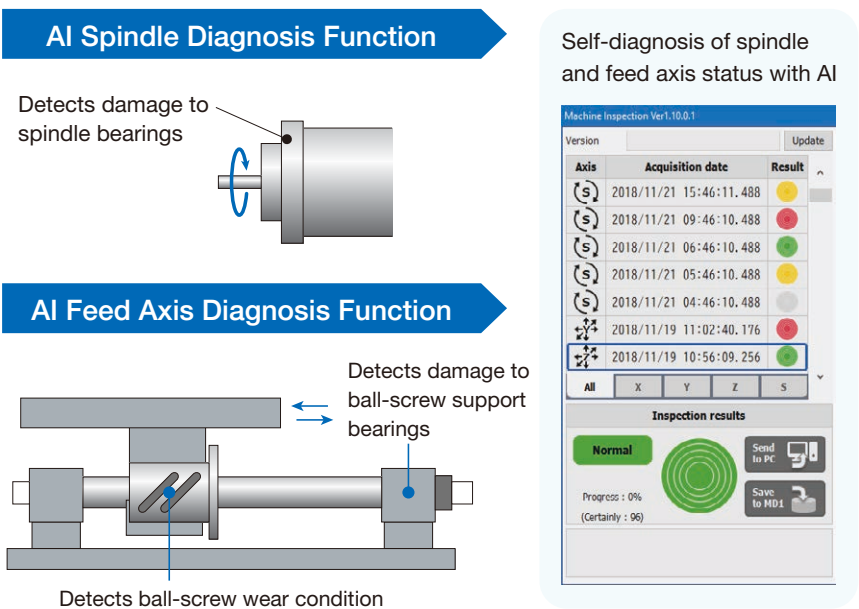


AI Machine Diagnosis Function
Machine tool diagnostics technology with artificial intelligence (AI)

option

Okuma's AI-equipped control detects abnormalities in the machine spindle and feed axes, leading to the prevention of long machine downtime and achieving stable production over a long period of time.

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.
AbsoScale detection specs is required for ball-screw wear detection.

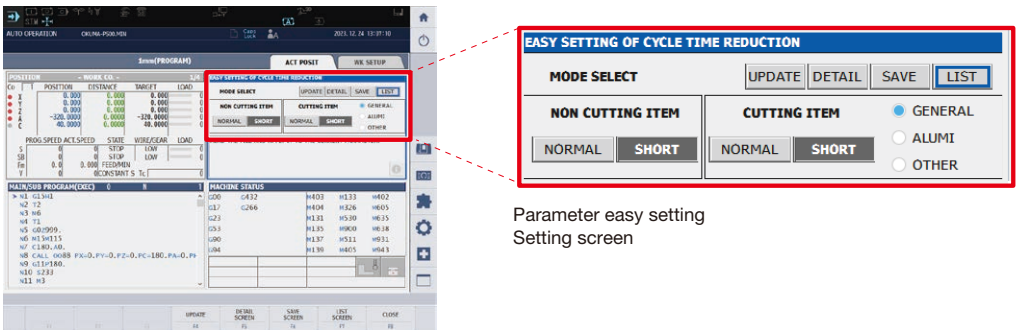
Significantly shortens cycle times and reduces power consumption

Cycle time reduction

● **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.



A next-generation CNC that makes customer manufacturing

OSP-P500

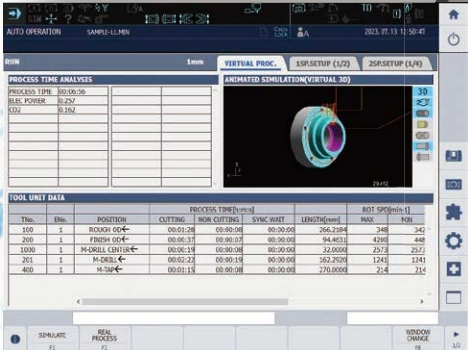
Improved productivity and stable production

As Your Single Source for M-E-I-K (Mechanics - Electronics - IT - Knowledge) merging technologies, Okuma offers this CNC to build an advanced “digital twin” that faithfully reproduces machine control and machining operations and creates new value. In addition, the product helps improve productivity and realize stable production, featuring ease of use that allows customers to use their machining know-how. Additional features are: control technology that achieves high-speed and high-accuracy machining, energy-saving solutions that achieve both high accuracy/productivity and eco-friendliness, and robust security functions to protect against the increasing threat of cyber attacks.

15-inch operation panel



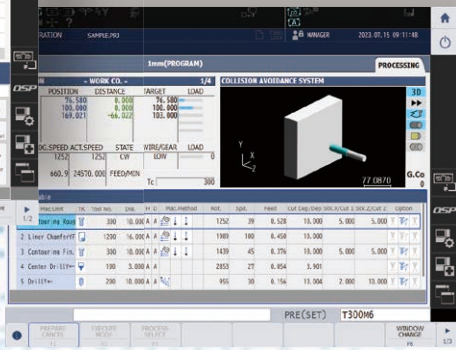
Home screen



Virtual machining



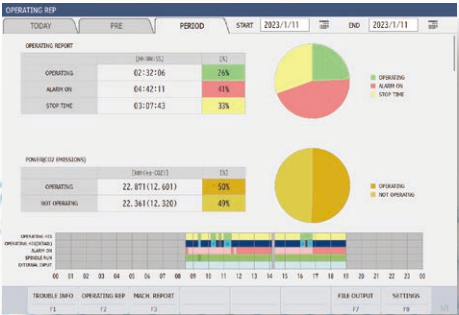
Preparation of the process chart



Operation with the process chart

DX (digital transformation) a reality

- 1 Faithful digital reproduction of machines and processes
 - Ground-breaking concept of a digital twin
- 2 Novice-friendly smart operation
 - Innovative operability
- 3 Realizing high-speed and high-accuracy machining
 - Revolutionary control technology
- 4 Reducing environmental impact
 - Energy-saving solutions
 - ECO suite plus
- 5 Increasing cyber resilience
 - Robust security



MacMan plus

OSP-P500 A next-generation CNC that makes customer manufacturing DX

1 Faithful digital reproduction of machines and processes

Digital Twin option

Ground-breaking concept of a digital twin

The digital twin calculates cycle time, machining shape, and electricity consumption through super high-speed and high-accuracy simulation. It supports accurate estimates of cycle time, development of the machining schedule, and quick and accurate estimates of delivery time and costs when an order is received.

Simulation using the latest machine information can be achieved even with an office PC or with the built-in OSP-P500. This enables preparation for machining in advance in the office environment (front loading). Physical machine preparation time can be reduced by using digital twin preparation results to prepare for machining the next parts while machining continues. When a problem occurs on the shop floor, it can be solved quickly on site without going back to the office.



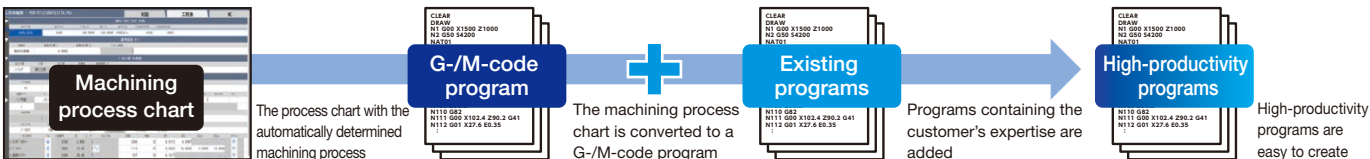
2 Novice-friendly smart operation

Smart OSP Operation option

Innovative operability

Conventionally, machining operations are programmed with G-/M-code based on drawings. With OSP-P500, however, you only have to follow the guidance to enter drawing information. So you can prepare for machining quickly, even if you have no familiarity at all with the NC program language.

High-productivity programs are easy to create



(digital transformation) a reality

3 Realizing high-speed and high-accuracy machining

Revolutionary control technology

CNC operation performance has been doubled compared to the conventional model (OSP-P300A). The processing capacity and the response speed between control modules have been improved to shorten the machining time. The time for machining general parts can be shortened if the machining program and machining conditions are the same as before.

4 Reducing environmental impact Energy-saving solutions

ECO suite plus

"ECO suite plus" features the functions ECO Idling Stop, which allows the device to autonomously judge and shut down unnecessary auxiliary equipment, ECO Power Monitor, which gives visibility to carbon dioxide emissions, enabling these to be recorded and analyzed, and ECO Operation, which enables the optimized operation of peripheral equipment during machining. This is an energy-saving system that achieves both high accuracy, high productivity, and environmental friendliness to support improvement cycles for decarbonization. For details, please refer to P24.

5 Protecting the operation of machines and precious assets such as part programs from cyber attacks

Robust security that increases cyber resilience

As digital networks develop and servers are increasingly connected to factory machines, the threat of cyber attacks increases, making it ever more important to protect against them. OSP-P500 is equipped with robust security functions for defense against and protection from cyber attacks, along with data restoration, to protect the operation of machines and precious assets such as part programs in the event of a cyber attack.

Defense	Prevent unauthorized access and connection	Identification of operators and communications, authentication function, etc.
Protection	Control damage	Anti-virus measures based on the allowlist, functions to prevent falsification and detect abnormalities, etc.
Data restoration	Preparation for emergencies	Control software and data backup function, etc.



OSP-VPSII (Virus Protection System II)

OSP-VPSII (Virus Protection System II) incorporates allowlisting*1 antivirus functions into the Okuma CNC (OSP) to prevent infection by viruses via networks and USB devices.

OSP-VPSII-STD

OSP-VPSII-STD [Standard] includes antivirus functions developed exclusively for Okuma's numerically controlled machines. Machines can be used safely, as only software tested by Okuma can be run.

Note: Because the allowlist is locked, only Okuma software can be run.

OSP-VPSII-EX (option)

OSP-VPSII-EX [Expert] includes antivirus functions made by TXOne Networks*2. The allowlist can be edited by the customer, so any software can be installed*3.

Note: Incorrectly editing the allowlist may prevent OSP from operating normally, so specialized knowledge of allowlisting antivirus functions is required.

*1. Allowlisting is a method in which safe software is listed and software not included in the list is prevented from running.
*2. TXOne Networks is a registered trademark of TXOne Networks Inc.
*3. This does not guarantee the operation of any software on OSP. Note that installed software may prevent OSP from operating properly.

Energy-saving technology

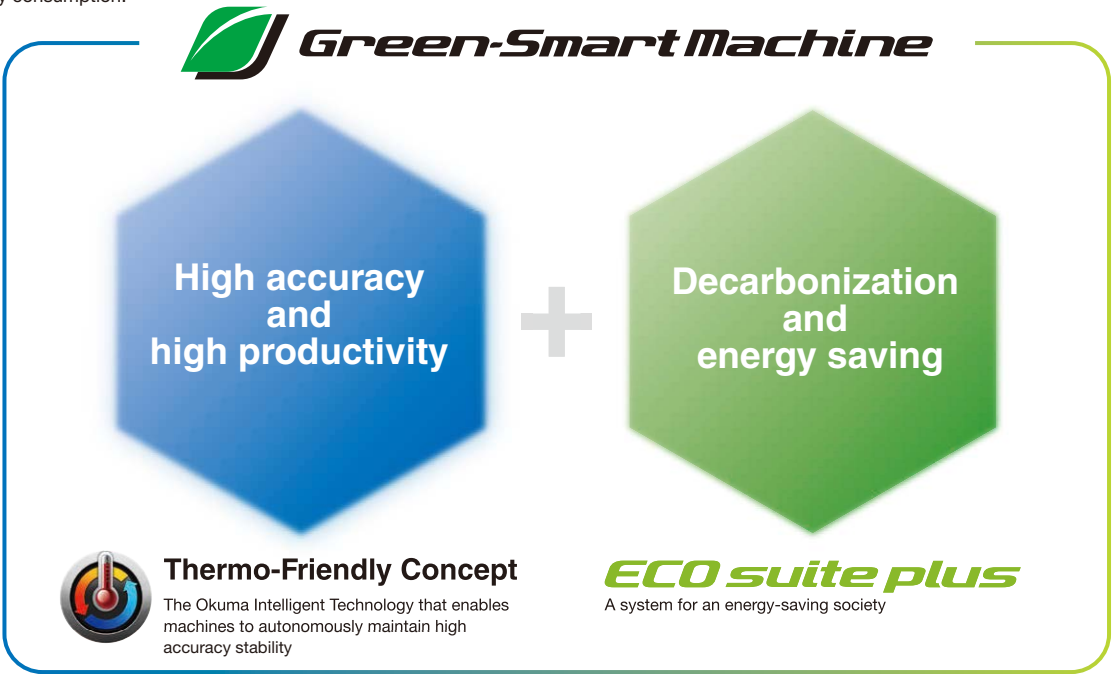
It contributes to providing both high productivity and high precision while being eco-friendly

Achieving high accuracy and high productivity while achieving decarbonization and energy saving



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.



The Okuma Intelligent Technology that enables machines to autonomously maintain high accuracy stability



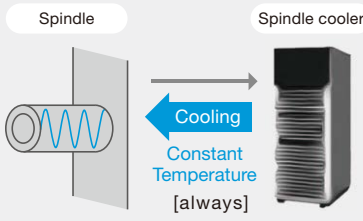
Thermo-Friendly Concept

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

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



A system for an energy-saving society

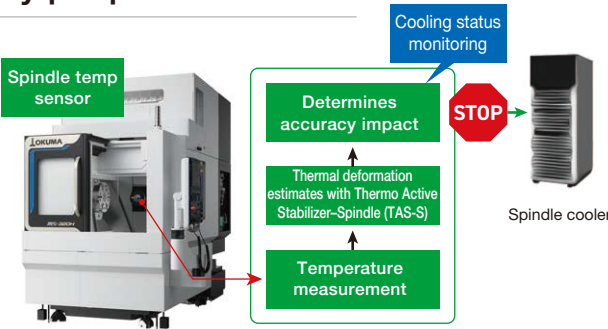
ECO suite plus

The "ECO suite plus" retains the concept of achieving both high machining accuracy stability and energy savings (less carbon dioxide emissions) achieved by the Thermo-Friendly Concept and the "ECO suite" that was put into practical use in 2014. It is an energy-saving system with enhanced high-accuracy/-productive functionality and advanced eco-friendly support.

Ensure accuracy and actively turn off unnecessary peripherals

ECO Idling Stop

All auxiliary equipment when not needed (most of factory power consumption), can be turned off. The ECO Idling Stop button enables diligent idle stop operations even during machining and maintenance work. The cooling system necessary for maintaining accuracy uses Thermo-Friendly Concept technology, and the machine itself decides when to cool and stop idling while maintaining high accuracy. With ECO suite plus, the machine automatically detects the operating status, eliminating the need to push buttons while reducing carbon dioxide emission as much as possible without operator awareness.



Peripheral equipment runs only when needed

ECO Operation

By using only the required peripherals (chip conveyors, mist collectors, etc.), energy-saving operations that also maintain high productivity are possible. ECO suite plus enables more detailed tuning of operations to thoroughly support carbon dioxide emission reduction activities that do not reduce productivity.

ECO PARAMETER	ECO IDLE STOP	ECO OPERATION
ECO IDLE STOP ELAPSED TIME	000:00:00	REMAINING TIME UNTIL ECO IDLE STOP READY
Chip conveyor interval control	OFF	PARAMETER UNIT
Chip conveyor interval:active time	100	[min]
Chip conveyor interval:suspended time	200	[min]

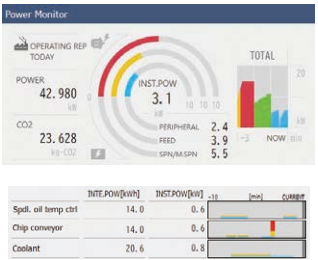
Confirming energy savings and analyzing reductions

ECO Power Monitor

Making it possible for the OSP control to analyze the operating status of each device. The decarbonization cycle on the shop floor is supported through the three phases, 1. View, 2. Record, and 3. Analyze.

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

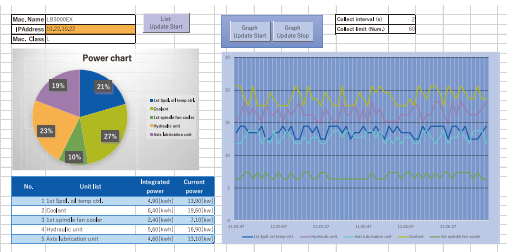
With ECO suite plus, recording carbon dioxide emissions for each device, and data output is possible.



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.



Machine Specifications

		MS-320H	
Travels	X-axis (column left/right)	mm (in)	250 (9.84)
	Y-axis (spindle up/down)	mm (in)	250 (9.84)
	Z-axis (table front/back)	mm (in)	570 (22.44)
Table	Spindle center to table top	mm (in)	0 to 250 (0 to 9.84)
	Spindle nose to table center	mm (in)	100 to 670 (3.94 to 26.38)
	Table size	mm (in)	ø320 (ø12.59)
	Max load capacity	kg (lb)	100 (220)
	Indexing angle	deg	0.001
	Max workpiece dimensions	mm (in)	ø500 × 400 (ø19.69 × 15.75)
Spindle	Speed	min ⁻¹	15,000
	Tapered bore		7/24 taper No. 40 [HSK-A63]
	Bearing dia	mm (in)	ø60 (ø2.36)
Feed rate	Rapid traverse	m/min (ipm)	X, Y: 50 (1,969), Z: 60 (2,362)
	Cutting feed rate	mm/min (ipm)	X, Y: 1 to 50,000 (0 to 1,969), Z: 1 to 60,000 (0 to 2,362)
Motors	Spindle	kW (hp)	25/15/11 (33/20/15) <15%ED/25%ED/cont>
	Feed axes	kW (hp)	X:3.5 (5) Y: 3.5 (5) Z: 3.5 (5)
	Table indexing	kW (hp)	2.2 (3)
Auto tool changer (ATC)	Tool shank		MAS403 BT40 [HSK-A63]
	Pull stud		MAS2 [MAS1, CAT, DIN, JIS]
	Magazine capacity	tools	10 [24]
	Max tool dia (w/ adjacent)	mm (in)	ø90 (ø3.54)
	Max tool dia (w/o adjacent)	mm (in)	ø115 (ø4.53)
	Max tool length	mm (in)	250 (9.84)
	Max tool mass	kg (lb)	5 (11)
	Tool selection		Memory random
Machine Size	Height	mm (in)	2,630 (103.54)
	Floor space; width × depth (RDF specs)	mm (in)	1,580 × 3,120 (62.20 × 122.83)
	Mass	kg (lb)	7,000 (15,400)
Controller			OSP-P500M

[]: option

Standard Specifications & Accessories

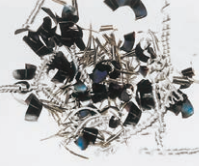
Spindle speed	15,000 min ⁻¹ , 25/15/11 kW (33/20/15 hp) <15%ED/25%ED/cont>	Hydraulic unit	
ATC magazine capacity	10 tools	Automatic 0.001° indexing table	
Spindle cooler	Oil temperature controller	Full enclosure shielding	
Centralized lubricant	Grease cartridge 700 ml, and with automatic oil supplier	ATC operation panel	
Coolant system	Tank 340 L (effective: 243 L) Pump 0.37/0.55 kW (50/60 Hz)	Status indicator	3 phase C type Red (alarm), Yellow (end), Green (running)
In-machine chip discharge	Hinge type chip conveyor	Work lamp	LED lamp
Chip pan for above		Foundation washers, jack bolts	
ATC air blower (blast)		Tapered bore cleaning bar	
Chip air blower (blast)	Nozzle type	Hand tools	
In-machine chip washer		TAS-S (Thermo Active Stabilizer–Spindle)	
Air filter and oiler		TAS-C (Thermo Active Stabilizer–Construction)	

Optional Specifications & Accessories

Dual contact spindle ^{*1}	HSK ^{*2} , BIG-PLUS [®]	Off-machine chip discharge (lift-up chip conveyor types) * See the table below for details	· Hinge type · Scraper type · Hinge + scraper type
ATC magazine capacity	24 (chain)	Chip buckets for above	
AbsoScale detection	X-Y-Z axes	Mist collector	
Oil-hole coolant system	1.5 MPa	Hydraulic oil cooler	
Thru-spindle coolant ^{*3}	1.5, 7.0 MPa	Coolant heater/cooler	
Suction of excess coolant in spindle		In-magazine tool breakage detection	Contact, non-contact
Table cleaning coolant		Auto zero offset	
Workpiece wash gun		Tool life management	By cumulative operation timer, etc
Oil skimmer		Pull stud bolt shape	MAS1, CAT, DIN, JIS
Oil mist lubricator		Ball-screw cooler	X-Y-Z axes
Chip air blower (blast)			
Sludgeless Tank			

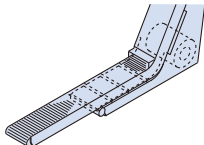
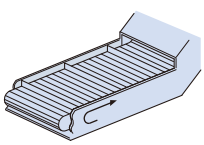
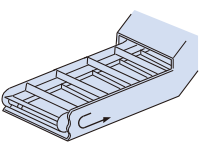
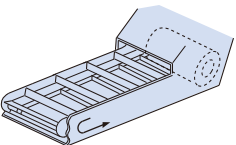
*1. Be sure to select this specification when BIG-PLUS[®] holder is used.
*2. Use an HSK holder equipped with a coolant supply pipe.
*3. Okuma pull stud required with thru-spindle coolant.

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}	○	○	○	○
	Hinge + scraper with drum filter	○	○	○	○
	Hinge type	○	—	—	△ ^{*2}
	Scraper type	—	○ (dry)	—	—
Off-machine chip discharge (option)	Scraper type with drum filter	—	○ (wet) with magnet	△ ^{*3}	—

*1. Scraper type (option) can be selected. *2. When there are few fine chips. *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.

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	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°, 0.01°, 1°
	Feed override	Cutting feed override 0 to 200%, rapid traverse override 0 to 100%
	Spindle override	Override 30 to 300%
	Tool information management	Compensation, life management, shape data, etc. are collectively managed for each tool (999 tools can be registered)
	Tool compensation	Tool length compensation/tool radius compensation 3 sets for each of the registered tools (up to 999 tools), maximum number of total sets: 999
	Operation panel	15-inch operation panel (15-inch XGA screen + multi-touch panel operations), Operation panel tilt adjustment, portable pulse handle (type A), Keyboard QWERTY layout, window operation that is optimal on machine shops
		Security
Machining programming	Program capacity	Program storage: 4 GB, operation buffer: 2 MB
	Programming	Program editing, file name index display, scheduled programs, Hole drilling fixed cycles (drill, deep bore drill, high-speed deep bore drill cycles, etc.), combined use of mm/min, keyway cycle, Coordinate calculation, area machining, coordinate change (shift, rotation and copying of the workpiece coordinate), Block skip (1 set), User Task (GOTO statement, IF statement, arithmetic operations, IF/THEN, DO/WHILE, GOTO (variables) statement, etc., functional operations, logic statements, inverse trigonometric functions, Common variables (std: 200 sets), local variables, system variables, sub-programs, G-/M-code macros (G-code: 20 sets, M-code: 20 sets), READ/WRITE/GET/PUT), basic interpolation, circular radius designate, taper angle designate, NCYL command, home position, Program operation type (A-Operation, B-Operation, S-Operation), oriented spindle stop, programming help
Operations	OSP suite	Various “suite” apps support the series of machining operations, and “suite operation” enables one-touch access to those apps
	Easy Operation	“Single-mode operation” to complete a series of operations, “Setup data” to set the zero point easily using the measuring function (option)
		Operations
Monitoring, Adaptive control		Real 2D display, load meter display, maintenance monitor, collection of log data for maintenance, SERVONAVI AP, SERVONAVI SF, rotary axis notch filter switch, local variables display, display of remaining machining time
MacMan plus		Aggregation and display of machining records, operating records, operating history and trouble information, Visualization of power consumption, Records, output of records and trouble info file
Automation/Unattended operation		Auto power shutoff
Communications/Networks		USB3.0 interface (2 ports), Ethernet interface, DNC-T1, Smart I/F (Connect Plan interface), browser
High-Speed/ High-Accuracy Functions		Hi-G control, Hi-Cut Pro, pitch error compensation, TAS-S (Thermo Active Stabilizer–Spindle), TAS-C (Thermo Active Stabilizer–Construction), cycle time reduction (operation time reduction, machining time reduction, easy parameter setting), in-position check, exact stop check, variable lost motion compensation
Energy-saving functions	ECO suite plus	ECO Idling Stop, ECO Operation, oil temperature controller auto control, ECO Power Monitor ¹
	Power Regeneration System	Regenerative power is used when the spindle and feed axes decelerate to reduce energy waste

*1. The displayed power is an approximate value. If you need an accurate power value, please select the option to attach a wattmeter.

Kit Specifications

		NML		OT-IGF		Digital twin				Digital Twin OT-IGF			
		E	D	E	D	E	D	VE	VD	E	D	VE	VD
Interactive functions	Advanced One-Touch IGF-M (including real 3-D simulation)			●	●					●	●	●	●
	Interactive MAP (I-MAP)					●	●	●	●				
	Smart OSP Operation			●	●	●	●	●	●	●	●	●	●
		Machining process chart preparation and operation, setup process chart operation											
High-Speed/High-Accuracy Functions	Dynamic displacement compensation	●	●	●	●	●	●	●	●	●	●	●	●
Digital Twin On Machine	Virtual Machining					●	●	●	●	●	●	●	●
	Quick modeling					●	●	●	●	●	●	●	●
	OPC UA for Machine Tools					●	●	●	●	●	●	●	●
	OSP API KIT					●	●	●	●	●	●	●	●
Digital Twin On PC	Virtual Machining						●	●			●	●	
	Quick modeling						●	●			●	●	
Programming	Operation buffer 10 MB	●	●	●	●	●	●	●	●	●	●	●	●
Machining	Program notes	●	●	●	●	●	●	●	●	●	●	●	●
Operations	Coordinate system selection	●		●		●		●		●		●	
	(Std: 20 sets)		●		●		●		●		●		●
	Helical cutting (within 360°)	●	●	●	●	●	●	●	●	●	●	●	●
	Synchronized Tapping II	●	●	●	●	●	●	●	●	●	●	●	●
	Arbitrary angle chamfering	●	●	●	●	●	●	●	●	●	●	●	●
	Programmable travel limits	●	●	●	●	●	●	●	●	●	●	●	●
	Coordinate change and drawing conversion		●		●		●		●		●		●
			●		●		●		●		●		●
	Sequence stop	●	●	●	●	●	●	●	●	●	●	●	●
	Sequence return		●		●		●		●		●		●
	Auto scheduled program update	●	●	●	●	●	●	●	●	●	●	●	●
	Tool wear compensation	●	●	●	●	●	●	●	●	●	●	●	●
	Tool wear compensation input restriction	●	●	●	●	●	●	●	●	●	●	●	●
	Tool life management (including prior notice, warning, and special prior notice/warning)	●	●	●	●	●	●	●	●	●	●	●	●
Monitoring	Real 3-D Simulation			●	●	●	●	●	●	●	●	●	●
	Simple load monitor	●	●	●	●	●	●	●	●	●	●	●	●
	NC operation monitor (counter, totaling)	●	●	●	●	●	●	●	●	●	●	●	●
	Tool breakage no-load detection		●		●		●		●		●		●
Measuring	Manual measuring (not including sensors)	●	●	●	●	●	●	●	●	●	●	●	●

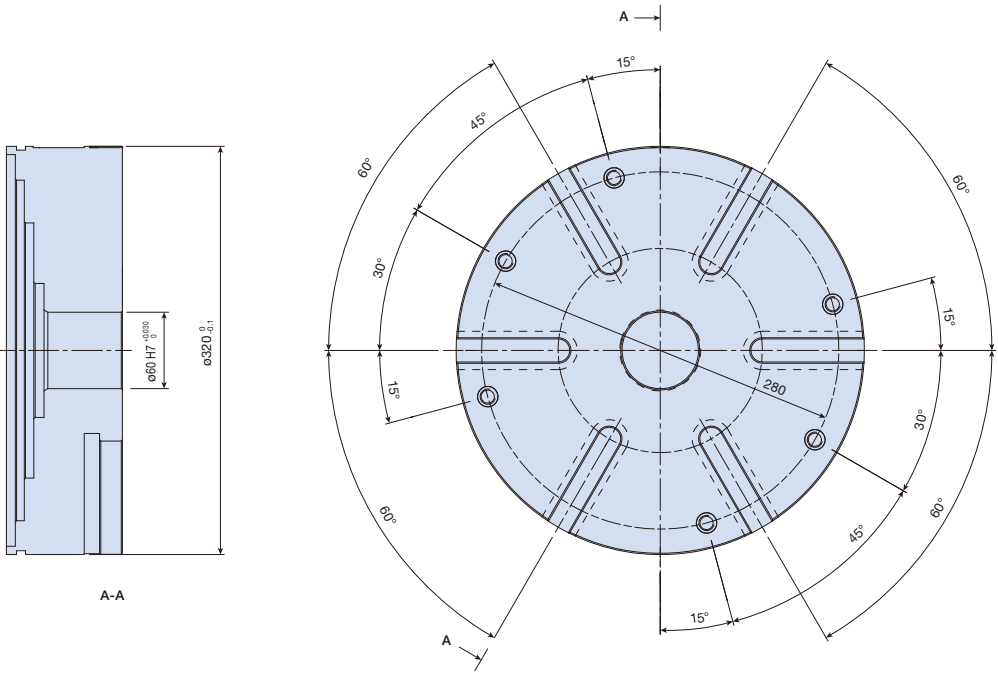
Notes. NML: Normal, OT-IGF: One-Touch IGF, E: Economy, D: Deluxe, VE: Virtual Economy, VD: Virtual Deluxe.
For each specification, please refer to Optional Specifications in P29 and P30.

Optional Specifications

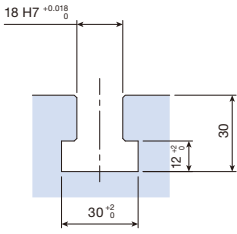
Operation panel	Pulse handle	Portable pulse handle with function buttons (type B1) Pulse handle with touch panel Pulse handle addition (3 pieces in total)
	Keyboard	Keyboard ABC layout
Interactive functions	Advanced One-Touch IGF-M	Auto operation decision (drilling, milling) A variety of machining including contouring, grooving, pocket machining, milling, boring and linear chamfering Realistic 3D simulated test cuts Direct from machining order tables (no G-/M-codes) Slope machining, 5-face machining
	Interactive MAP (I-MAP)	Part programs can be edited according to guide maps (with figure calculation function)
	Interactive MAP (I-MAP-B)	Solid shape machining function added to I-MAP pattern cycle
	Interactive MAP (I-MAP-C)	Functions to determine cutting conditions and automatically determine drilling cycle added to I-MAP
	Smart OSP Operation	Machining process chart preparation and editing functions: By using the process chart to follow the guidance, rapid preparation for machining operations is possible even without knowing G-/M-code. Machining process chart operating functions: Direct operation from the machining order chart (no G-/M-code). Independent operation for each process or from the middle of a process is possible. Task support functions using the setup process chart: Pre-machining setup task guidance
	Virtual Machining	Confirmation tasks are more efficient in a virtual space. Machining trajectories, material scraping, interference checks.*1 High-speed, high-precision machining time estimation. Power consumption (carbon dioxide emissions) estimation. Easy preparation of 3D models of tools, jigs and workpieces. Supply of affluent 3D model data. Selecting 3D models of tools allows not only virtual spaces for digital twins but also automated configuration of real space control data.
	Quick modeling	
Digital Twin	OPC UA for Machine Tools	Communication specification for machine tools compatible with OPC UA communication (Compatible with OPC UA version 1.00 (essential functions))
	OSP API KIT	API for Windows®-based application development
Programming Machining Operations	Imperial/metric switch	Program commands and data setting operations are switchable between metric and imperial.
	Operation buffer	10 MB
	Sub-program large capacity operation	When a sub-program is called and executed, the relevant sub-program is searched for and executed
	Program notes	To show notes in part program screens
	Auto scheduled program update	Updates part programs during a scheduled run
	Block skip	Use soft ON/OFF keys on screen to skip execution of a part program Block skip 9 sets
	Program branch	The branch of the part program can be turned ON/OFF with soft keys on the screen (number of sets: 9)
	Work coordinate system	Number of selected sets: 100, 200, 400
	Helical cutting	Circular interpolation + helical axis interpolation
	3D circular interpolation	Three dimensional interpolation
	Skip	Axis travel by G-code, movement skip by sensor input
	Arbitrary angle chamfering	Easy chamfering at an arbitrary corner angle (C, R)
	Synchronized Tapping II	Synchronized tapping, deep bore synchronized tapping, high-speed deep bore synchronized tapping cycle
	Cylindrical side machining	Can easily carry out machining of cylindrical side
	Tool max rotational speed setting	The rotation speed limit is set for each milling tool
	F1-digit feed	Feed speed command by designating the number - external switch type/parameter type
	Programmable travel limits	Per G22, G23
	Axis name designation	Can change axis name by G-code
	Slope machining	Type I/Type II
	Fixture offset	The workpiece coordinate of the rotary/tilting axis is offset
	Dynamic fixture offset	The workpiece coordinate is automatically offset according to the movement of the rotary axis
	Harmonic Spindle Speed Control (HSSC)	The spindle speed is periodically changed to avoid chatter during cutting
	Tool grooving	Hale machining (simultaneous XY + spindle)
	Inverse time feed	Feed rate command with cutting time
	Spindle path control	Contouring per simultaneous control of spindle C and X-Y-Z axes
	Dynamic Tool Load Control	Control of chipping due to tool runout during the machining of difficult-to-cut materials
	Punch tap cycle	High-speed threading cycle using tools dedicated to punch tap
	Coordinate change and drawing conversion	Enlarges and reduces drawings, programmable mirror image
	User Task	Common variables: 1,000 or 2,000 sets G-code macros: 100 sets (80 sets added) Input/output variables (16 points each)
	Sequence stop	Stops machining at prescribed sequence number
	Sequence return	Mid-block sequence return
	Pulse handle angle and arc feed	Angle and arc feed with simultaneous 2-axis control by pulse handle
Tool management	Tool life management	The cumulative number of machined workpieces or cumulative cutting time is calculated, and when the preset value is reached, a spare tool is automatically assigned. Life data of each tool are displayed as graphs; tool life prior notice, tool life warning, tool life special prior notice/warning
	Tool wear compensation	Compensation for the wear amount of the tool
	Tool wear compensation input restriction	Limitation on the amount of tool wear compensation
	3D tool compensation	Designates offset direction at I, J, K
	TOOL-ID (with chips)	Central management of tool data for tools with ID chips
	TOOL-ID (without chips)	Integration of tool data with tools for management and storage
	TOOL-IC	Tool management with Factory Manager manufactured by BIG DAISHOWA SEIKI

External input output Communication functions Networking	DNC connection	DNC-C/Ethernet	Connected to host using Ethernet
		DNC-T3	I/F for MacMan-net
		DNC-B	Ethernet RS-232C for OSP, connects to host RS-232C; remote buffer operations
		DNC-DT	Remote operation using Ethernet: part programs are downloaded from PCs for the machining operation
	RS-232C interface		RS-232C interface 1CH to 4CH
	FL-net		Connected to host and other machines using FL-net
	Ethernet/IP		Connected to host and other machines using Ethernet/IP
	OSP-MTConnect		MTConnect I/F for production management systems produced by other companies
Measuring	In-magazine tool breakage detection		Automatically performs tool breakage detection in the magazine
	Auto gauging		Checks workpiece dimension, and auto zero offset; Measured data output to file
	Manual measurement		Easy manual tool length compensation, workpiece gauging and zero setting according to guidance on the display
	Interactive gauging		Easy semi-automatic tool length compensation, workpiece gauging and zero setting according to guidance on the display
	NC Gage		Workpiece dimensions and geometrical tolerance can be measured
Monitoring, Adaptive control	One-Touch Spreadsheet		Excel® files assist machining setups
	Collision Avoidance System (Units and actions to prevent interference are limited)		Interference during automatic, MDI and manual operations is prevented Easy modeling of shape data Simultaneous movement with Hyper-Surface II and Tool Center Point Control II
	Real 3-D Simulation		Real time simulation of all machining modes (auto, MDI, manual operation) Solid/cross section/transmission display of workpieces, tool path display, tool shape display
			With cycle time calculator
	Simple load monitor		Monitors spindle overload (machining stops when overloaded)
	NC operation monitor		NC hour meters for NC start, spindle rotation, cutting, etc. and 4 NC workpiece counters
	Status indicator		NC running lamp, alarm lamp, machining end lamp
	Tool breakage no-load detection		In drilling, detects the no-load cutting status of the spindle caused by tool breakage, triggers an alarm and stops operation
	Synchronized tapping torque monitoring MOP–TOOL		During synchronized tapping, monitors for spindle overload (overload causes machining stop and evacuation) Overload monitoring and adaptive control
	AI Machine Diagnosis*2		AI-based spindle and feed axis diagnostics
	Machine Status Logger		Commands, operations and spindle and feed axis loads are recorded to increase, analyze and improve machining traceability
	Cutting Status Monitor		To reduce machining failure, spindle and feed axis loads are monitored to trigger an alarm, pause operations, and/or trigger evacuation operations
	Machining Navi M-i		Based on chatter vibration during machining, the spindle speed is automatically optimized to stabilize machining
	Machining Navi M-gII+		Chatter vibration during machining is visualized to help automatically select the optimal spindle speed for stable machining
	Feed axis retraction		Pull back in axial direction during power failures
	Tool retract cycle		Execute shelter cycle according to interruption signal
	Workpiece counters on machine		Counted with M02 and M30 or dedicated M-code
	Hour meters on machine		The power ON time, spindle rotation time, NC running time and cutting time are counted
	Operation end buzzer		A buzzer goes off at M02/M30 and M00/M01 and also when an alarm is generated
Automation/Unattended operation functions	Tapping retraction		Retract the tapping tool when a power failure occurs during tapping
	Adaptive control (AC) using external signals		Interruption program function, slide hold, feed axis override activated using external signals
	Tool monitoring system		CARON TMAC8 I/F
	General purpose overload detection		Detect overload in external devices and display an alarm
	Warm-up		Automatically turn on the power to perform warm-up at the preset time
	External program		Push button, rotary switch, digital switch, BCD
	Connection with automated devices		Robot loader I/F, stacker crane I/F, FMS link I/F
High-Speed/ High-Accuracy functions	AbsoScale detection		X-Y-Z axes
	Dynamic displacement compensation		Dynamic displacement during acceleration/deceleration is compensated for, to improve machining accuracy
	0.1 μm control		0.1 μm command increments
	Hyper-Surface II		3 linear axes, 3 linear axes + 2 rotary axes
	Inductosyn detection, DD encoder detection		A-axis, B-axis, C-axis
	Straightness compensation		Compensation for linear axis motion
	Misalignment compensation		Compensation for misalignment of the rotary axis rotation center
Energy-saving functions	ECO suite plus		ECO Power Monitor (on-machine wattmeter), ECO Hydraulics, Spindle Power Peak Limiter, External output interface of consumed electricity
Other functions	Circuit breaker		Power shutoff with the detection of earth leakage
	External M-signals		[4 sets, 8 sets] Signals for controlling external devices such as rotary indexing tables
	OSP-VPSII-EX		Allowlist-based virus protection system
	Monitor display language (multi-language)		Language switchable

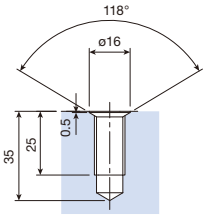
*1. If the Collision Avoidance System specs are enabled, then interference checks can be performed for structural components of the machine in addition to workpiece, tools, and fixtures.
*2. With AbsoScale detection specs, ball-screw wear detection is possible.
Note: Cannot be selected for some machine specifications.



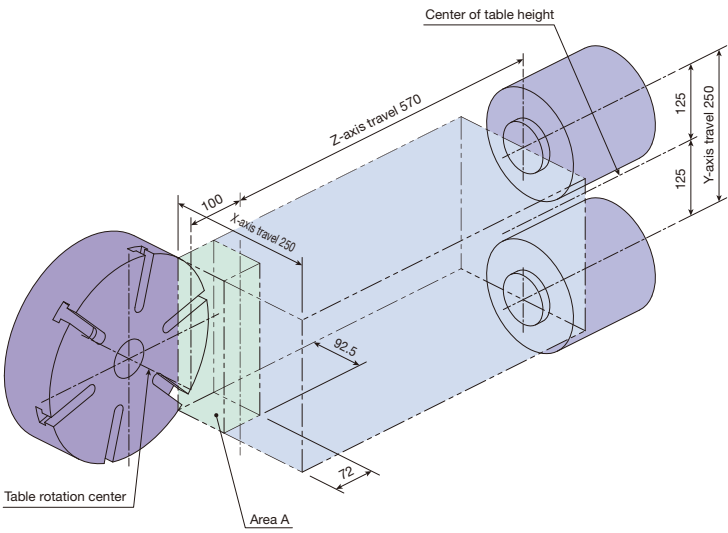
A-A



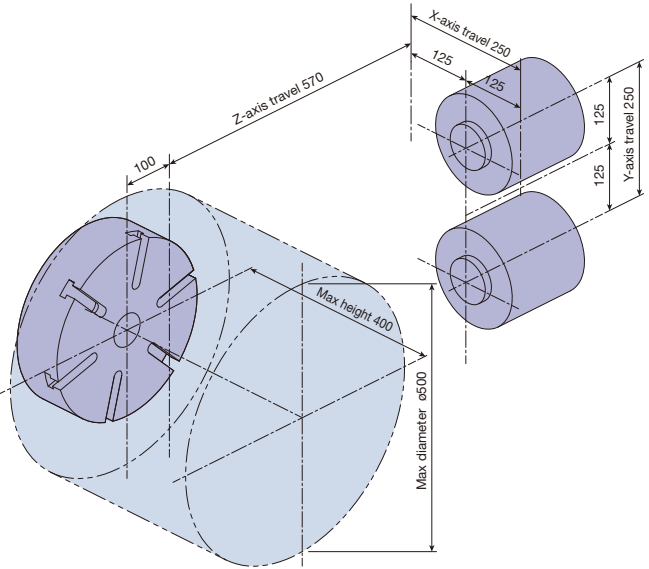
T-slot detail (6)



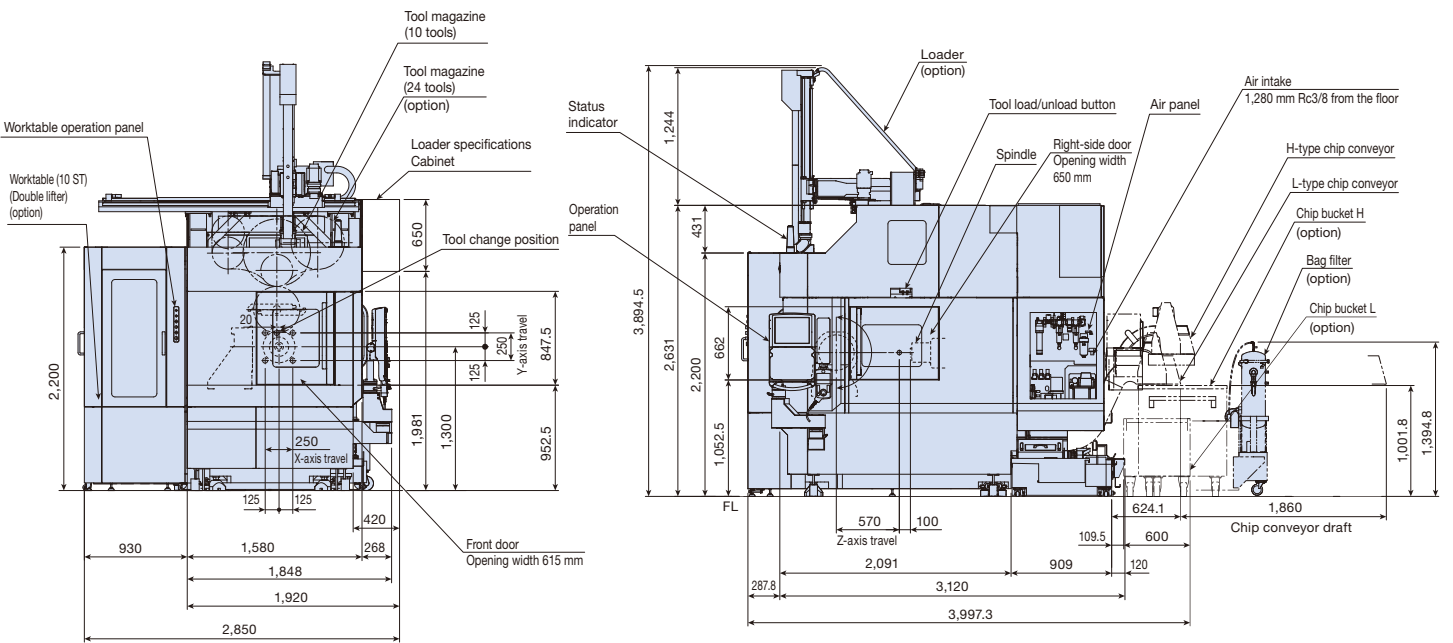
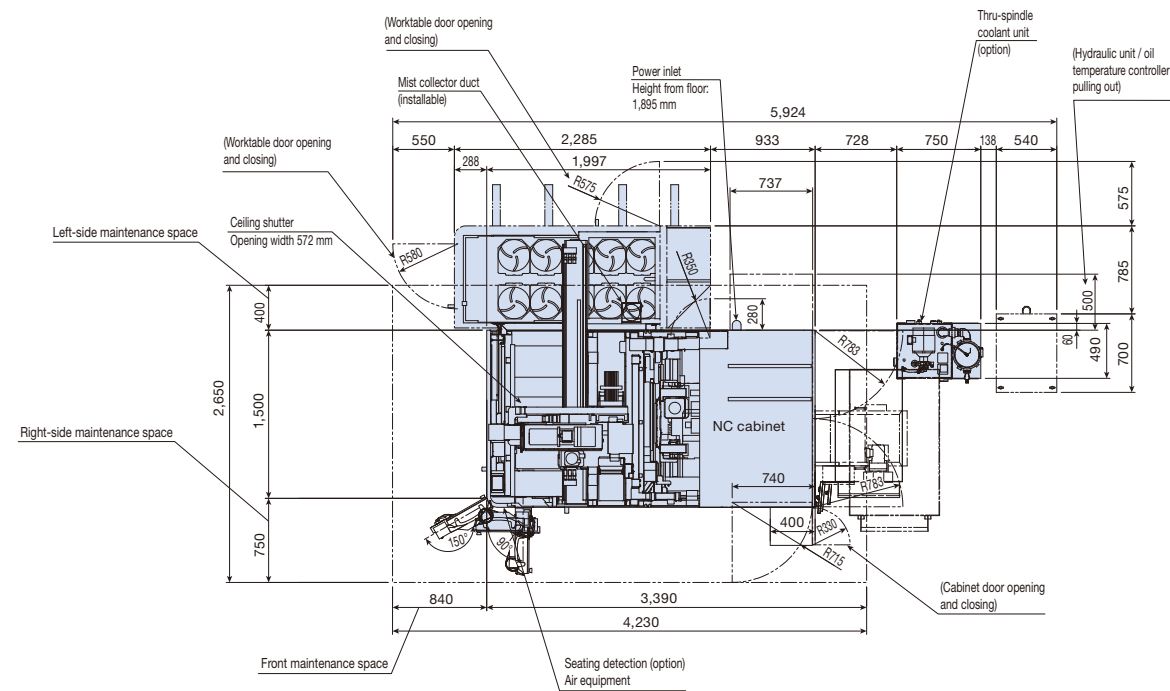
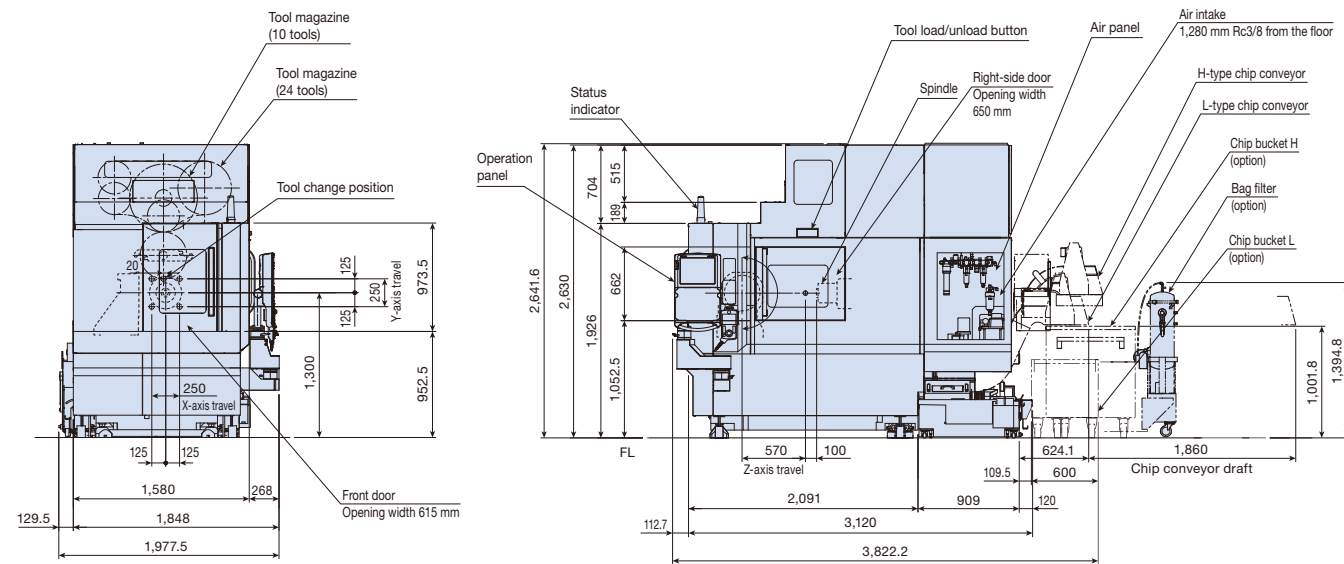
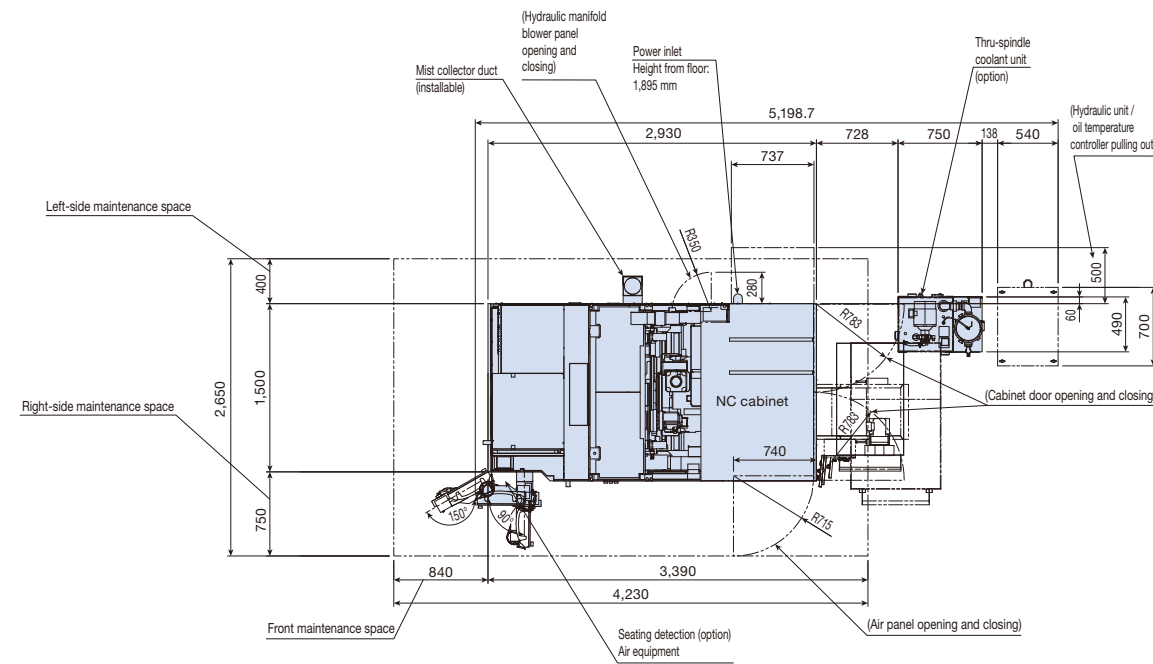
Fixture fixation hole detail (6 locations)



Note: The following interference area exits, so please be careful when using the machine.
Area A: Spindle and table interference



Note: The following interference areas exit, so please be careful when using the machine.
· The minus Z limit area is a spindle/workpiece interference zone.
· The minus Z and plus X limit area is a spindle/table interference zone.



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

● The specifications, illustrations, and descriptions in this brochure vary in different markets and are subject to change without notice.
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This product is subject to the Japanese government Foreign Exchange and Foreign Trade Control Act with regard to security controlled items; whereby Okuma Corporation should be notified prior to its shipment to another country.



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