

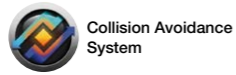
MU-4000V

5-Axis Vertical Machining Center



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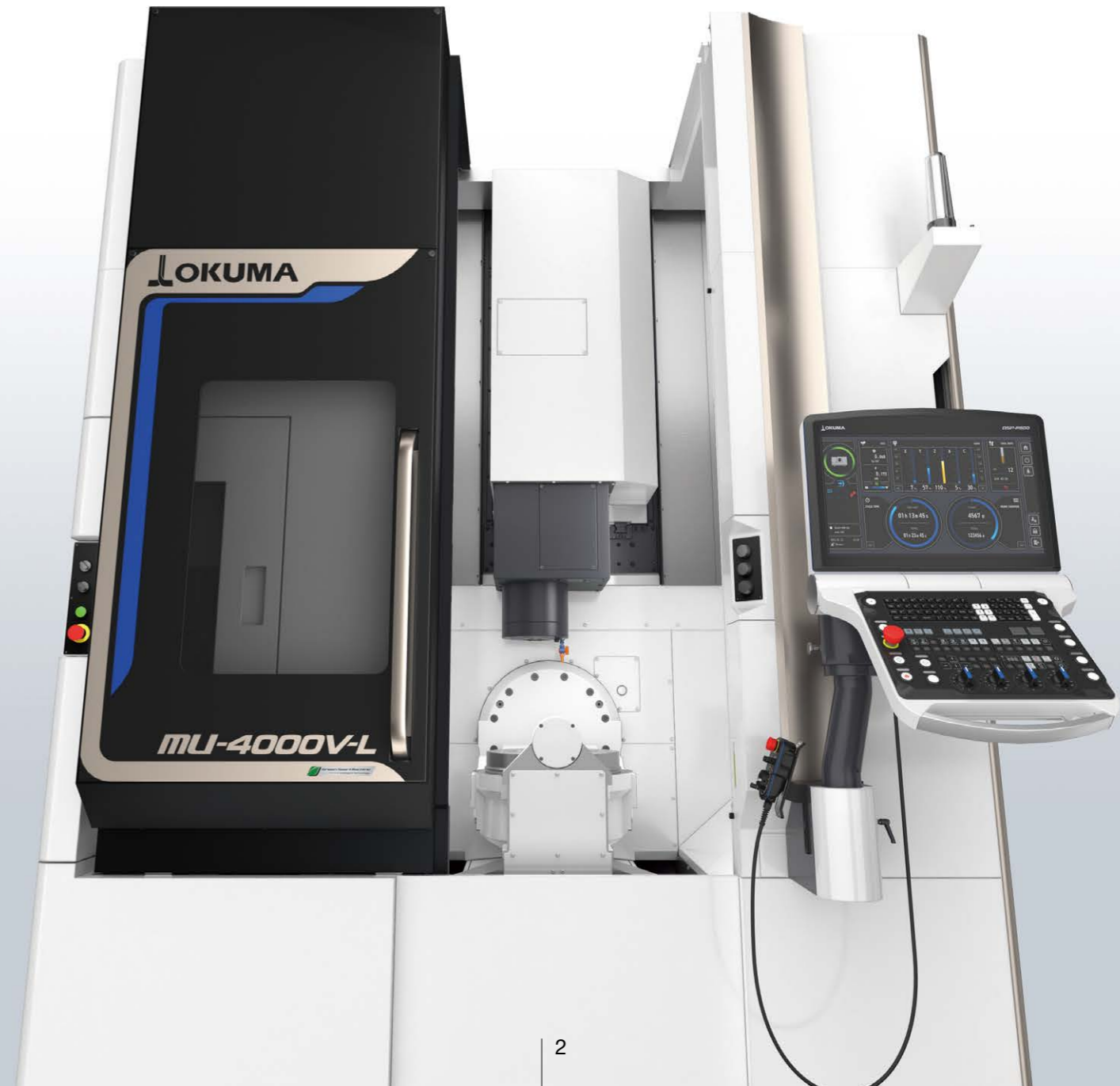
A next generation machine that opens new possibilities in “Monozukuri”^{*1} with “M-E-I-K”^{*2} merging technologies

The MU-4000V is a 5-axis machining center that opens new “Monozukuri” possibilities with superior basic functions for 5-axis machining, a large machining range, and ease of use. It can perform jobs from high quality 5-axis machining to process-intensive machining that exceeds conventional multitasking machines, including turning, cutting, grinding and gear cutting.

MU-4000V is equipped with a next-generation CNC “OSP-P500,” which makes manufacturing DX (digital transformation) a reality, with the cutting information, tool information, and fixture information necessary for 5-axis machining as well as digital twins, further improving productivity and ensuring stable production.

- *1. *Monozukuri* (manufacturing) – the art of “making things” better than ever.
- *2. The merging of Mechanics - Electronics - Information (IT) - Knowledge (creation) technologies, only Okuma can provide, as *Your Single Source for Machine & Control*.

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



High-accuracy 5-axis machining

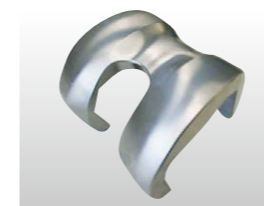
A next generation machine that surpasses the normal 5-axis machining center

A high-performance machine with the ease of use, work envelope, high accuracy, and high quality demanded in 5-axis machining, all in a compact space.

The MU-4000V merges M-E-I-K technologies to open new areas to multitasking operations—turning, grinding, gear cutting—and expand the possibilities of “Monozukuri” manufacturing.

Highly accurate 5-axis machining

Superior dimensional stability is achieved over many hours with a highly rigid trunnion table that supports accurate 5-axis machining, the 5-Axis Auto Tuning System that automatically measures and compensates for geometric error, and the Thermo-Friendly Concept that minimizes dimensional changes due to changing temperature or heat.



Artificial joint



Satellite parts



Blisk

Operator-friendly

Good access to the table and spindle, a table structure for good visibility of the tool tip, a large window to visually check the machining chamber, and brighter, reduced-flicker LED lamps for all make it easier for operators to perform their work.

Large machining area and tool travel

The machining area is large and tool changes can be done even with the trunnion table swung over.

Shorter machining times with high cutting capability

High torque motors are used for the spindle and turning spindle to handle heavy-duty cutting, difficult-to-cut material and many other types of machining. The result is highly efficient machining.

Flexible expandability to automated systems

In addition to a large capacity ATC magazine, it is easy to install an automatic pallet changer (APC), robots and loaders. The best automated system for the purpose can be built.

Spindle speed	15,000 min ⁻¹
Table top to spindle nose	120 to 580 mm
Table dimensions	ø400 mm
Max workpiece dimensions	ø500 × H400 mm
Max load capacity	300 kg
Rapid traverse	X, Y, Z: 50 m/min
Tool magazine capacity	32-tool (chain magazine)



(Equipped with a 21.5-inch operation panel screen)

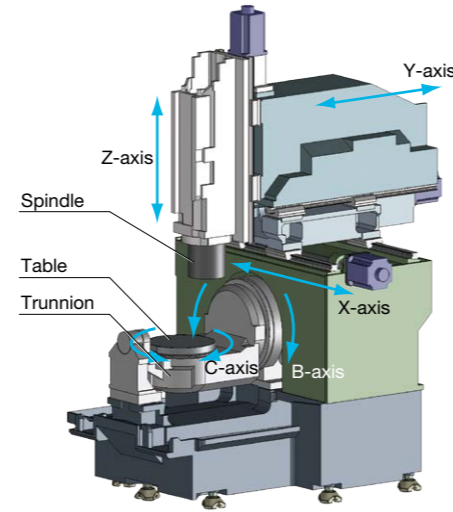
High accuracy 5-axis machining with “M-E-I-K” merging technologies

A trunnion table for high accuracy, ease of use, and compactness

The MU-4000V has a very rigid roller gear cam suited to high-speed drive on the trunnion table B-axis, and a direct drive motor that produces high torque even at low speeds on the C-axis. This makes it possible to achieve both high-speed and high-accuracy machining.

- **High-speed**
 - B-axis: 50 min⁻¹
 - C-axis: 120 min⁻¹ (standard) 1,200 min⁻¹ [turning]
- **Indexing accuracy***
 - B-axis indexing accuracy: ±1.8 sec repeatability: ±0.5 sec
 - C-axis indexing accuracy: ±2.3 sec repeatability: ±0.1 sec

* [Actual data]
Note: The data mentioned in this brochure are “actual data” and do not represent guaranteed accuracies.



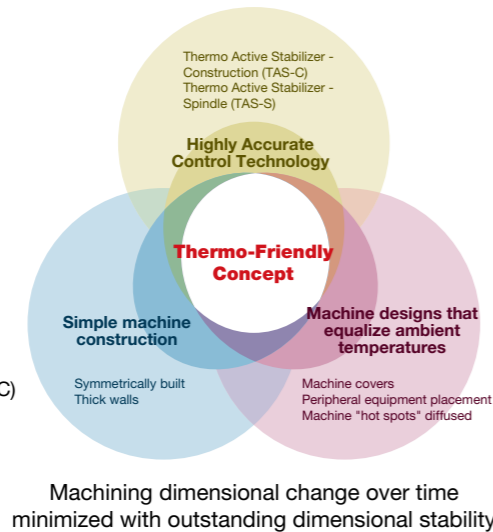
Thermo-Friendly Concept The innovation that accepts temperature changes

Thermo-friendly structure gives outstanding dimensional stability

~~Forced cooling and restraining of thermal deformation~~

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

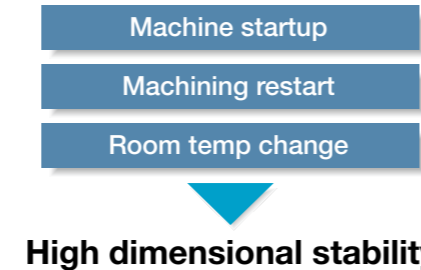
Thermo Active Stabilizer—Construction (TAS-C)
Thermo Active Stabilizer—Spindle (TAS-S)



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.



TAS-C (Thermo Active Stabilizer—Construction)

TAS-C estimates and accurately controls the volumetric thermal deformation of the machine's construction due to ambient temperature changes; based on data from properly placed sensors, feed axis positions, and actual machine thermal deformation characteristics.

TAS-S (Thermo Active Stabilizer—Spindle)

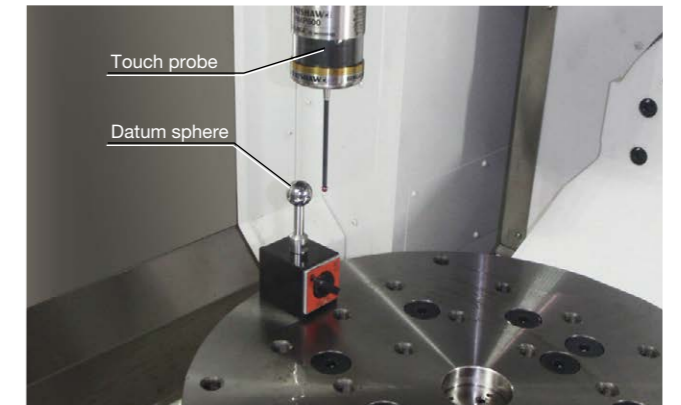
The TAS-S spindle thermal deformation control takes into account various conditional changes such as the spindle's temperature data, modification of the spindle rotation and speed, as well as spindle stoppage. The spindle's thermal deformation will be accurately controlled, even when the rotating speed changes frequently.

Okuma's Intelligent Technology—maximizes machining accuracy

5-Axis Auto Tuning System (option) Gauging and compensation of geometric error

Higher accuracies in 5-axis machining

5-axis machining accuracy is greatly affected by misalignment and other “geometric errors” on the rotary axis. The 5-Axis Auto Tuning System measures geometric error using a touch probe and datum sphere, and performs compensation using measurement results to tune the movement accuracy on 5-axis machines. In this way 5-axis machining accuracy on a higher level is achieved.

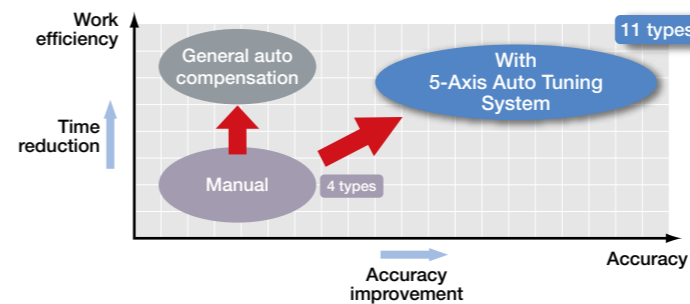
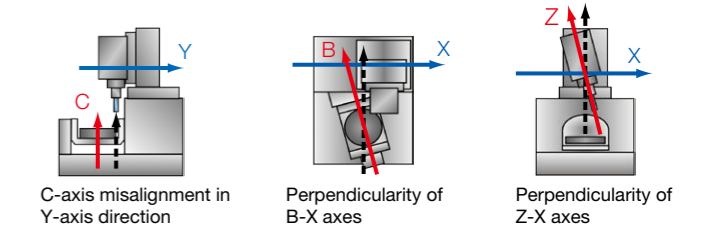


Geometric error measuring and auto tuning performed with a touch probe and a datum sphere

Automatic tuning for geometric error is quick, easy, and can be done by anyone

Previously, manual measurements of the rotating center were bothersome and time-consuming, but with the 5-Axis Auto Tuning System the measurements are made automatically by the machine. Measurements can therefore be done with stable accuracy in a short time by anyone. (Up to 11 geometric errors tuned automatically.) In addition, the results of tuning are applied regardless of whether the operation in auto, manual, or MDI and whether Tool Center Point Control is on or off. Setup and machining can therefore be done with the same operations as before.

[Examples of geometric error]



High accuracy maintained with 5-axis machining

Stable high-accuracy 5-axis machining is achieved even in a typical factory environment, with the synergistic effects of the Thermo-Friendly Concept and the 5-Axis Auto Tuning System.

Contribution to the realization of a carbon-free society



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.



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

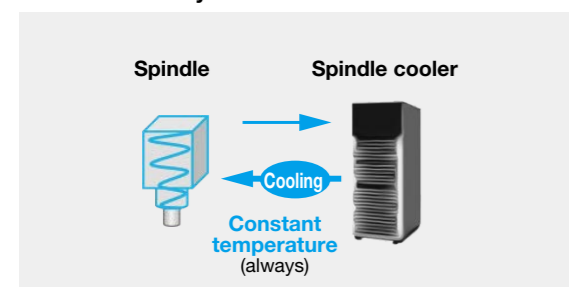
Reduction of power used for air conditioning

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



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

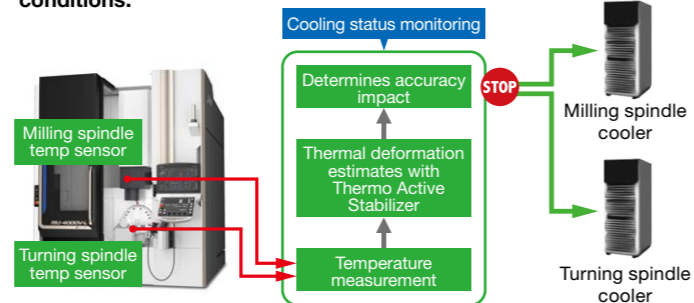
ECO suite plus

A system for an energy-saving society

ECO Idling Stop

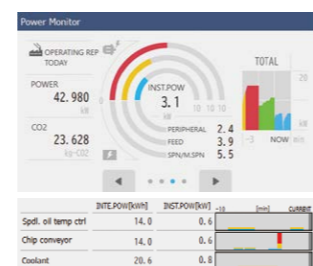
Auxiliary equipment consume a substantial portion of the power used in a factory. This function enables each of them to be turned off when not needed to reduce power consumption. In addition to when automatic operation is suspended, it is now possible to stop idling during manual operation. Power consumption and carbon dioxide emissions are reduced without conscious effort by the operator.

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



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.



ECO Operation

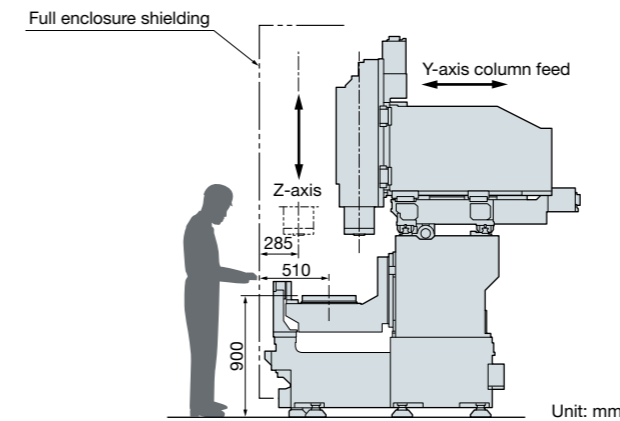
By using only the required peripherals (chip conveyor, mist collector), energy-saving operations are possible.

Easy-to-use 5-axis machine from well-considered design

Good access reduces operator burden

Good access of 510 mm to the center of the table is achieved by approaching from the trunnion axial direction.

Access to the spindle is also good, reducing operator burden during machining preparation and increasing work efficiency.



Improved visibility during machining

The B/C table structure allows confirmation of the workpiece status at an angle of 120° and the front door has a large window. LED lamps are used for bright, reduced-flicker lighting within the machining chamber, improving visibility during machining.



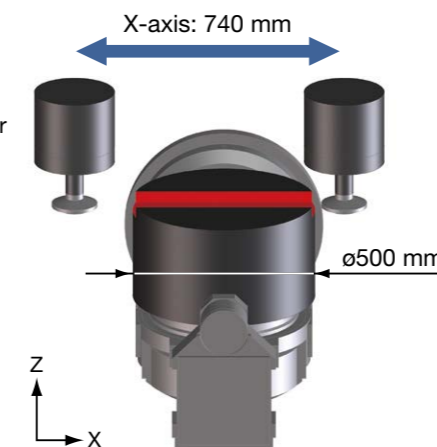
Large working range for applicable workpieces

The machining area is large enough to handle workpieces with a maximum diameter of ø500 mm and maximum height of 400 mm. Tools can also reach the end of workpieces even with the table inclined at various angles, making 5-axis machining possible over a wide range.

Tools can be changed even with the trunnion in a swung position, contributing to reduced cycle times and improved machining accuracies.

Even the largest workpieces are machined with capacity to spare

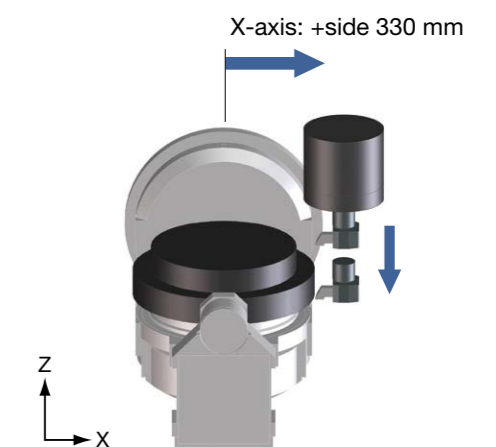
- With a long X-axis travel, peripheral machining of the maximum workpiece diameter (ø500 mm) is possible.



Large machining area

- Swing range: B-axis: +90° to -120°, C-axis: 360° (infinite rotation)
- Max workpiece size: ø500 x 400 mm height
- Max workpiece weight: 300 kg

Visibility of the cutting edge at the time of cutting also excellent

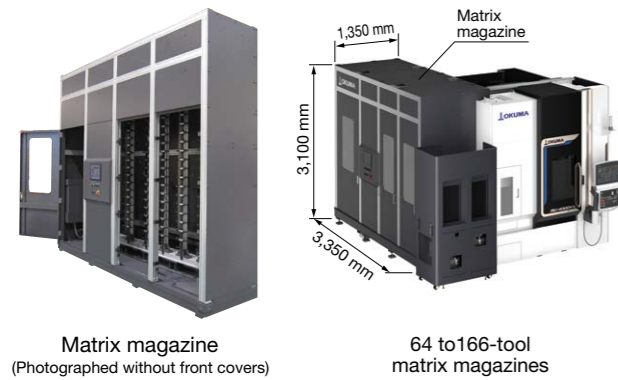


Flexible scalability for optimal automation

Flexible automation options

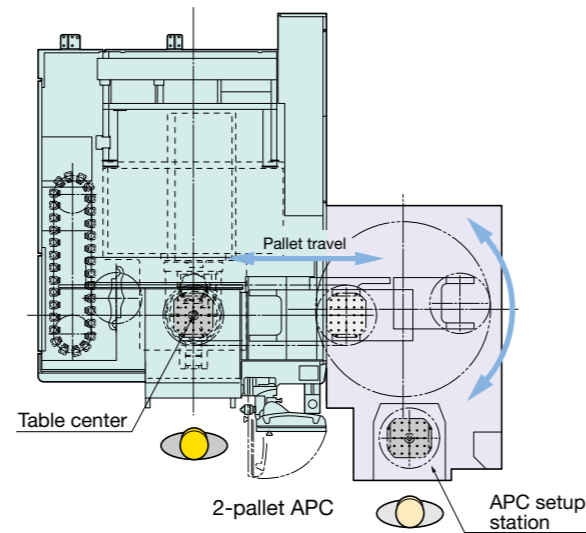
ATC magazine systems

- Chain magazine: 48, 64 tools (standard: 32 tools)
- Matrix magazine: 64, 98, 132, 166, 200, 234, 268 tools



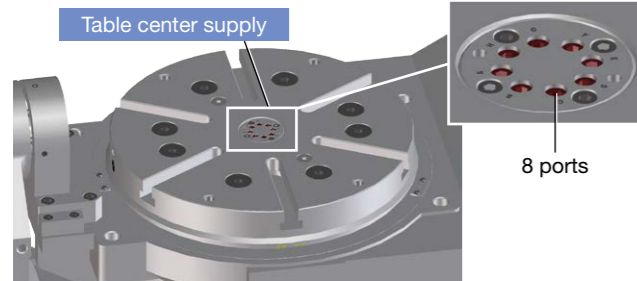
Auto pallet changer (APC)

- External setup of workpiece preparations improve machine utilization.
- The good approach from the machine front is not compromised thanks to a structure in which pallet changes with an APC are done on the right side.
- Turning specs can also be selected.



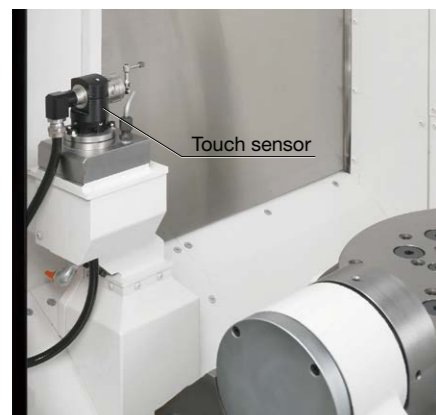
Extra ports for complex hydraulic or pneumatic fixture arrangements

- Max ports: 8 ports* (option)



* The number of ports for turning or APC applications differ.

Auto tool gauging with workpiece mounted

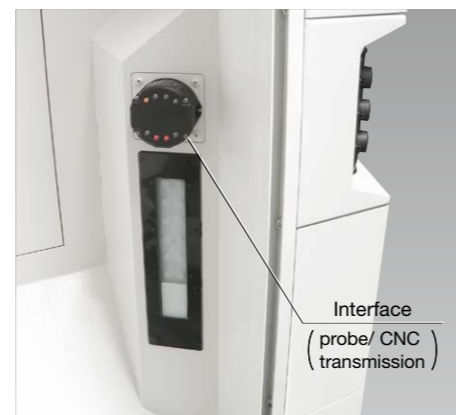


Tool breakage detection/Auto tool length compensation

Automatically measures workpiece alignment and dimensions

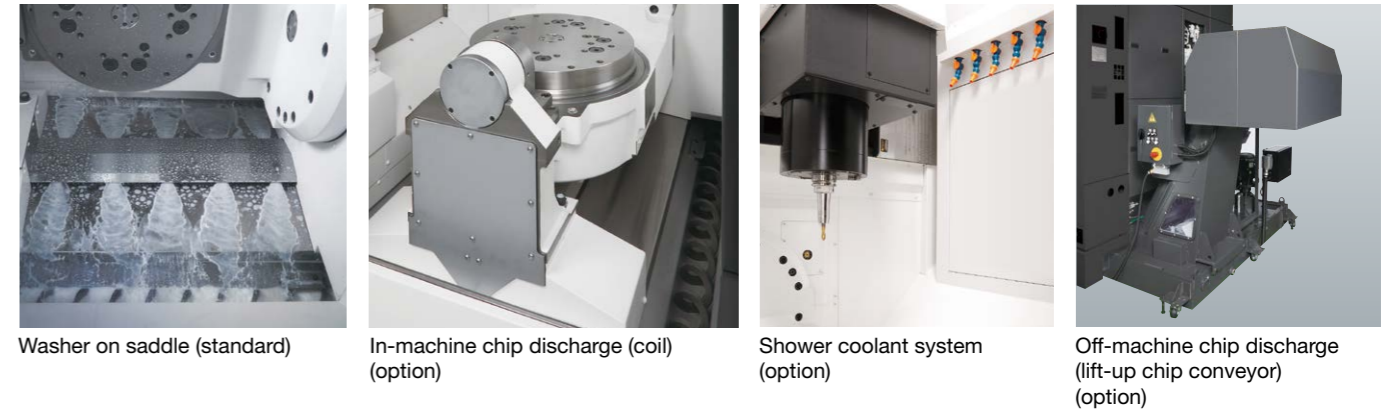


Auto zero offset, auto gauging (radio transmission)



Safe, reliable chip discharge

Excellent chip discharge



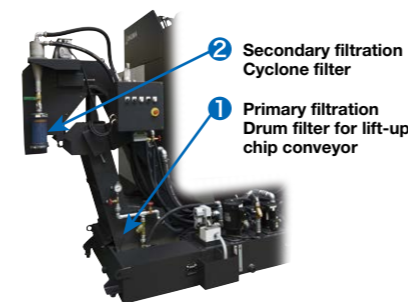
Sludgeless Tank (option)

Reducing waste oil by suppressing coolant deterioration

Troublesome coolant tank cleaning work is reduced dramatically to increase productivity. In addition, the environmental impact caused by the disposal of coolant is 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 (option) circulates coolant at a constant speed in the tank to effectively collect sludge even during non-machining while reducing defects caused by the sludge contained in the coolant, such as scratches on machined surfaces and troubles of cutters, as well. 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. In the thru-spindle coolant specification (option), the bag filter collects even finer sludge to improve the quality of machined surfaces.

Note: It is necessary to select the drum filter type chip conveyor if the Sludgeless Tank option is chosen.



Sludge removal rate

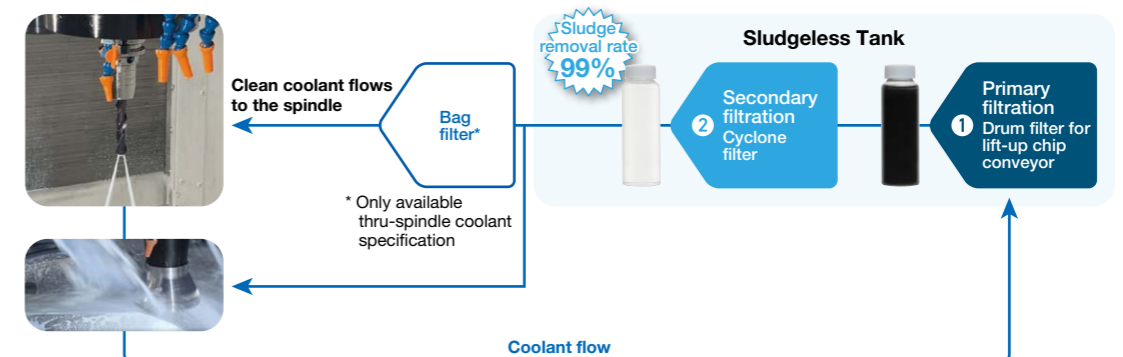
99% (when the material is casting and aluminum)

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)

Tank structures vary by model or specification.

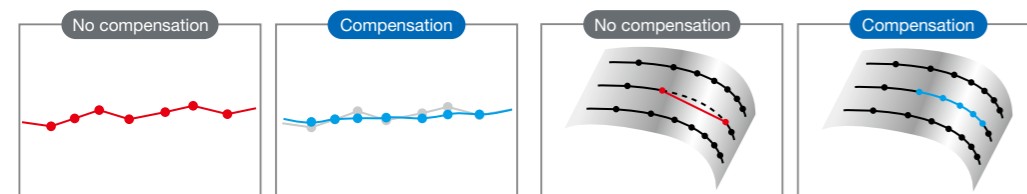


With simultaneous 5-axis control that produces excellent machined surface quality

Hyper-SurfaceII (option)

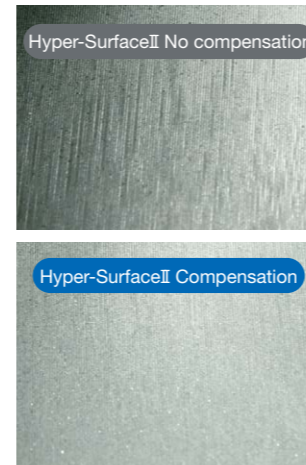
Easy and improved die/mold surface quality

By suppressing streaks and edge irregularities caused by CAM machining data, hand finish polishing time can also be reduced. In addition to the Sculptured-Surface Adaptive Acceleration Control with the previous Super-NURBS, the new Hyper-Surface function automatically compensates for edge positioning errors of the machining data output from CAM or the adjacent cutting path while maintaining shape accuracy.



Smooths minor fluctuations and variations in command points

Adjust steps errors between adjacent cutter paths



Comparison of machined surface quality

Even easier to use with simultaneous 5-axis kit

Tool center point manual feed (option)

This feature will provide rotary operation with a tool point as the center when operating the rotary axes manually. When the table is swiveled, axis movement will occur with no change in the tool position on the workpiece.

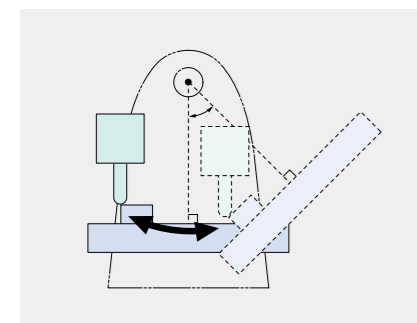
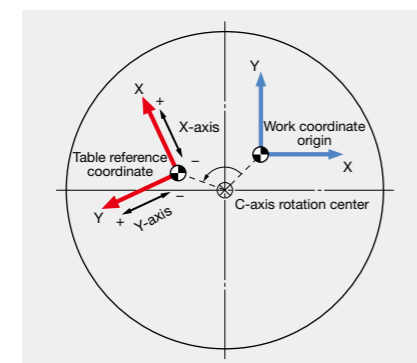


Table origin coordinate manual feed (option)

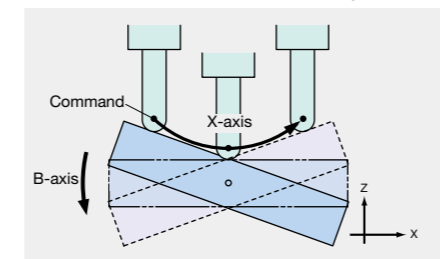
A feature to perform X-, Y-, Z-axis manual feed (rapid traverse, cutting feed, pulse handle) when origin coordinate systems shift on a swiveling table.



Tool center point controlII (option)

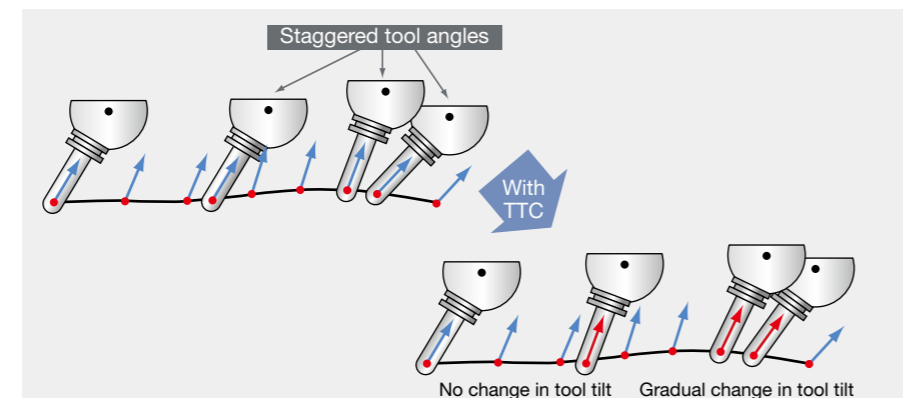
Function controls the path of the tool tip with respect to the workpiece on each axis so that the tool tip trajectory is linear with the axis travel command including the A-, B-, and C-axis.

- In the case of simultaneous X-axis and B-axis commands with the linear command (G01), the tool path is a straight line when viewed from the workpiece.



Tool Tilt Compensation (Included in Tool center point control II)

The tool angle on a workpiece (tool tilt) in 5-axis machining will change on a waving surface. CAM processing errors will cause the tool to stagger with unnecessary accel/decel and reverse angles during axis feed. TTC will keep feedrates steady with a smooth sequence of commands to automatically correct tool tilt angles—resulting in shorter cycle times and smoother surface finishes.

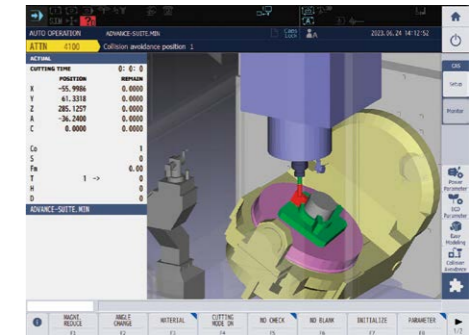


Intelligent Technology to enable the machine to show its maximum potential

Collision Avoidance System (option) Collision prevention

World's first "Collision-Free Machine"

NC controller (OSP) with 3D model data of machine components—workpiece, tool, fixture, spindle, table—performs real time simulation just ahead of actual machine movements. It checks for interference or collisions, and stops the machine movement immediately before collision. Machinists (novice or pro) will benefit from reduced setup and trial cycle times, and the confidence to focus on making parts.



SERVO NAVI Optimized Servo Control

Achieves long term accuracy and surface quality

SERVO NAVI AI (Automatic Identification) Optimum settings automatically identified

Automatically estimates the workpiece weight on the table and optimizes the table rotation axis acceleration for the weight.

Stable machining of heavy workpieces and faster machining of light workpieces.

SERVO NAVI SF (Surface Fine-tuning) Enables longer machine use

When decreased machining accuracy is recognized to have occurred with many years of use, SERVO NAVI restores machined surface accuracy. It can improve crease marks in machined surfaces that occur where the feed axis reverses with worn ball-screws or guideways.

Even noise or vibration that occurs when there are large changes in the machine state can be immediately eliminated.

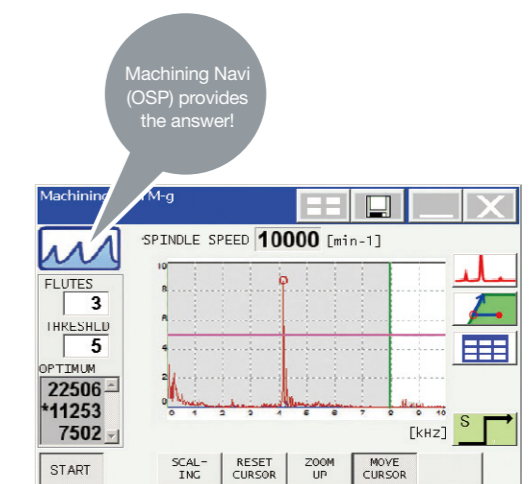
Machining Navi M-i, M-gII+ (option) Cutting condition search for milling

Automatically changes to optimum spindle speed (M-i)

Built-in sensors measure chatter vibration and the machine automatically changes to the best spindle speed.

Adjust cutting conditions while monitoring the data (M-gII+)

Navigates effective measures by detecting and analyzing machining chatter with a microphone attached to the machine.



This sign indicates a change to the optimum spindle speed.



This sign indicates that spindle speed is being changed.



This sign indicates that the cutting load needs to be reduced.

Machine specifications

	Item	Unit	MU-4000V	MU-4000V-L Turning Specs
Travels	X-axis (spindle ram L/R)	mm (in)	740 (29.13) (+20 (0.79) ATC movements)	
	Y-axis (spindle ram front/back)	mm (in)	460 (18.11)	
	Z-axis (spindlehead up/down)	mm (in)	460 (18.11)	
	B-axis (trunnion rotation)	deg	+90 to -120	
	C-axis (table rotation)	deg	360 (infinite)	
	Table surface to spindle nose	mm (in)	120 to 580 (4.72 to 22.83) {50 to 510 (1.97 to 20.08)}	
Table	Table size	mm (in)	ø400 (15.75)	
	Max workpiece dimensions	mm (in)	ø500 × H400 (ø19.69 × H15.75) {ø500 × H330 (ø19.69 × H12.99)}	
	Floor to table top	mm (in)	900 (35.43)	
	Max load capacity	kg (lb)	300 (660) {200 (440)}	
	Turning spindle speed	min ⁻¹	— 1,200	
Spindle	Speed	min ⁻¹	15,000 [20,000, 25,000]	12,000
	Speed ranges		Infinitely variable	
	Tapered bore		7/24 taper No. 40 [HSK-A63]	HSK-A63
	Bearing dia	mm (in)	ø70 (2.76)	
Feed	Rapid traverse	m/min (ipm)	X, Y, Z: 50 (1,969)	
	Rapid traverse	deg/min	B: 18,000 (50 min ⁻¹) C: 43,200 (120 min ⁻¹)	
	Cutting feed rate	mm/min	X, Y, Z: 1 to 50,000	
Motors	Spindle (10 min/cont)	kW (hp)	22/18.5 [30/22, 15/11] (30/25 [40/30, 20/15])	22/18.5 (30/25)
	Feed axes	kW (hp)	X, Y, Z: 3.5, B: 4.6 (X, Y, Z: 4.67, B: 6.13)	
	Feed axes (C-axis: milling)	kW (hp)	6.7 (8.93)	
	Turning (15 min/cont)	kW (hp)	—	15/10 (20/13)
Auto tool changer (ATC)	Tool shank		MAS BT40 [HSK-A63]	HSK-A63
	Pull stud		MAS2 [—]	—
	Tool capacity (magazine)		32-tool (chain) [48-tool, 64-tool: chain, over 64-tool: matrix]	
	Max tool dia (w/ adjacent / w/o adjacent)	mm (in)	ø90/ø125 (ø3.54/ø4.92)	
	Max tool length	mm (in)	300 (11.81)	
	Max tool mass	kg (lb)	8 (18)	
	Max tool mass moment	N-m	7.8	
	Tool selection		Memory random (matrix magazine is fixed address system)	
Machine size	Height	mm (in)	2,950 (116.14)	
	Floor space W x D	mm (in)	2,399 × 3,444 (94.45 × 135.59)	
	Mass	kg (lb)	9,700 (21,340)	
CNC		OSP-P500M-H	OSP-P500S-H	

[]: Option, { }: APC

Standard specifications / accessories

Std spindle	50 to 15,000 min ⁻¹	22/18.5 kW [10 min/cont], No. 40	Washing device on saddle	
Multitasking spindle	50 to 12,000 min ⁻¹	22/18.5 kW [10 min/cont], HSK-A63	Coolant supply system*2	Tank: 315 L (Effective: 170 L), pump: 250 W
			ATC air blower (blast)	
Rapid feedrate	X, Y, Z: 50 m/min		Chip air blower (blast)	Nozzle type
Spindle/Spindlehead cooling system	Oil temperature controller		Work lamp	LED (installed on right sides)
Air cleaner (filter)	Including regulator		In-machine chip discharge*3	Chip flusher system table L/R
Operation panel with color LCD	21.5-inch touch panel		Chip pan	Effective capacity 60 L
Pulse handle			Foundation washers (with jack bolts)	7 pcs
Tapered bore cleaning bar			3-lamp status indicator	Type C (LED signal tower)
B-/C-axis rotary table	0.0001 deg			Red (alarm), Yellow (end)
C-axis table*1	ø400 mm, 6 18H7 T-slots			Green (running)
Hand tools			32-tool ATC	
Tool box			ATC magazine shutter	
TAS-S	Thermo Active Stabilizer—Spindle		Full enclosure shielding	With ceiling (full enclosure)
TAS-C	Thermo Active Stabilizer—Construction		Chemical anchors	

*1. Turning specs have ø400 mm, M12 tapped holes in 28 locations

*2. Do not use oil-based coolants. In cases when use of such coolants is unavoidable, the pump capacity must be increased to 800 W.

*3. When oil-based coolants are used, select an in-machine chip conveyor (coil).

Note: Oil-based coolants are highly flammable, so fire prevention measures must always be taken when using these coolants. Do not operate unattended.

Optional specifications / accessories

Name	Remark	Name	Remark
High-speed spindle 50 to 20,000 min ⁻¹	△ 30/22 kW [10 min/cont]*1	Workpiece wash gun	
		Sludgeless Tank	
High-speed spindle 50 to 25,000 min ⁻¹	△ 15/11 kW [10 min/cont]*1	In-machine chip conveyor (coil)	
		Off-machine chip discharge	△ Refer to recommended chip conveyors.
Dual contact spindle*2	△ HSK, BIG-PLUS®	Chip bucket for above	△
Ball-screw cooling	X-Y-Z axes	Hyper-SurfaceII	
AbsoScale	X-Y-Z axes	Tool breakage detection/auto tool length compensation	Touch sensor (Renishaw)
Auto pallet changers (APC)*3	2-APC, 6-APC, FMS	Auto zero offset/auto gauging	Touch probe (Renishaw)
ATC magazines	△ Chain: 48, 64 tools Matrix: 64, 98, 132, 166, 200, 234, 268 tools	5-Axis Auto Tuning System	By touch probe, datum sphere (Renishaw)
Pull stud specs	△ MAS1, JIS, CAT, DIN	Tool life management (time counter, etc)	
Table surface	△ Tapped table top	Overload monitor (w/ feed adaptive control)	
Thru-spindle coolant*4	Specify 1.5 MPa or 7.0 MPa 25,000 min ⁻¹ specs available for HSK-A63 only.	Automatic door	
Oil mist coolant			
Shower coolant	5 nozzles on the right side in the machine		

△: Corresponding standard specification deleted.

*1. Spindle accepts 7/24 No. 40 (BIG-PLUS®), or HSK-A63 tapers.

*2. Be sure to select this specification when BIG-PLUS® holder is used.

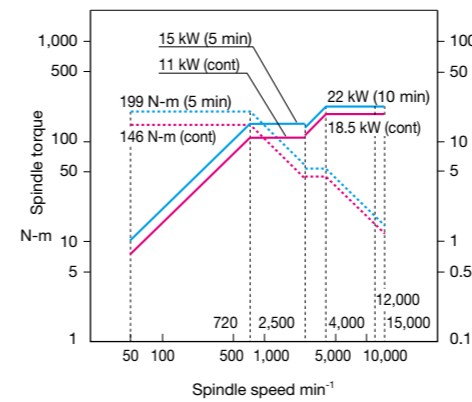
*3. Pallet top comes with 28 M12 tapped holes.

*4. Okuma pull stud required (End-face grinding, O-ring, and through-hole diameter differ from those of commercial pull studs.)

Spindle torque / output diagram

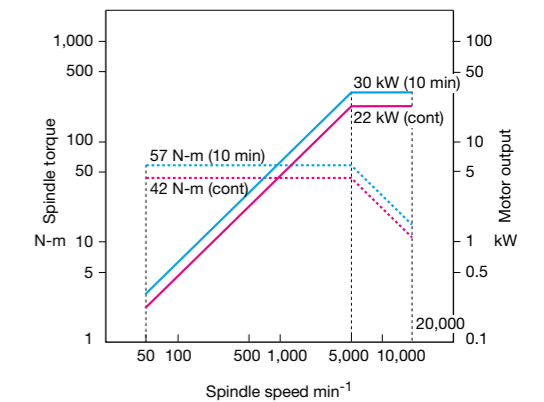
Standard spindle

- Speed: 15,000 min⁻¹ (with turning specs: 12,000 min⁻¹)
- Max output: 22/18.5 kW (10 min/cont)
- Max torque: 199/146 N-m (5 min/cont)



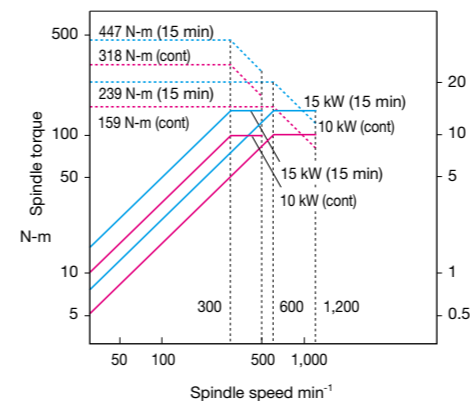
High-speed spindle

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



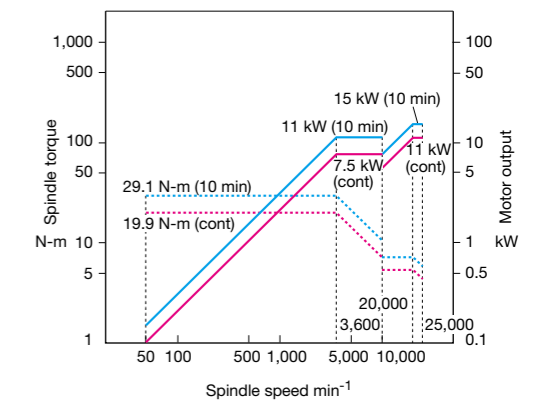
Turning spindle

- Table (turning spindle) spindle speed: 1,200 min⁻¹
- Max output: 15/10 kW (15 min/cont)
- Max torque: 447/318 N-m (15 min/cont)

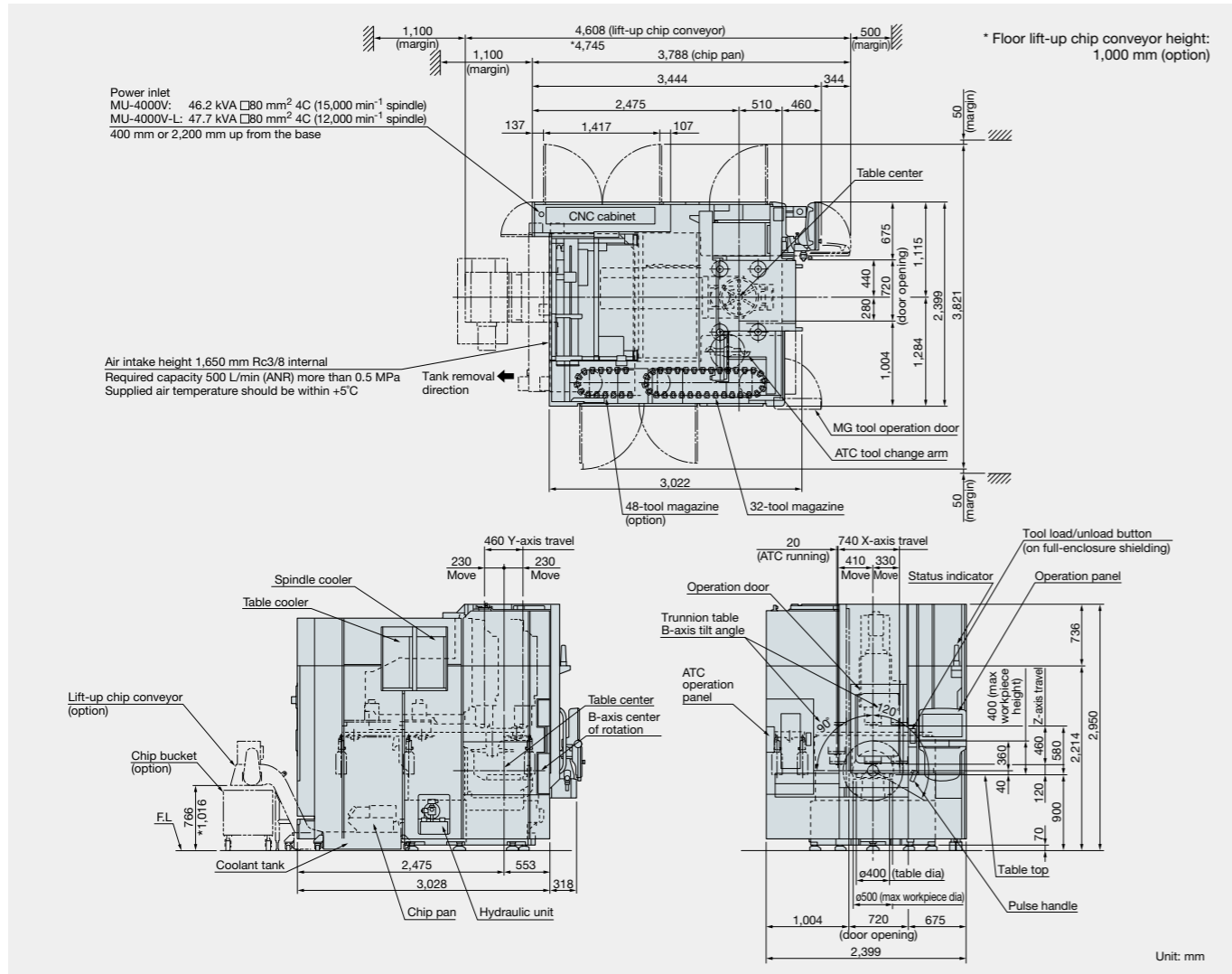


High-speed spindle

- Speed: 25,000 min⁻¹
- Max output: 15/11 kW (10 min/cont)
- Max torque: 29.1/19.9 N-m (10 min/cont)



Dimensional and installation drawings



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

○: Recommended
△: Conditionally recommended

Workpiece material		Steel	Cast iron	Aluminum / Nonferrous	Mixed (general use)
Chip shape					
In-machine	Chip flusher (standard)	—	○ (wet)	○	—
	Coil (option)	○	○ (dry-wet)	—	○
Off-machine (option)	Hinge (floor)	○	—	—	△*1
	Scraper	—	○ (dry)	—	—
	Scraper with drum filter	—	○ (wet) with magnet	△*2	—
Hinge + scraper with drum filter		△*3	△ (wet)*4	○	○

*1. When there are few fine chips *2. When chips are shorter than 100 mm *3. When there are many fine chips *4. When chips are longer than 100 mm
Note: Chip conveyor with drum filter when Sludgeless Tank (option) is selected.

Off-machine lift-up chip conveyors

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

Working range

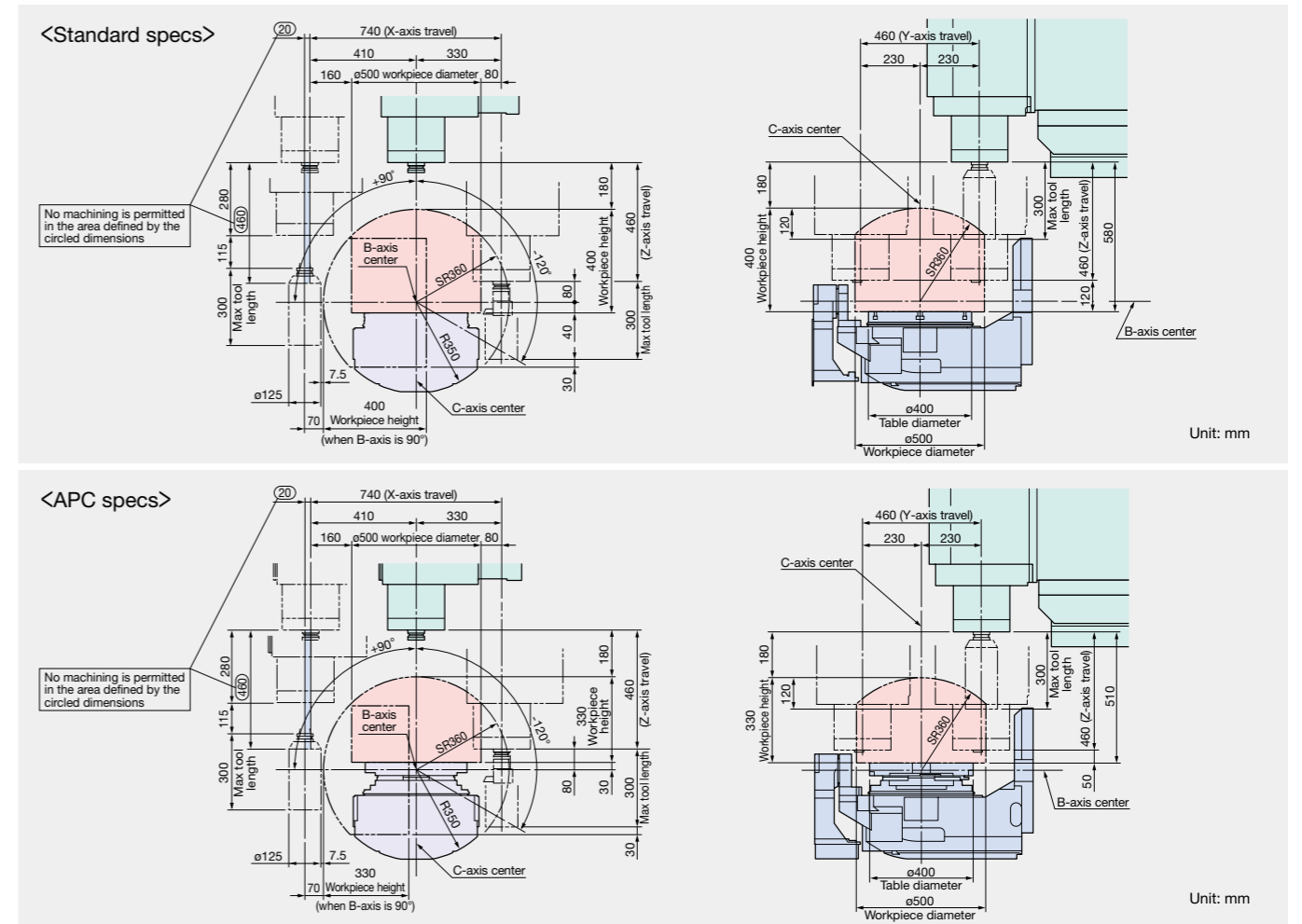
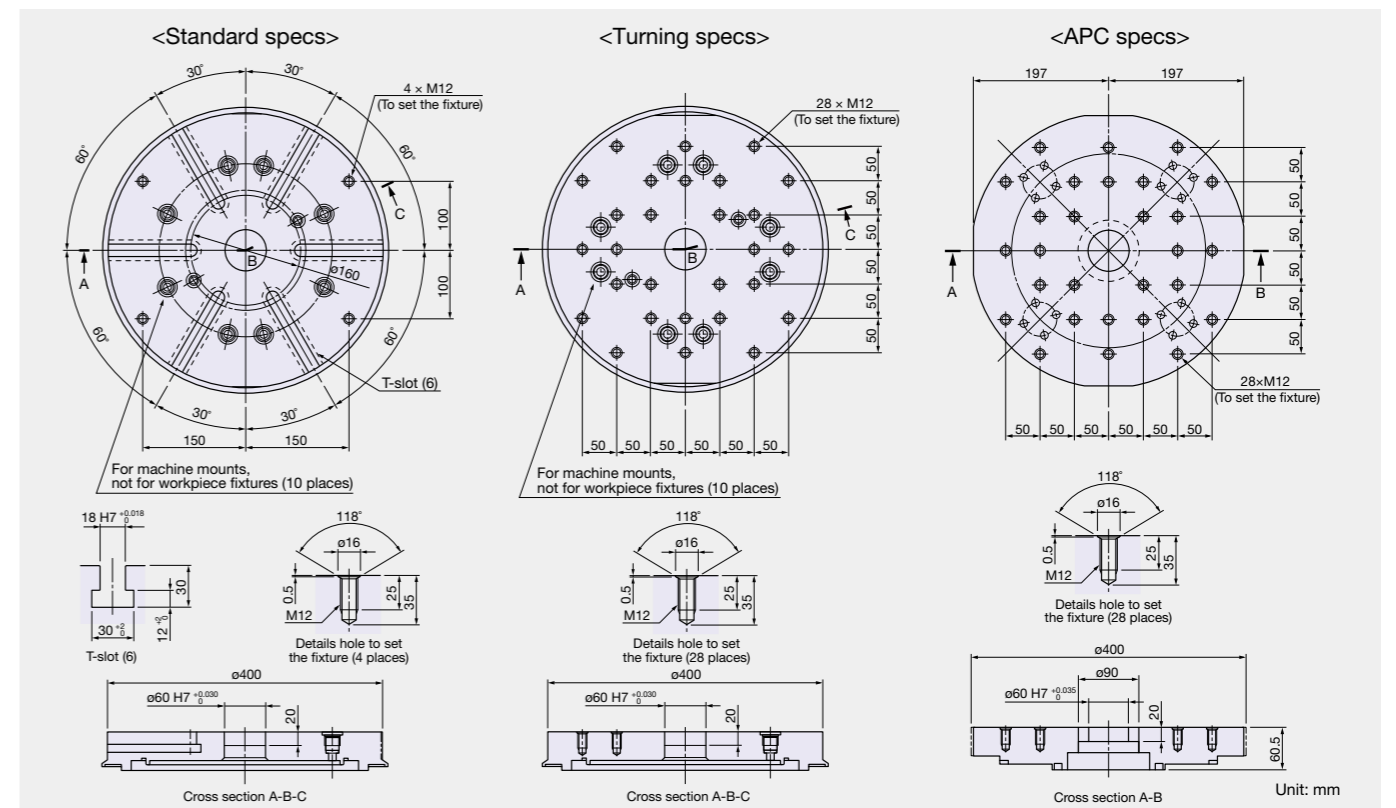


Table dimensions



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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