

## OPEN POSSIBILITIES







5-Axis Vertical Machining Center





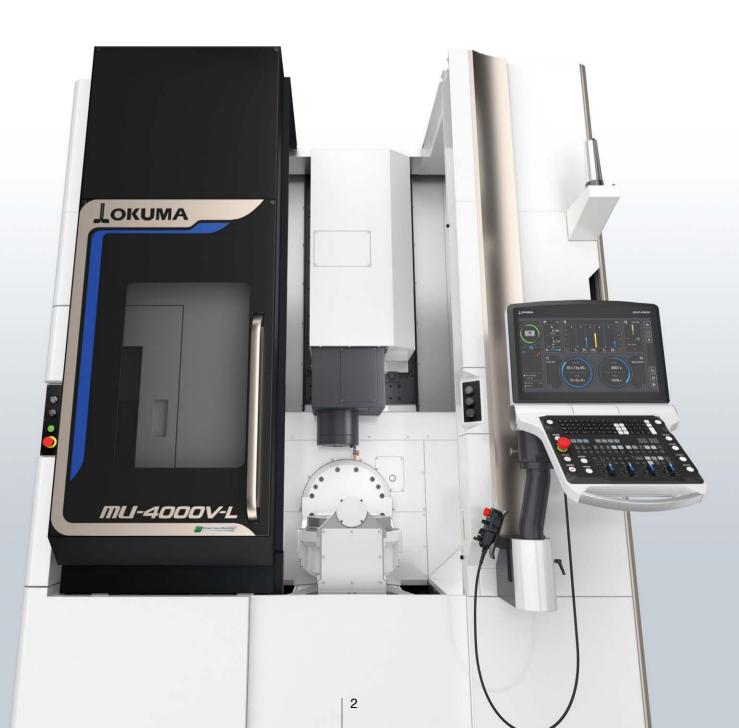


## A next generation machine that opens new possibilities in "Monozukuri"\*<sup>1</sup> with "M-E-I-K"\*<sup>2</sup> merging technologies

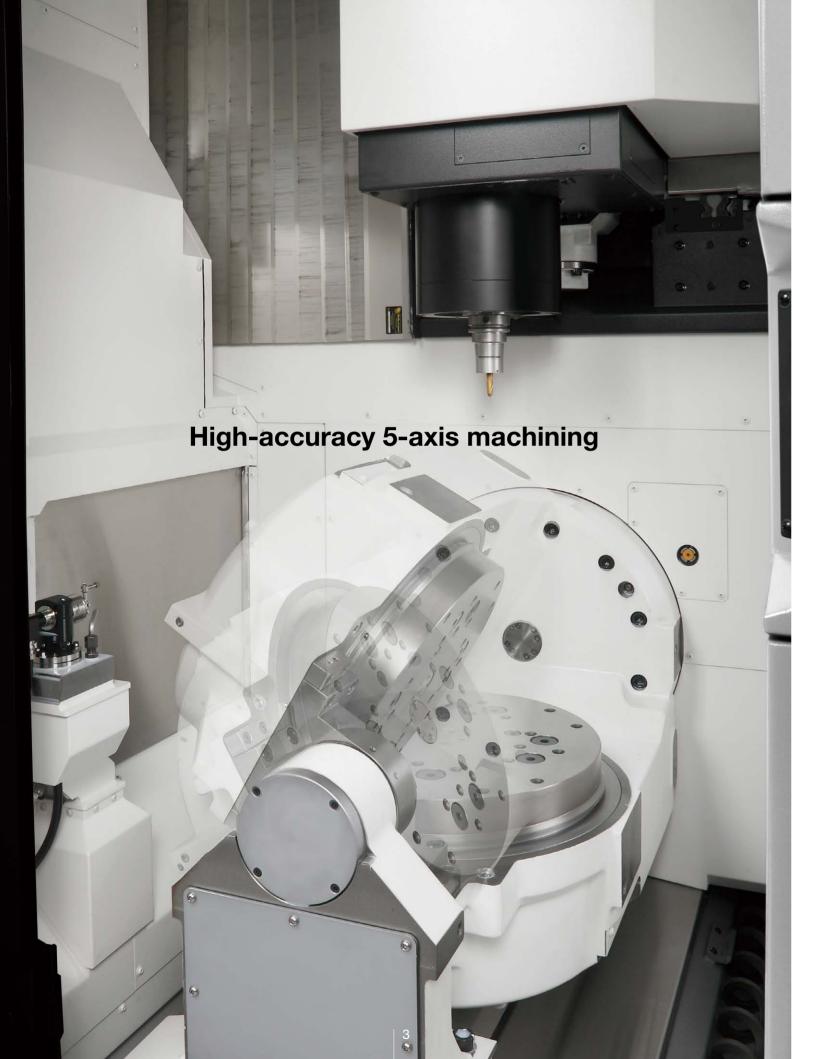
The MU-4000V is a 5-axis machining center that opens new "Monozukuri" possibilities with superior basic functions for 5-axis machining, a large machining range, and ease of use. It can perform jobs from high quality 5-axis machining to process-intensive machining that exceeds conventional multitasking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



# 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.







Satellite parts

## **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.



Blisk

Spindle speed	15,000 min <sup>-1</sup>
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 torgue 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<sup>-1</sup> C-axis: 120 min<sup>-1</sup> (standard)  $1,200 \text{ min}^{-1}$  [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]

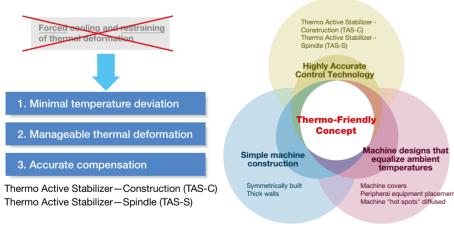
Note: The data mentioned in this brochure are "actual data" and do not represent guaranteed accuracies.



## **Thermo-Friendly Concept**

The innovation that accepts temperature changes

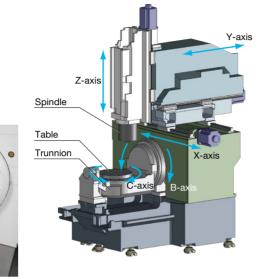
## Thermo-friendly structure gives outstanding dimensional stability



Machining dimensional change over time minimized with outstanding dimensional stability

### TAS-C (Thermo Active Stabilizer—Construction)

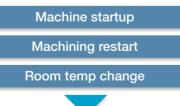
TAS-C estimates and accurately controls the volumetric thermal deformation of the machine's construction due to ambient temperature changes; based on data from properly placed sensors, feed axis positions, and actual machine thermal deformation characteristics.



#### 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.



## **High dimensional stability**

### 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

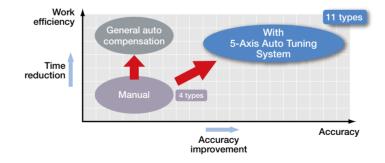


5-Axis Auto Tuning System (option) Gauging and compensation of geometric error

#### Higher accuracies in 5-axis machining

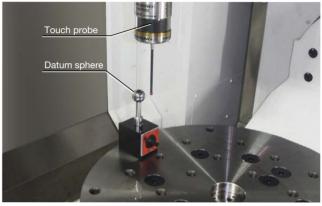
5-axis machining accuracy is greatly affected by misalignment and other "geometric errors" on the rotary axis. The 5-Axis Auto Tuning System measures geometric error using a touch probe and datum sphere, and performs compensation using measurement results to tune the movement accuracy on 5-axis machines.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





#### 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.



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

### Automatic tuning for geometric error is guick. 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]



C-axis misalignment in Y-axis direction



Perpendicularity of B-X axes



Perpendicularity of Z-X axes

## Contribution to the realization of a carbon-free society

Highly productive, accurate and eco-friendly Green-Smart Machine

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

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

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

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

## Green-Smart Machines are environmentally friendly

products that autonomously achieve stable dimensional accuracies and reduced energy consumption.

Green-Smart Machine Technology that achieves Green-Smart Machine

## **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.

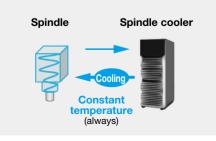
Reduction of warm-ups and dimensional compensation

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

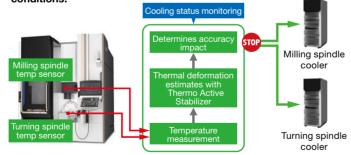
## ECO suite plus

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.

Full enclosure shielding Y-axis column feed

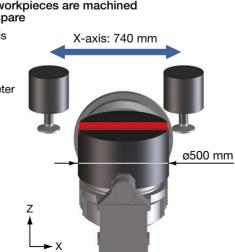
## Large working range for applicable workpieces

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.





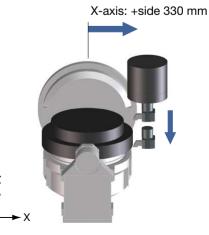
## Improved visibility during machining

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 machining area

- Swing range B-axis: +90° to -120° C-axis: 360° (infinite rotation)
- Max workpiece weight: 300 ka
- Max workpiece size: ø500 × 400 mm height
- Visibility of the cutting edge at the time of cutting also excellent



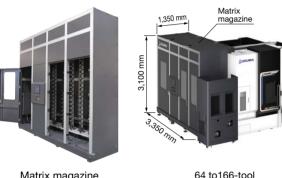
## Flexible scalability for optimal automation

## Safe, reliable chip discharge

## Flexible automation options

### ATC magazine systems

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

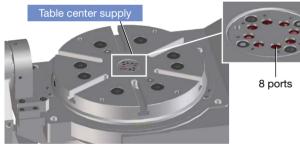


Matrix magazine (Photographed without front covers)

64 to166-tool matrix magazines

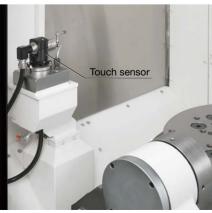
### Extra ports for complex hydraulic or pneumatic fixture arrangements

#### Max ports: 8 ports\* (option)



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

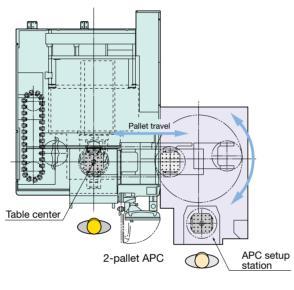
## Auto tool gauging with workpiece mounted



Tool breakage detection/Auto tool length compensation

## 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.

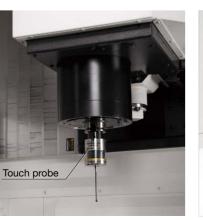


Interface

probe/ CNC

transmission

Automatically measures workpiece alignment and dimensions



Auto zero offset, auto gauging (radio transmission)

## **Excellent chip discharge**





Washer on saddle (standard)

In-machine chip discharge (coil) (option)

## Sludgeless Tank (option) Reducing waste oil by suppressing coolant deterioratio

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 unprove the quality of machined surfaces.

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





Shower coolant system (option)



Off-machine chip discharge (lift-up chip conveyor) (option)

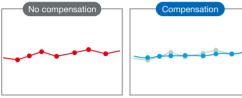
99% (when the material is casting and aluminum)

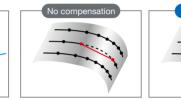
# With simultaneous 5-axis control that produces excellent machined surface quality

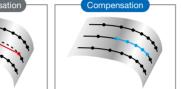
## Hyper-SurfaceI (option)

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.





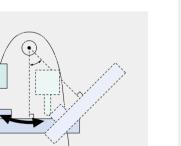


Smooths minor fluctuations and variations In command points Adjust steps errors between adjacent cutter paths

## 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.

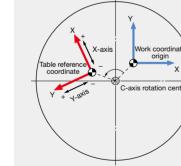


#### Tool Tilt Compensation (Included in Tool center point control II)

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.

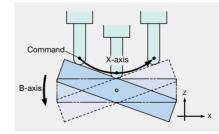
#### Table origin coordinate manual feed (option)

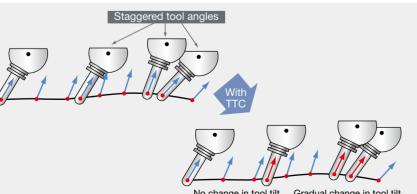
A feature to perform X-, Y-, Z-axis manual feed (rapid traverse, cutting feed, pulse handle) when origin coordinate systems shift on a swiveling table.





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.







# 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.



**Optimized Servo Control** 

Achieves long term accuracy and surface quality

SERVONAVI 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.



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.

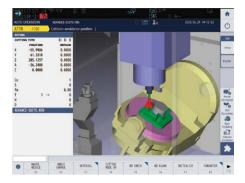


vper-SurfaceI No compensa

Comparison of machined surface quality

### Tool center point control I (option)

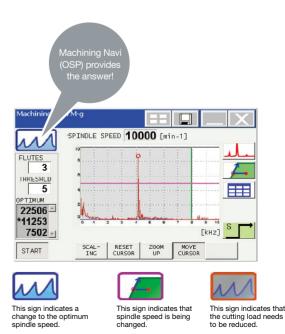
Function controls the path of the tool tip with respect to the workpiece on each axis so that the tool tip trajectory is linear with the axis travel command including the A-, B-, and C-axis.





When decreased machining accuracy is recognized to have occurred with many years of use, SERVoNAVI 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.



#### Machine specifications

	Item	Unit	MU-4000V	MU-4000V-L Turning Specs			
Fravels	X-axis (spindle ram L/R)	mm (in)	740 (29.13) (+20 (0.7	9) ATC movements)			
	Y-axis (spindle ram front/back)	mm (in)	460 (*	8.11)			
	Z-axis (spindlehead up/down)	mm (in)	460 (*	8.11)			
	B-axis (trunnion rotation)	deg	+90 to	o -120			
	C-axis (table rotation)	deg	360 (ir	nfinite)			
	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 (3	35.43)			
	Max load capacity	kg (lb)	300 (660)	[200 (440)]			
	Turning spindle speed	min <sup>-1</sup>	-	1,200			
Spindle	Speed	min <sup>-1</sup>	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: 5	0 (1,969)			
	Rapid traverse	deg/min	B: 18,000 (50 min <sup>-1</sup> ) C: 43,200 (120 min <sup>-1</sup> )				
	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]	22/18.5 (30/25)			
			(30/25 [40/30, 20/15])				
	Feed axes	kW (hp)	X, Y, Z: 3.5, B: 4.6 (X	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 shank		MAS BT40 [HSK-A63]	HSK-A63			
tool	Pull stud		MAS2 [-]	—			
changer (ATC)	Tool capacity (magazine)		32-tool (chain)				
			[48-tool, 64-tool: chair	· · ·			
	Max tool dia (w/ adjacent / w/o adjacent)	mm (in)	ø90/ø125 (e	· · · · · · · · · · · · · · · · · · ·			
	Max tool length	mm (in)	300 (*	,			
	Max tool mass	kg (lb)	,	18)			
	Max tool mass moment	N-m	7.	-			
	Tool selection		Memory random (matrix maga	azine is fixed address system)			
Machine size	Height	mm (in)	2,950 (	,			
3120	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 <sup>-1</sup>	22/18.5 kW [10 min/cont], No. 40	Washing device on saddle	
Multitasking spindle	22/18.5 kW [10 min/cont], HSK-A63	Coolant supply system*2	Tank: 315 L (Effective: 170 L), pump: 250 W
50 to 12,000 min <sup>-1</sup>		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	30/22 kW [10 min/cont]*1	Workpiece wash gun	
50 to 20,000 min <sup>-1</sup>		Sludgeless Tank	
High-speed spindle	15/11 kW [10 min/cont]*1	In-machine chip converyor (coil)	
50 to 25,000 min <sup>-1</sup>		Off-machine chip discharge $\triangle$	Refer to recommended chip conveyors.
Dual contact spindle*2	HSK, BIG-PLUS <sup>®</sup>	Chip bucket for above $ riangle$	
Ball-screw cooling	X-Y-Z axes	Hyper-SurfaceII	
AbsoScale	X-Y-Z axes	Tool breakage detection/auto tool	Touch sensor (Renishaw)
Auto pallet changers (APC)*3	2-APC, 6-APC, FMS	length compensation	
ATC magazines	Chain: 48, 64 tools	Auto zero offset/auto gauging	Touch probe (Renishaw)
	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	
Table surface	Tapped table top	(time counter, etc)	
Thru-spindle coolant*4	Specify 1.5 MPa or 7.0 MPa	Overload monitor	
	25,000 min <sup>-1</sup> specs available for HSK-A63 only.	(w/ feed adaptive control)	
Oil mist coolant		Automatic door	
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

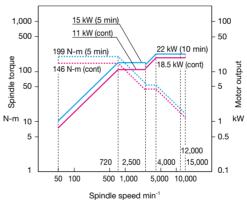
#### Standard spindle

Speed: 15,000 min<sup>-1</sup>

(with turning specs: 12,000 min<sup>-1</sup>)

Max output: 22/18.5 kW (10 min/cont)

Max torque: 199/146 N-m (5 min/cont)

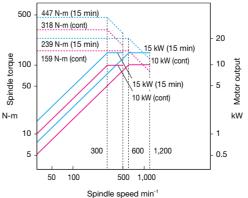




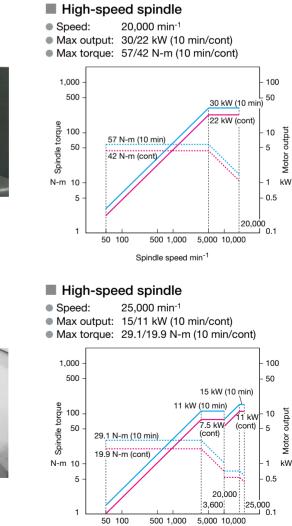
Turning spindle

Table (turning spindle) spindle speed: 1,200 min<sup>-1</sup> Max output: 15/10 kW (15 min/cont)

Max torque: 447/318 N-m (15 min/cont)







Spindle speed min<sup>-1</sup>





## A next-generation CNC that makes manufacturing DX (digital transformation) a reality



## Improved productivity and stable production

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

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

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

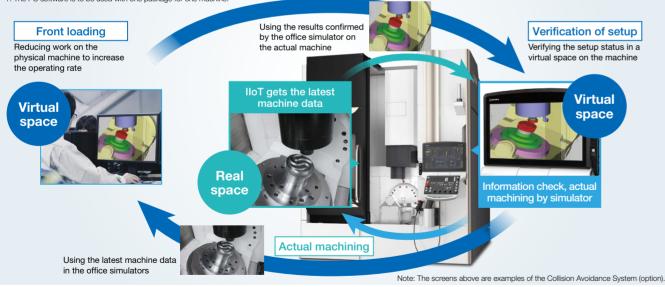
Simulation using the latest machine operation data can be achieved with an office PC and OSP-P500 installed on the physical machine. This enables preparation for machining in advance in the office environment (front loading). Physical machine preparation time can be reduced by using digital twin preparation 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.

## Digital Twin On PC

## Simulate shop machines in the office

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

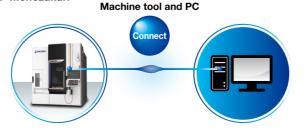
\*1. The PC software is to be used with one package for one machine



## **Connect Plan** Get Connected, Get Started, and Get Innovative with Okuma "Monozukuri"

## Connect, Visualize, Improve

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



21.5-inch operation panel

Simulating the CNC of a real machine

Super-fast and super-accurate machining simulations are performed with the CNC of a real machine on-site to minimize machining preparation work.

Actual machining can be started immediately, greatly improving the

**Digital Twin On Machine** 

operating rate of the machine.

OSP-P50	00M/S standard spe	ecifications						
Basic Specs	Control	X, Y, Z, B, C simultaneous 5-axis, spindle control (1 axis)						
	Position feedback	OSP full range absolute position feedback (zero point return not required)						
	Coordinate functions	Machine coordinate system (1 set), work coordinate system (20 sets)						
	Min / Max command	±99999.999 mm, ±9999.9999° 8-digit decimal, command units: 0.001 mm, 0.01 mm, 1 mm, 0.0001°, 0.001°, 1°						
	Feed	Cutting feed override: 0 to 200%						
	Spindle control	Direct spindle speed commands, override 30 to 300%, multi-point indexing						
	Tool compensation	No. of registered tools: Max 999 sets, tool length/radius compensation: 3 sets per tool						
	Display	21.5-inch color LCD + multi-touch panel operations						
	Security	Operator authentication, Lock screen, OSP-VPSII-STD						
Programming	Program capacity	Program storage capacity: 4 GB; operation buffer: 2 MB						
	Program operations	Scheduled program, fixed cycle, G-/M-code macros, arithmetic, logic statements, math functions, variables, branch commands,						
		Coordinate calculate, area machining, coordinate convert, programming help, user task, keyway cycle, fixture offset I						
Operations	OSP suite	"suite apps" to graphically visualize and digitize information needed on the shop floor,						
		"suite operation" enable one-touch access to "suite apps".						
	Easy Operation	"Single-mode operation" to complete a series of operations. Advanced operation panel/graphics facilitate smooth machine control						
	MacMan plus	Machining management: aggregation and display of machining records, operating records and problem information,						
		Visualization of power consumption, file output						
	Machine operations	Operation help, load meter, alarm help, sequence return, manual interrupt/auto return, pulse handle overlap, parameter I/O,						
		PLC monitor, easy parameter setting						
Communications / Networking		USB (2 ports), Ethernet, DNC-T1, Smart I/F						
High speed/accu	racy specs	Thermo Active Stabilizer – Spindle (TAS-S), Thermo Active Stabilizer – Construction (TAS-C), Hi-Cut Pro,						
		Pitch error compensation, Hi-G control, SERVONAVI, cycle time reduction						
Energy-saving	ECO suite plus	ECO Idling Stop, ECO Operation, oil temperature controller auto control, ECO Power Monitor						
	Power Regeneration System	Regenerative power is used when the spindle and feed axes decelerate to reduce energy waste.						

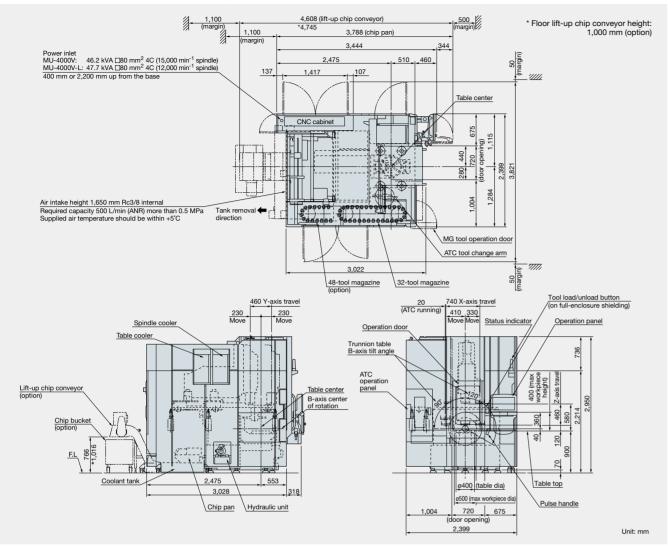
#### OSP-P500M/S optional specifications

	ive optional specific				DT.		T	DT	AOT			A.14	41		ът I	<b>D</b>	T	DT 4	OT
Item	Kit Specs		ML D	E	от D	E	DT D	E	AOT D	Item	Kit Specs	NN E	ML D	AC E		D' E	_	DT A	
Digital Twin					U				U	Monitoring			D	E	U	<b>E</b>	U		U
Virtual Machining			1	T							acat								
vii tuai wachining						(VE)	(VD)	(VE)	(VD)	One-Touch Spreadsheet Collision Avoidance System									
Quick Modeling		-	-	+		•	•	•	•	Real 3-D Simulation	System			•	•	•	•	•	•
Quick Wodening						(VE)	(VD)	(VE)	-	Simple load monitor	Spindle overload monitor	•	•	•	•	•	•	•	•
OPC UA for Machine	Foolo	-	-	-		•	•	•	•	NC operation monitor		•	•	•	•	•	•	•	•
OSP API KIT	loois	-	-	-		•	•	•	•	Status indicator	Hour meter, workpiece counter	-	•	•	-	-	•	-	-
Interactive functions						-	-	-	-	Tool breakage no-loa	ddataation		•		•		•		•
	ICE M (w/ Beel 2 D simulation)		1			1	1			MOP-TOOL			•		-		-		-
	IGF-M (w/ Real 3-D simulation)	-	-	•	•			•	•		Adaptive control, overload monitor								
Interactive MAP (I-MA	P)	-	-	•		•	•	•		Al machine diagnostic									
Smart OSP Operation				-	•	-	-	-	•	Machine Status Log									
Programming										Cutting Status Monit									
Operation buffer 10ME	3		•	•	•	•	•	•	•		M-gI+(cutting condition search)								
Program notes (MSG)		•	•	•	•	•	•	•	•	Feed axis retraction									
Auto scheduled progra	am update	•	•	•	•	•	•	•	•	Tool retract cycle									
Block skip; 9 sets				-						Automation / unatten									
Program branch; 9 set		L	<u> </u>	-		-	<u> </u>	_		Auto power shut-off	M02 and END alarms,		•	•		•	•	•	•
Coordinate system select (Std: 20 sets)	100 sets	•		•		•		•			work preps done $\rightarrow$ OFF								
select (Std. 20 sets)	200 sets		•	-	٠		•		٠	Warm-up (calendar t									
	400 sets									External program	Button, rotary switch								
Helical cutting		•	•	•	•	•	•	•	•		Digital switch, BCD (2-digit, 4-digit)								
3-D circular interpolati	on									Connection with	Robot, loader I/F								
Synchronized Tapping	I				•			•	•	automated devices	Stacker crane I/F								
Arbitrary angle chamfe	ering										FMS link I/F								
Cylindrical side facing										High-speed, high-pre	ision								
Tool max rotational sp	eed setting									AbsoScale detection	X-Y-Z axes								
F1-digit feed	External switch type, parameter type									5-Axis Auto Tuning System									
Programmable travel I	imits (G22, G23)	•			•		•	•	•	Dynamic displacement compensation						•			
Slope machining	Туре I, Туре II									0.1 µm control (linea	axis commands)								
Dynamic fixture offset	•									Hyper-SurfaceI 3 li	near axes, 3 linear axes + 2 rotary axes								
Gear Machining Packa	age									5-axis machining									
Hobbing and skiving										Tool center point cor	trol I (w/ tool tilt comp)								
Dynamic Tool Load Co	ontrol									Tool tilt command									
3-D tool compensation	n									Cutting point comma	nd								
Drawing conversion	Programmable mirror image (G62)				•				•	Tool side machining									
, s	Enlarge/reduce (G50, G51)									Leading edge offset									
User task	Common variables 1,000, 2,000 pcs									Tool side offset									
	G-code macros: 80 sets added			1						Tool-axial tool length	comp								
	I/O variables (16 each)										ool feed (tool-axial), manual tool feed (right angle)								
Sequence stop		•	•	•	•	•	•	•	•		tandard coordinate system manual feed								
Sequence return	Mid-block sequence return		•	1	•		•		•	Tool center point manual feed									
	Includes input restriction	•	•	•	•	•	•	•	•	ECO suite plus									
Tool life management	Includes warning	•	•	•	•	•	•	•	•	ECO Power Monitor	On-machine wattmeter								
External I/O communic	1 -	-				-	-	-		Spindle Power Peak									
RS-232C connector											ace of consumed electricity								
DNC connection	DNC-T3, DNC-B, DNC-DT			1						Other									
Bito connocion	DNC-C/Ethernet									Simultaneous 5-axis	kit								
Gauging			-	1						5-Axis Auto Tuning S									_
Auto tool length offset	/breakage detection									NC Gage kit	, int								_
In-magazine tool break			-	+						Circuit breaker									
Auto Workpiece Gaug		-	-	-		-	-			OSP-VPSI (Virus Protection System)									
Manual gauging (w/o		•	•	•	•	•	•	•	•					-					_
		-	-	-	-	-	-	-	-										
NC Gage	uch sensor, touch probe required)	-	-	+		-	-				OT: Advanced One-Touch IGF-M kit, E								
INO Gaye				1		1	1			DT AOT: Digital Tw	in Advanced One-Touch IGF-M, E: Eco	onom	iy, D:	Delu	xe				

VE and VD kits are also equipped with the Digital Twin on PC function, allowing running from a PC \* With AbsoScale detection specs, ball screw wear detection is possible

Specifications, etc. are subject to change without notice.

### Dimensional and installation drawings



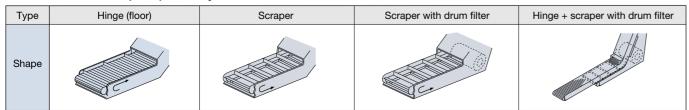
Recommended chip conveyors (Please contact an Okuma sales representative for details.)

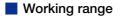
 $\bigcirc$ : Recommended  $\triangle$ : Conditionally recommended

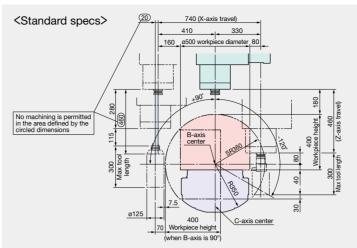
Workpiece material		Steel	Cast iron	Aluminum / Nonferrous	Mixed (general use)
Chip shape					
In-machine	Chip flusher (standard)	—	O(wet)	0	—
III-machine	Coil (option)	0	◯(dry-wet)	_	0
	Hinge (floor)	0	—	—	∆*1
Off-machine	Scraper	—	◯(dry)	—	—
(option)	Scraper with drum filter	_	$\bigcirc$ (wet) with magnet	∆*2	_
	Hinge + scraper with drum filter	∆*3	$\triangle$ (wet)*4	O O	0

\*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







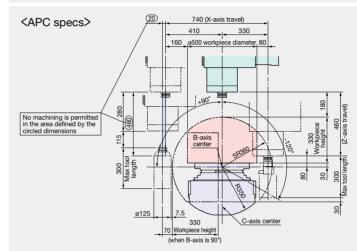
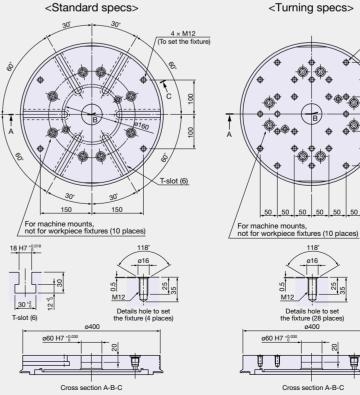
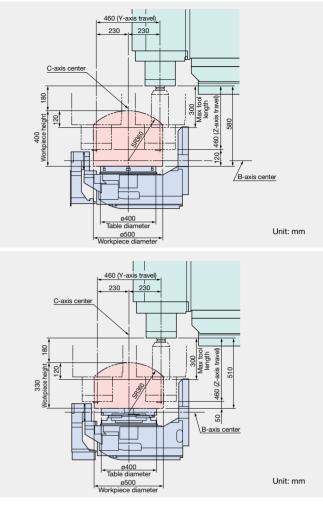


Table dimensions





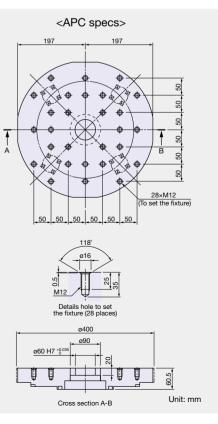














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