

**Providing a Large Machining Space in a Compact Footprint While
Combining High Accuracy and High Productivity with Decarbonization
Green-Smart Machine for Accelerating the Adoption
of 5-axis Machining Center
MU-500VIII**

Okuma Corporation has developed the MU-500VIII 5-axis machining center (MC), a Green-Smart Machine that **provides a large machining space in a compact footprint** while also **combining high accuracy and high productivity with decarbonization (energy saving)**.

In response to the growing global demand for decarbonization and process-intensive machining, Okuma has developed a compact, easy-to-use 5-axis MC capable of machining a maximum workpiece size of 700 mm (diameter) x 500 mm.

With the same space-saving footprint, operability, high accuracy, and high machining capacity as a 3-axis vertical MC, 5-axis machining that combines both high accuracy and energy savings is now more accessible than ever. Okuma uses single-chucking multi-face machining to enable high-accuracy, process-intensive machining for enabling customers to improve their productivity and profitability.

As a Green-Smart Machine equipped with the OSP-P500, a new generation CNC, this product is expected to contribute to solving the social issues facing the manufacturing industry (shrinking workforce, skill transfer issues, and decarbonization).

- ◆ **World's highest level of accuracy and stability for a 5-axis MC**
Thermal deformation over time: 7 μm max. (for ambient temperature change of 8°C)
- ◆ **Combining high productivity and high accuracy with decarbonization at a high level**
Power usage reduced by 12% (Okuma estimate)
- ◆ **Providing a large machining space in a compact design**
Provides 68% more machining space (compared to the same series machine with a maximum workpiece diameter of 600 mm)
Minimizes floor space expansion for facilitating adoption of 5-axis MCs
- ◆ **Provides innovative HMI (human-machine interface)**
Even beginners unfamiliar with machining programs can perform 5-axis machining and multi-face machining from program creation to first-part machining in one day

Compared to the MU-400VII 5-axis MC with a maximum workpiece diameter of 600 mm, the new MU-500VIII is a higher-end model and supports a maximum workpiece diameter of 700 mm for enabling significantly more machining space. The MU-1000V series (MU-4000V/5000V/6300V/8000V), which offers even higher process-intensive machining capability, and the MU-500VIII, which has a space-saving footprint and is easy to install, are two 5-axis MC model lineups that will meet the growing demand for labor saving through process-intensive machining.

Background

Recently, the demand for decarbonization throughout the entire supply chain in the manufacturing industry, coupled with soaring energy prices, has further strengthened the push towards greater decarbonization and energy conservation. Also, as labor shortages grow worse, demand for labor saving measures and automation is increasing together with demand for labor saving through process-intensive machining.

In this environment, not only in strong industries such as semiconductor manufacturing equipment, energy, and EVs, and the aircraft industry which is recovering and growing, but also in the manufacturing industry in the future, the demand for lower costs, shorter delivery time, and higher quality, in addition to decarbonization, will increase further.

The manufacturing industry, which is facing such social issues, requires compact, easy-to-use, and easy-to-install 5-axis MCs that can easily replace existing vertical MCs.

Aim of Development

The new MU-500VIII combines high accuracy and decarbonization (energy saving) and is more compact than 5-axis control MCs in the same class for providing a large machining space and high machining capacity.

The MU-500VIII is equipped with the OSP-P500, a next-generation CNC featuring revolutionary ease of use that enables anyone to easily perform advanced 5-axis machining and the Digital Twin On Machine functionality which enables front-loading for even better productivity.

In response to customer needs for productivity improvements and decarbonization, Okuma has developed the MU-500VIII as an introductory machine for customers who are integrating processes in 5-axis machining for the first time. The machine has been developed based on the following concepts.

- (1) Green-Smart Machine where the machine autonomously achieves both high accuracy and decarbonization (energy saving)
- (2) Large machining space that supports a wide variety of workpieces while minimizing footprint
- (3) 5-axis MC with powerful cutting and high accuracy rivaling vertical MCs
- (4) Minimizes operator burden and provides maximum ease of use
- (5) Enables advanced 5-axis machining to be easily performed by anyone and allows the fastest possible production ready time

Features and implementing technology

- (1) **Green-Smart Machine where the machine autonomously achieves both high accuracy and decarbonization (energy saving)**
 - Decarbonization results from using Green-Smart Machines with OSP-P500 **12% reduction** in power usage compared to equivalent machines without energy-saving features (Okuma estimate)

- **Thermo-Friendly Concept**, an intelligent technology that allows machines to autonomously and stably maintain a high level of accuracy
Achieves the world's highest level of accuracy stability for a 5-axis MC under typical factory conditions

Machining dimensional change over time: **7 µm maximum**

Because the machine does not require a temperature-controlled room to maintain a constant temperature, plant facility costs and power usage can be significantly reduced.

This also greatly reduces the operating time required for warm-up operation and dimensional corrections for further cutting power usage

- **ECO suite plus** energy-saving system installed as standard
ECO Idle Stop intelligent energy-saving function based on the Thermo-Friendly Concept is used to enable the machine itself to determine whether cooling is necessary and to perform an idling stop of the cooling system while maintaining high accuracy.

High-accuracy 5-axis machining is combined with reductions in CO₂ emissions for providing strong support for factory decarbonization.

- **Sludgeless Tank** (optional specification) for drastically reducing the frequency of coolant tank cleanings

The sludgeless Tank controls the flow of coolant in the tank and eliminates sedimentation for automatically and efficiently collecting the sludge contained in coolant.

Sludge recovery rate of 96% (actual data when using aluminum workpiece material)

No coolant tank cleaning is required for three years, and no coolant changing is required for three years (actual results at Okuma facilities)

This feature dramatically reduces the time and labor required to clean the coolant tank, which used to rely on manual labor and required the machine to be stopped.

This enables a longer service life for coolant, which becomes waste fluid after use, for contributing to reduced environmental impact.

- Stabilizes accuracy even in 5-axis machining centers, which have more complex structures

5-Axis Auto Tuning System (optional specification) maximizes the accuracy of 5-axis machines in less than 10 minutes.

(2) Large machining space for a wide variety of workpieces while minimizing footprint

- Compact machine that can be installed in any space for machining workpieces with a maximum **diameter of 700 mm x height of 500 mm**

Compared to the MU-400VII 5-axis MC with a maximum workpiece diameter of 600 mm, the MU-500VIII minimizes its footprint (34% larger) while supporting a maximum workpiece diameter of 700 mm for further **expanding machining space by 68%**.

Compact footprint similar to a vertical machining center for enabling easy installation in confined spaces

- Provides the largest machining space in its class and can easily handle 5-axis machining of large-diameter workpieces (700 mm)

X-axis travel: **1,050 mm**, Y-axis travel: **560 mm**, Z-axis travel: **460 mm**

(3) 5-axis control machining center with powerful cutting and high accuracy rivaling vertical machining centers

- Lineup of powerful spindles for heavy-duty cutting of a wide range of materials and reduced machining time

Maximum rotational speed: **15,000 min⁻¹**, Maximum output: **22 kW** (optional specifications)

Maximum chip volume: **672 cm³/min** (workpiece material: steel S45C, end milling)

- Uses a high-rigidity mechanical structure that provides stable support of heavy cutting loads

High-rigidity double-column structure with a proven track record in double-column machining centers

High-rigidity trunnion table with double-ended support that firmly supports heavy workpieces up to **400 kg**

- High-accuracy process-intensive machining by single-chucking multi-face machining for significantly improving productivity

Throughput improved by 35% compared to 3-axis vertical MCs (trial calculation using sample workpieces)

Reduces time-consuming workpiece setups, thereby drastically shortening production lead times.

Also, eliminates workpiece misalignment caused by setup changes for enabling high-accuracy multi-face machining.

(4) Minimizes operator burden and provides maximum ease of use

- Ease of use that enables 5-axis machining using the same operations as a vertical machining center

Trunnion table with excellent workpiece visibility during machining

- User-friendly machine structure that allows setup work in a comfortable posture

Table with excellent accessibility and that is easy to reach

Distance from machine front to table center: **495 mm**

- Uses new design with a seamless blend between man and machine

Ergonomically designed work spaces for maximum ease of use by customers

(5) Enables advanced 5-axis machining to be easily performed by anyone and allows the fastest possible production ready time. Incorporates the OSP-P500 new-generation CNC

- With **Smart OSP (Okuma Sampling Path Control)** operation, even beginners unfamiliar with machining programs can perform advanced 5-axis machining and multi-face machining from program creation to first-part machining in one day at the earliest.

Innovative HMI (human-machine interface) enables anyone to easily determine the machining process by simply following the guidance and importing drawing information

- **Innovative Digital Twin feature** for significantly reducing machining preparation time

As a developer of both machines and CNCs, Okuma had the unique capability to

make these two Digital Twins where information (data) and the actual object match.

- **Ultra-fast (1/1,000 of actual machining time)** and ultra-accurate (**error of 1% or less**) simulations can be implemented on a CNC at the machining site and on a PC in the office for quickly formulating high accuracy production plans.

Digital Twin on Machine

Ultra-high-speed and ultra-high-accuracy simulations are performed on the actual CNCs on site to minimize machining preparations. This enables immediate machining for significantly increasing machine utilization and productivity.

Digital Twin on PC

The ability to perform the same verification work on an office PC as on the actual machine allows for accurate front-loading for further improving productivity.

Highly accurate pre-verification minimizes machine downtime without trial-and-error processes.

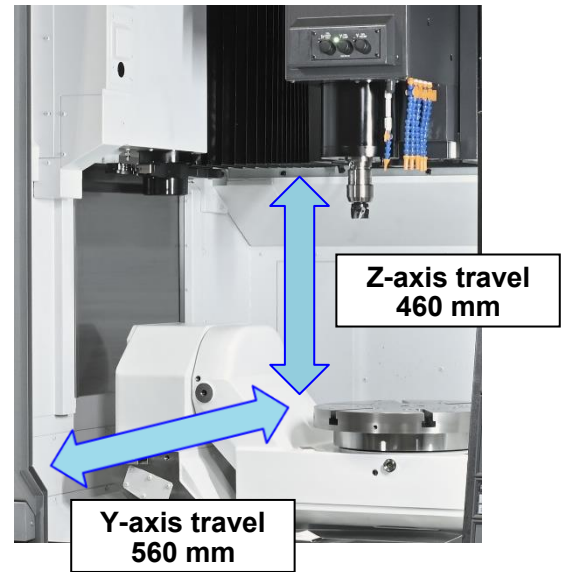
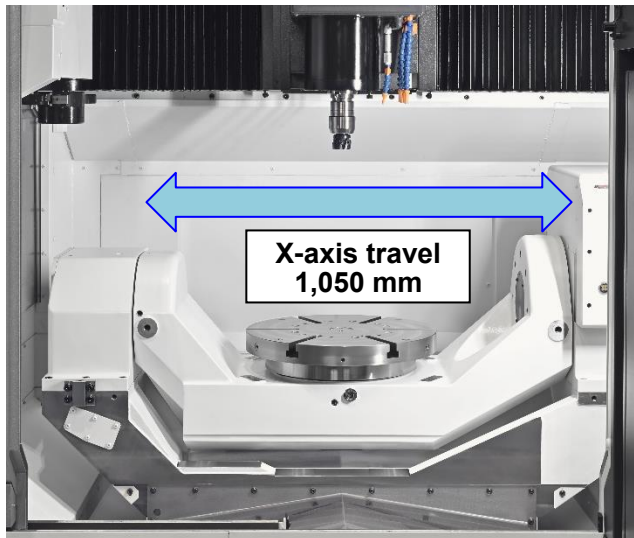
- **Robust security** for protecting machine operations and valuable assets such as programs from cyberattacks

Provides safe and secure Digital Twin environment from the standpoints of defense, protection, and recovery and accumulates customers' expertise

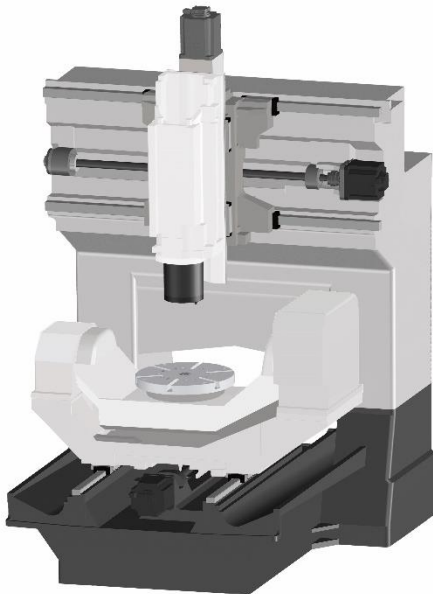
- **AI machine diagnostics** to check for signs of failure based on changes in machine status

Easy-to-use machine status visualization for preventing unexpected production losses due to machine malfunctions

Large Machining Space

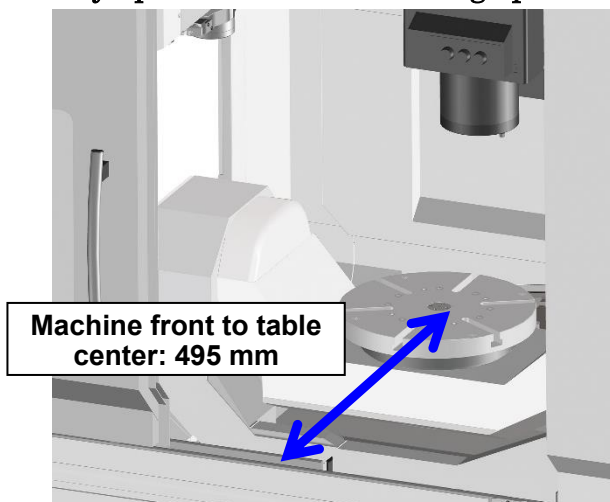


High Rigidity Mechanical Structure



High-rigidity double-column structure with a proven track record in double-column machining centers

Easy operation for minimizing operator burden



Excellent accessibility to table



Clear visibility during machining

Product Specifications

* The descriptions in brackets [] indicate optional specifications.

Item		MU-500VIII
Travel	X-axis travel	1,050 mm
	Y-axis travel	560 mm
	Z-axis travel	460 mm
	A-axis travel	+20° to -110°
	C-axis travel	360°
Table	Table dimensions	500 mm diameter
	Maximum workpiece dimensions	700 (dia.) × 500 (height) mm
	Maximum load capacity	400 kg
Spindle	Maximum speed	Standard 8,000 min ⁻¹ [15,000 min ⁻¹ , 20,000 min ⁻¹ , 25,000 min ⁻¹ , 35,000 min ⁻¹]
	Maximum output (10 min/continuous)	11/7.5 kW [22/18.5 kW, 30/22 kW, 15/11 kW, -/15 kW]
	Maximum torque	198/135 N·m (5 min/continuous) [199/146 N·m (5 min/continuous), 57/42 N·m (10 min/continuous), 29.1/19.9 N·m (10 min/continuous), 4 N·m (continuous)]
	Tapered bore	7/24 taper No.40, [HSK-A63, HSK-F63]
Feed rate	Rapid traverse	X-axis: 40 m/min, Y-axis: 40 m/min, Z-axis: 32 m/min
		A-axis: 14,440°/min (40 min ⁻¹) C-axis: 18,000°/min (50 min ⁻¹)
ATC	Tool magazine capacity	20 tools [32 tools, 48 tools, 60 tools]
	Maximum tool diameter	125 mm (with adjacent tool: 90 mm)
	Maximum tool length	300 mm
	Maximum tool weight	8 kg
Machine size	Machine height	3,045 mm
	Required floor size (width x depth)	2,515 × 3,231 mm (tool magazine capacity: 20, 32, 48) [2,515 × 3,718 mm (tool magazine capacity: 60)]
	Machine weight	10,000 kg

End